Washington State
Department of Transportation

2019 Washington State RAIL SYSTEM PLAN

DECEMBER 2019

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Chapter 1 Introduction

1.1 Background and context

Rail is an integral part of the statewide multimodal transportation system that keeps people and businesses moving. Serving freight and passengers, the rail system provides efficient transportation critical to maintaining our economy, environment and quality of life. The Washington State Rail Plan comes during a time of change for rail transportation in the state, with the rail transportation system facing important near and long-term challenges that include:

- Addressing issues related to the December 2017 Amtrak Cascades derailment at DuPont, WA
- Meeting the increasing demand for passenger and freight rail services in Washington on the private rail network over which passenger and freight trains operate
- Developing more efficient and effective connections between rail and other modes of transportation
- Ensuring the sustainability of Washington's public and private short line railroads that face infrastructure investment needs in order to preserve these important services to communities

The Washington State Rail Plan is a single, integrated plan for both passenger and freight rail

The Washington State Rail Plan is a single, integrated plan for both passenger and freight rail and is the planning foundation for future actions. To address rail system challenges and identify opportunities for improvement, the Washington State Department of Transportation's (WSDOT) plan describes the rail system and the state's interest in it, identifies potential actions to improve the rail system, and recommends strategies consistent with Washington's' transportation policy goals of economic vitality, preservation, safety, mobility, environment, and stewardship.

It's important to note that planning documents such as this represent a snapshot in the continuous improvement of the rail system in Washington. For example, deliberations, obligations and the needs of the state's rail program in response to the December 2017 Amtrak Cascades derailment, passage of I-976, and transportation impacts resulting from potential Snake and Columbia river dam breaching are still being assessed as this plan is being written.

NOTE: These issues could have significant implications to the state's rail system and WSDOT may need to perform a technical update as appropriate prior to the next five-year plan update cycle.

1.2 Vision and goals for Washington's rail system

The vision and goals set the direction for the plan. They helped identify and prioritize needs. The objectives and implementation strategies describe how the plan will achieve the vision and goals by identifying and recommending future state investment in Washington's passenger and freight rail system.

Vision

WSDOT collaborated with freight and passenger rail stakeholders while developing the 2014 State Rail Plan to create a vision statement for the rail system that is still in place today.

This vision provides a blueprint for future rail planning and investment activities. A comprehensive, multimodal planning approach, which considers rail along with highways and public transportation and incorporates land use considerations, is essential to achieving this vision.

Vision for Washington's Rail System

As an integral part of Washington's multimodal transportation network, the rail system provides for the safe, reliable and environmentally responsible movement of freight and passengers to ensure the state's economic vitality and

Transportation policy goals

Washington has six transportation system policy goals defined by statute.[1] These goals are used to guide the planning, operation, performance of, and investment in the state's transportation system. WSDOT's activities to implement the rail vision are guided by these policy goals.

Economic Vitality: To promote and develop transportation systems that stimulate, support, and enhance the movement of people and goods to ensure a prosperous economy.

Preservation: To maintain, preserve and extend the life and utility of prior investments in transportation systems and services.

Safety: To provide for and improve the safety and security of transportation customers and the transportation system.

Mobility To improve the predictable movement of goods and people throughout Washington, including congestion relief and improved freight mobility.

Environment: To enhance Washington's quality of life through transportation investments that promote energy conservation, enhance healthy communities and protect the environment.

Stewardship: To continuously improve the quality, effectiveness and efficiency of the transportation system.

Performance measures

The rail performance measures described and evaluated in Chapters 3 through 5 are aligned with WSDOT's Practical Solutions Performance Framework[2]. The Performance Framework supports performance-based decision making and identifies measures for the six transportation policy goals. Sub-policies and measures have been identified for the Mobility policy goal and are still under development for the other five policy goal areas. The rail performance measures incorporated in this plan are aligned with the three sub-policies and measures for Mobility Performance Framework:

- Accessibility: passenger rail multimodal connectivity analysis presented in Appendix B measures multimodal accessibility for Cascades stations and supports the accessibility sub-policy goal;
- Predictability: on-time performance metrics for passenger rail services presented in Chapter 4 measure travel reliability and supports the predictability sub-policy goal;
- Efficiency: rail system capacity analysis discussed under Chapter 5 assesses system utilization and supports the efficiency sub-policy goal.

[1] RCW 47.04.280

[2] Practical Solutions Performance Framework: https://www.wsdot.wa.gov/about/practical-solutions/performance-framework

Other rail performance measures discussed in Chapters 3 through 5 such as safety performance and system conditions directly support the Safety and Preservation transportation policy goals.

Statutory requirements

There are several state and federal requirements that pertain to rail planning in Washington. This State Rail Plan is a single plan that meets all these requirements, is integral to the Washington State Department of Transportation's rail program, and is consistent with other state and regional transportation planning documents.

The rail performance measures described in this plan are aligned with WSDOT's Practical Solutions Performance Framework

The federal requirements for a state rail plan are outlined in 49 USC 22705 and 49 CFR 226.15 which implement the Passenger Rail Investment and Improvement Act of 2008 and the FAST Act of 2015. These federal acts require states to take a more active role in setting statewide rail policy and complete a state rail plan that includes inventories and proposed improvements for freight and passenger rail systems, an examination of how freight and passenger systems function together, and a rail investment plan.[3]

There are four separate state requirements for WSDOT to develop rail plans:

- Freight Rail Plan required in RCW 47.06.080
- State Rail Plan required in RCW 47.76.220
- Intercity Passenger Rail Plan required in RCW 47.06.090
- Rail Passenger Plan required in RCW 47.79.040

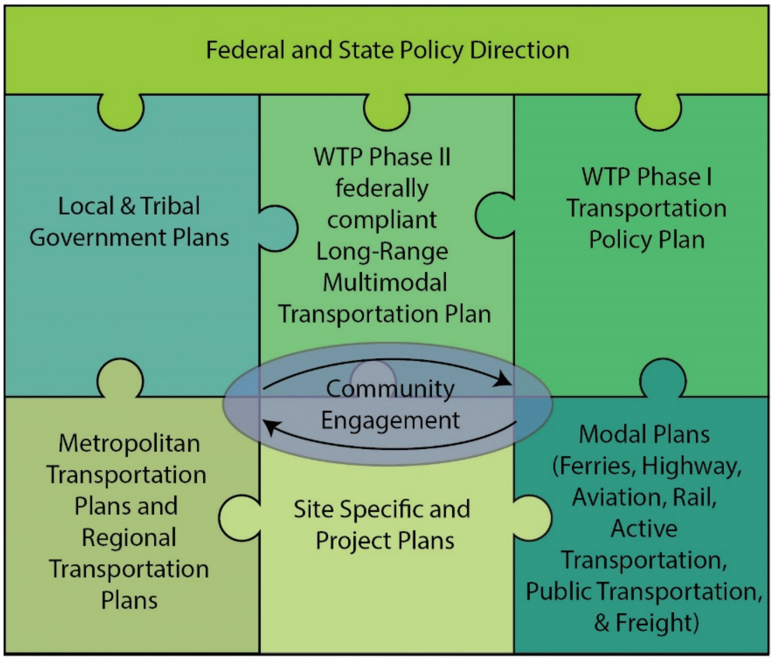
1.3 Transportation planning in Washington

The transportation planning process is not a straight line with one plan directing another plan to take action. Instead, it can be thought of as a puzzle, with multiple partners each providing a piece that together forms the overall planning process, as illustrated in Exhibit 1-1. WSDOT and its partners agree on the need for an integrated process based on collaboration with each other and the public to arrive at planning and investment decisions. Federal law requires statewide planning to be integrated, but does not define integration. Jurisdictions in Washington achieve integration in their planning processes through sharing the same:

- Goal to move people and goods on the multimodal transportation system.
- Purpose to demonstrate to the public how they will implement policy direction.
- Commitment to coordinate plans with each other.

[3] FRA, Overview, Highlights and Summary of the Passenger Rail Investment and Improvement Act of 2008 http://www.fra.dot.gov/eLib/details/L02692

Exhibit 1-1 Transportation planning integration



1.4 Alignment with planning activities

WSDOT's 2014 state rail plan, Washington State Rail Plan 2013-2035, provided a strategic direction for public investment in the state's rail transportation system. It included 5- and 20-year funding strategies that met federal and state requirements. The plan established priorities for determining which freight rail investments should receive public support. It also guided coordination with Oregon and British Columbia to continue to grow intercity passenger rail service. Since that plan's completion, much progress has been made to address the issues and take action on recommendations. Below are examples of completed activities:

- **State-owned short line railroad:** In 2015, WSDOT completed the Palouse River and Coulee City Rail System Strategic Plan to outline the vision and goals for the system and to communicate what policies and funding are needed to achieve the goals.
- **Railroad condition:** In 2015, WSDOT completed the Short Line Rail Inventory and Needs Assessment. Needs identified in that study are reported in Chapter 4.
- **Performance management:** In 2016, WSDOT developed the Amtrak Cascades Performance Database to monitor and track service outcomes contractually negotiated with Amtrak, BNSF and Sound Transit related to on-time performance and travel times. Amtrak Cascades service delays and issues are discussed in Chapter 4, and Cascades on-time performance is reported in Chapter 5.
- **Station stop policy:** With advisory committee and stakeholder participation, WSDOT and the Oregon Department of Transportation developed a corridor-wide policy on station stops for Amtrak Cascades service. The Station Stop Policy was formally adopted on June 1, 2016. The policy and associated guidance document establishes a process and approach for outlining the data and facts needed to determine the value and benefit of proposed station stop changes to

the Amtrak Cascades corridor.

- **Fleet Management Plan:** In 2017, WSDOT completed the Amtrak Cascades Fleet Management Plan which evaluates passenger rail service goals of increasing service, improving reliability, and reducing journey times from an equipment perspective. The plan addresses the equipment needed to deliver passenger service over the next 20 years, the resources required to sustain the equipment, and the capacity of equipment maintenance facilities.
- **Program analysis:** In 2017, WSDOT completed the 2017-2027 Grain Train Strategic Plan that outlines the vision and goals for the program as well as identifying operational improvements and policy changes.
- **Asset Management Plan:** WSDOT completed an asset management plan for WSDOT passenger and freight rail assets in 2019 as part of an agency-wide asset management initiative. The plan addresses the current status, condition and performance of rail assets, risk management, investment options for managing the assets, and long-term funding strategies. Findings from the asset management plan fed into the development of Chapters 4 and 7.

The State Rail Plan is also aligned with other state and regional transportation planning activities.

- **Long-range statewide transportation planning**: In 2018, WSDOT completed the Washington Transportation Plan, Phase 2-Implementation 2017-2040, which is the long-range statewide transportation plan required under Section 135 of Title 23. Chapter 6 includes recommendations to address these Action Items related to rail activities:
    - Support ways to help jurisdictions, transportation asset owners, and transportation service providers prepare for, respond to, and become resilient to emergencies and disasters.
    - Research, evaluate, adapt to, and deploy technologies and innovations in all modes; share best practices.
    - Work to achieve better travel time reliability and door to door multimodal connections for people of all backgrounds and abilities through continued application of practical solutions.
- **Freight planning:** In 2017, WSDOT completed the Freight System Plan, which includes trends, issues, needs, and strategies for the rail system. Key findings and recommendations from Freight System Plan informed the identification of trends, issues, and needs in Chapter 4 and fed into the development of rail investment plan in Chapter 7.
- **Human services transportation planning:** WSDOT published the Statewide Human Services Transportation Plan in 2013 and is currently working on an update. This work informed the identification of trends, issues, and needs in Chapter 5 - Station Access and also Exhibit B.
- **Intercity bus planning**: WSDOT is updating the study for the Travel Washington Intercity Bus Program, which provides bus service to rural residents so they can connect to major transportation hubs and urban centers. This work informed the identification of trends, issues, and needs in Chapter 5- Multimodal Connectivity to Passenger Rail.

- **Active transportation planning**: WSDOT is currently developing an Active Transportation Plan that provides a statewide strategy for bicycle and pedestrian facilities. This work helped identify trends, issues, and needs in Chapter 5 - Multimodal Connectivity to Passenger Rail.
- **Metropolitan and regional planning:** WSDOT reviewed existing metropolitan and region transportation plans and identified key rail-related issues that were discussed during community outreach. In addition, WSDOT reached out to each MPO and RTPO and offered to provide presentations at regularly scheduled meetings. Key issues from these meetings and from the metropolitan and regional plans informed the identification of trends, issues, and needs in Chapters 3, 4, and 5.

1.5 Plan development

WSDOT reached out to each MPO and RTPO to discuss key issues in this plan during their regularly scheduled meetings.

Planning and investment in the state's rail system is guided by the vision of the Washington State Department of Transportation for a safe, sustainable and integrated multimodal transportation system. The State Rail Plan is consistent with the Transportation System Policy Goals adopted by the state legislature and with statewide and metropolitan planning. Combined, these policy frameworks provide the context for how the state approaches its involvement in the rail system. They were also instrumental in forming the vision statement that drove the technical work completed as part of this rail plan. This plan incorporates vision, policy guidance, and recommendations from previous planning efforts including the Cascades Rail Corridor Management Workplan (2013), Washington Transportation Plan 2040 and Beyond, Washington Transportation Plan Phase 2 – Implementation 2017-2040, 2017 Washington State Freight Plan, and the Sound Transit 2014 Regional Transit Long-Range Plan.

WSDOT developed this plan consistent with the agency's Community Engagement Plan. The term community includes partners (stakeholders/agencies/governments) and the public, who are invited to share their perspectives after reviewing this draft plan. The rail community includes those that own portions of the rail system (railroads), those that provide service (such as Amtrak and Sound Transit[4]), those that use the rail system (passengers and freight shippers), those that manage transportation systems that connect to the rail (federal, tribal, state, and local governments), and those affected by rail. WSDOT reached out to this community by attending meetings and events of organizations and groups and conducting interviews. Partners include groups that will help implement the plan and include: freight rail industry representatives, passenger rail representatives, metropolitan planning organizations, regional transportation planning organizations, cities, counties, ports, tribal governments, federal agencies, and state agencies. WSDOT will work with this community to implement strategies and take actions identified in this plan.

Major themes from stakeholder engagement during development of the plan include:

- Rail safety is a high priority for many, including trespassing and grade crossing incidents, passenger train safety, and the movement of hazardous materials.
- Local communities are interested in additional passenger rail service, more trips and new

[4] The formal name of Sound Transit is Central Puget Sound Regional Transit Authority

stations for existing services, as well as new routes.

- Trains occupying grade crossings for extended periods, creating a barrier for travel, is a concern in affected communities.
- Short line railroad infrastructure investment to preserve and maintain existing rail lines is also a common concern.

Rail safety is a high priority for many, including trespassing and grade crossing incidents, passenger train safety, and the movement of hazardous materials.

Preservation work on the Palouse River and Coulee City (PCC) rail system

Chapter 2 Rail system overview

Washington's rail system is a central part of a multimodal transportation strategy that provides choices, supports broad-based economic growth and offers an environmentally efficient transportation option. The rail network is categorized into freight services and passenger services. This categorical division is reflected throughout the structure of this document. Yet, both freight and passenger services share much of the same infrastructure and operate as an integrated rail system.

This chapter provides an overview of the rail system in Washington. It describes rail infrastructure and services, the institutional structure that governs rail, and funding programs administered by the state in the last ten years. Additional detail on the rail system and the issues associated with each element can be found in Chapters 3, 4, 5 and in the Appendices.

2.1 Rail system elements

The rail system is part of a larger transportation network that includes many transportation modes (roadway, air and water) to move people and goods. Rail can play different roles in these trips by serving as the primary mode of transportation, providing only a single leg of the journey, or acting as a mode that expands transportation choice and provides resilience.

Likewise, the rail system is composed of different parts, or elements, each with a specific role and purpose. This system connects communities within Washington to each other and to other communities throughout North America and the world.

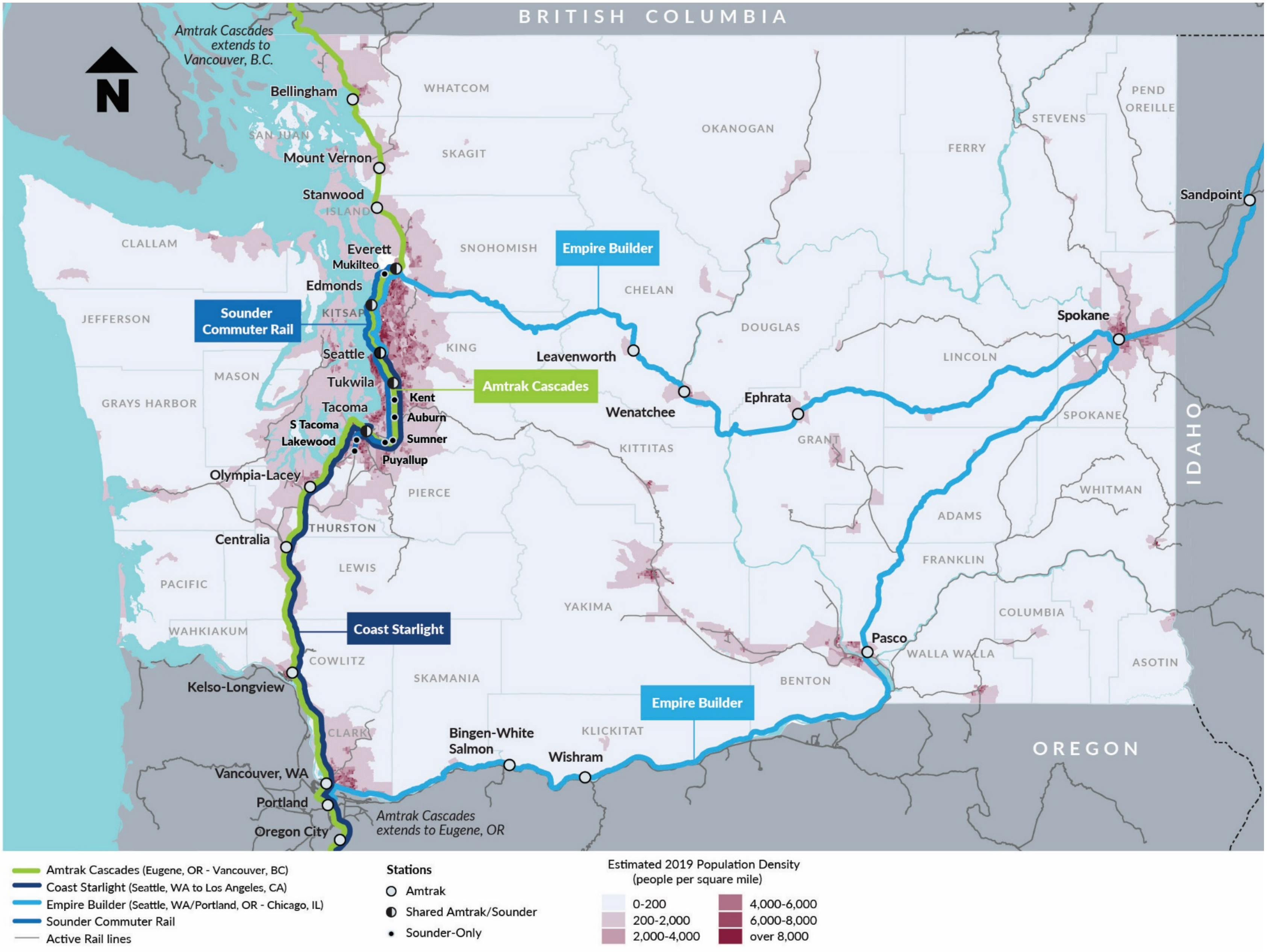
The Rail System in Washington state includes two Class I and twenty-seven Class III (short line) railroads that operate on approximately 3,200 route miles composed of:

- ***Class I = 1,900 miles***
- ***Class III = 1,300 miles***

The rail system in Washington consists of both freight and passenger rail elements. The freight rail system consists of an expansive network of main lines, branch lines, yards and terminals. The passenger rail system consists of long distance, intercity and commuter rail services operating mostly on freight rail lines. Exhibit 2-1 shows the rail system by owner in Washington, and Exhibit 2-2 shows the passenger rail services in the state.

Exhibit 2-1 Washington state rail system by owner

378 **Exhibit 2-2 Primary rail corridors used for passenger rail services in Washington state**



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2.2 Freight services

Freight railroads are commonly categorized by their operating revenue, a classification system used by the federal Surface Transportation Board (STB). The three classes of railroads are as follows:

Class I: Annual operating revenue in excess of $489.9 million. BNSF Railway and Union Pacific are the only Class I railroads operating within Washington. These two railroads provide the majority of rail service in terms of traffic handles and operate the majority of freight rail lines.

Class II: Annual operating revenue between $39.2 million and $489.9 million. Class II railroads are also commonly referred to as regional railroads by the Association of American Railroads (AAR). There are no Class II railroads operating in Washington.

Class III: Annual operating revenue of less than $39.2 million. Class III railroads are commonly referred to as short line railroads. These rail carriers connect communities to the national rail system. Switching and terminal railroads are a subcategory of Class III railroads that provide pick-up or delivery service within a specific area. Currently there are 27 short lines in Washington – 18 local and seven switching and terminal railroads. Short line railroads provide short distance connectivity to Class I rail lines across Washington.

The two Class I railroads and 27 Class III (short line) railroads operate more than 3,300 miles of track in Washington.

Class I railroads

BNSF Railway 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.

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

Class III railroads

While the Class I main line railroads provide the primary arteries for the movement of goods throughout Washington, short line railroads provide important collector/distributor services for the larger railroads and local rail services for shippers. While some lines carry high volumes of freight, others have struggled as the industries they serve have declined, moved, shifted to other transportation modes, or disappeared completely. Some of the short lines serve Washington's agricultural industries that would otherwise be inaccessible by rail. Even though short lines carry a small share of total rail traffic in Washington, they comprise about 40 percent of all railroad mileage in the state. The short lines in Washington combined have over 1,300 route miles of track. The mileage of individual short line railroads varies from one route mile to over 150 route miles. Exhibit 2-3 shows the short line railroads in Washington, including the mileage of rail owned.

Short line rail ownership also varies. Nationally, approximately half of the short line railroads are owned by holding companies, such as Genesee & Wyoming and Watco. These companies own and manage

419 **Exhibit 2-3 Short line railroad operators in Washington state**

Name	Parent Company	Route Miles Operated in Washington
Ballard Terminal Railroad	Ballard Terminal	3
Eastside Freight Railroad	Ballard Terminal	14
Meeker Southern Railroad	Ballard Terminal	5
Tacoma Rail	City of Tacoma	94
Central Washington Railroad	Columbia Basin Railroad Company	71
Columbia Basin Railroad	Columbia Basin Railroad Company	106
Columbia-Walla Walla Railway	Columbia Rail	82
Olympia & Belmore Railroad	Genesee & Wyoming	5
Cascade & Columbia River Railroad	Genesee & Wyoming	145
Puget Sound & Pacific Railroad.	Genesee & Wyoming	158
Kennewick Terminal Railway	Columbia Rail	2
Mount Vernon Terminal Railway	Mount Vernon Terminal Railway	3
Spokane, Spangle and Palouse [a]	Omaha Track	87
Kettle Falls International Railway	OmniTRAX	36
Columbia & Cowlitz Railroad	Patriot Rail	9
Tri-City Railroad Company	Tri-City Railroad Company	32
Port of Chehalis Rail	Port of Chehalis	1
Pend Oreille Valley Railroad	Port of Pend Oreille	80
Portland Vancouver Junction Railroad	Portland Vancouver Junction Railroad	14
St. Paul & Pacific Northwest Railroad	Progressive Rail	69
Washington Eastern Railroad [a]	The Western Group	109
Longview Switching Company.	Union Pacific and BNSF	9
Great Northwest Railroad	Watco Companies	78
Palouse River & Coulee City Railroad [a]	Watco Companies	84
Rainier Rail	Rainier Rail	40
The Washington Royal Line	Columbia Rail	26
Yakima Central Railway	Columbia Rail	22

420 [a] Private operator of PCC Rail System line owned by WSDOT

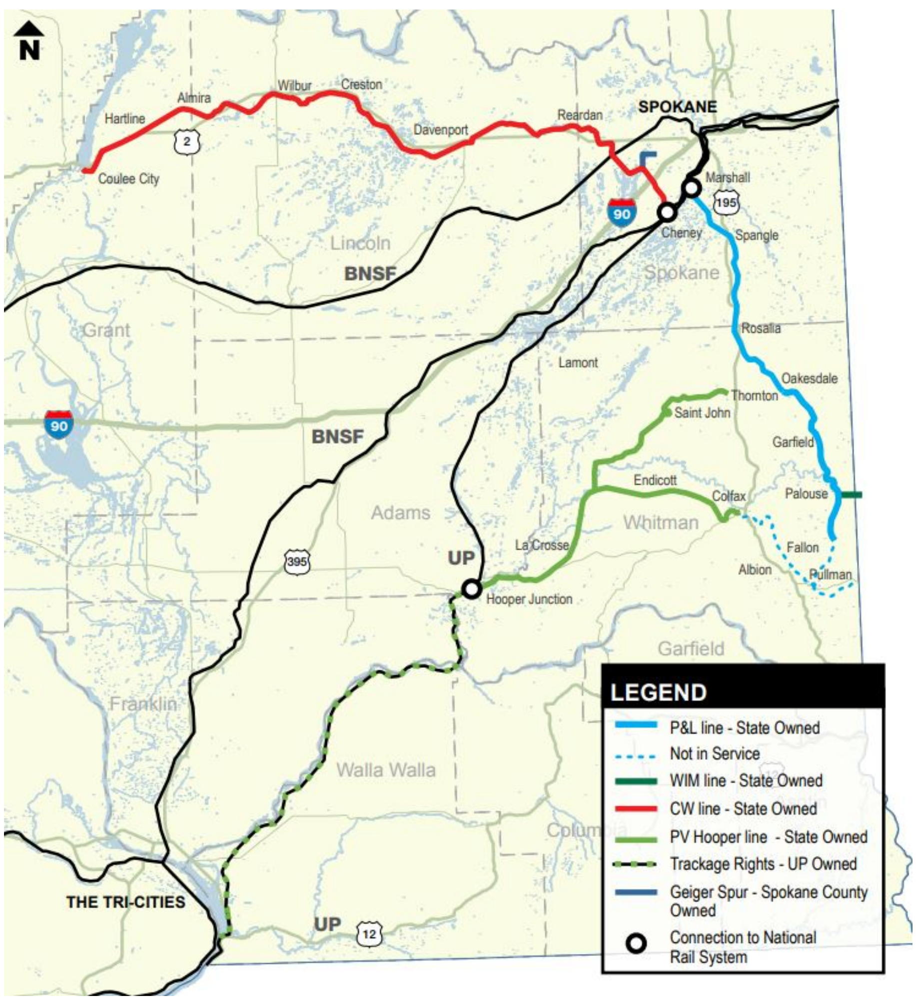
multiple railroads. The rest are stand-alone railroads. Some short line railroads operate lines leased from Class I railroads. There also are several railroads in Washington that are publicly owned, either by the state, a public port, or a local jurisdiction.

Palouse River and Coulee City (PCC)

The state of Washington owns three rail lines that comprise the Palouse River and Coulee City (PCC) rail system in eastern Washington.

The state of Washington owns three rail lines that comprise the Palouse River and Coulee City (PCC) rail system in eastern Washington. It is the longest short line freight rail system in Washington, at 297 miles in length. The PCC rail system consists of three branches: the CW branch, the P&L branch, and the PV Hooper branch, as shown in Exhibit 2-4. WSDOT contracts with private companies to operate each of the branches. The Palouse River and Coulee City Railroad operates the PV Hooper Branch; the Washington Eastern Railroad operates the CW Branch; and the Spokane, Spangle and Palouse Railroad operates the P&L Branch. WSDOT oversees the facilities and regulatory portions of the operating leases. The PCC Rail Authority — an intergovernmental entity formed by Grant, Lincoln, Spokane, and Whitman counties — oversees the business and economic development portions of the operating leases.

Exhibit 2-4 Palouse River and Coulee City (PCC) rail system



2.3 Passenger services

Passenger rail services link cities and regions throughout the state, supporting commuter, business and leisure travel needs while promoting economic activity and providing an alternative to highway travel. There are three types of passenger rail services: long distance, intercity, and commuter. In addition to the local, regional and statewide importance of these services, the Pacific Northwest Rail Corridor, on which Amtrak Cascades service travels, is one of 11 federally-designated high-speed rail corridors. Passenger service in Washington operates mainly on freight rail infrastructure.

Passenger service in Washington operates mainly on freight rail infrastructure.

Federal definitions for passenger rail systems are:

- Long distance passenger rail service with routes of more than 750 miles between endpoints
- Intercity passenger rail service with routes of 750 miles or less, but not commuter rail
- Commuter passenger rail transportation in metropolitan and suburban areas usually having reduced fare, multiple-ride, commuter tickets, and morning and evening peak period operations[5]

Passenger rail stations connect passengers with the rest of the transportation system. For more information on multimodal connections at passenger stations, see Exhibit 5-8 in Chapter 5.

Long distance

Long distance passenger rail services are routes of more than 750 miles between endpoints and are operated by Amtrak. These routes are funded by ridership revenue and federal subsidies, and are managed by Amtrak with no WSDOT involvement. The two long distance Amtrak services that operate in Washington are the Empire Builder and the Coast Starlight.

- The Empire Builder operates one train each direction daily between Chicago and Seattle/Portland, serving 11 stations in Washington. Half of the train serves the route between Spokane and Seattle that is 326 miles long, with six stations west of Spokane. The other half of the train serves the route between Spokane and Portland and is 376 miles long, with four stations west of Spokane. East of Spokane the two routes continue as one train to Chicago for an additional 1,879 miles, 20 of which are in Washington.
    - The stations in Washington for Empire Builder service between Chicago and Seattle are Spokane, Ephrata, Wenatchee, Leavenworth, Everett, Edmonds, and Seattle.
    - The stations in Washington for Empire Builder service between Chicago and Portland are Spokane, Pasco, Wishram, Bingen-White Salmon, and Vancouver.
- The Coast Starlight service operates between Los Angeles and Seattle. The route is 177 miles long in Washington, with one train each direction daily serving six stations in the state. An additional 1,328 miles are located in Oregon and California.
    - The stations in Washington for Coast Starlight service are Seattle, Tacoma, Olympia-Lacey, Centralia, Kelso-Longview, and Vancouver

[5] United States Code Title 49 Section 24102 (49 USC § 24102).

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Intercity

Intercity passenger rail service, except commuter service, are routes of 750 miles or less. Amtrak Cascades, sponsored by Washington and Oregon, is the only intercity passenger rail service operating in the Pacific Northwest. Seattle to Portland is the only major air market outside of the Northeast Corridor (Washington D.C.-Boston) where Amtrak carries more passengers than airlines.[6]

The Cascades service operates between Eugene, Oregon and Vancouver, British Columbia. The route is 467 miles long, with 300 miles in Washington. The service offers four daily roundtrips between Seattle and Portland and two daily roundtrips between Seattle and Vancouver, B.C., as well as two daily roundtrips between Portland and Eugene. Two additional roundtrips between Seattle and Portland will be added once replacement equipment for the trainset damaged in the December 2017 derailment at DuPont arrives and the Point Defiance Bypass is reopened for passenger service.

The Cascades trains stop at 12 stations in Washington, as well as one station in Vancouver, B.C. and five stations in Oregon.

The Pacific Northwest Rail Corridor is one of eleven federally designated higher-speed rail corridors in the United States. The corridor extends from Eugene, Oregon through Washington to Vancouver, British Columbia. It was designated a high-speed rail corridor in 1992, although it is now called a higher-speed rail since the minimum speed for a high-speed rail is designated as 125 mph.

- The stations in Washington with Amtrak Cascade service are: Bellingham, Mount Vernon, Stanwood, Everett, Edmonds, Seattle, Tukwila, Tacoma, Olympia-Lacey, Centralia, Kelso-Longview, and Vancouver.

Commuter

Commuter passenger rail services are located in metropolitan areas and consist of shorter routes that are focused on morning and evening peak period directional operations. Central Puget Sound Regional Transit Authority (Sound Transit) operates Sounder commuter rail service[7] north and south of Seattle. It is the only commuter rail service in Washington. Sounder includes two routes, described below.

- The North Line between Everett and Seattle operates on 35 route miles, serving 4 stations with 4 daily trains each direction. The stations for the North Line are King Street (Seattle), Edmonds, Mukilteo, and Everett.

- The South Line between Lakewood and Seattle operates on 48 route miles, serving 9 stations with 13 daily trains each direction. The stations for the South Line are King Street (Seattle), Tukwila, Kent, Auburn, Sumner, Puyallup, Tacoma, South Tacoma, and Lakewood.

Other rail systems

Other rail systems are not covered in this plan. There are several active tourist trains in Washington, which provide scenic rides and often showcase historical trains or routes. There are two publicly owned light rail transit systems in Washington, Link Light Rail and Tacoma Link operated by Sound Transit. This system uses a fixed guideway, but it does not share infrastructure with other types of rail. Light rail

[6] AMTRAK SERVICE LINE PLANS | FY 2019–2024, page 22
[7] Sound Transit. Sounder service. https://www.soundtransit.org/sounder

is considered a rapid transit service. There are two publicly owned streetcar lines in Washington. The City of Seattle has two separate lines, the South Lake Union Line and the First Hill Line. Other rail systems, including the Seattle Monorail, also are not included.

2.4 Strategic Rail Corridor Network

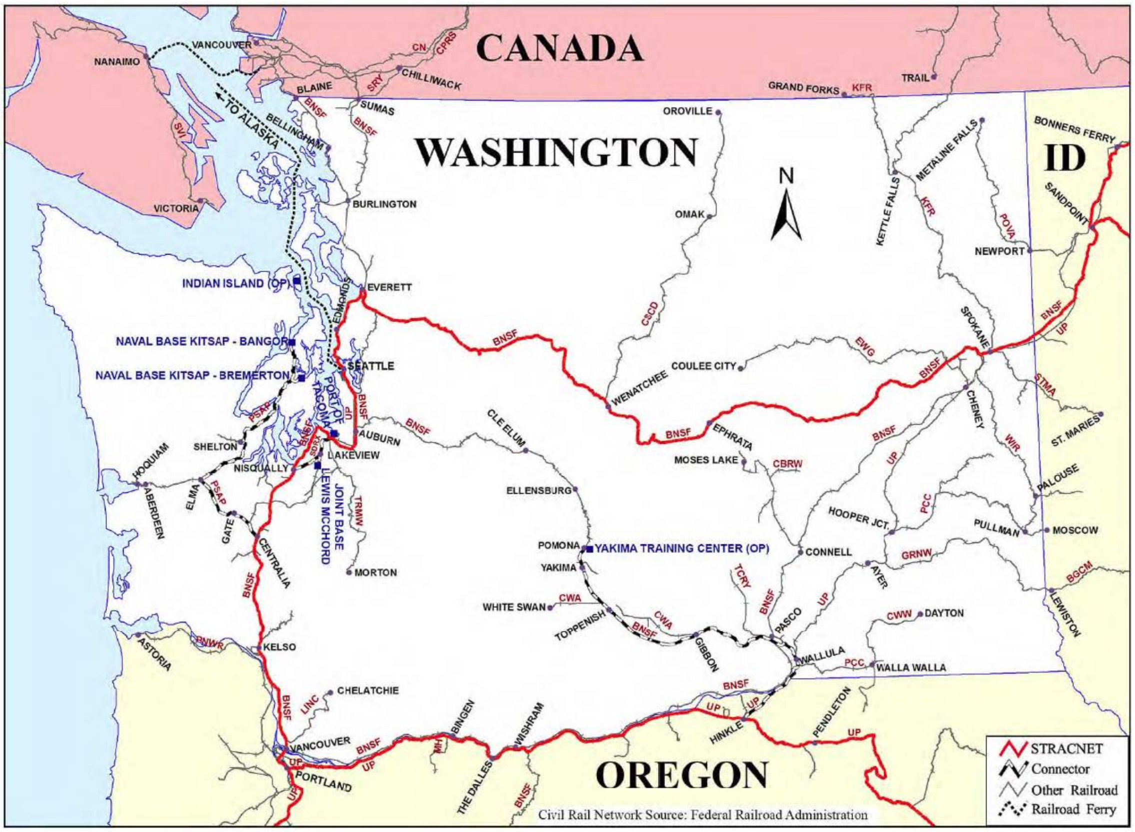
Military equipment, oversized loads, distillates, and other military-related cargo all move on the rail system. The system allows for a large amount of equipment to move efficiently between bases and to ports.

The Department of Defense and the Federal Railroad Administration established the Strategic Rail Corridor Network[8] (STRACNET) to ensure rail transportation readiness capabilities during a time of need. STRACNET is an interconnected and continuous rail line network consisting of more than 36,000 miles of track serving more than 120 defense installations. Approximately 850 miles of STRACNET rail lines are located within Washington, serving six defense installations. One rail line, from Shelton to Bremerton and Bangor, is owned by the U.S. Navy and operated by the Puget Sound & Pacific Railroad. All of the other rail lines that are part of the STRACNET network are privately owned. The purpose of this network is coordination with appropriate transportation authorities, including railroads. Many of the heavy and tracked vehicles shipped by the military will deploy by rail to seaports of embarkation.

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

[8] US Army Transportation Engineering Agency. https://www.sddc.army.mil/sites/TEA/Functions/SpecialAssistant/Pages/RailroadsNationalDefense.aspx

Exhibit 2-5 Strategic Rail Corridor Network designation in Washington state [9]



2.5 Roles and responsibilities

Privately-owned railroads

The rail system differs from the roadway, transit, aviation and water transportation systems in Washington. Unlike other modes of transportation that are generally owned and maintained at public expense and accessible to any licensed operator, rail carriers not only move the freight, they commonly also own, maintain and control the physical infrastructure. Each railroad functions as an integrated business, including marketing and pricing services, operating and dispatching trains, maintaining assets, and allocating capital for rolling stock and infrastructure.

The public sector's role in the rail system must be balanced with the needs and goals of the private railroad industry. Though the railroads work with the public sector to operate passenger rail service and to help plan necessary freight projects, it is nevertheless the responsibility of each railroad to make decisions about capital investments and maintenance spending. Railroads maintain their infrastructure assets to meet safety standards and to avoid expensive reconstruction. Railroads also must consider which expansions of capacity will provide the most benefit to their business.

The public sector interacts with private freight railroads in multiple ways. In general, overlap between public policy and private railroad decision-making occurs in five areas: publicly-sponsored and publicly-owned assets, taxation, grade crossings, rail safety and economic incentives.

[9]Strategic Rail Corridor Network (STRACNET) and Defense Connector Lines (2018) www.sddc.army.mil/sites/TEA/Functions/SpecialAssistant/RND%20Publications/STRACNET%202018_Reduced.pdf

Federal agencies

Federal Railroad Administration

The Federal Railroad Administration (FRA) promotes safe, reliable, and efficient rail transportation to move people and goods. With the responsibility of ensuring railroad safety throughout the nation, the FRA employs safety inspectors to monitor railroad compliance with federally mandated safety standards including track maintenance, inspection standards and operating practices. FRA actively manages rail policy development and investment. This includes providing oversight and guidance in support of rail planning projects, as well as awarding and administering grants that fund safety, state of good repair, and capacity improvement projects. The FRA conducts research and development tests to evaluate projects in support of its safety mission and to enhance the railroad system as a national transportation resource. Public education campaigns on highway-rail grade crossing safety and the danger of trespassing on rail property are also administered by FRA.

Federal Transit Administration

The Federal Transit Administration (FTA) provides financial and technical assistance to state and local public transit service providers, including commuter railroads. FTA awards and oversees formula-based and competitive federal grant programs, distributing funding to state and local transit providers to assist them in developing transit systems, or to improve, maintain, and operate existing systems. FTA also provides federal oversight of transit safety, in coordination with the states. FTA grantees, public transportation providers, are responsible for managing their transit programs in accordance with federal requirements.

Surface Transportation Board

The Surface Transportation Board (STB) is the successor agency to the Interstate Commerce Commission. It is an economic regulatory agency that has jurisdiction over railroad rate and service issues and rail restructuring transactions (mergers, line sales, line construction, and line abandonments). The STB is an independent agency, although it is administratively affiliated with the Department of Transportation.

State agencies

Washington State Department of Transportation

Washington State Department of Transportation (WSDOT) is charged with planning, funding, implementing, constructing and maintaining the multimodal transportation system in the state. WSDOT is responsible for managing and directing the state's freight and passenger rail capital and operating programs. WSDOT sponsors Amtrak Cascades intercity passenger rail service in conjunction with the Oregon Department of Transportation. It also owns and manages the Palouse River and Coulee City Railroad system, three short line railroads in eastern Washington leased to private operators. WSDOT manages the Freight Rail Assistance Program (grants) and Freight Rail Investment Bank (loans) that provide state funding for freight rail capital projects across the state.

Freight Mobility Strategic Investment Board

Freight Mobility Strategic Investment Board (FMSIB) FMSIB was created by the Washington State Legislature in 1998. The Board proposes policies, projects, corridors and funding to the Legislature to promote strategic investments in a statewide freight mobility transportation system. The Board also proposes projects that reduce the effect of freight movement on local communities The Board designates Washington's Strategic Freight Corridors and awards grant funds for freight mobility projects.

Utilities and Transportation Commission

The Washington Utilities and Transportation Commission (UTC) is the state agency responsible for regulating railroad safety in Washington.[10] It protects consumers by ensuring that utility and transportation services are fairly priced, available, reliable and safe. The UTC is responsible for inspecting railroad crossings in the state every three years, and railroad crossings located on crude oil routes every 18 months, tracking railroad grade crossing inventory information, and documenting trespassing and incident data. The UTC, through Title 49, CFR Part 212, is the designated state agency that partners with the FRA to inspect rail shipments of hazardous materials. There are more than 300 inspection points throughout the state, including shippers' facilities, railroad yards and terminals. In addition to these hazardous materials inspections, the UTC's FRA-certified inspectors perform inspections on signal and train control equipment, track, motive power and equipment, and railroad operating practices. In 2019, the UTC expanded its participation with the FRA by adding several inspectors to the newly-created FRA grade crossing safety inspection discipline.

The UTC has regulatory authority over public safety at highway-rail grade crossings. 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 and along railroad rights-of-way. 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 regulates railroad crossings, the safety of rail operations, and railroad employee safety, resolves complaints, and funds safety improvements at or near highway-rail crossings. The UTC also partners with Operation Lifesaver, Inc., and houses and coordinates activities for Washington Operation Lifesaver, a public service education program dedicated to preventing collisions, injuries, and fatalities on and around railroad tracks and highway-rail grade crossings

Department of Ecology

The Department of Ecology (DOE) is responsible for oil transportation spill prevention, preparedness, and response. With the relatively recent emergence of rail as a means to transport large volumes of oil in Washington, DOE has added spill prevention and preparedness requirements for railroads in the state. DOE also tracks the volume of oil moving on Washington rail lines. It issues a quarterly report on crude oil transportation volumes by mode and route.

Local agencies and ports

Local jurisdictions are responsible for the local roads and active transportation networks in their communities. They typically manage railroad grade separation projects that reduce conflicts between railroads and other modes. They also take the lead on 'quiet zone' projects at grade crossings. Some local jurisdictions own railroads, either operating them or leasing them to private operators. Commuter rail is a local agency responsibility. In Washington, Sound Transit operates the only commuter rail system.

Public ports often own rail infrastructure within their facilities. Some also own rail lines that connect their port district to the national railroad network.

[10] Title 81 RCW (transportation)

Chapter 3 Freight rail system strengths and challenges

In order to identify needs and opportunities for the rail system, it is important to understand what is working well and identify the challenges. This chapter discusses the key trends affecting freight rail demand; examines existing freight rail demand; and projects future freight rail flows through 2040. Class I and short line railroads also are analyzed for their conditions, and major challenges and issues. Key findings most relevant to identifying needs and developing plan recommendations are highlighted in this chapter.

3.1 Trends that may affect the freight rail system

This section examines the key drivers affecting rail industry direction in Washington state. The intent is to provide insights on the factors driving rail industry trends beyond the macro-economic environment that influence freight traffic growth. While there is a broad range of external factors influencing future freight rail demand, three key factors with the greatest impact are discussed under this section, including market, regulation, and technology trends.

Market trends

With transportation being a derived demand, the industries and populations that produce and consume goods create the demand for freight movement. Market trends in key rail-oriented industries are examined, including agriculture and energy. Another critical driver of rail market demand is international trade, with key trends such as Panama Canal expansion and North American Free Trade Agreement also examined.

Agricultural exports

Many field crops, such as wheat produced in the Upper Midwest and northern tier states, are shipped west to Washington state for export to Asia. According to the Federal Highway Administration's Freight Analysis Framework version 4.4 (FAF 4.4) dataset, agricultural exports through Washington seaports, including cereal grains and tree fruits, have increased 30 percent from 29 million tons in 2007 to 38 million tons in 2016. The key origins for the rail agricultural shipments to the ports are in Washington state and outside the state in the Midwest region. The primary risk to exports is an expanding tariff war with China's tariffs on soybean imports already having dampened soybean volumes through Washington ports. While China receives the vast majority of soybeans exported from the Pacific Coast, wheat and corn are exported in similar volumes and to a variety of countries.

Energy exports

Demand for crude oil by rail is driven largely by relative price differences between the producing and consuming regions, the availability of pipeline capacity, and the ability to export. As a result, in areas where pipeline capacity is scarce, such as the Pacific Northwest, crude will be transported by rail to the extent that there is demand. Currently, crude oil from North Dakota's Bakken region is exported from the Pacific Northwest. Refineries in Washington state also process crude oil from Alaska's North Slope and western Canada in addition to North Dakota's Bakken region. Several projects have been announced to construct high-capacity facilities for export, but thus far none has been constructed. If those facilities are developed, they will increase freight train volumes in Washington.

As a consumer of utility coal, Washington's sole remaining power plant is TransAlta's Centralia generating station. In addition, Powder River Basin coal is transported through Washington to Oregon's Portland General Electric Boardman generating station. Both of these facilities are expected to cease using coal by the mid-2020s. This will leave coal exports as the only such traffic handled through Washington. Currently, some coal exports have been handled through the Port of Longview, but the majority has been shipped out through Roberts Bank, British Columbia. Currently, some proposals are under consideration to enhance port capacity in Washington for coal exports. If those facilities were built and operated, demand for coal train shipment will increase significantly in Washington.

International trade

Washington state ranked as the 7th most trade-dependent state in 2018. A prosperous Washington economy depends heavily on freight imported and exported through Washington state ports and connected freight rail infrastructure. Competition among the major West Coast ports in Southern California, the Pacific Northwest, and British Columbia has long been fierce, with each region offering a mix of advantages and disadvantages. More recently, with the expansion of the Panama Canal, the West Coast ports also face increased competition from the East and Gulf Coasts. The Panama Canal expansion spurred a shift in traffic from the West Coast to the Gulf and East coasts, including grains near the Mississippi River that now are exported through New Orleans. Washington still has grains arriving from the western parts of the U.S. that are too far from the Mississippi River basin for efficient waterway transport.

Washington state's close proximity to Canada makes the North American Free Trade Agreement (NAFTA) particularly significant to the state's economy and freight flows. NAFTA is a trilateral trade agreement between the U.S., Canada, and Mexico that was signed into law in January 1994. Overall trade between the three NAFTA partners has increased from approximately $290 billion in 1993 to over $1.1 trillion in 2016. Canada is a strong trade partner to Washington state. In 2018, about 25 percent of imports to Washington originated in Canada and 12 percent of exports from Washington ended up in Canada.[11] On September 30, 2018, the governments of the United States, Canada and Mexico announced they had reached a new trade deal agreement called the United States-Mexico-Canada Agreement (USMCA), which was signed in November 2018 and must be ratified by each country's legislature before taking effect. It was reported that the main structure of the trade deal remains unchanged, and that the most significant changes will affect the automobile sector, dairy sector, and investor-state dispute settlement rules[12].

The evolving trends and uncertainties around international trade has the potential to affect international trade volume in either direction, implying high level of uncertainties in future freight rail demand for import and export through Washington state. The impacts of these evolving market trends are considered to establish alternative future scenarios to project freight rail demand, as presented in section 3.2.

Regulatory trends

Since the passage of the Staggers Act in 1980, the economic regulatory environment has remained largely benign for railroads. If this continues, the focus will remain on market responses to a changing environment.

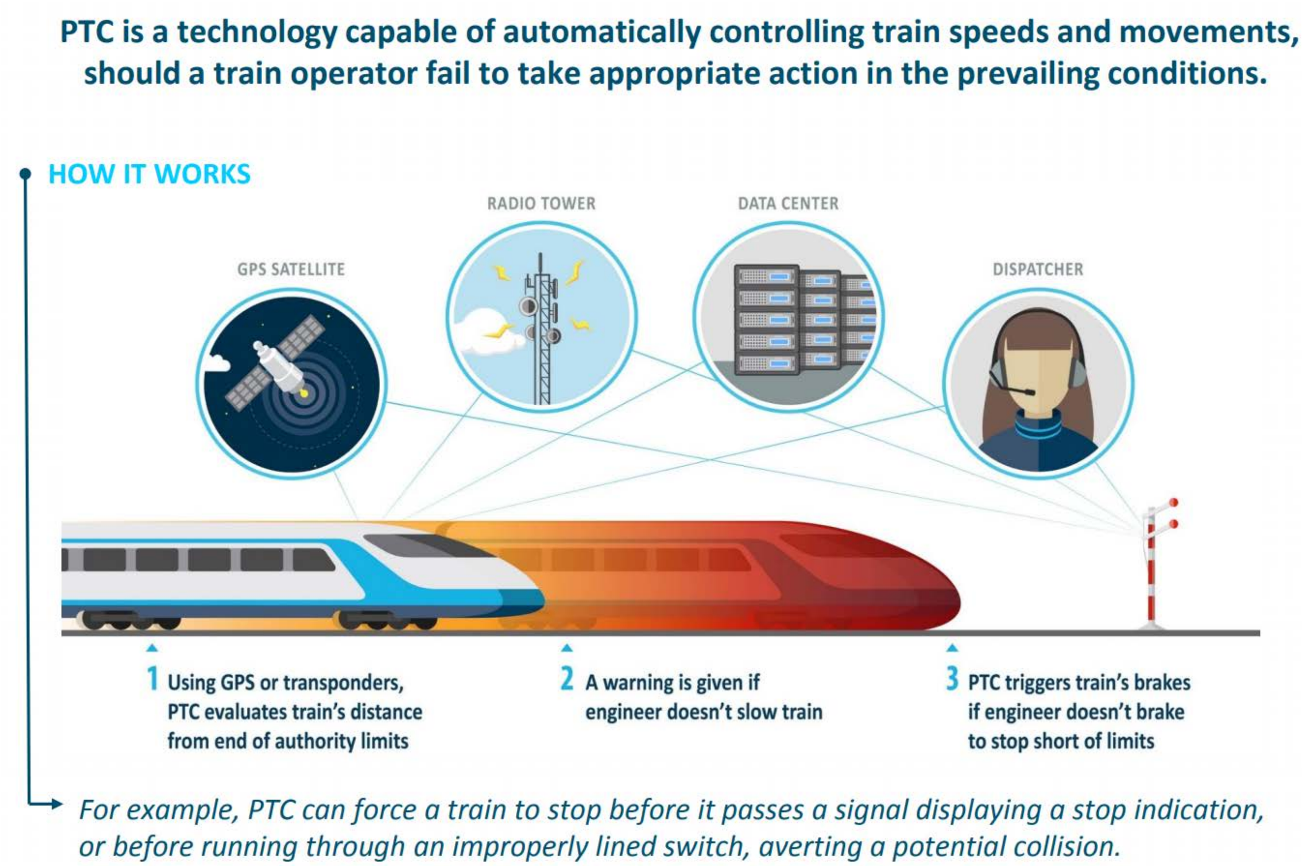
[11] US Census Bureau, Foreign Trade Data by States. https://www.census.gov/foreign-trade/statistics/state/data/imports/wa.html

[12] https://www.brookings.edu/blog/up-front/2018/10/02/5-things-to-know-about-usmca-the-new-nafta/

Implementation of Positive Train Control (PTC) is a major safety-related mandate from the federal government. PTC systems use communication-based and processor-based train control technology to reliably and functionally prevent train-to-train collisions, overspeed derailments, incursions into established work zone limits, and movements of trains through switches in the wrong position. Exhibit 3-1 explains how PTC works. PTC is required by federal law to be installed and implemented on Class I railroad main lines (i.e., lines with over 5 million gross tons annually) over which any poisonous- or toxic-by-inhalation hazardous materials are transported; and, on any railroad's main lines over which regularly scheduled passenger intercity or commuter operations are conducted. PTC has been implemented on all rail lines (equipment and infrastructure) in Washington where it is required by law. For the short lines, depending on whether they have to use PTC-equipped track or not, effects will either be inconsequential or substantial, given the cost of implementing and maintaining PTC hardware and systems.

PTC has been implemented on all rail lines (equipment and infrastructure) in Washington where it is required by law.

Exhibit 3-1 How Positive Train Control works [13]



While Positive Train Control (PTC) is fully installed and operation where it is required on rail lines in Washington, railroads are continuing to work on interoperability. Interoperability is the ability of one railroad's back office servers and onboard equipment to communicate effectively with the back office operations of another railroad. This is an issue where one railroad operates its trains on a different

[13] Amtrak, Overview: Positive Train Control (PTC), media.amtrak.com/wp-content/uploads/2018/06/PTC-Media-Brief_June-2018.pdf

railroad, either through established operating rights (trackage rights) or a temporary detour. Interoperability is also important for passenger rail services operating on host railroads. Amtrak and Sound Transit have established interoperability with BNSF's PTC system and are using it in Washington, but refinements must continue as issues are identified.

Technology trends

Among the most far-reaching technological advancements will be the increase of automated transportation which is expected to reach across all modes including trucking and railways. Leveraging PTC to further automate train operations, combined with expanded use of distributed power, provides railroads with a competitive response to autonomous trucks. As Class I railroads develop and execute new technology, smaller railroads will be challenged to keep pace with the technological advances. The Class II and III railroads generally do not have the traffic volume and financial wherewithal to implement these new technologies, but they could benefit from developed technology that becomes less expensive over time.

The development of autonomous trucks has similar implications for Washington state as it does for the nation. Autonomous trucks could bring increased efficiencies to motor carriers and ameliorate the significant shortage of truck drivers. It also will bring about a new set of issues related to infrastructure, safety, and public policy. Since the trucking industry both complements and competes with rail delivery, autonomous trucks will likely bring both competitive reactions and partnerships with the railroads. For short lines, these effects will similarly vary, depending on the nature of the industries that they serve in terms of commodities, volumes and distances. However, although the precise impacts are difficult to project given the potential for far-reaching changes, reduced trucking costs are likely to affect short lines disproportionately, given their tighter profit margins and lower labor productivity.

3.2 Existing and future demand for freight rail transportation

The freight handled on Washington's rail network reflects the industrial base of the state, its demographics, domestic and international trade that flows through the state, and the characteristics of rail and competing modes. Notably, Washington's economy is driven by trade with other states and countries. Freight volumes are indicative of this characteristic and rail plays a central role. This section examines the existing demand for freight rail transportation and provides a summary of projected freight rail flows in Washington state through 2040.

Freight rail flows have been relatively stable between 2014 and 2017 with an annual average of 120 million tons

- ***40% was exported***
- ***20% was imported***
- ***40% originated in the state***
- ***Top commodities by weight are cereal grains and coal***

Existing demand for freight rail transportation

Exhibit 3-2 shows the freight volume moved by rail in Washington during the past ten years. Freight rail flows declined between 2009 and 2013; rebounded in 2014; and remained relatively stable over the following four years. Consistent with Washington's trade-oriented economy is the nature of rail flows by trade type, shown in Exhibit 3-3. In 2016, the freight rail system in Washington moved 122 million tons of freight, with 32 percent exported through Washington ports and 6 percent imported from ports. About 14 percent of freight was U.S. imports from NAFTA countries (Canada and Mexico). Domestic freight accounted for 40 percent of total rail flow, including domestic inbound (25 million tons), domestic through (12 million tons), domestic outbound (8 million tons), and domestic intrastate (4 million tons). In 2017, there were 42.8 million tons of cereal grains and other agricultural products shipped by rail, accounting for 35 percent of total rail shipments. Coal was the second largest commodity moved by rail, accounting for 10 percent of total rail flows.

Exhibit 3-2 Freight rail shipment by tonnage in Washington state

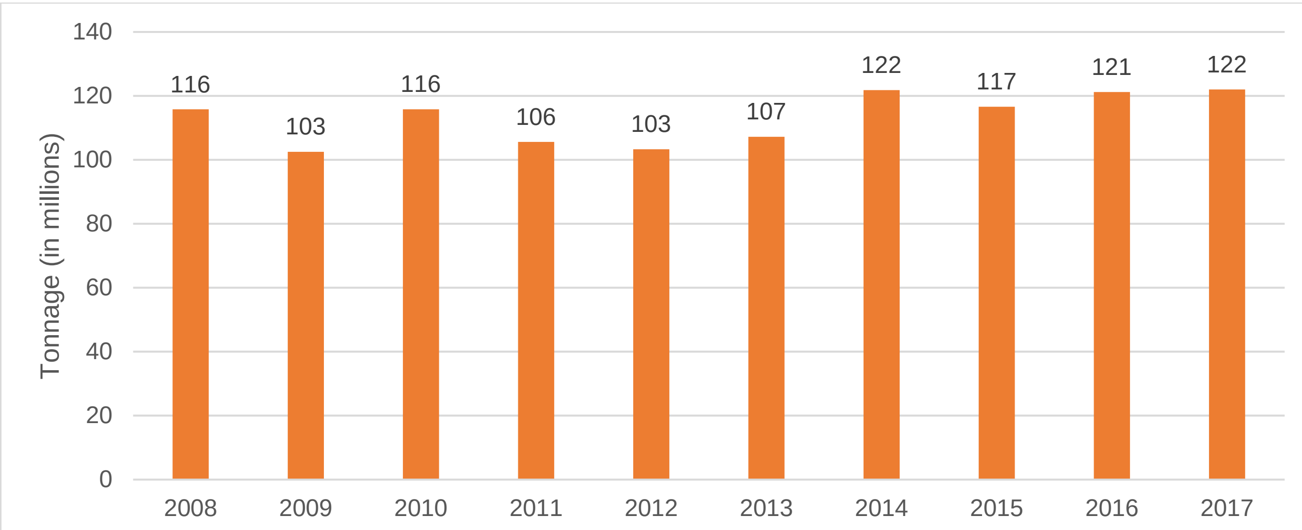
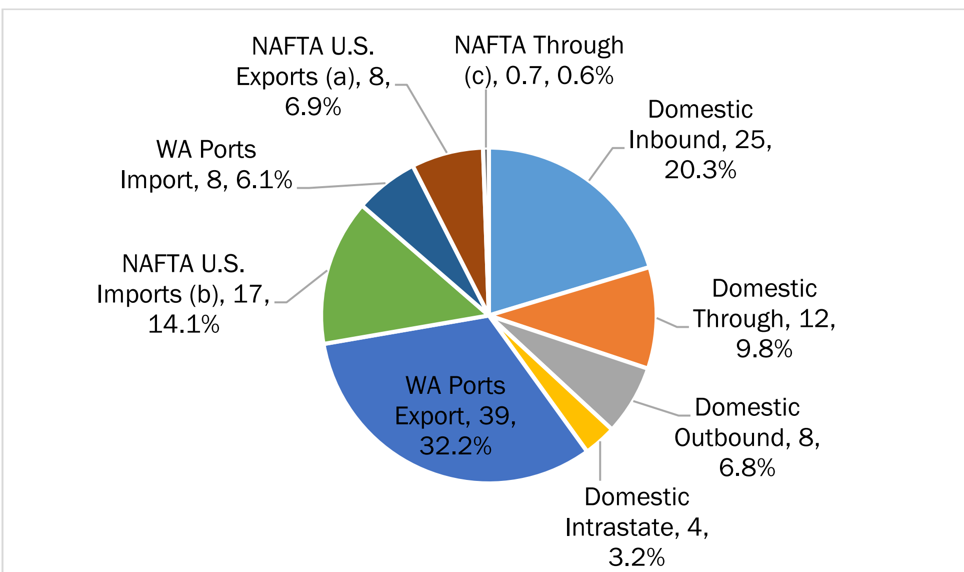


Exhibit 3-3 Annual rail flows in Washington state by trade type, 2016 (in millions of tons)



Scenario planning: uncertain future demand for freight rail transportation

Projecting the future demand for freight rail transportation always comes with uncertainty. Current and evolving trends, particularly around international trade, appear far more uncertain than has been the case in past years. In order to effectively plan for the rapidly changing environment and better address uncertainties in the driving factors of freight and economic growth, the 2019 rail plan established three scenarios to forecast a range of different futures: low growth, moderate growth, and high growth. These scenarios are described in Exhibit 3-4.

Exhibit 3-4 Freight Rail Demand Forecast Scenarios

Low growth scenario	Moderate growth scenario	High growth scenario
• Driven by a significant decline in export volumes and the resulting cumulative effects • Assumes that tariffs imposed by the U.S. and other nations have a substantial, lasting effect on international trade and suppress export activity • Assumes high potential negative effects on agricultural imports/exports and international containerized trade, and declined energy exports	• Driven by growth in industries requiring long-haul movement of heavy commodities • Assumes no long-term effects from tariff and trade tensions • Based on FHWA's FAF 4[14] growth rates and long-term macroeconomic forecasts derived from REMI model[15]	• Driven by robust growth in export volumes • Assumes that tariffs imposed by the U.S. and other nations have little to no effect on international trade volumes and/or are removed with minimal or no lingering effects • Assumes high potential growth in energy exports caused by proposed bulk shipment facilities for coal and oil, and robust potential growth in international containerized trade and agricultural imports and exports

The primary data sources utilized to develop the freight rail forecast are the Surface Transportation Board's 2016 Carload Waybill data, FHWA Freight Analysis Framework (FAF) version 4 forecast, REMI Economic model for Washington state forecast, and Oak Ridge National Laboratory rail network. Additional key inputs include freight train counts provided by the railroads and rail import and export volume data from the largest Washington ports.

In 2016, Washington's freight rail system moved 122 million tons of goods. The low growth scenario projects a decline in rail tons to 110 million tons (0.4 percent annual decline). Under the moderate forecast, freight rail traffic is projected to grow annually by 2.4 percent to 216 million tons by 2040. The high growth scenario projects major growth to 321 million tons by 2040, an annual growth of 4.1 percent.

Exhibit 3-5 and Exhibit 3-6 show the forecasted tonnage by movement type for the three scenarios. With the exception of the low growth scenario, this represents a significant increase in the amount of rail traffic today, with volumes nearly doubling in the moderate growth scenario and tripling in the high growth scenario.

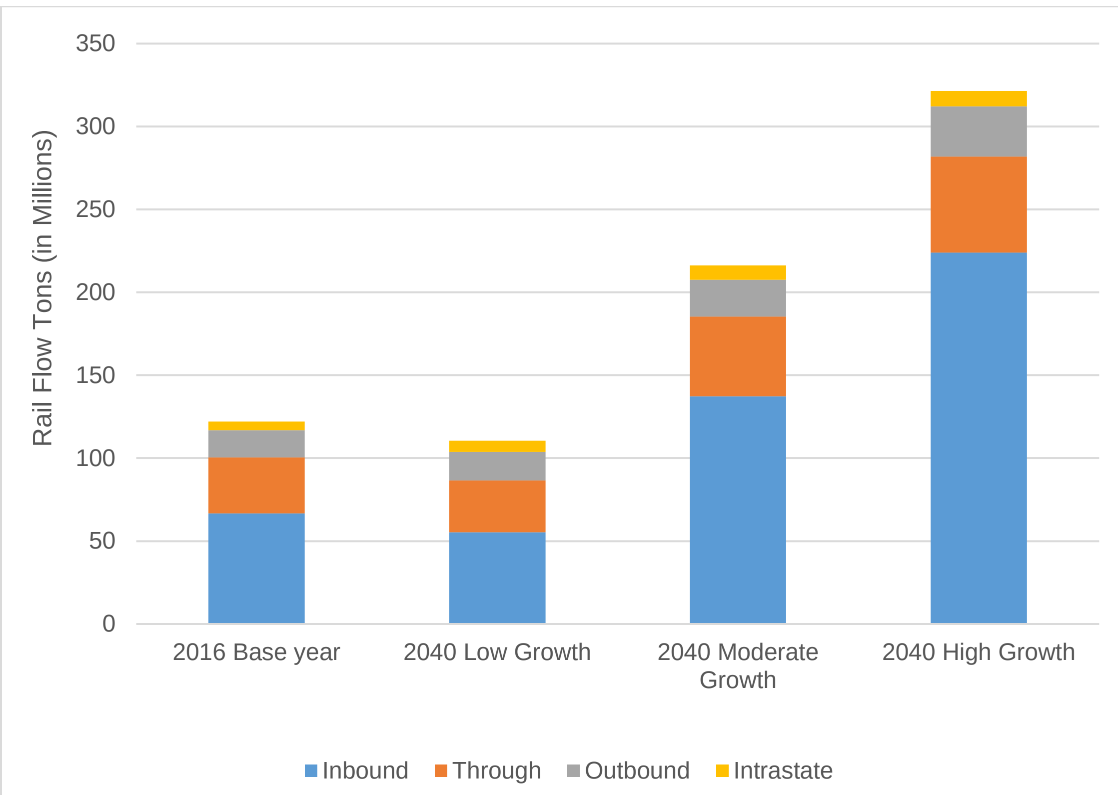
[14] FHWA Freight Analysis Framework version 4.4.1 forecast: https://ops.fhwa.dot.gov/freight/freight_analysis/faf/
[15] Economic forecasts including population and gross domestic product from WSDOT purchased REMI economic model.

Exhibit 3-5 Statewide rail tonnage by movement type, 2016 and 2040 forecasted scenarios (table)

Movement Type	2016 Rail Tonnage (thousands)	2040 Low Scenario Rail Tonnage (thousands)	2040 Moderate Scenario Rail Tonnage (thousands)	2040 High Scenario Rail Tonnage (thousands)
Inbound	66,677	55,354	137,379	223,894
Through	33,882	31,219	48,071	57,878
Outbound	16,345	17,244	22,143	30,304
Intrastate	5,134	6,604	8,611	9,304
Total	**122,038**	**110,421**	**216,204**	**321,381**

Source: 2016 Enhanced Carload Waybill Sample, FAF4 Forecast with Adjustments.
Note: Inbound flows indicate rail movements that terminate in Washington; outbound flows indicate rail movements that originate in Washington; through flows indicate rail movements that neither originate nor terminate in Washington; and intrastate flows indicate rail movements that both originate and terminate in Washington.

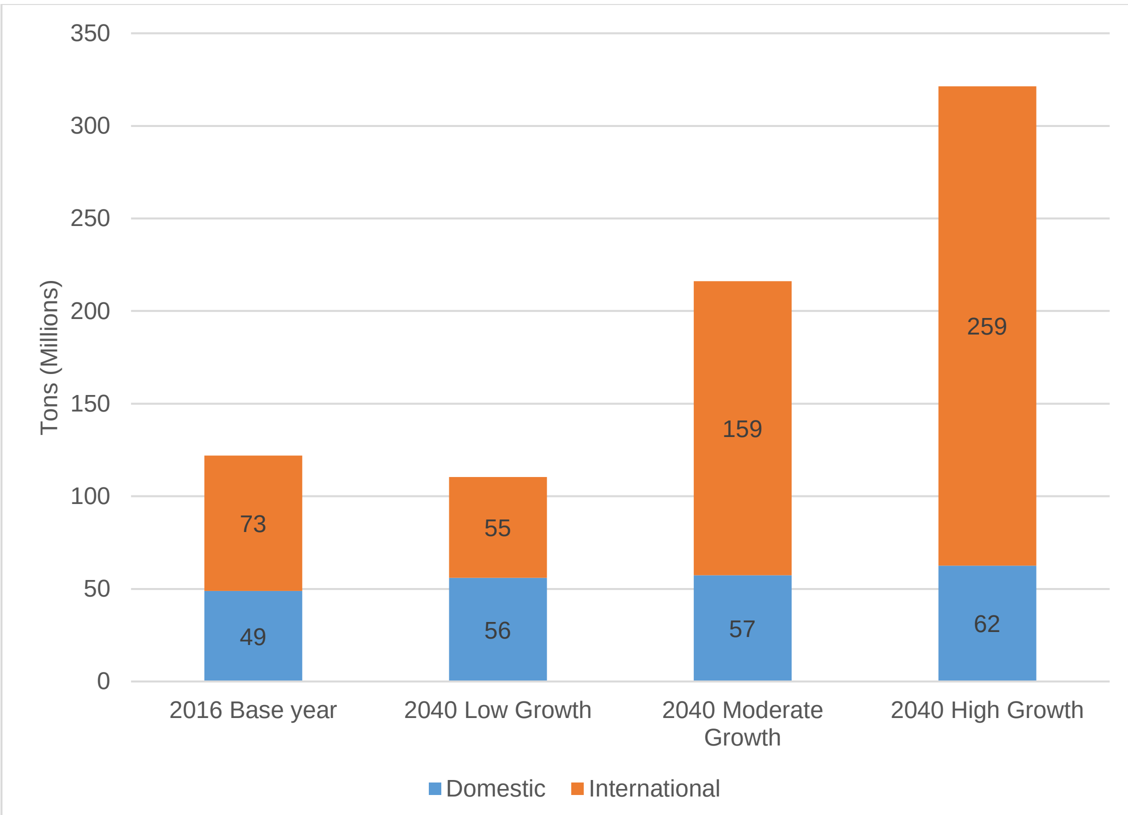
Exhibit 3-6 Statewide rail tonnage by movement type, 2016 and 2040 forecasted scenarios (chart)



The reduction in volumes in the low growth scenario is largely driven by projected decreases in inbound rail traffic mostly for exports through state ports. Inbound traffic in this scenario is anticipated to decrease by 17 percent. In contrast, the moderate and high growth scenarios show 64 percent and 70 percent growth in inbound traffic respectively, well above growth in other movement types. The highest growth expected is inbound field crops such as soybeans, corn, and wheat destined for export from Washington state ports.

Exhibit 3-7 shows the freight rail forecast by trade type[16] for the three scenarios. The reduction in volumes to 110 million under the low growth scenario is driven by reductions in international trade. In contrast, the moderate and high growth scenarios project that international traffic is expected to double or triple by 2040. The international traffic in the low growth scenario is anticipated to decrease by 26 percent, resulting in a relatively even split between domestic and international movement types. In the moderate and high growth scenarios, international movements are projected to increase by 117 percent and 254 percent respectively.

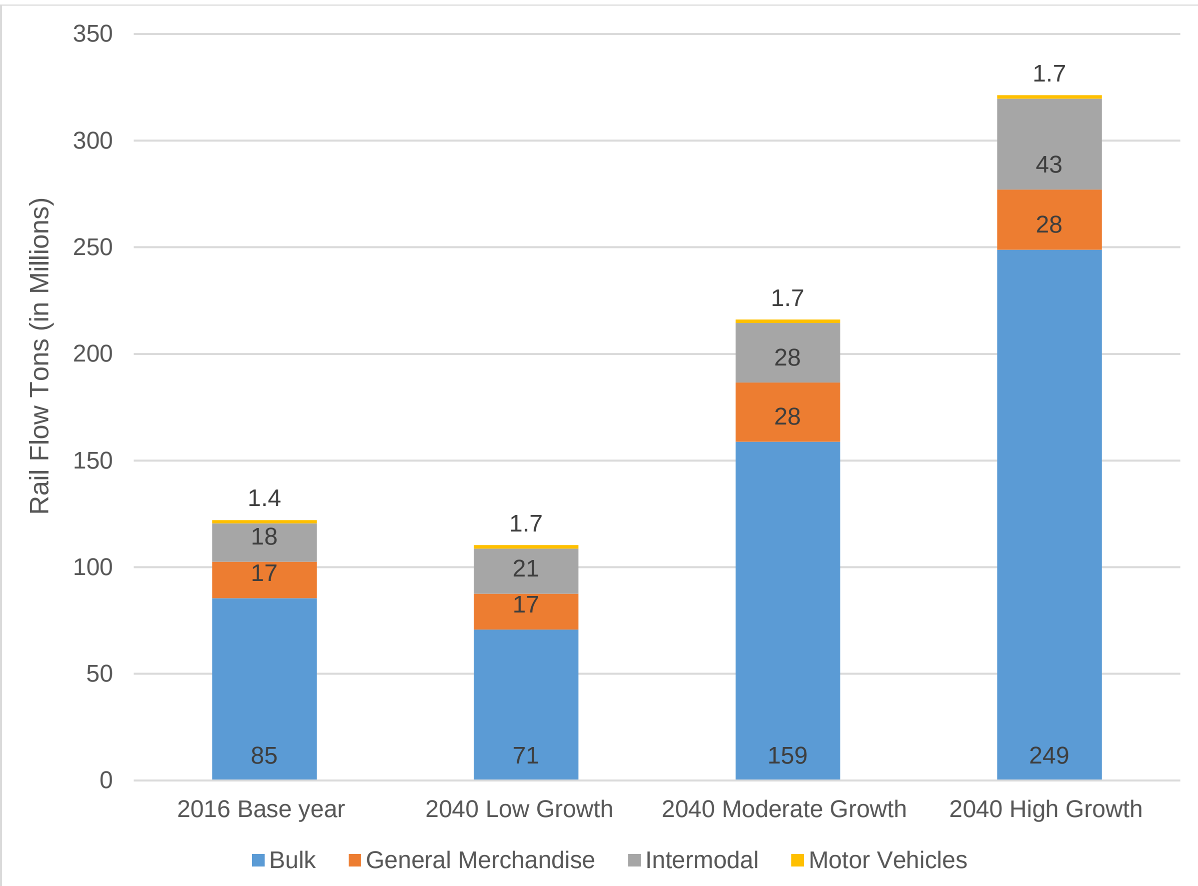
Exhibit 3-7 Statewide rail tonnage by trade type, 2016 and 2040 forecasted scenarios



[16] Categorized into domestic trade and international trade. International trade includes both Washington port and NAFTA U.S. import and export volumes.

Examining rail traffic trends by type of services[17], shown in Exhibit 3-8, the reduction in rail tonnage under low growth scenario is due to a 17 percent decrease in bulk volume. However, in moderate and high growth scenarios, bulk rail services are projected to be the drivers of rail volume growth with an increase of 86 percent and 191 percent, respectively. Intermodal service, the second largest category moved by rail, is expected to grow annually by 1.8 percent and 3.6 percent under moderate and the high growth scenarios respectively. It will grow much slower under the low growth scenario, at about 0.6 percent annually. General merchandise is expected to grow at two percent annually, except under the low growth scenario where it is expected to remain stable and exhibit no growth. Assembled motor vehicles are expected to experience modest growth of just under one percent annually.

Exhibit 3-8 Statewide rail tonnage by service type, 2016 and 2040 forecasted scenarios

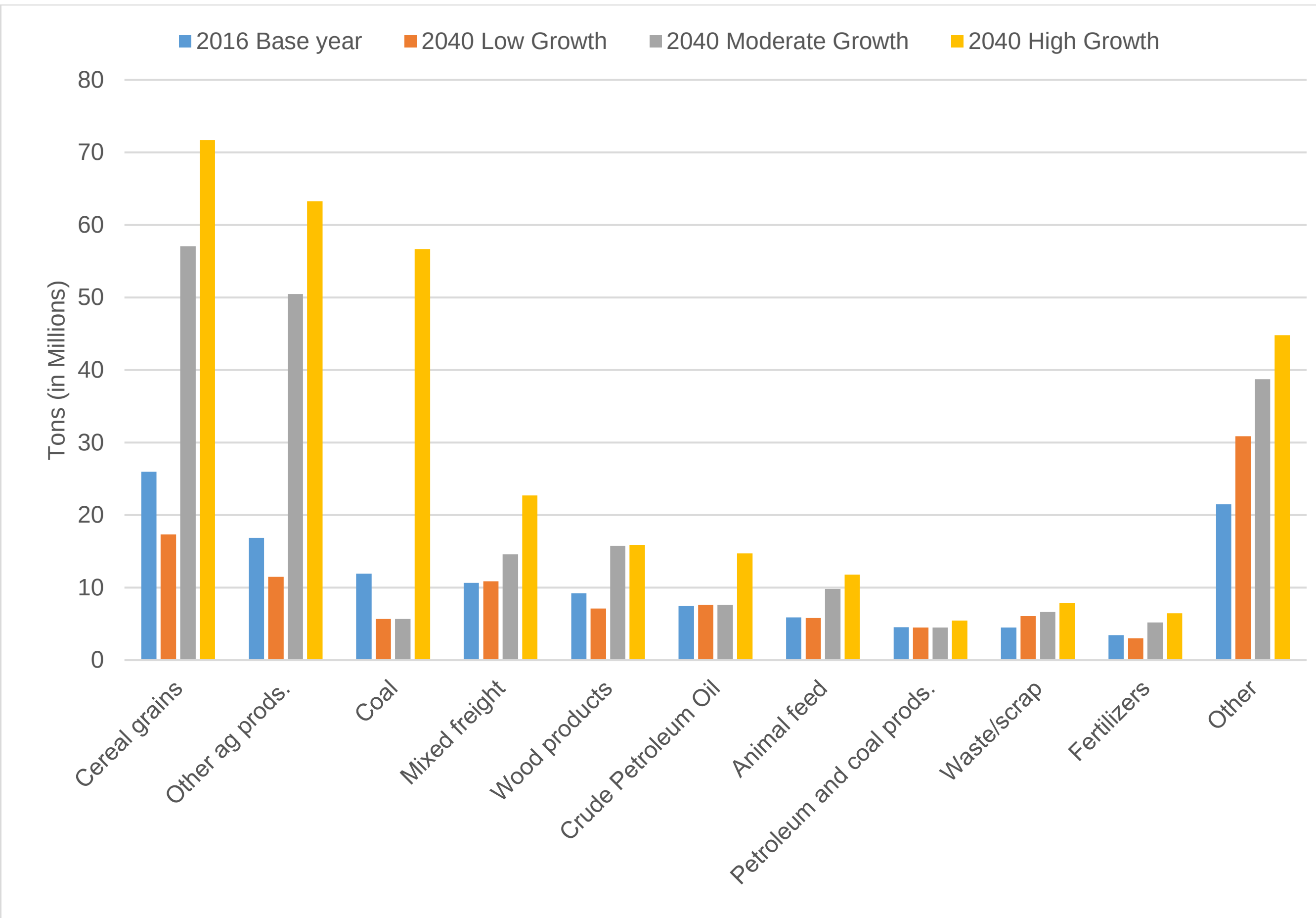


[17] Classified based on the type of rail equipment used to transport cargo. Bulk service includes freight shipment in covered hopper cars and tank cars; intermodal service includes intermodal cars; motor vehicle service include vehicular flat cars, and general merchandise service are all other equipment types.

Cereal grains[18] and other agricultural products[19] are expected to stay as the top commodities moved by rail in Washington under all of the forecast scenarios, as shown in Exhibit 3-9. Under the low and moderate growth scenarios coal shipments are expected to decline by half, as inbound shipments to Washington to the Centralia Power Plant and through shipments to Portland General Electric are expected to cease within the next decade. The high growth scenario assumes that new high-capacity facilities for crude oil export and at least one facility for coal exports will be constructed and operating at full capacity by 2040. If those facilities were built and operated, coal and crude petroleum volumes are forecasted to grow, driving the rail tonnage increase under the high growth scenario. Rounding out the top four commodities in 2016 is mixed freight, a category for which the specific commodity is not identified. This commodity class is handled almost entirely in intermodal service. Mixed freight is expected to grow through 2040 under all three scenarios, displaying particular sensitivity to trade policy.

Cereal grains and agricultural products are expected to stay as the top commodities moved by rail in Washington under all of the forecast scenarios.

Exhibit 3-9 Top rail commodities by tonnage, 2016 and forecasted 2040 scenarios



Based on the demand forecast results, North Dakota is anticipated to continue to be Washington's greatest trade partner for rail traffic through 2040. Most of the rail traffic with North Dakota is inbound

[18] i.e. wheat, corn, barley, oats, etc.
[19] Everything but cereal grains, and not including animal products, e.g., soybeans, beans, lentils, peas, cotton, and rapeseed.

crude oil, cereal grains and agricultural products. Other key trading partners for cereal grains and agricultural products are Minnesota, Illinois, South Dakota, Nebraska and Montana. Montana and Wyoming are also strong trading partners for coal shipments to Washington.

3.3 Class I railroads

The two Class I freight railroads that operate in Washington are BNSF Railway and the Union Pacific Railroad. Together, they own 60 percent of the rail infrastructure by mileage and carry millions of carloads of commodities each year. These two railroads are responsible for moving the vast majority of freight handled by rail into, out of, within and through Washington.

Based on the demand forecast results, North Dakota is anticipated to continue to be Washington's greatest trade partner for rail traffic through 2040.

State role and interest

BNSF and UP are important to Washington by virtue of the volume of freight traffic hauled, the rail infrastructure that serves freight (and passenger) rail traffic in the state, the economic impact of these two Class I railroads and the benefits they provide to the economy. The two railroads connect short line railroads to the national rail network, and host most of the passenger rail service.

A well-functioning rail system provides considerable benefits to Washington's economy. For example, availability of reliable rail service can make Washington ports more competitive for discretionary cargo – cargo that could easily be routed to ports outside of Washington.

A decline in rail service may shift freight traffic to trucks for high-value goods that are typical of the manufacturing and retail sectors. This would negatively affect the state's economy. Taxpayers would bear the costs for increased wear and tear and congestion on Washington's roadways and those increased costs could lead to rising prices or loss of trade and industry. Overall, the federal Government Accountability Office (GAO) has estimated the per-ton-mile social costs of trucking are six times greater than for rail.[20] These costs include collisions and pollution.

Existing and future conditions

The physical condition of railroads can be measured by two metrics:

- Percent of railroad system that can be operated at 25 mph or above
- Percent of railroad system capable of handling 286,000-pound rail cars

BNSF and UP are capable of handling 286,000 pound rail cars over all of their main routes in Washington. Almost all of the BNSF and UP mainlines can be operated at 25 mph or above. The BNSF corridors which accommodate Amtrak Cascades and Amtrak long distance services support higher operating speeds for freight trains up to 60 mph.

Issues and needs

Higher freight rail volumes

The freight volume forecasts indicate that some Class I rail corridors in Washington could see volumes

[20] GAO, (2011), A Comparison of the Costs of Road, Rail and Waterways Freight Shipments That are Not Passed on
to Consumers, https://www.gao.gov/new.items/d11134.pdf.

that exceed current capacity. Maintaining reliable service while moving additional volume could require changes. Unless rail system infrastructure is enhanced, this future growth could overwhelm rail system capacity due to shortcomings, such as passenger/freight conflicts, height limitations on rail tunnels and bridges, inadequate siding lengths or bridge capacity. (Please see section 5.3, which provides 2040 rail system capacity analysis results for varying future scenarios.)

Rail capacity is not static. The volume of traffic a railroad can handle depends not only on infrastructure, but also on the railroad's operating strategies, traffic mix, use of technology and many other business decisions. Working with freight and rail stakeholders to ensure rail service is comparable or better than its modal competitors helps Washington stay nationally and internationally competitive. Since people have other options for personal travel or shipping goods, a well-functioning rail system will protect and grow rail's mode share. For example, maintaining and improving reliable rail service could help Washington ports compete for discretionary cargo. Additionally, the increased movement of manufactured and retail products by rail helps minimize congestion on the state's highways, providing additional positive benefits to the state economy. Taxpayers could benefit from the decreased wear and tear on Washington's roadways and efficiencies in rail service could lead to lower prices and increased industrial business opportunities.

Capacity constraints along the state's three east-west rail corridors have long affected the competitive position of Washington's ports as well as the region's freight shippers and short lines. Improvements such as the implementation of directional running over Stampede Pass and the construction of additional sidings and sections of second main track between Vancouver and Spokane by BNSF has deferred the immediate need for more extensive action. However, ensuring the availability of adequate east-west capacity is vital to the future of rail service in Washington if volumes grow in the future.

3.4 Short line railroads

Short line railroads provide a vital link to the two Class I railroads in Washington and provide access to the national freight rail network for communities and businesses. Switching or terminal railroads that primarily offer services to other railroads also are considered short line railroads.

State role and interest

Washington's short line railroads are tied to the economies of the region where they operate, including industries of great importance to the state, such as agriculture, food processing, forestry and industrial manufacturing.

Washington state law directs WSDOT to invest in the short line rail system to address a number of transportation needs.[21] In the absence of short line railroads, freight currently carried on rail would likely be diverted to trucks using Washington's roads. This would increase wear and tear with associated roadway preservation costs, congestion, as well as increase the safety concerns caused by potential truck/vehicle interactions. In addition, short line rail provides cost-effective service to important industries, in particular, those in rural areas and those with limited road access. Finally, in some areas, they provide competition to trucking, which can improve the cost

In the absence of short line railroads, freight currently carried on rail would likely be diverted to trucks using Washington's roads.

[21] RCW 47.76

effectiveness and reliability of shipping.

Existing and future conditions

The condition of short line railroads in Washington state is quite varied. To assess the current conditions of the state's short line railroads, WSDOT surveyed 26 short line railroads in 2019 and received responses from 19 of them. These 19 short line railroads combined manage about 1,110 miles of tracks in Washington, accounting for 82 percent of the total short line mileage in the state. Although the survey results did not fully capture condition data for the entire short line system throughout the state, it does provide a reasonable assessment of the system based on survey data. The survey results indicate that out of the 1,110 miles of short line railroads:

- 91 percent are still active and in operation
- 61 percent can be operated at 25 mph or above
- 55 percent are capable of handling 286,000-pound rail cars

The future viability of the short line system is largely driven by rail industry trends. As the industry standard has moved towards use of 286,000-pound railcars rather than 263,000-pound cars, only about 55 percent of the surveyed short line railroads can handle the heavier cars. It will be critical for the future success of Washington state short line railroads to make improvements in order to meet the industry's 286,000-pound rail car standards.

Issues and needs

Addressing deferred maintenance and optimizing for economic sustainability

The future of Washington's short line railroads is very much tied to the success of the state's Class I railroads and the entire national rail network.

Many short line railroads were created from lines that were determined to no longer be 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 even more costly than if they had been addressed 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.

The future of Washington's short line railroads is very much tied to the success of the state's Class I railroads and the entire national rail network. Successful short line railroads align with Class I railroads in implementing new technology, and increasing efficiency and streamlined marketing. This only can be achieved if short line railroads are able to overcome the deferred maintenance of their infrastructure and succeed in profitably growing their businesses.
Class I railroads encourage efficiency and modernization by providing shippers with incentives to ship larger quantities of product. While increasing efficiency is a long-term benefit, it requires short line railroads to make costly improvements to bridges and track in order to handle the increased tonnage. This can be seen in the adoption of 286,000-pound capacity rail equipment.

Car weight and operating speed are closely related. Track capable of handling 286,000-pound cars is usually FRA Class 2 or higher track where railroads can operate freight trains at least 25 miles per hour. On track classified as either FRA Class 1 or excepted track, freight trains can operate only at 10 mph.[22] 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.

WSDOT completed a short line rail study[23] in 2015 to evaluate the condition and needs of the entire short line rail system in the state. It focused on two metrics: the ability to operate 286,000-pound railcars and the amount of track classified as FRA Class 2 track. While some short lines or parts of short lines may not benefit from meeting these metrics, these are useful to assess the condition of the system.

Part of the existing short line rail system in Washington currently only can accommodate cars with gross weights of less than 268,000-pounds. Over 55 percent of the system has less than 112-pound rail, the recommended weight to operate the 286,000-pound railcars currently in use on most of the Class I system. Moreover, one quarter of short line miles have a rail weight of less than 90 pounds, the absolute minimum rail weight required to 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 that require the heavier cars.

Short line railroads may need other infrastructure investments to successfully work with Class I railroads. Short lines that are successful in generating higher freight volumes may find their facilities for exchanging freight cars with Class I railroads are too small and inefficient. In addition, they may need track expansions to handle longer unit trains.

Paying for work to address deferred maintenance and make improvements necessary to work successfully with Class I railroads can be a challenge for many short lines.

Palouse River and Coulee City (PCC) Rail System

WSDOT described system needs and growth strategies for the state-owned Palouse River and Coulee City (PCC) Rail System in the 2015 *PCC Rail System Strategic Plan*. The plan identified and prioritized $58 million in infrastructure projects to be implemented over ten years. Preservation projects include identifying and replacing defective rail through integrity testing, addressing ongoing maintenance needs, and rehabilitating track located in moderate and sharp curves in order to allow for increased speeds. The plan also describes the need to inspect and load rate bridges along the PCC and establish a programmatic response to prioritize additional capital requirements that will result from those bridge inspections.

River navigation

The U.S. Army Corps of Engineers, the Bureau of Reclamation, and the Bonneville Power Administration are preparing the Columbia River System Operations Environmental Impact Statement (EIS)[24] to assess and update their long-term strategy for the operation and configuration of the multiple-purpose Columbia Snake River Navigation System. The three federal agencies are evaluating four multi-objective alternatives that would affect navigational operations of the system over a span of five years. They anticipate issuing a Draft EIS for public review in February 2020 that will identify the preferred alternative. Three of the alternatives relate to changes to navigation channel depths and the

[22] 49 CFR § 213.9 - Classes of track: operating speed limits https://www.ecfr.gov/cgi-bin/text-idx?SID=88c2ec37b28a3b1d1c6bb3d69b849fce&mc=true&node=se49.4.213_19&rgn=div8

[23] Washington State Short line Rail Inventory And Needs Assessment www.wsdot.wa.gov/research/reports/fullreports/842.1.pdf

[24] Columbia River System Operations EIS website www.nwd.usace.army.mil/CRSO/

timing of navigation operations. A fourth alternative includes breaching the four Lower Snake River dams, which would eliminate the navigation channel and the ability for barges to move up and down the Snake River. If implemented, this may disrupt port and transportation operations that have relied on a navigable river system.

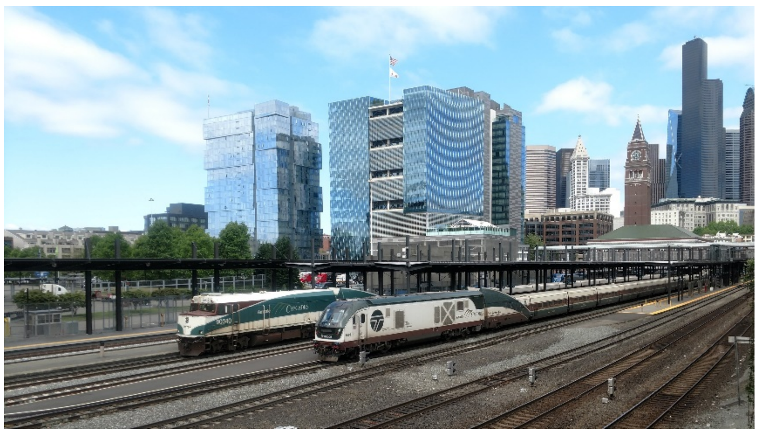
Washington grain moves to export ports primarily (60%) by barge.[25] Rail carries 37 percent and trucks carry around 3 percent to the exporting port. Much of the grain moved by barge originates from terminals on the Snake River. If the three agencies move forward with breaching the Lower Snake River dams, commodities currently transported by barge on the lower Snake River would likely be shipped by rail or truck. Rail could become the most economically viable means for affected shippers to move their products to market. However, shifting this freight from river barges to the railroads could present challenges. Rail rates could potentially rise without competition from barges, resulting in increased shipping costs that could make products currently shipped on the river less competitive. Short line rail infrastructure may need rehabilitation and some expansion to handle the increased volume. Shippers and short lines may need assistance ensuring they have a consistent supply of rail cars to meet the additional demand. At the time of writing, the EIS process is still ongoing and the subsequent results of EIS decisions are unknown. WSDOT will continue to monitor the process and take action as appropriate.

[25] Washington Grain Commission, Washington Wheat Facts wagrains.org/wp-content/uploads/2019/01/WGC-2018-19WF4Web-1.pdf

Chapter 4 Passenger rail system strengths and challenges

Passenger rail services provide high capacity transportation between locations served along their respective routes. Within the borders of Washington, these passenger services operate on tracks owned predominantly by BNSF (discussed in the previous section on freight rail). Each of the service classifications (long distance, intercity and regional/commuter) provides a unique role within the system for their respective routes.

This chapter examines the trends affecting passenger rail demand, and analyzes the existing conditions, future ridership and important challenges and issues for each type of passenger rail service in state. Key findings most relevant to identifying needs and developing plan recommendations are highlighted in this chapter.



Amtrak Cascades trains at King Street Station in Seattle

4.1 Trends that may affect passenger rail demand

Population growth is one of the key factors affecting demand for passenger rail service. Washington's population grew from 4.1 million in 1980 to 6.7 million in 2010 and is expected to reach 9.2 million by 2040, mirroring national population growth rate projections.[26] In 2018, Washington's population grew by an additional 93,200 people to 7.5 million residents. Most of that increase, roughly 75 percent, occurred in the states' five largest metropolitan counties: Clark, King, Pierce, Snohomish and Spokane. Four of these five counties are served by Amtrak Cascades and three by Sounder commuter rail.

According to the Washington Office of Financial Management (OFM), in 2016 the state had about 1,073,300 persons ages 65 and older, representing 15 percent of Washington's total population. By 2040, the adult population age 65 and older is forecast to reach 2,000,000 people, representing 22 percent of the state's total population. Another way to look at it: by 2030, more than one of every four Washingtonians will be 65 or older. And as the population ages, more people are likely to experience limitations to their mobility, which may create a greater need for transportation options like passenger

[26] Office of Financial Management, Forecast of the State Population December 2018 Forecast, ofm.wa.gov/sites/default/files/public/dataresearch/pop/stfc/stfc_2018.pdf

rail.

In 2015, millennials surpassed baby boomers[27] as the nation's largest living generation. This millennial group promises to influence a range of policy decisions across the state and the nation, including transportation. This segment of the population includes people born in the 1980s through the late 1990s and accounts for just over 27 percent of Washington's population. This generation is, thus far, largely choosing to live in affordable neighborhoods and suburbs in and around urban areas. Numerous studies show they are choosing to live in areas that provide the best options for transportation that do not involve driving their own cars alone. According to the Puget Sound Regional Council's 2014 Regional Travel Study[28], the most significant decreases in automobile use for the Puget Sound region between 2006 and 2014 were among millennials. Passenger rail can be an attractive option for this age group, supporting car-free travel between urban centers. The different types of passenger rail can also play important roles in an equitable transportation system, particularly for people with disabilities or low incomes.

4.2 Long distance

Long distance, multistate passenger rail services are provided by Amtrak's Empire Builder and Coast Starlight. These two services have many things in common and a few differences based on geography and markets served.

The trains are operated by Amtrak, using tracks owned by BNSF, UP and other railroads outside Washington and Oregon. These routes are funded by ridership revenue and federal subsidies, and are managed by Amtrak with no WSDOT involvement.

State role and interest

The National Railroad Passenger Corporation (Amtrak) is a federal corporation with direct oversight by the FRA, and has private contracts with freight rail infrastructure owners within Washington. Therefore, the state of Washington has a limited role and limited involvement with Amtrak's long distance services.

Long distance trains, including the Empire Builder and the Coast Starlight services, have played an important role in supporting the development of regional intercity services. Their presence allowed for the implementation of new intercity services, where it otherwise would be extremely difficult. The Pacific Northwest Rail Corridor is one such example. Furthermore, by providing national connectivity, the long distance trains feed traffic into the regional intercity services, and as these regional services grow, long distance services stand to benefit, and vice versa.

The Empire Builder provides the only passenger rail service in eastern Washington. The Coast Starlight service follows the same route as the state-sponsored Amtrak Cascades service between Seattle and Eugene, but with fewer station stops.

One area where the state directly interacts with the long distance trains is at train stations. Stations were once typically the responsibility of the owning railroad and perhaps Amtrak. In recent years the responsibility for stations has largely fallen on the communities. In Washington, the state has provided

[27] The U.S Census Bureau defines baby boomers as people born between 1946 and 1964 and millennials as people born between 1982 and 2000.
[28] Puget Sound Regional Council, Regional Travel Study www.psrc.org/sites/default/files/regionaltravelsurveyscomparison.pdf

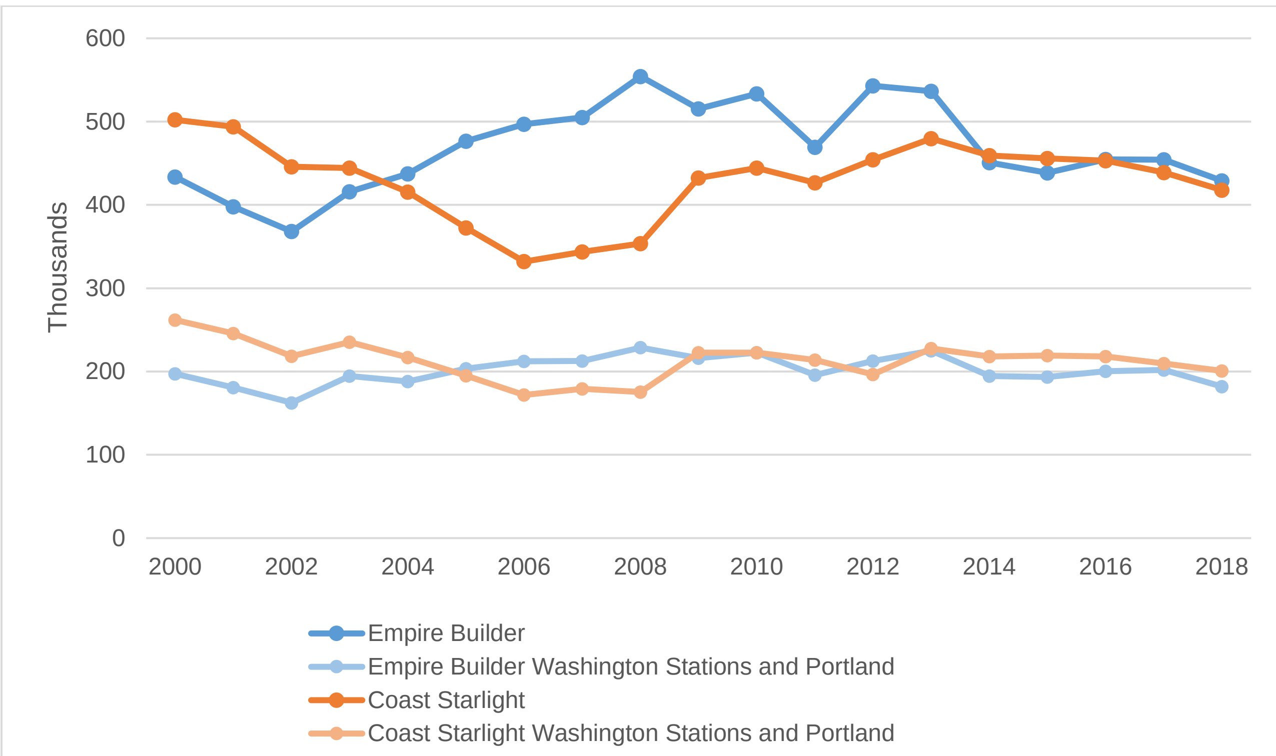
financial assistance for station projects served exclusively by Amtrak long distance trains.

Existing and future conditions

Existing conditions

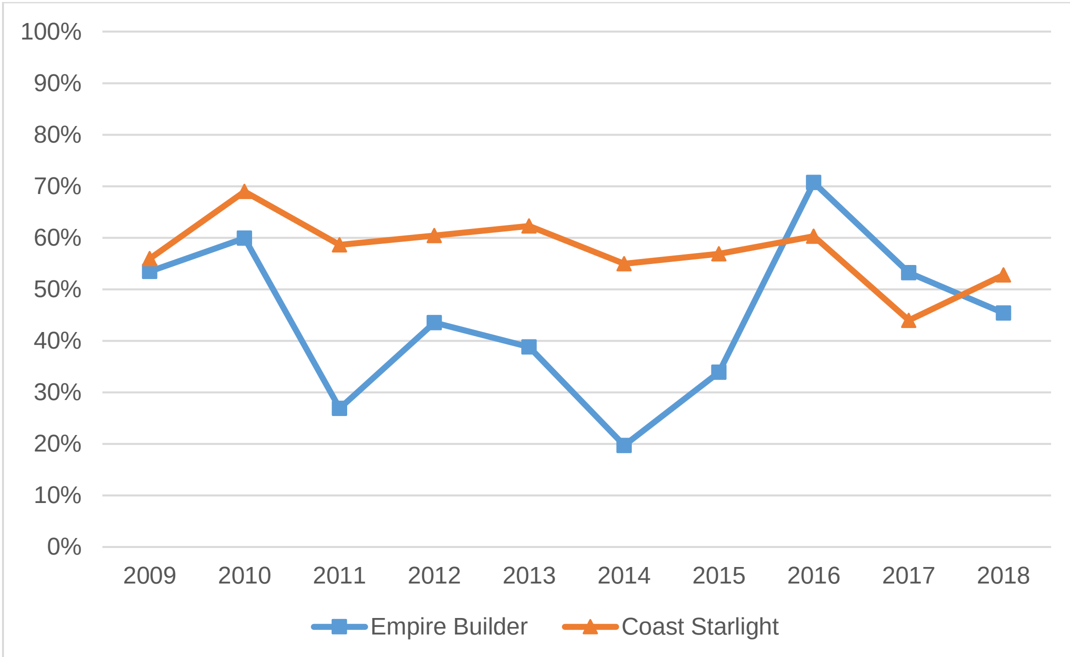
In federal fiscal year 2018, the two Amtrak long distance trains that operate in Washington — Empire Builder and Coast Starlight — had approximately 368,000 and 446,000 ridership respectively. About 42 percent of Empire Builder riders and 48 percent of Coast Starlight riders got on or off at stations in Washington or the station in Portland, Oregon. As shown by Exhibit 4-1, the Empire Builder's ridership increased in the 2000s and peaked in 2008 with approximately 554,000 passengers; Coast Starlight's ridership peaked in 2000 with 502,000 passengers and declined until 2006, and then rebounded to 433,000 in 2009. The ridership for both services declined slowly during the past five years.

Exhibit 4-1 Empire Builder and Coast Starlight ridership, Fiscal Year 2000 – 2018



For Amtrak long distance trains, on-time performance is measured as the percentage of trains arriving at their stations within 15 minutes of scheduled arrival time. As shown by Exhibit 4-2, the on-time performance of Coast Starlight trains was relatively stable at about 55 to 60 percent between Fiscal Year 2010 and 2016; decreased to 44 percent in 2017; and rebounded to 53 percent in 2018. Empire Builder service experienced poor on-time performance between 2011 and 2014, and saw a significant improvement between 2014 and 2016, reaching its record high at 71 percent in 2016. In the past two years it declined to 45 percent. Compared to intercity passenger rail, long distance trains operate over much longer distance (over 1,300 route miles for Coast Starlight and 2,200 miles for Empire Builder) with long journey time, and are more likely to be delayed by multiple causes along its route affecting its on-time performance.

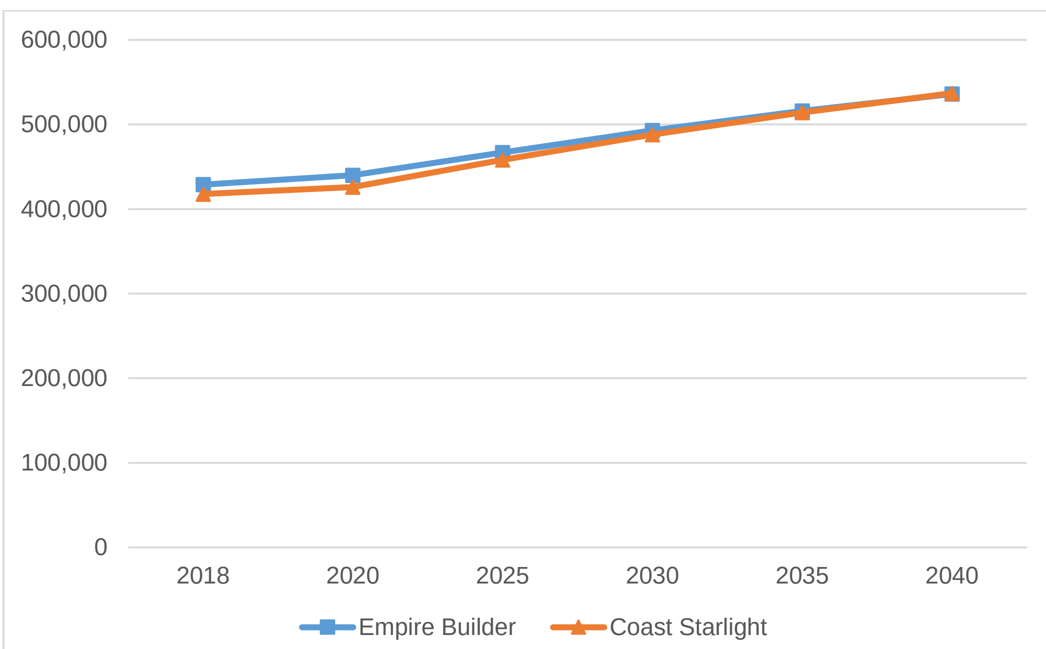
Exhibit 4-2 Empire Builder and Coast Starlight on-time performance, Fiscal Year 2009 – 2018



Future ridership

Overall ridership is expected to increase steadily through 2040 for both the Empire Builder and Coast Starlight (Exhibit 4-3). Annual ridership on the Empire Builder is projected to increase from 428,900 in Fiscal Year 2018 to 536,000 in Fiscal Year 2040, representing 25 percent growth over 22-year period. Annual ridership on the Coast Starlight is projected to increase from 417,800 in Fiscal Year 2018 to 537,000 in Fiscal Year 2040, representing a total of 29 percent growth[29].

Exhibit 4-3 Empire Builder and Coast Starlight ridership projection, Fiscal Year 2018 – 2040



[29] Ridership forecast for Amtrak long distance services are provided by Amtrak upon request.

Issues and needs

On-time performance

Poor on-time performance continues to plague long distance passenger lines nationwide. Most passenger train delay is caused by host railroads. Unreliable service is a major inconvenience for travelers and costs Amtrak millions in operational delays.[30] BNSF, the host railroad for most passenger rail service in the state, continues to work alongside Amtrak to address reliability issues. Some delays, including some slow speed orders for maintenance and inspections, are unavoidable, but delays caused by dispatching decisions usually is avoidable. Interference from freight trains is a common reason for delays, but there are other contributing factors including equipment failures, track maintenance, weather, and passenger train interference. BNSF rates better than most other host railroads in terms of passenger reliability; however performance has been negatively affected by freight volume increases in recent years.

Equipment replacement

Amtrak operates a fleet of equipment, a significant portion of which is at or nearing the end of its useful service life. In Washington, Amtrak diesel locomotives and Superliner passenger cars are used on the Empire Builder and Coast Starlight long distance trains.

Amtrak's fleet of 200 P-40 and P-42 locomotives, currently used on the Empire Builder and Coast Starlight long distance routes in Washington and occasionally on Amtrak Cascades, is rapidly approaching the end of its useful life. They suffer from increased mechanical challenges to reliable operation due to their age and worn condition. Amtrak has seen an approximate 20 percent increase in both incidents and minutes of delay due to mechanical problems with P-42 diesel locomotives.

The Superliner passenger cars used by Amtrak on its long distance trains are also nearing the end of their lifespan. The oldest cars, 244 of them, were built between 1979 and 1981. The newest cars, a group of 184 cars, were built between 1993 and 1995. Amtrak has performed extensive overhauls, retrofits and repairs to keep this aging fleet in operating condition, fashioning custom made parts to replace original equipment manufacturer-supplied components that are no longer available.

4.3 Intercity

Amtrak Cascades is a multi-frequency intercity service linking Vancouver, British Columbia with Eugene, Oregon via Seattle and Portland (467 miles). The route generally parallels Interstate 5, calling at a total of 18 stations, 12 in Washington. King Street Station in downtown Seattle and Portland's Union Station serve the largest number of passengers. Many stations also serve light rail, bus and pedestrian facilities, which provide multimodal connections for travelers.

State role and interest

Amtrak Cascades is part of the state's strategy to provide a multimodal transportation system to move people and goods. Intercity passenger rail plays an especially important role in providing travel options that reduce reliance on single-occupancy vehicles along the I-5 corridor.

[30] Amtrak Office of Inspector General, Train Operations: Better Estimates Needed of the Financial Impacts of Poor On-Time Performance, OIG-A-2020-001, https://amtrakoig.gov/audit-documents/audit-reports/train-operations-better-estimates-needed-financial-impacts-poor-time

Existing and future conditions

Existing conditions

Amtrak Cascades annual ridership has increased 51 percent since 2000, with significant growth in early and late 2000s as new services and stations were added. In 2011, the total annual ridership on the Amtrak Cascades corridor reached its record high at approximately 848,000. Between 2011 and 2017, WSDOT delivered federally funded rail infrastructure projects to enhance the Amtrak Cascades program. In the short term, interruptions caused by these construction projects contributed to a drop in ridership. Ridership is affected by seasonal demand, with higher ridership during the summer tourist season between June and September. In 2018, 802,000 passengers traveled on Amtrak Cascades, a decrease from the previous year that was primarily due to a 19% decrease in ridership in January 2018 — the month following the derailment of an Amtrak Cascades train. Ridership returned to more consistent levels in subsequent months. In 2018, 56 percent of the trips occurred between Seattle and Portland. Exhibit 4-4 shows the annual ridership on Amtrak Cascades corridor between Eugene, Oregon and Vancouver, British Columbia since 2000.

Exhibit 4-4 Amtrak Cascades ridership between 2000 and 2018

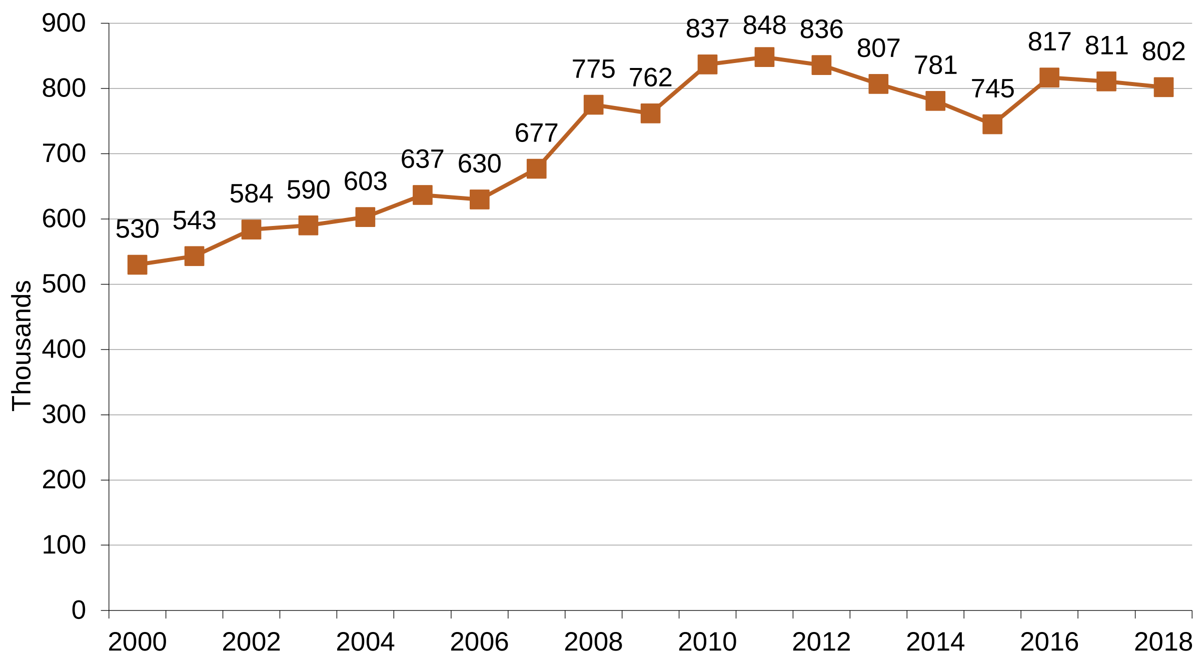


Exhibit 4-5 shows the passenger miles by corridor segments in the past ten years. Passenger miles measure the person miles traveled by Cascades riders between their origin and destination stations along the corridor. Cascades passenger miles reached its highest record in 2011 at 132 million, and then dropped between 2011 and 2015 due to the effect of infrastructure construction projects. It leveled off between 2016 and 2018. The segment between Seattle and Portland is the most heavily used along the corridor, accounting for 69 percent of total passenger miles in 2018.

Exhibit 4-5 Amtrak Cascades passenger miles between 2009 and 2018

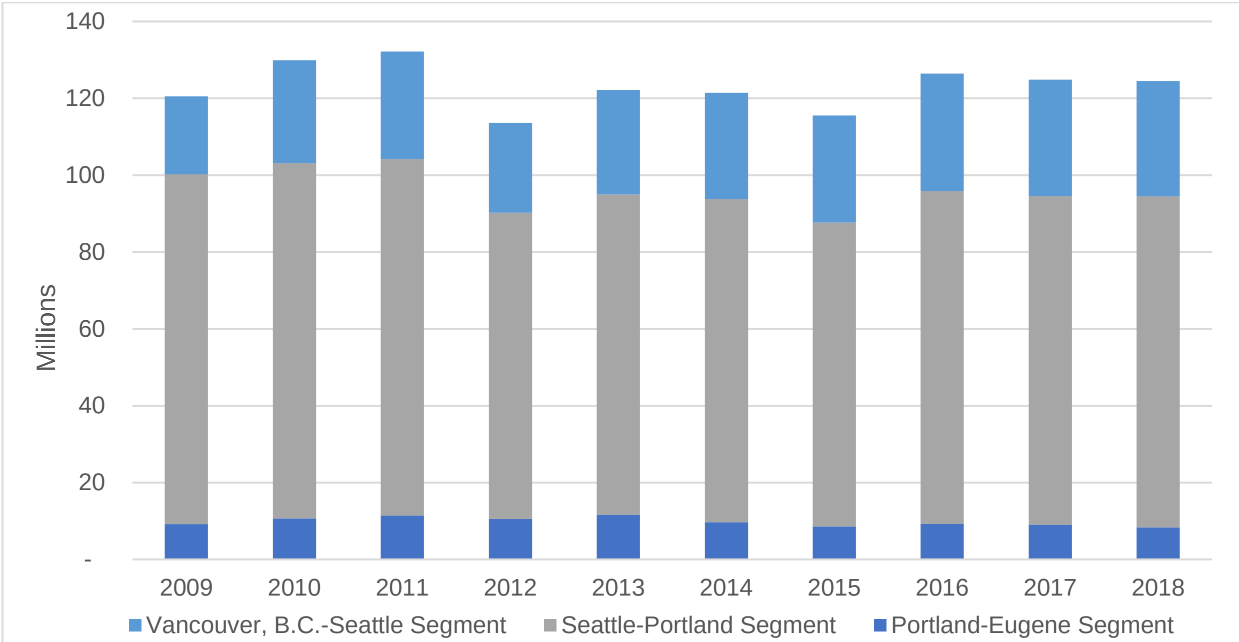
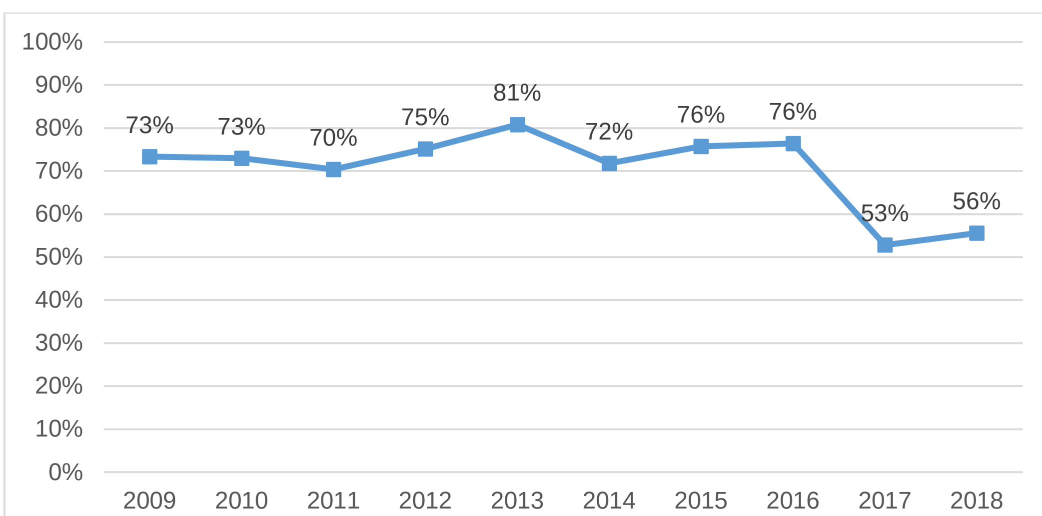


Exhibit 4-6 shows the Cascades on-time performance for the entire corridor between Vancouver, British Columbia and Eugene, Oregon in the past ten years. On time performance measures how a train performs compared to the scheduled arrival time at the endpoint station. With the 2017 completion of WSDOT's federally-funded rail capital improvement projects, the goal for Cascades service is to achieve 88 percent on-time reliability between Portland, Seattle, and Vancouver, B.C. Between 2009 and 2016, Cascades on-time performance was between 70 and 81 percent, but dropped to 53 percent and 56 percent in 2017 and 2018, far below the goal of 88 percent. The decline in on-time performance since 2017 is mostly due to more frequent slow speed restrictions and longer delays caused by freight and passenger train interference. These top three causes resulted in a 19 percent increase in total delay minutes from 2016 to 2017 between Portland, Oregon and Vancouver, British Columbia.

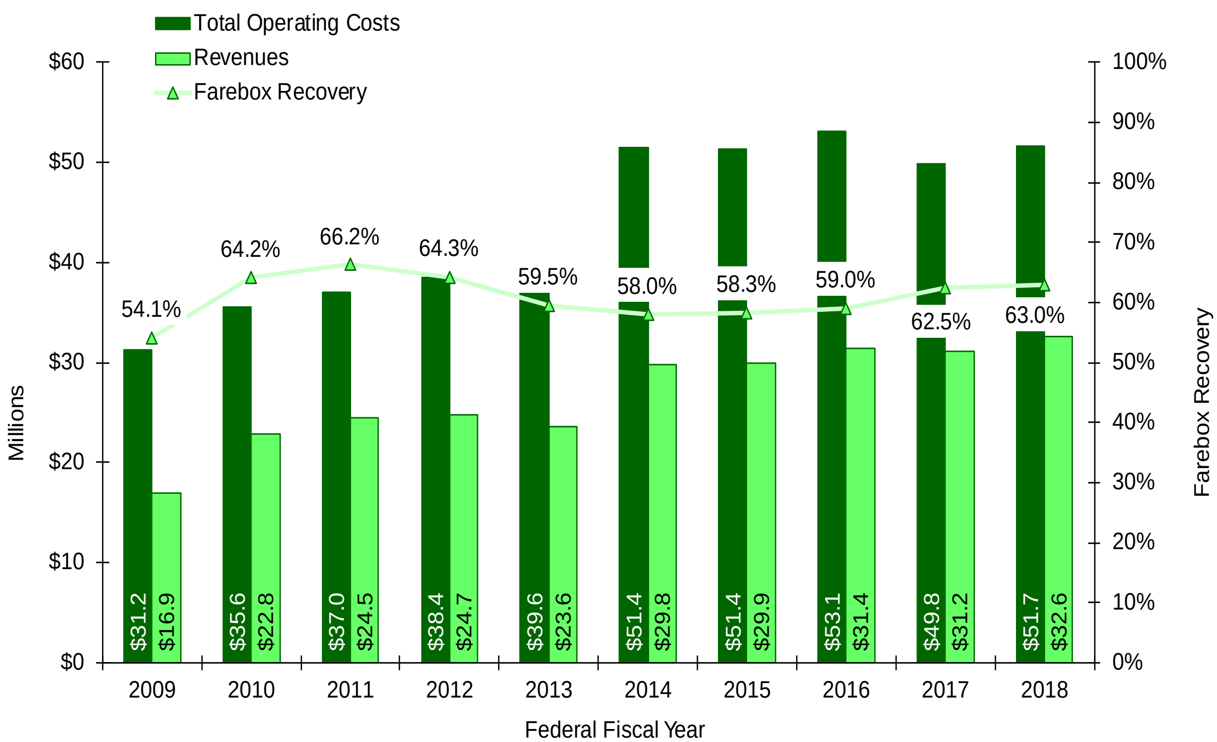
Exhibit 4-6 Amtrak Cascades on-time performance between 2009 and 2018



Note: Between 2009 and 2017, trains were considered to be on time if arriving at the scheduled final destination *station within a tolerance of 10 to 15 minutes, depending upon route length. Beginning from 2018, all trains overseen by WSDOT are considered on time if they arrive within 10 minutes of scheduled arrival at endpoint station within each segment (Seattle to Portland, and Seattle to Vancouver).*

Exhibit 4-7 shows the operating cost, revenue, and farebox recovery rates for Washington-funded trains. In late 2013, the federal government shifted responsibility for funding Amtrak Cascades services completely to the states, and as a result, the state of Washington incurred higher costs starting in FFY 2014. The annual revenue has more than tripled in the past ten years, and despite the increases in operating cost, the farebox recovery rate (revenue divided by operating cost) has increased from 58 percent to 63 percent between FFY 2014 and FFY 2018.

Exhibit 4-7 Amtrak Cascades operating cost, revenue and farebox recovery rate for Washington-funded trains



Future ridership

Passenger rail ridership is driven by a number of factors, including but not limited to population and population density, average income, the type of rail service offered, the presence of competing transportation options (such as intercity air service, bus or highways), travel time, schedule reliability and travel costs.

This section presents a summary of ridership forecasts for the Amtrak Cascades corridor between Eugene, Oregon and Vancouver, British Columbia. This forecasting model adopts a high-level direct demand approach which forecasts ridership at the station level, and is built based on key input variables including service frequency, travel time, on-time performance, and station catchment area population. This model also incorporates elements such as station access and egress modes and capacity constraints to consider the effect of those factors on passenger rail demand.

Four scenarios were established to forecast future ridership under various service alternatives, ranging from no improvement to a full set of service enhancements. These scenarios were developed in consultation with ODOT, to ensure consistency with its plans for future service between Portland and Eugene. The service level assumptions for Seattle to Portland service under high growth scenario are aligned with the assumptions adopted in WSDOT's previous rail planning efforts — such as the 2006 Long Range Plan, 2014 State Rail Plan, and 2017 Fleet Management Plan — to ensure consistency.

The baseline scenario assumes maintaining status quo and no improvements beyond adding the two additional trips between Seattle and Portland once the Point Defiance Bypass is reopened and replacement equipment is available. The low growth assumes a small increase in reliability, service frequency, and minor reduction in travel time. The moderate growth assumes moderate service enhancement by adding additional trips and reducing travel time across the corridor. The highest growth assumes most aggressive set of service improvements, with significant reduction in travel time, much more frequent service, longer trains, and much higher reliability. See Exhibit 4-8 for current service level in base year 2018, and detailed service level assumptions in future year 2040 by each scenario. These forecasts help predict ridership demand and potential capacity constraints resulting from various growth scenarios.

Exhibit 4-8 Amtrak Cascades scenarios for demand forecasting

Scenarios	Frequency and Travel Time by Segments			Reliability	Train Capacity (seats)
	Vancouver BC to Seattle	Seattle to Portland	Portland to Eugene		
2018 Base year	2 daily round trips with a travel time of 245 minutes	4 daily round trips with a travel time of 210 minutes	2 daily round trips with a travel time of 155 minutes	56%	268
Baseline scenario 2040	2 daily round trips with a travel time of 240 minutes	6 daily round trips with a travel time of 200 minutes	2 daily round trips with a travel time of 155 minutes	88%	268
Low growth scenario 2040	2 daily round trips with a travel time of 240 minutes	8 daily round trips with a travel time of 190 minutes	2 daily round trips with a travel time of 155 minutes	90%	300
Moderate growth scenario 2040	3 daily round trips with a travel time of 230 minutes	8 daily round trips with a travel time of 190 minutes	4 daily round trips with a travel time of 145 minutes	90%	300
High growth scenario 2040	4 daily round trips with a travel time of 157 minutes	13 daily round trips with a travel time of 150 minutes	6 daily round trips with a travel time of 140 minutes	95%	300

As shown in Exhibit 4-9, system-level ridership is forecasted to range from 1.28 million passengers in 2040 for the baseline scenario to over 2.5 million for the high growth scenario, representing a range of 60 percent to 214 percent growth over 2018 ridership.

Exhibit 4-9 Amtrak Cascades ridership, 2018 and 2040 scenarios

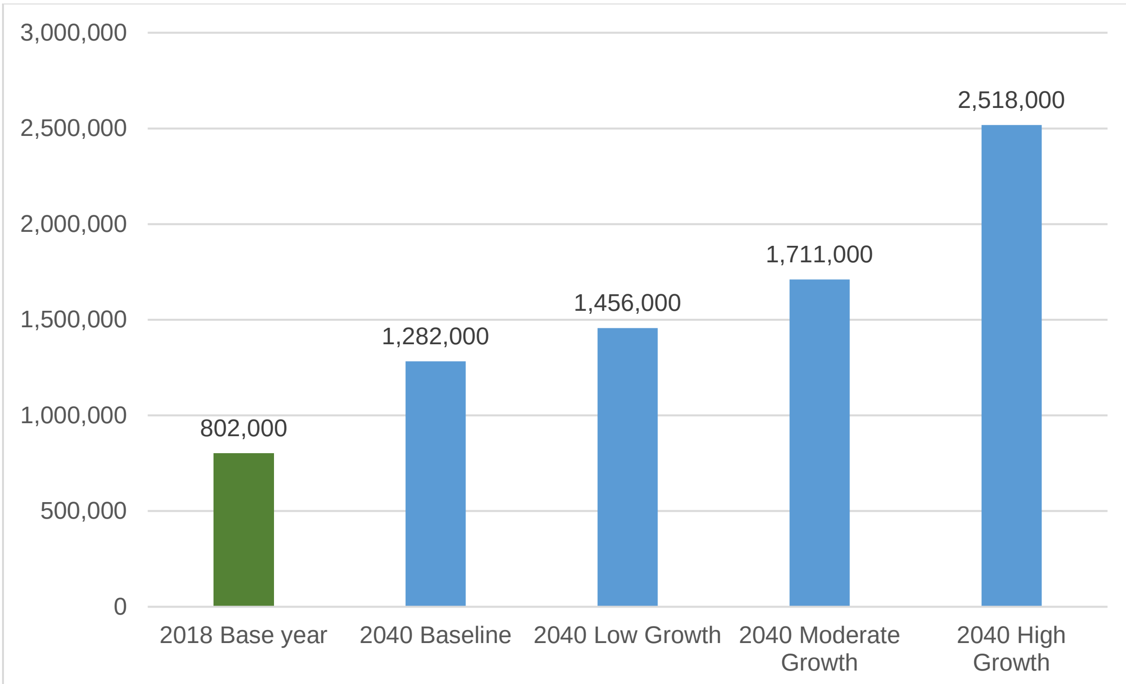


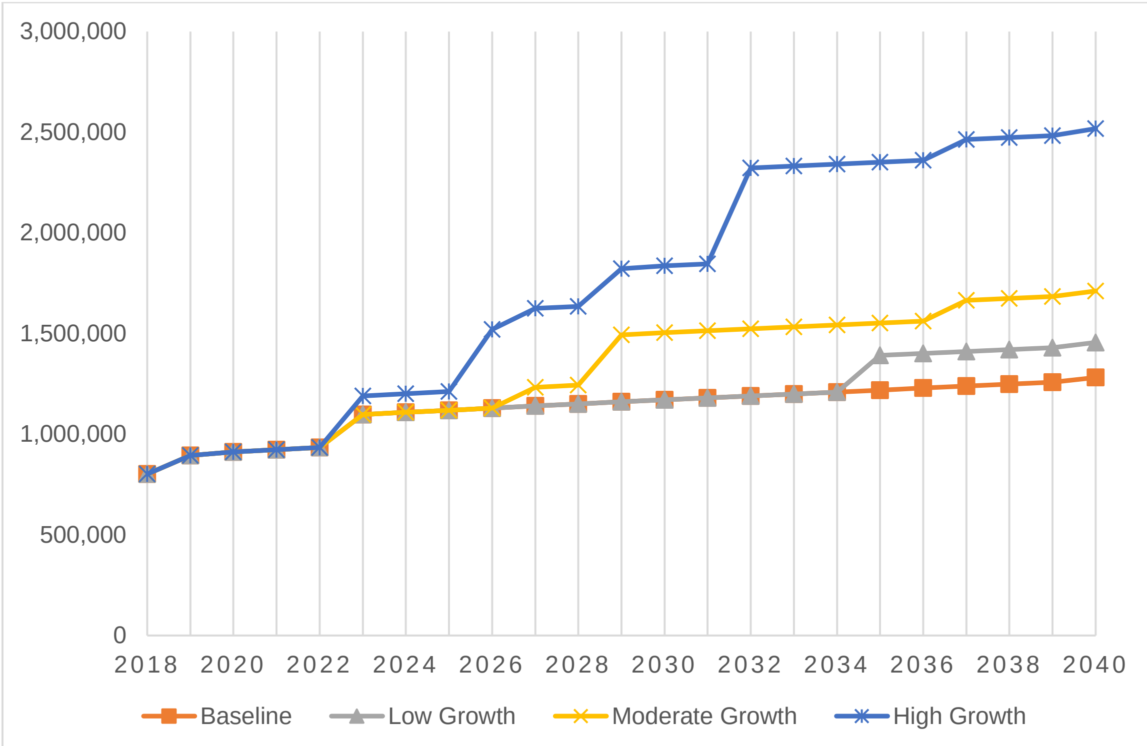
Exhibit 4-10 shows ridership forecasts by year for each scenario. Future ridership growth is due to steady population growth. The baseline scenario shows a spike in ridership in 2023 due to the projected addition of two round trips in 2023 between Seattle and Portland.[31] For the low growth scenario, ridership growth tracks the baseline until 2035 when additional train trips are assumed to be added between Seattle and Portland. 2040 ridership is 13 percent higher under the low growth scenario compared to baseline.

The moderate growth scenario forecasts ridership for 2040 at over one third higher than the baseline, and 15 percent higher than the low growth, with notable spikes in ridership occurring in 2029 and 2037 when service improvements are assumed to occur. The ridership increases follow service improvements associated with this scenario.

The high growth scenario has substantially higher forecasted growth – 47 percent above moderate growth and 96 percent above the baseline in 2040. The 2040 high growth scenario ridership is more than three times that of 2018.

[31] The timing for introduction of additional Amtrak Cascades trips was chosen for modeling purposes. Additional trips will be added when feasible.

Exhibit 4-10 Amtrak Cascades ridership forecast by year, 2018-2040



Under current conditions, Amtrak Cascades trains experience some days of crowding, particularly on weekend days of summer months. The effect of potential train crowding on future ridership is evaluated by examining load factors, which is the ratio of passengers on board to seats provided, focusing on July and August weekend peak days. The analysis shows that the peak load factors are expected to exceed 1.0 between 2019 and 2022 for all scenarios, implying peak demand will exceed the number of seats available. Since standees are not allowed on intercity trains, the peak summertime overcrowding may result in 0.2% to 0.4% dip in total annual system ridership between 2019 and 2022. Starting from 2023, peak load factors reduce below 1.0 as additional train trips are added between Seattle and Portland, indicating that no crowding issue is anticipated for future years between 2023 and 2040.

Improvements to station access/egress can positively affect Amtrak Cascades ridership at select stations. The Sound Transit 3 improvement program is projected to increase regional transit ridership by 14 percent in the Puget Sound area[32], which is expected to improve urban transit accessibility by 14% for five Cascades stations within Sounder service area. Such regional transit service improvements are projected to result in 2 to 3% ridership increase for Everett, Edmonds, Seattle, Tukwila, and Tacoma stations.

Issues and needs

On-time performance

Like other modes of transportation, all passenger rail services in Washington experience delays. Reliability, measured as on-time performance, is an important factor that travelers consider when choosing how to get to their destination. It can be particularly important in some situations, like going to

[32] Sound Transit 3 Appendix C: https://www.soundtransit.org/sites/default/files/project-documents/st3-system-plan-2016-appendix-c.pdf

work, traveling to an appointment, or making a trip that would require connecting to another scheduled transportation service. More details about Cascades train on-time performance can be found in section 4.3 under existing conditions.

To track delays, Amtrak has developed a set of delay categories. Train delays are recorded in minutes. Delays are classified by specific cause. Types of delay causes have been grouped together into the eight general categories. WSDOT uses these delay types, described below, to track delay on the Amtrak Cascades route in Washington.

- **Track and signal delays:** All delays related to the railroad infrastructure. Any type of delay involving problems with the tracks or the signals, or delays involving maintenance work being done on the tracks or signaling systems. This includes delays from reduced speeds to allow safe operation due to track problems.
- **Train interference delays:** All delays related to other train movements in the area. Primary causes of these types of delays are freight trains but also can include commuter trains and other Amtrak passenger trains. This category also includes delays due to switching to alternate tracks or routes to operate around other trains.
- **Equipment delays:** All delays related to problems with the passenger train cars or locomotives. These delays can be due to unplanned equipment servicing or due to an equipment failure that may have occurred enroute or at the initial terminal. This includes delays due to a disabled passenger train ahead.
- **Weather delays:** All delays related to weather conditions, including speed restrictions due to excessive heat or flash flood warnings, an infrastructure failure due to severe weather, such as flooding, mudslides, washouts, wind damage, fallen trees, lightning strikes and power outages.
- **Passenger delays:** All delays related to assisting passengers. These delays include holding a station departure for passengers boarding or detraining, for passengers connecting from another train or for assistance to an ill or injured passenger. Also included are any necessary delays for providing appropriate assistance to disabled passengers.
- **Operational delays:** All delays related to the late arrival and turning of train equipment at an initial terminal, movement of train equipment between the servicing yard and the initial terminal and all train crew related delays, such as providing adequate crew rest or re-crewing as required by the federal hours of service law. Also included are delays over a detour route.
- **Non-railroad delays:** All delays related to a non-railroad third party. These delays can be due to customs and immigration, a bridge opening for waterway traffic, police activity, grade crossing collisions, or loss of power due to a utility company failure.
- **Other:** A unique delay occurrence which does not fall under any of the normal delay categories.

WSDOT tracks delay on the Amtrak Cascades route in Washington through the Cascades Performance Database, which collects and reconciles daily Cascades train delay data from Amtrak and BNSF for service outcome reporting. Cascades delays reported by Amtrak delay categories in 2018 are shown in Exhibit 4-11. Delay types are categorized into three groups to identify responsibility: host railroad, Amtrak, and third party.

Exhibit 4-11 2018 Amtrak Cascades delays by category (minutes)

Delay Code	Description	Responsible	Total	%
DSR	Slow Order Delays	Host	32,966	21.5%
FTI	Freight Train Interference	Host	25,848	16.9%
PTI	Passenger Train Interference	Host	18,318	11.9%
RTE	Routing	Host	9,357	6.1%
DCS	Signal Delays	Host	8,919	5.8%
ENG	Locomotive Failure	Amtrak	5,965	3.9%
SYS	Crew & System	Amtrak	5,497	3.6%
MBO	Drawbridge Openings	Third party	4,506	2.9%
ADA	Disabled Passenger Related	Amtrak	4,008	2.6%
HLD	Passenger Related	Amtrak	3,965	2.6%
DMW	Maintenance of Way	Host	3,530	2.3%
POL	Police-Related	Third party	3,469	2.3%
CAR	Car Failure	Amtrak	3,422	2.2%
OTH	Miscellaneous Delays	Amtrak	3,400	2.2%
TRS	Trespassers	Third party	2,533	1.7%
CTI	Commuter Train Interference	Host	1,741	1.1%
CCR	Cab Car Failure	Amtrak	1,603	1.0%
SVS	Servicing	Amtrak	1,487	1.0%
ITI	Initial Terminal Delay	Amtrak	1,151	0.8%
CUI	Customs	Third party	1,142	0.7%
WTR	Weather-Related	Third party	757	0.5%
CON	Hold for Connection	Amtrak	675	0.4%
DBS	Debris	Third party	159	0.1%
INJ	Injury Delay	Amtrak	64	0.0%
DTR	Detour	Host	36	0.0%
Grand Total			**144,518**	**100.0%**

In 2018, BNSF was responsible for nearly 70% of the delay minutes. The majority of BNSF-responsible delays were due to slow order delays, freight train interference, and passenger train interference, which were identified as the top three causes of Amtrak Cascades service delays. Amtrak was responsible for about 22% of the total delays, largely due to equipment failures (locomotives, cars, and cab cars). Third parties (not Amtrak or the host railroad) were responsible for the remaining 8% of total delays. Those included drawbridge openings, police-related incidents, people trespassing on the railroad, and customs delays.

Equipment needs

The four Talgo Series 6 Amtrak Cascades trainsets, representing two-thirds of the Amtrak Cascades fleet, were built in 1999 and are approaching the planned end of their useful life. The equipment's condition will begin to deteriorate at an accelerated pace; therefore, continued operation means WSDOT will incur increases in annual operation and maintenance (O&M) costs. In keeping with its Amtrak Cascades Fleet Management Plan, WSDOT planned to replace its Talgo Series 6 trainsets in the mid-2020s. The need to acquire new trainsets has been accelerated by the National Transportation Safety Board's recommendation that Talgo 6 trainsets be replaced as soon as possible.

Amtrak provides P-42 locomotives to supplement the Amtrak Cascades fleet. As noted in the discussion of long distance passenger rail, these locomotives have increased mechanical challenges to reliable operation due to their age and worn condition. To the extent that these locomotives are needed to substitute for the newer WSDOT-owned Charger locomotives, Amtrak Cascades service can be affected by their reliability. WSDOT has identified a need for three more locomotives to eliminate the use of Amtrak locomotives as substitutes when locomotives are out of service for maintenance or repair.

Planning for future demand

More planning is needed to develop an intercity passenger rail system in Washington state that meets future demand. Plans are used to guide WSDOT activities, inform decision makers, and qualify for funding opportunities. This Rail Plan is not intended to provide detailed proposals for increasing passenger rail service. Further planning studies are needed to develop detailed strategies for reaching service goals.

Amtrak Cascades improvements

This rail plan confirms the long-term vision for intercity passenger rail based on strategic planning that was set out in earlier plans (Long-Range Plan for Amtrak Cascades, 2006; and Amtrak Cascades Mid-Range Plan, 2008):

- Portland, Oregon to Seattle: 13 daily round-trip trains; 2 hours, 30 minutes total travel time
- Seattle to Vancouver, British Columbia: 4 daily roundtrip trains; 2 hours, 37 minutes total travel time
- Vancouver, British Columbia to Portland, Oregon: 5 hours, 22 minutes total travel time

Much has changed since the long-range plan was published in 2006. A fresh look at the future of Amtrak Cascades is warranted to update the planning for future incremental improvements to the service.

East-west intercity rail service

Some rail advocates have encouraged WSDOT to add state-supported passenger rail service on an east-west corridor between Seattle and Spokane, with stops in cities not currently served by Amtrak's long-distance service. The only passenger rail service in eastern Washington is Amtrak's Empire Builder, a train operating between Seattle/Portland and Chicago. The Empire Builder stops at several communities in central and eastern Washington, but intrastate service is not its primary function. It offers only one train a day each direction, and trains often arrive in the middle of the night. Train arrivals are unreliable. Other public transportation options are limited, especially for those who look to transit service to travel between cities or to access passenger rail service. Drivers frequently cancel or avoid travel across the mountain passes due to adverse weather in the winter and recreational traffic in the summer. Intercity train travel could be a viable solution to improve mobility, access to services, and economic development across the state. In 2019, the State Legislature funded a study to evaluate the viability of a potential east-west intercity rail line, similar to Amtrak Cascades, to improve connectivity.

WSDOT last studied rail passenger rail service between western and eastern Washington on the Stampede Pass corridor in 2001. The study determined passenger service was technically feasible and identified infrastructure improvements that would be needed. Ridership was not estimated. A marketing survey performed by Central Washington University in 2017 showed considerable interest in cross-state passenger train service through south central Washington and documented substantial population growth along the corridor. To assess the current viability of establishing rail service between Seattle and Spokane, a ridership analysis and an updated list of infrastructure improvements are needed.

Ultra-high speed ground transportation

Looking to longer-term needs, WSDOT has been studying Ultra-High-Speed Ground Transportation (UHSGT) under the direction of the legislature. UHSGT is ground transportation capable of test speeds of up to 250 miles per hour, operating on an independent corridor separate from existing freight and passenger rail systems. The term is technology neutral, encompassing any mode of ground transportation capable of delivering such speeds, including heavy rail, MAGLEV and Hyperloop systems. Due to increasing congestion on highway, rail, and air travel systems in the Pacific Northwest, UHSGT has attracted attention in recent years for its potential to enable one hour travel times between Seattle and Portland or between Seattle and Vancouver, BC.

Ultra-high-speed ground transportation is capable of test speeds of up to 250 miles per hour, operating on an independent corridor.

WSDOT completed a feasibility study in 2017 that concluded that an UHSGT network between Vancouver, Seattle and Portland was feasible to build and operate in the Cascadia corridor and thereby positioning the Pacific Northwest megaregion to be globally competitive in the decades to come. A supplemental economic study by Microsoft and Washington Building Trades identified economic return and benefits of approximately $355 billion in Gross Domestic Product over 30 years with a UHSGT system.

In 2019, Washington state, in cooperation with British Columbia, Oregon, and Microsoft, performed a business case analysis of UHSGT that validated the cost estimates from the feasibility study and showed how an ultra-high-speed system could form the spine of a transportation network capable of managing the Cascadia corridor's explosive economic growth and accompanying population increase. This foundational planning work has indicated that UHSGT could be feasible and beneficial for the region, but there is still a good deal of work to be done. Establishing a new high speed ground transportation system that crosses state and international borders will require a high level of intergovernmental coordination. Understanding the entities, policies, and processes that need to be in place to plan and implement such a system would aid further work.

4.4 Commuter

Commuter rail systems typically offer passenger service within a single region, and occasionally between regions. In Washington, commuter train service is provided by the Central Puget Sound Regional Transit Authority (Sound Transit) with its Sounder train service. Sounder operates on an 82-mile route between Everett in the north and Lakewood in the south, providing morning and evening rush hour service during the week, with occasional weekend service for special events.

Sound Transit manages the service and owns the passenger cars and locomotives, and contracts with BNSF for operating crews and Amtrak for maintaining the equipment. Infrastructure access was gained by Sound Transit through the acquisition of operating easements between Everett and Tacoma over BNSF's track along the I-5 corridor. The line used by Sounder between Tacoma and Lakewood was acquired from BNSF, and thus is under the full control of Sound Transit.

State role and interest

Sounder provides high-capacity public transportation that increases travel options and relieves congestion. The service helps fulfill state objectives for reducing vehicle miles traveled and greenhouse gas emissions. WSDOT coordinates train schedules with Sound Transit for mutual benefit of Amtrak Cascades and Sound Transit's commuter services in the Puget Sound region. The state has contributed funds to Sounder projects that also provide benefits for other rail users.

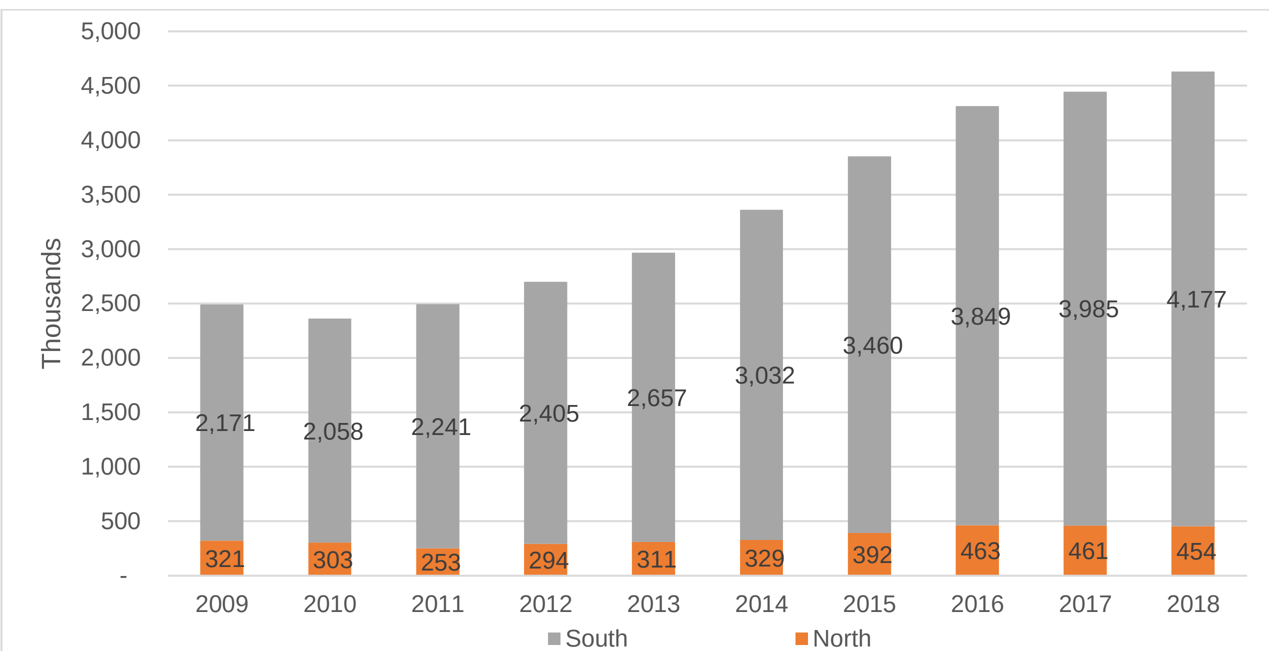
Existing and future conditions

Existing conditions

The total ridership on Sounder commuter rail, operated by Sound Transit, has grown steadily from about 2.5 million riders in 2009 to 4.6 million riders in 2018 (Exhibit 4-12), an 86% increase over past ten years. The ridership increase is mainly driven by growth in the number of daily trips on the South line, where annual ridership almost doubled over the past ten years, accounted for 90% of total riders in 2018. Two additional Sounder South line round trips were introduced in fall 2017 contributing to further ridership growth in 2018 and beyond.

Ridership on Sound Transit's Sounder commuter rail has grown over 86% in the past ten years.

Exhibit 4-12 Sounder train annual ridership by lines, 2009 – 2018[33]



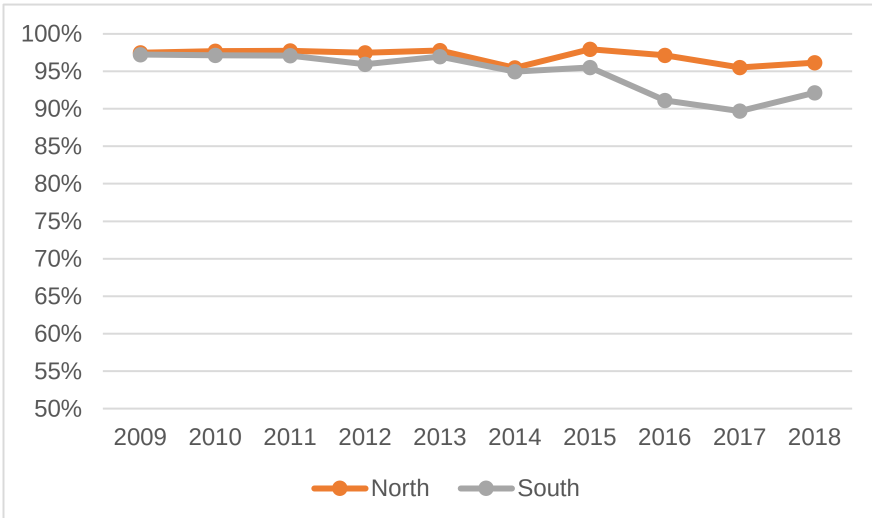
Sound Transit measures and reports on-time performance for Sounder trains as the percent of trips operated arriving within 7 minutes of the scheduled arrival time at final station. In the last ten years, the on-time performance for north line has been consistently above 95%, meeting its 95% OTP target

[33] Sounder annual ridership data was provided by Sound Transit.

(Exhibit 4-13). The on-time performance for south line was between 97% and 95% from 2009 to 2015, declined to 91% in 2016 and stood at 92% in 2018.

Compared to intercity passenger rail, Sounder commuter rail operates over much shorter distance (under 40 miles for the north line and 50 miles for the south line), mainly serves daily commuters, and therefore has higher requirement for on-time performance to meet their customer needs. Because Sounder operates on shorter routes, these trains have fewer opportunities to encounter delays. Passenger trains on longer routes, such as the Amtrak Cascades and Amtrak long-distance trains, are more likely to encounter issues like stretches of track with slow orders or interference from other trains.

Exhibit 4-13 Sounder train on-time performance, 2009 - 2018[34]



Sound Transit tracks and reports delays that occur on its service routes. Sounder train delay minutes in 2017 by Sound Transit delay categories are shown in Exhibit 4-14. The top three delay causes for Sounder trains were force majeure (unpredictable events such as trespassing), freight train interference, and maintenance and repairs along the right-of-way, which accounted for 53 percent of the total delay minutes in 2017.

Future ridership

Projections for total ridership on Sounder through 2040 were determined based on the Sound Transit 3 System Plan published by Sound Transit. The forecasts are based on the Puget Sound Regional Council's published population and employment forecasts and a modeling methodology approved by Federal Transit Administration[35].

Sounder commuter rail ridership is projected to reach 8 to 11 million by 2040 with Sound Transit 3 investments. Major Sounder improvements built into Sound Transit ridership forecasts include extending Sounder commuter rail service during peak hours from Lakewood south to new stations at Tillicum and DuPont. Sound Transit also is exploring the possibility of adding trips to its existing routes.

[34] Sounder train on-time performance data was provided by Sound Transit.
[35] Sound Transit 3: Appendix C https://st32.blob.core.windows.net/media/Default/Document%20Library%20Featured/8-22-16/ST3_Appendix-C_2016_web.pdf

Exhibit 4-14 2017 Sounder train delays by category (minutes) [36]

Delay Category	Total minutes	Percentage
Force Majeure	2,467	20.30%
Freight Interference	2,007	16.50%
Maintenance of Way	1,985	16.40%
Construction	1,652	13.60%
Other	1,472	12.10%
Mechanical	1,181	9.70%
Landslide	722	5.90%
Dispatching	267	2.20%
Amtrak Interference	175	1.40%
Weather	139	1.10%
Positive Train Control	71	0.60%
Total	**12,138**	**100.0%**

Issues and needs

Planning for future demand

Sound Transit has seen growing ridership on Sounder, particularly south of Seattle. Sound Transit 3 investments in Sounder South will address several challenges that constrain the ability of Sound Transit to accommodate additional passengers.

One challenge is infrastructure that limits the length of trains. Stations south of King Street station which are served only by Sounder (i.e., not by Amtrak Cascades) have platforms that support train lengths up to the 7-car trains currently operated by Sound Transit. Another challenge is station access. Stations have limited parking that often fill to capacity very early in the day. Making it easier to get to stations without personal vehicles would support higher ridership. Another challenge to adding capacity for more riders is track ownership. BNSF owns most of the route used by Sounder. As a result, Sound Transit needs to negotiate with BNSF to add more trains.

[36] Sounder train delay data was provided by Sound Transit.

Chapter 5 Integrated rail system

The rail system connects and interacts with other elements of the transportation system in Washington, and are intertwined with the communities through which they pass. The following section addresses issues that are common to and affect the entire rail system.

5.1 Rail system capacity

How will the rail system operate in the future? This section provides an integrated system capacity analysis of freight and passenger rail services for the 2016 base year, and three scenarios of low growth, moderate growth, and high growth. This capacity analysis combines the freight rail demand and passenger rail demand forecasts developed in Chapters 3 and 4 to examine how rail traffic growth would affect rail system performance, and where bottlenecks are likely to occur if no additional capacity or operational improvements were made to the rail network in Washington state.

Three future scenarios were evaluated for system capacity analysis:

- Low growth scenario (LGS): combines the low growth scenario established for freight rail volume forecast, and for Cascades passenger rail ridership forecast;
- Moderate growth scenario (MGS): combines the corresponding moderate scenarios established for freight rail volume forecast and for Cascades passenger rail ridership forecast;
- High growth scenario (HGS): combines the corresponding high growth scenarios established for freight rail volume forecast and for Cascades passenger rail ridership forecast.

Combining both freight and passenger rail demand allows forecasting of rail traffic growth, system performance, and potential bottlenecks.

These three scenarios include existing long distance and commuter services for capacity analysis, but do not account for additional Amtrak long distance trains nor Sounder commuter rail trains.

The capacity analysis results are expressed as level of service (LOS) grades, by comparing combined freight and passenger train volume to the practical capacities of each segment. The general approach for the capacity analysis is by identifying the rail network's physical attributes, estimating the base and future rail traffic over the network, determining the capacity by route, and calculating base year and future LOS by route. The LOS grades and descriptions correspond generally to the LOS grades used in the Federal Highway Administration's Highway Performance Monitoring System (HPMS)[37]. The V/C ratios and the corresponding LOS grades are listed in Exhibit 5-1.

[37] For example of highway LOS calculation methodologies, see Simplified Highway Capacity Calculation Method for the Highway Performance Monitoring System, Federal Highway Administration, 2017 (https://www.fhwa.dot.gov/policyinformation/pubs/pl18003/hpms_cap.pdf). Sample LOS calculations are shown on Tables 11-12, pp. 21.

Exhibit 5-1 Volume-to-capacity ratios and level of service grades

LOS Grade	Description		Volume/Capacity Ratio
A	Below Capacity	Low to moderate train flows with capacity to accommodate maintenance and recover from incidents	0.0 to 0.2
B			0.2 to 0.4
C			0.4 to 0.7
D	Near Capacity	Heavy train flow with moderate capacity to accommodate maintenance and recover from incidents	0.7 to 0.8
E	At Capacity	Very heavy train flow with limited capacity to accommodate maintenance and recover from incidents	0.8 to 1.0
F	Above Capacity	Unstable flows; service breakdown conditions	> 1.00

The results of capacity analysis are summarized in Exhibit 5-2 and visually represented in Exhibits 5-3, 5-4, 5-5 and 5-6 for existing conditions (2016) and the different future scenarios (2040). These exhibits provide an indication of current and future demands for capacity and resulting congestion, absent any operational change and investments to increase capacity. The capacity analysis results identified multiple segments where capacity will be insufficient to handle projected traffic. In 2016, a substantial portion of the Class I rail network in Washington was operating below capacity, primarily LOS C. However, there also were particularly congested segments, including Lakeside-Spokane and Vancouver-Pasco, both at LOS E.

Under the low growth scenario, none of the major corridors except Portland, OR – Vancouver are projected to experience higher train volumes and a decreased LOS by 2040. Some corridors would experience reduced volumes and a higher LOS. Although the low growth scenario would result in fewer trains on the statewide rail system, there would be a corresponding decrease in economic growth associated with this scenario.

Under the moderate scenario, 79% of network mileage and 89% of train miles would operate at capacity (LOS E) or above capacity (LOS F) in 2040. The following major corridors are expected to deteriorate to LOS F:

- Vancouver – Pasco
- Everett – Spokane
- Lakeside – Spokane
- Spokane – Sandpoint, Idaho (BNSF)

Notably, these include both of BNSF's primary northern transcontinental routes across Washington – the northernmost Everett-Spokane route, and the low-grade Columbia River route. The BNSF Auburn-Pasco corridor parallel to these routes continues to operate below capacity even as rail volumes increase. This is due to Stampede Pass tunnel clearance restrictions that limit the types of rail cars that can pass through it, requiring trains with those cars to use one of the other two routes.

Under the high growth scenario, conditions will worsen with 82% of the network and 96% of the train miles operating at (LOS E) or above capacity (LOS F). The following corridors are expected to deteriorate to LOS F by 2040 without any improvements in capacity and/or operational changes:

- Everett – Vancouver, British Columbia
- Hinkle, OR – Lakeside

- Pasco – Lakeside
- Vancouver – Pasco
- Tacoma – Vancouver
- Seattle – Everett
- Everett – Spokane
- Lakeside – Spokane
- Spokane – Sandpoint, Idaho (BNSF)
- Spokane – Sandpoint, Idaho (UP)

If the high growth scenario is realized, Washington's entire primary rail network as it exists today would cease to function reliably. All of Washington's passenger service would be affected, with the higher freight volumes causing even greater effects on service reliability than would be the case with the 2040 moderate scenario.

Exhibit 5-2 Level of service estimation for base and forecast year scenarios

Name of Corridor	2019 State Rail Plan Update LOS			
	2016 Base year	2040 Low growth	2040 Moderate growth	2040 High growth
Auburn-Pasco	B	A	B	B
Everett-Vancouver, B.C., Canada	C	C	E	F
Hinkle, OR-Lakeside	C	B	E	F
Pasco-Lakeside	C	C	E	F
Vancouver-Pasco	E	D	F	F
Seattle-Tacoma (BNSF)	C	C	D	E
Seattle-Tacoma (UP)	A	A	B	B
Tacoma-Vancouver (BNSF/UP Shared Use Segment)	C	C	E	F
Seattle-Everett	C	C	E	F
Everett-Spokane	C	C	F	F
Lakeside-Spokane (BNSF/UP Shared Use Segment)	E	D	F	F
Spokane-Sandpoint, ID (BNSF)	C	C	F	F
Spokane-Sandpoint, ID (UP)	C	B	E	F
Portland, OR-Vancouver (BNSF/UP Shared Use Segment)	B	C	C	E
Fallbridge-Chemult, OR	A	A	A	A

Exhibit 5-3 Mainline level of service analysis for base year 2016

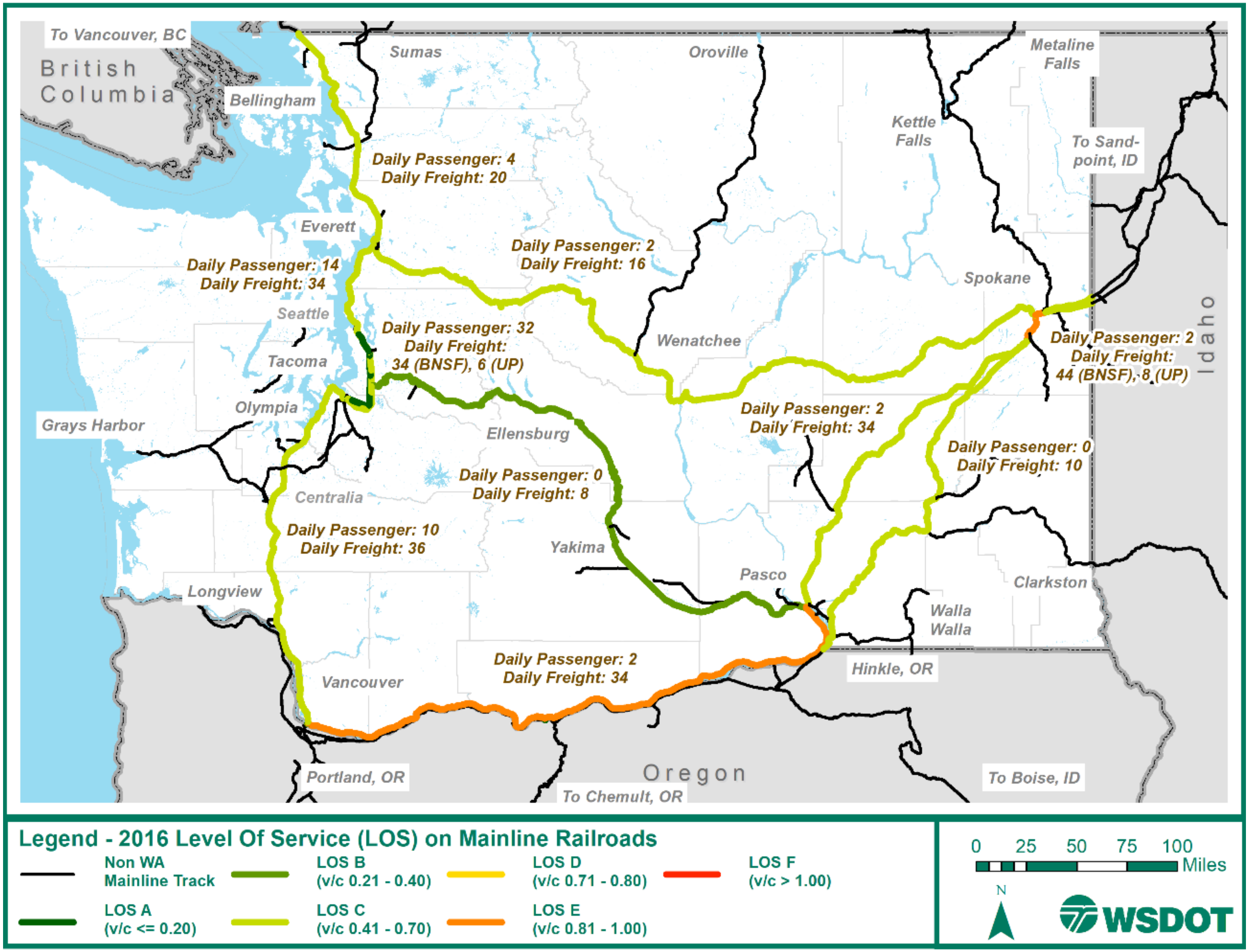
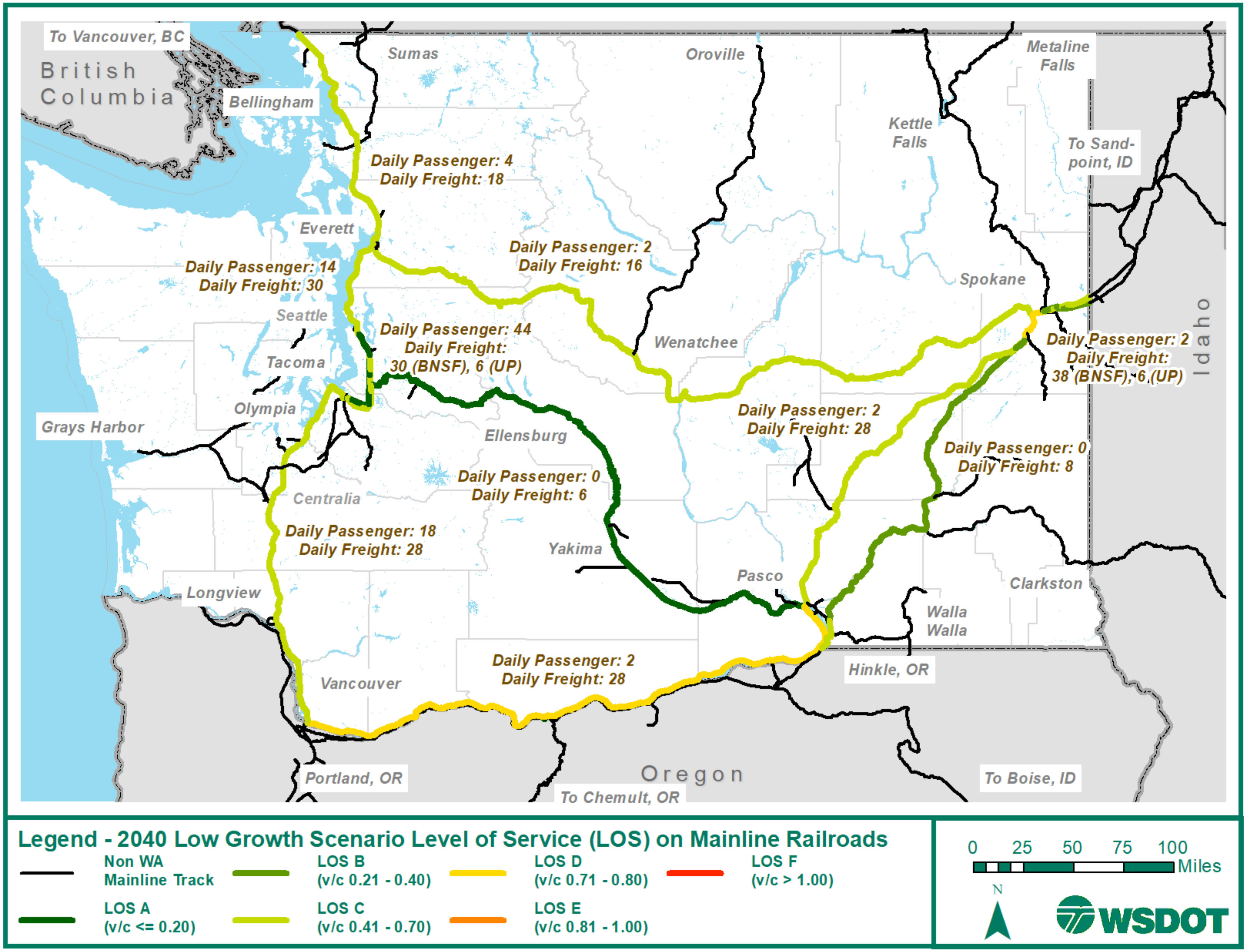
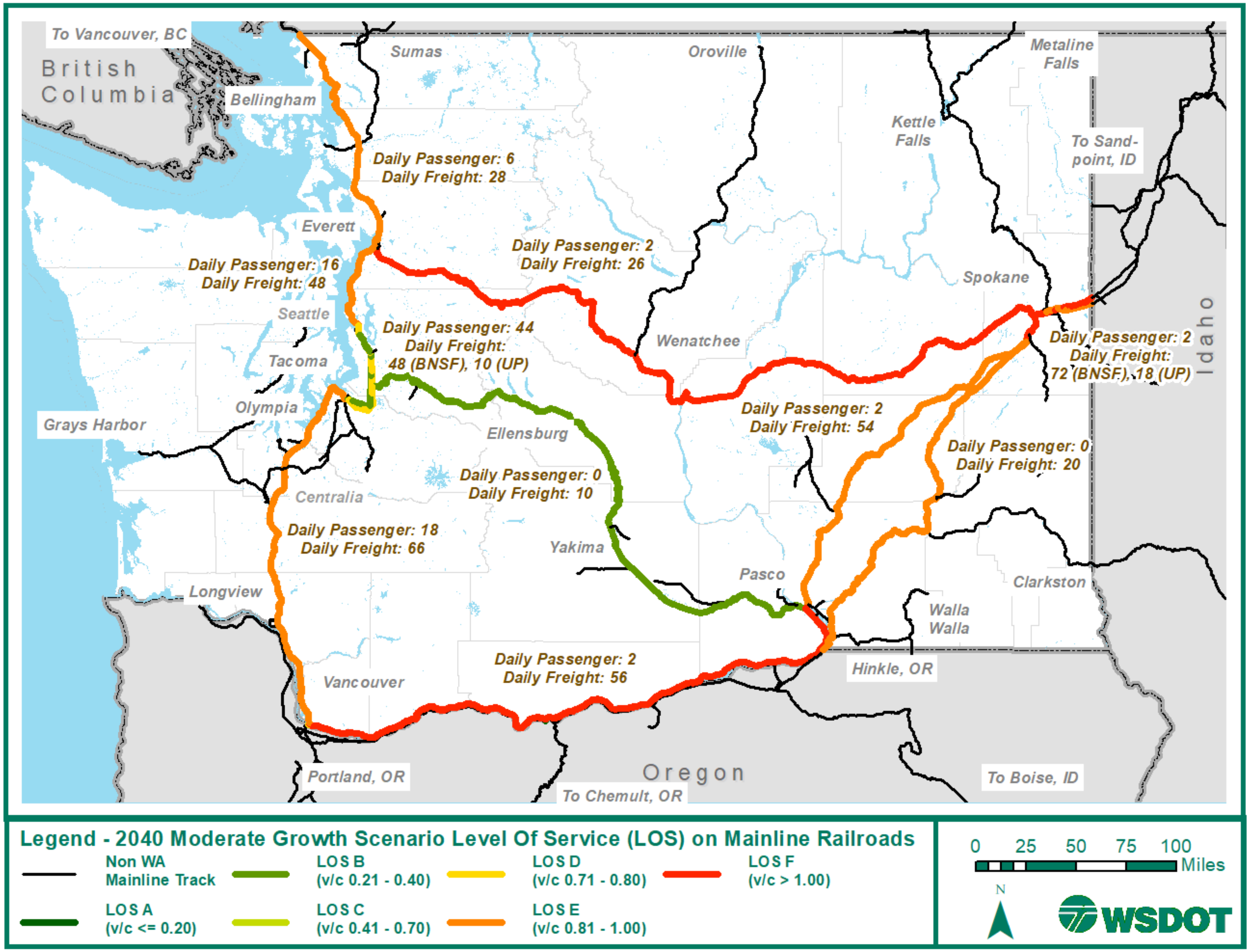


Exhibit 5-4 Mainline level of service analysis for 2040 Low Growth Scenario



1578 **Exhibit 5-5 Mainline level of service analysis for 2040 Moderate Growth Scenario**



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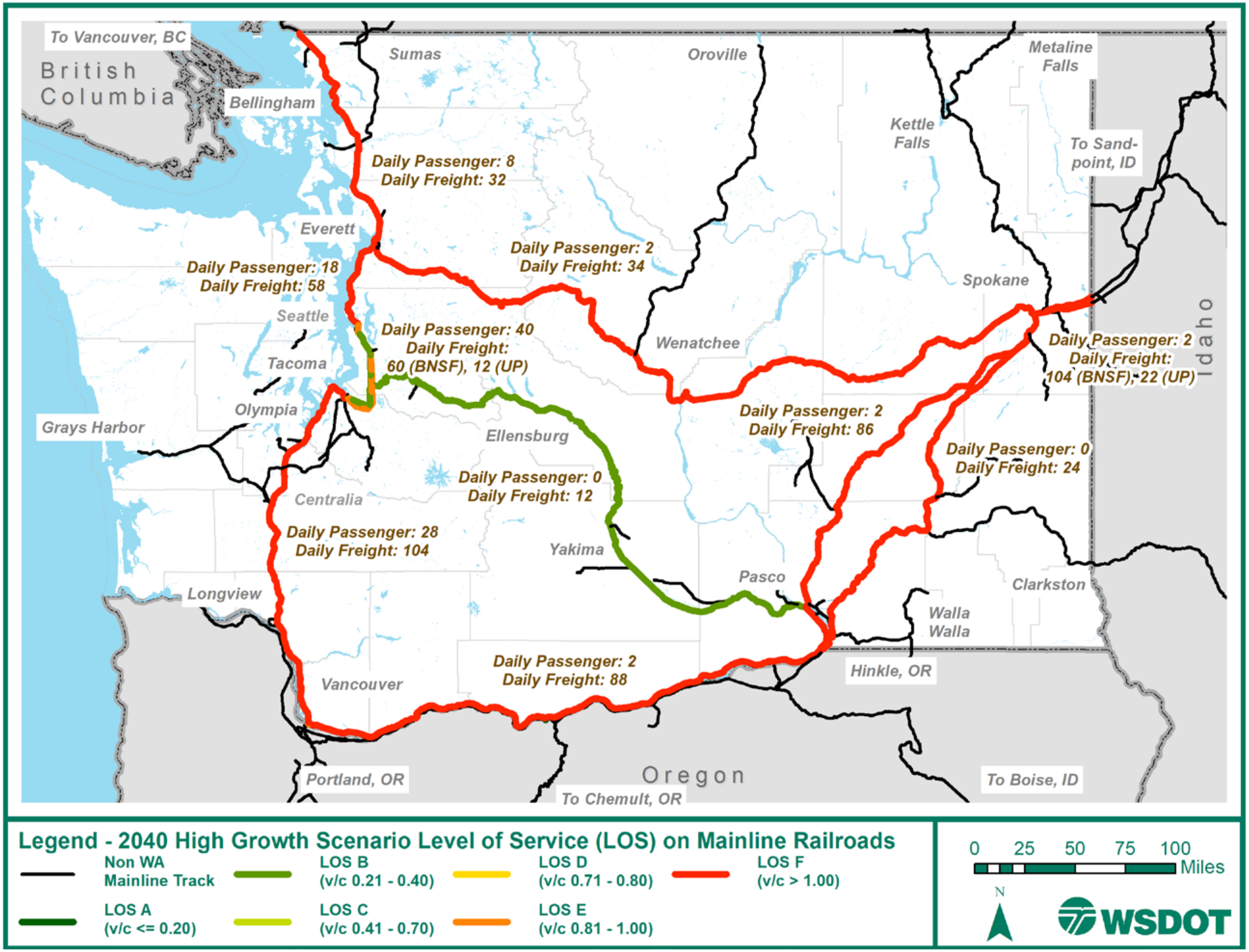
1580 **Exhibit 5-6 Mainline level of service analysis for 2040 High Growth Scenario**



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5.2 Multimodal connectivity for freight rail

Connections from rail to other modes of transportation are important for freight rail. Reliable and efficient access to the rail system throughout the state increases attractiveness of Washington ports and helps make Washington's goods more competitive in the global market. There are several types of rail transfer facilities, each suited for a different purpose.

An example of an intermodal freight movement is a container that is imported on a ship and then transferred to a truck and then transferred to a railcar. Intermodal container terminals provide for connectivity to other modes such as trucking and shipping. These terminals typically move 40-foot containers but also move containers of various sizes, including 53-foot containers that serve North America exclusively. Ships carrying international and domestic containers can be loaded directly onto railcars at on-dock intermodal facilities within NWSA terminals at Port of Seattle and Port of Tacoma, or containers can be drayed by trucks and then loaded onto railcars at near-dock or off-dock facilities. BNSF has three commercial intermodal yards: Seattle, South Seattle, and Spokane. Union Pacific has two commercial intermodal container yards: Argo in Seattle and TacSim in Fife.

Bulk transfer facilities are used for transloading bulk goods between rail and other modes, typically highway and water, and facilitate transferring the commodity from one mode specific vehicle to another. Grain elevators are an example.

Maintaining the supply of suitable industrial lands around rail terminals is important to encourage future industrial and rail growth.

Specialized yards are used for automobile loading/unloading facilities and other commodities that require special handling. Automobile facilities are located in Spokane, Tacoma, Kent, and Tukwila.

Transload terminals transfer carload freight between rail cars and trucks. Some facilities offer storage services for customers. BNSF and Union Pacific partner with the operators of these facilities to offer affiliated networks of transload terminals. Common commodities that move through these facilities include lumber and bulk goods (dry or liquid), such as plastic pellets and vegetable oil. Union Pacific also has its own transload facility in Wallula that specializes in food and beverages, operated by its Cold Connect service.

State role and interest

Terminals and yards facilitate the movement of freight by providing essential functions in support of other carriers. As one example, intermodal terminals are key links in supply chains that use Washington's ports. They serve as the primary means of providing access to the U.S. interior. Intermodal terminals are especially important for Washington as they support the Puget Sound region's growing intermodal container trade. In Washington, rail intermodal traffic accounted for 18 million tons, or 15 percent of total freight commodity flow in 2016. Terminals are also important for the movement of Washington agricultural products and other freight, allowing shippers not located on a rail line to access the rail system.

Issues and needs

Land use

Maintaining the supply of suitable industrial lands around rail terminals is important to encourage future industrial and rail growth. Industrial access to freight railways is critical for many industries to remain competitive. These industries often supply family-wage jobs to areas where economic growth can be scarce. Railroads and cities have grown symbiotically in the western United States since the industrial revolution with rail-centric industry and passenger rail being a principal driver in westward expansion. This trend resulted in population centers surrounding rail facilities. As urbanization brings more people into cities, gentrification and housing shortages increase pressure to redevelop rail-dependent industrial areas. When this happens, industrial land values can increase to a point where the land may be more valuable for residential developments than manufacturing or distribution facilities. Additionally, many obsolete rail-served industrial facilities are not economically feasible to be redeveloped for modern industry. Local governments face a dilemma of whether or not to hold onto industrial areas for future use or rezone them to increase tax revenues. However, if these industrial areas are rezoned for residential uses, new conflicts may develop between new residents and the adjacent railroad.

Washington ports

Railroads have an important role as Washington ports adapt to a changing maritime industry. These changes include changing trade economics (primarily due to tariffs), competition from other ports, the trend towards larger ships, and the growing practice of transloading containers.

A prosperous Washington economy depends heavily on goods imported by container through marine and land-side transportation infrastructure and the ability to economically export products. 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.

Larger vessels using the Panama Canal and a shift in manufacturing from China to other nations has changed the economics for some shippers moving freight to the central and eastern parts of the United States, with total annual tonnage increasing 22 percent between 2016 and 2017. This increase reflects bulk and containerized freight that once passed through ports on the West Coast and traveled across the country by rail. Much of that freight now is passing through ports closer to where it is destined.

Expansion of ports in British Columbia has increased the number of containers moving by rail through Canada to locations in the eastern half of the United States. In 1995, Seattle and Tacoma combined had five times the market share of the Ports of Prince Rupert, British Columbia and Metro Vancouver, British Columbia combined. Now they are nearly equal.[38] The Port of Prince Rupert, developed as part of the Canadian government's national trade strategy, has been particularly effective in competing with ports in Washington for containerized freight. Its container volume growth rate is outpacing ports in Washington due to a variety of advantages, including transit time and cost. Because of the remoteness of the port from major population centers, rail moves 99 percent of cargo processed via Prince Rupert. The port advertises rail transit times to Chicago nearly a day faster than the transit time from Seattle, and has closer proximity to key Asian markets. It also costs much less to ship a container from Asia to Chicago through Prince Rupert versus other west coast ports, partly attributable to the differences in tax structures. The Harbor Maintenance Fee (HMF) adds to the cost of each container imported through a U.S. port. In contrast, U.S. imports moving through Canadian ports do not pay the tax. The Port of Prince Rupert recently completed a 500,000 TEU expansion in 2017 to further expand its capacity. Canadian ports also compete for movement of bulk freight.

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

Changes in containerized freight movement are straining the inland transportation system supporting Northwest Seaport Alliance terminals in Seattle and Tacoma. Container ships are getting larger every year due to economies of scale. This allows shipping companies to cut costs by consolidating cargo into larger loads and call at fewer ports. In the 1970s, the average size was 1,100 twenty-foot equivalent units (TEU), a unit of capacity based on the volume of a 20-foot-long intermodal container. Between 2010 and 2015, the average vessel size increased from 5,500 to 6,500 TEU in the Trans-Pacific Fleet. Today, 10,000 TEU ships are becoming a common sight in Puget Sound. While this trend is beneficial to ocean carriers, the large spike in volume when a ship arrives places pressure on ports and inland transportation systems to handle higher volumes in more compressed periods.

An increasing portion of containers passing through Northwest Seaport Alliance terminals are going to local warehouses to be resorted and transloaded into larger domestic containers for rail shipment to inland destinations. This practice allows shippers to combine freight from multiple originating points bound for a single destination and they also can save money by using domestic containers that are longer than international containers. This trend creates additional truck trips between the port, the warehouses, and the domestic intermodal terminals operated by the railroads in Seattle and Tacoma. To compete with other ports and support the state economy, Washington ports need an efficient reliable inland transportation system, with roadway networks that provide access to the rail network.

First/last mile connectors

In the context of freight rail, first/last mile connectors are the roads that connect rail facilities with farms, industrial centers, ports, freight corridors, and the rest of the transportation system. Freight rail competes with long haul trucking for the movement of many goods. Freight rail is beneficial to the highway system because railroads can reduce the number of trucks causing congestion and wear on highways. However, rail cargo often travels by truck to and from the rail system using first/last mile connectors.

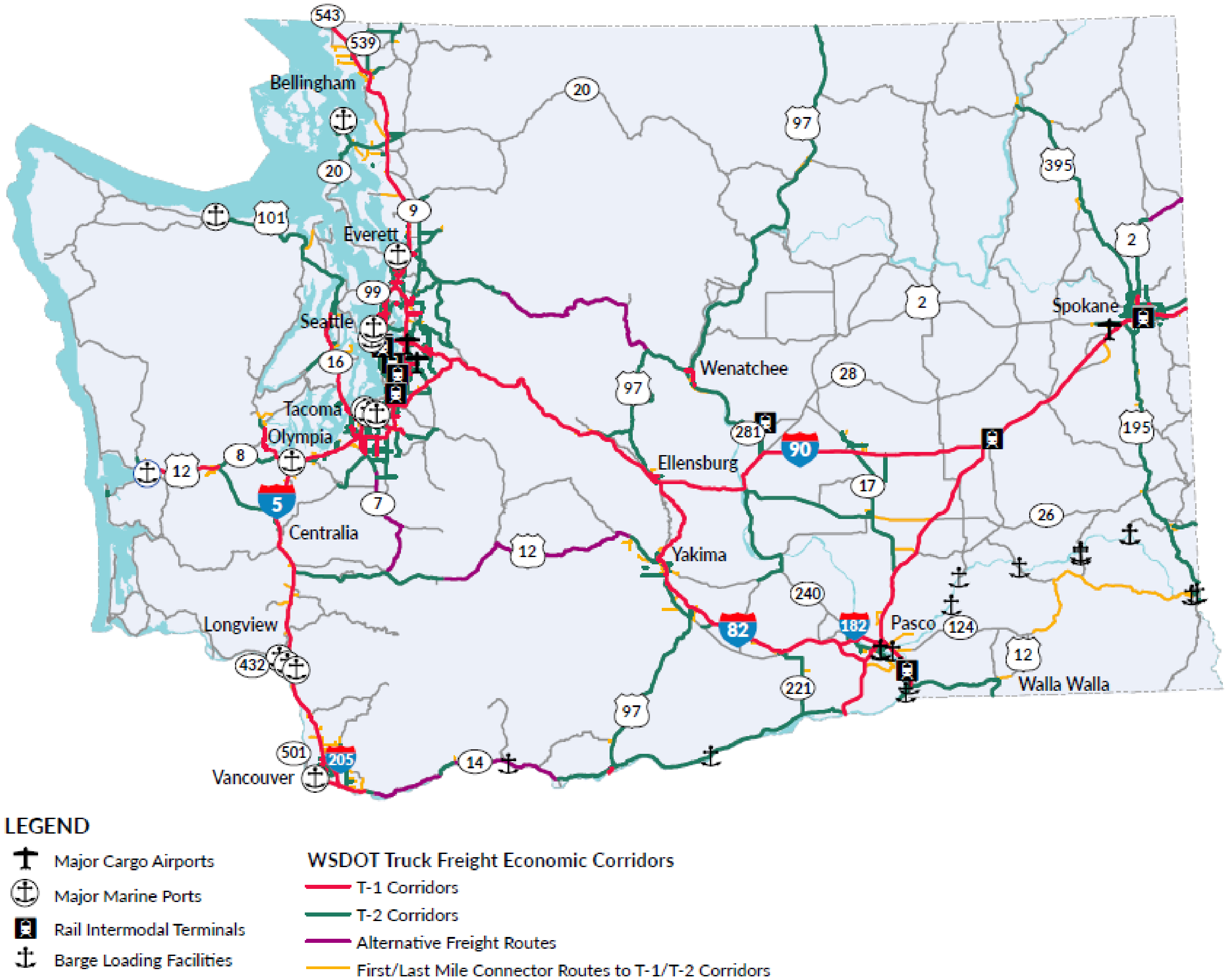
Current supply chain and economic trends are creating even more pressure on these routes. Many rail-served facilities, including mills and grain elevators, are consolidating. Ports utilize the rail system for much of their freight. While some shippers can move freight directly into or out of rail cars, freight is often loaded onto trucks to get to or from the rail system. As the use and volume of freight rail increases, these connectors are at risk of becoming overwhelmed. Increased truck traffic could cause congestion and wear out pavement faster. A 2017 FHWA Freight Intermodal Connector Study found that only nine percent of National Highway System Freight Intermodal Connectors nationwide have a good or very good pavement condition.[39]

WSDOT collaborates with local and regional partners to identify first-mile and last-mile connections on the freight system. In 2014, WSDOT established the Truck Freight Economic Corridors that include local connections to freight-intensive land uses and freight intermodal facilities critical to supply chains in the state. Exhibit 5-7 shows the first/last mile connectors designated as part of the 2014 network. This has been used as a planning tool to assist with identifying freight needs, support freight planning efforts and inform freight investment decisions. In 2017, WSDOT used the corridor designation as one quantitative criteria for evaluating freight project benefits and supporting freight investment decisions for National Highway Freight Program funding allocation. WSDOT is currently working with freight partners to update the 2014 first/last mile designation as part of the 2019 Freight and Goods Transportation

[39] FHWA Freight Intermodal Connectors Study, April 2017: https://ops.fhwa.dot.gov/publications/fhwahop16057/fhwahop16057.pdf

System Update.

Exhibit 5-7 Truck Freight Economic Corridors in Washington state[40]



5.3 Multimodal connectivity for passenger rail

Rail passenger trips start and end somewhere other than the train station. Riding a passenger train is typically just one part of a journey, with passengers using some other mode of travel to get to or from the train station. Seamless connections with other modes is important to integrate passenger rail into the statewide transportation system and making it a viable, attractive option for travelers.

Access to passenger rail train stations by car, bike, transit or walking is often referred to as multimodal connectivity. Passenger rail becomes more attractive and easier to use as access to and from train stations becomes more multimodal, frequent, and efficient. A primary component of connectivity that must be considered is “first and last mile” connectivity: the idea that a passenger is able to conveniently and efficiently access the rail station and system to begin their journey and/or conveniently and

[40] 2017 Washington State Freight System Plan: https://www.wsdot.wa.gov/publications/fulltext/freight/Freight-Plan-2017SystemPlan.pdf

efficiently reach their final destination through transit connections, walking, biking or a personal vehicle.

State role and interest

Easy connections for passengers to get to and from the stations by multiple transportation modes would make train travel more attractive and support higher ridership. With higher ridership, passenger rail service providers can cover more of their operating costs with fares. High-quality multimodal connections at passenger rail stations can also facilitate higher volumes of passengers. The need for high quality connections between modes will increase as WSDOT adds Amtrak Cascades trips and Sound Transit increases Sounder commuter rail capacity to meet demand.

Because many of the rail stations serve multiple services, there are opportunities for Amtrak, WSDOT and Sound Transit to partner on things like shared parking, improved transit connections, or a seamless fare payment system.

Existing conditions

Nearly all passenger rail stations in Washington have dedicated parking spaces, local transit service, paratransit service, and sidewalks. Many also have connections to intercity bus routes. Dedicated bicycle lanes or trails connecting to stations are less common. WSDOT evaluated multimodal connectivity at Amtrak Cascades stations from Portland, Oregon to Vancouver, British Columbia, which can be found in Appendix B.

Amtrak Cascades and Sounder commuter rail jointly serve four stations – Everett, Edmonds, Seattle, and Tukwila. Once Amtrak Cascades trains return to the Point Defiance Bypass, they will jointly serve the Tacoma Dome station as well. Travelers can transfer between Sounder commuter rail and Amtrak long distance trains at the same stations, except for Tukwila. The Empire Builder stops at Everett, Edmonds, and Seattle. The Coast Starlight stops at Seattle and will eventually move to Tacoma Dome station when the Amtrak Cascades trains begin serving that station again. Amtrak Cascades and the Coast Starlight also share stations in Washington at Olympia-Lacey, Centralia, Kelso-Longview, and Vancouver.

Detailed information about modal connections and supporting infrastructure at passenger rail stations in Washington is provided in Exhibit 5-8.

1747 **Exhibit 5-8 Modal connections and supporting infrastructure at Washington state passenger rail stations**

Location	Owner	Service	Local Bus	Paratransit	Intercity Bus	Regional Express Bus	Local Shuttle	Parking	EV Charging	Ferry	Light Rail	Commuter Rail	Intercity Rail	Long Distance Rail	Sidewalks	Bike Lanes or Sharrows	Bike Racks	Bike Lockers or Boxes
Auburn	Sound Transit	Sounder	●	●		●		●				●			●			●
Bellingham	Port of Bellingham	Cascades	●	●	●			●					●		●		●	
Bingen/White Salmon	BNSF Railway	Empire Builder	●	●				●						●				
Centralia	City of Centralia	Cascades, Coast Starlight	●	●				●					●	●	●		●	●
Edmonds	BNSF and Sound Transit	Cascades, Empire Builder, Sounder	●	●	●			●		●		●	●	●	●			●
Ephrata	City of Ephrata	Empire Builder	●	●	●			●						●	●	●		
Everett	City of Everett	Cascades, Empire Builder, Sounder	●	●	●	●		●				●	●	●	●		●	●
Kelso/Longview	City of Kelso	Cascades, Coast Starlight	●	●	●			●					●	●	●			
Kent	Sound Transit	Sounder	●	●		●		●				●			●		●	●
Lakewood	Sound Transit	Sounder	●	●		●		●				●			●		●	●
Leavenworth	City of Leavenworth	Empire Builder		●			●	●						●				
Mount Vernon	Skagit Transit	Cascades	●	●	●			●					●		●		●	
Mukilteo	Sound Transit	Sounder	●	●				●		●		●					●	●
Olympia/Lacey	Intercity Transit	Cascades, Coast Starlight	●	●				●					●	●			●	
Pasco	City of Pasco	Empire Builder	●	●	●			●						●	●			●
Puyallup	Sound Transit	Sounder	●	●		●		●				●			●		●	●
Seattle	City of Seattle	Cascades, Coast Starlight, Empire Builder, Sounder	●	●	●	●					●	●	●	●	●	●	●	●
South Tacoma	Sound Transit	Sounder	●	●				●				●			●	●	●	●
Spokane	City of Spokane	Empire Builder	●	●	●			●						●	●	●		●
Stanwood	WSDOT	Cascades	●	●				●					●		●			
Sumner	Sound Transit	Sounder		●		●		●				●			●		●	●
Tacoma (Tacoma Dome)	WSDOT and Sound Transit	Cascades, Coast Starlight, Sounder	●	●	●	●		●			●	●	●	●	●	●		●
Tukwila	Sound Transit	Cascades, Sounder	●	●				●	●			●	●		●	●	●	●
Vancouver	City of Vancouver	Cascades, Coast Starlight, Empire Builder		●				●					●	●				
Wenatchee	BNSF	Empire Builder	●	●	●			●						●	●			
Wishram	BNSF	Empire Builder	●	●				●						●				

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WSDOT

Issues and needs

Station access

All passenger rail stations have opportunities for improving connectivity with other modes.

The largest cities on the Amtrak Cascades route (Seattle, Portland, Oregon, and Vancouver, British Columbia) have the best multimodal connectivity, reflecting surrounding land uses that are conducive to multiple modes as well as the transportation infrastructure and services available around the stations.

Olympia-Lacey and Vancouver (WA) have the greatest connectivity challenges among Amtrak Cascades stations, largely due to their locations. Olympia-Lacey is located at the east edge of Lacey, where suburban land uses transition to rural. While bus transit service is available at the station, the circuitous route it takes to downtown Olympia results in an hour-long trip. The station is isolated from the pedestrian and bicycle infrastructure in Olympia and Lacey, on a highway with no shoulder or separation. Vancouver is located in an industrial area, in the middle of one of the busiest rail junctions in Washington. While the Vancouver station is not very far from downtown, viable pedestrian and bicycle routes to the station are minimal. Frequent, unpredictable rail traffic makes the station difficult to serve with scheduled bus transit service and no routes currently stop in the immediate station area.

WSDOT's Travel Washington Intercity Bus Program[41] provides bus service to rural residents so they can connect to major transportation hubs and urban centers. The intercity bus program fills gaps in the public transportation network and makes travel more accessible, reliable and convenient. Travel Washington is the first public/private partnership model in the country where transportation companies provide in-kind (non-monetary) contributions to an intercity bus program, such as aligning schedules for passengers from rural areas to seamlessly connect to nationwide bus and train networks, airports, state ferries and other transportation hubs. All of the Travel Washington bus routes connect to Amtrak stations served by the Empire Builder. Only the Dungeness Line makes a direct connection to the Coast Starlight and Amtrak Cascades service as well, at King Street Station in Seattle.

Schedule coordination

The passenger rail services coordinate their schedules to make passenger operations as smooth as possible. This includes train schedules of Amtrak long distance trains, Amtrak Cascades intercity trains, and Sounder commuter trains, as well as intercity thruway bus routes to improve connections outside stations. Thruway bus routes can build ridership on passenger rail corridors by connecting them to communities away from the corridor. They can also be used to connect stations along a passenger rail corridor, adding service in advance of increasing rail trips.

Coordination with local and regional transit service is also important, to make the whole door-to-door trip efficient for rail passengers. Sound Transit has been working with local transit agencies to coordinate local bus service with Sounder train schedules. Comprehensive coordination of local bus service and Amtrak Cascades schedules can be a challenge in some communities because there are train arrivals outside the service hours of local buses.

Shared passes

The RailPlus program allows Sound Transit passengers to use Amtrak Cascades trains at Seattle's King Street Station, Edmonds and Everett by purchasing an Amtrak RailPlus ticket. Tickets can be purchased with an ORCA card, ORCA Passport card, or at the regular Amtrak ticket rate. Likewise,

[41] wsdot.wa.gov/transit/intercity

Amtrak Cascades ticket-holders can ride designated Sounder trains between Seattle and Everett at no additional charge. This opportunity strengthens both services.

5.4 The rail system in communities

The rail system, like the rest of the transportation system, does not exist in isolation. It is intertwined with our communities and our environment.

Safety is critically important for communities. Though rail is considered a safe, efficient mode of transportation, continued work is needed to maintain and improve rail safety. Therefore, WSDOT and its partners remain focused on providing and operating safe rail infrastructure.

The environment can be affected by the rail system. Air quality and fish passage are two examples. The environment can also affect the rail system. Natural events like landslides, floods, and fires affect the resiliency of the rail system.

The rail system can affect the environment, including air quality and fish passage. The environment also can affect the rail system, such as landslides, floods, and fires.

Existing conditions

Rail safety is a serious consideration for state and federal agencies, and it is regulated through several different public agencies including the Federal Railroad Administration (FRA) and the Washington Utilities and Transportation Commission (UTC).

Exhibit 5-9 shows the rail incidents in the past ten years in Washington reported by FRA's Office of Safety Analysis[42]. The total rail incidents have dropped from 254 in 2009 to 213 in 2018, a 16 percent decrease over the last ten years. Highway-rail collisions at crossings accounted for 17 percent of total rail incidents in 2018, while train incidents accounted for 16 percent, and other incidents accounted for 66 percent. The total rail incidents in Washington comprised 2 percent of the total number of incidents nationally in 2018.

[42] FRA Office of Safety Analysis: safetydata.fra.dot.gov/OfficeofSafety/Default.aspx, data retrieved in July 2019.

Exhibit 5-9 Washington rail incidents, 2009 – 2018

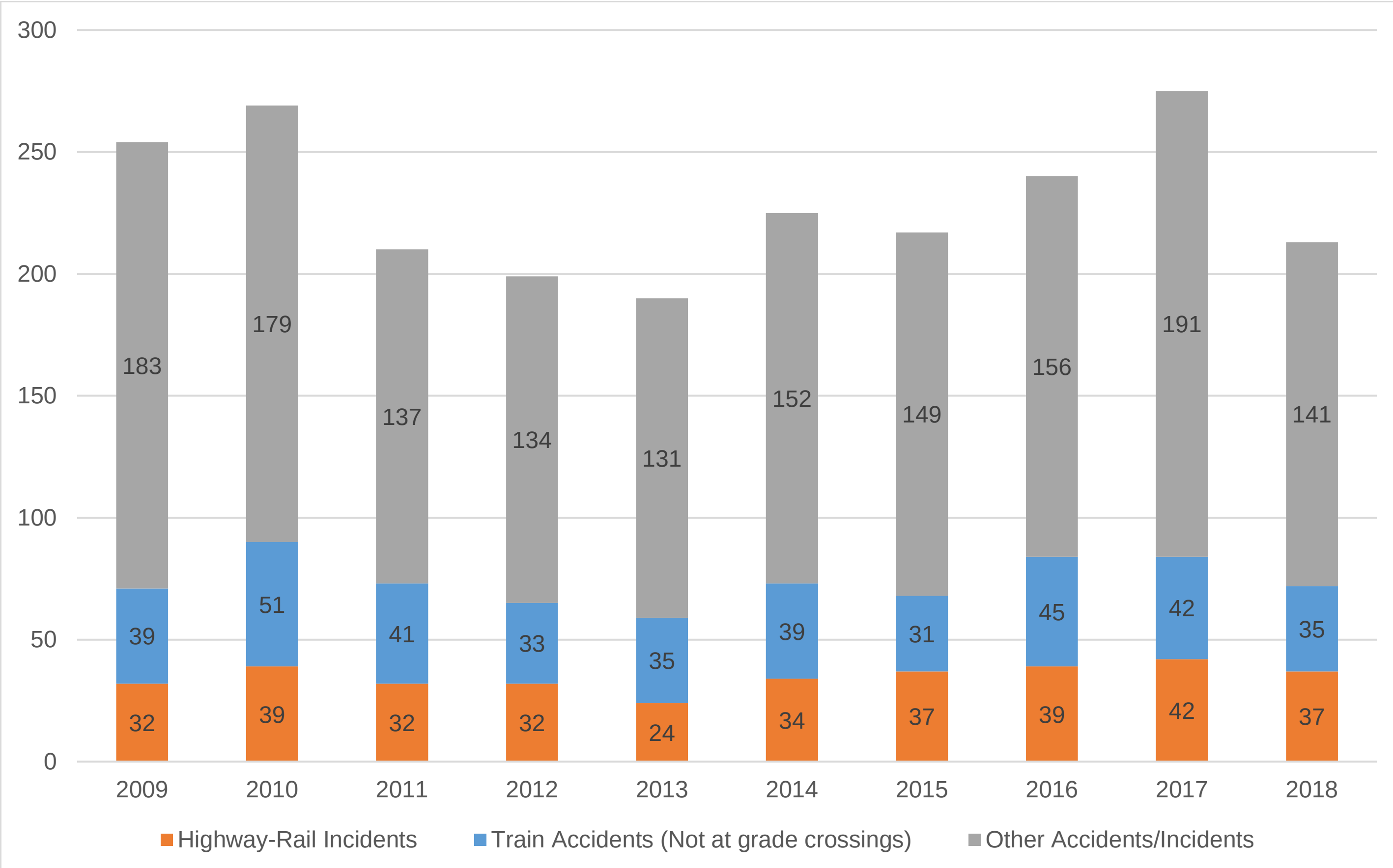


Exhibit 5-10 shows the rail crossing collision and trespassing data collected and reported by UTC from 2010 through 2018. The number of crossing collisions[43] and crossing fatalities declined for several years, but increased in 2016 and 2017. The safety performance improved significantly in 2018 with a drop in crossing collisions and crossing fatalities. In 2018, there were 34 collisions at crossings, resulting in 12 injuries and 6 fatalities. Fatalities related to accidental or purposeful trespassing incidents vary from year-to-year on active rail lines, ranging between 7 and 23 trespassing fatalities during this period.

Exhibit 5-10 Washington rail crossing/trespassing incidents, 2010 – 2018

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
Crossing Collisions	36	29	33	20	35	37	40	40	34
Injuries	10	4	18	10	10	7	13	5	12
Fatalities	4	8	2	4	5	4	7	10	6
Trespassing Fatalities	15	22	10	17	9	23	7	21	18

[43] A variance is noted between UTC and FRA crossing and trespassing statistics.

State role and interest

Given the potentially severe outcomes of rail incidents, rail safety is a serious consideration for state and federal agencies. Rail safety and security is regulated through several different federal and state agencies, including the FRA, the Washington Utilities and Transportation Commission, and the Department of Homeland Security. WSDOT serves primarily as a public educator. In 2016-2017, WSDOT developed its own multi-faceted rail safety education campaign, Stay Back From The Tracks, which was recognized with a national award from the American Association of State Highway and Transportation Officials (AASHTO).

Issues and needs

At-grade rail crossing safety and trespassing

At-grade rail crossing safety

At-grade rail crossing concerns tend to focus on the potential for train/roadway vehicle conflicts, the potential for disrupted emergency vehicle response time, congestion caused during “gate down time,” and air quality concerns from vehicles idling at grade crossings. For these reasons, at-grade crossing safety is a priority concern for the community, UTC, FRA, WSDOT and railroads. The dual pressures of growing populations, coupled with increasing rail traffic, are bringing at-grade crossing concerns to the forefront of statewide rail planning in many states.

The UTC and FRA track aggregate incident/collision data across the nation. There were 2,216 highway-rail incidents nationally in 2018, of which 37 (1.6 percent) were in Washington[44]. The UTC tracks these incidents, and also keeps a rail grade crossing database comprised of all the rail grade crossings in the state.

Collisions at at-grade highway-rail crossings declined to 20 in 2013, but have increased in subsequent years, varying from 34 to 40 per year since then.[45] Due to the cost of installing protective measures, not all crossings have the same level of protection. At a minimum, most have some form of advanced warning sign and pavement markings. Only 20 percent of all public crossings in Washington have gate arms which can physically deter vehicles from crossings in front of trains.

Trespassing

Accidental or intentional trespassing occurs regularly on active rail lines. This practice is illegal and strongly discouraged. Of the 161 trespassers involved in incidents between 2013 and 2017 in Washington, nearly 60 percent resulted in fatalities.

The dual pressures of growing populations, coupled with increasing rail traffic, are bringing at-grade crossing concerns to the forefront of rail planning

Trespassing incidents occur when a person who should not be on railroad property does not observe posted signage, does not understand the hazards of being around an active railroad, or intends self-harm. This includes travelling over or along railroad property. Railroads tracks are often trespassed because they offer the shortest route and easiest grade between two points. Railroad property is linear,

[44] FRA Office of Safety Analysis: safetydata.fra.dot.gov/OfficeofSafety/Default.aspx, data retrieved in October 2019.

[45] Washington Utilities and Transportation Commission, https://www.utc.wa.gov/publicSafety/railSafety/Pages/WARailCrashStats.aspx

at times without breaks to allow safe crossing. At some locations, the property passes over bridges or through tunnels where there are limited transportation options.

In recent years, some railroads have seen an increase in homeless encampments. Railroads in both urban and rural areas have reported being challenged by this issue. These encampments are a safety issue for both the people living in them and the railroad workers who encounter them. While it is a problem for both Class I and short line railroads, short line railroads can face a higher burden in dealing with the issue since they tend to have fewer resources than the larger railroads.

Rail crossing conflicts in communities

As both rail and highway traffic increases and trains get longer, at-grade crossings can result in adverse effects to mobility in communities. These include:

- Long and unpredictable travel delays for both the general public and freight users
- Collisions between trains and vehicles, bicycles, or pedestrians
- Temporary increase of emergency response times

With the growth of the state's population and increasing highway and rail traffic, communities throughout the state are concerned about the reliable and safe movement of rail and truck freight, general traffic, and emergency vehicles. A key concern with long trains is the length of time that road crossings are occupied by trains. While a 10,000 foot train going 60 miles per hour takes two minutes to clear a crossing, at 10 miles per hour it takes 12 minutes, thus increasing the amount of time roadway traffic has to wait. Blocked railroad crossings are national issue. Existing state rules are unenforceable due to court rulings, and states are strongly requesting that the FRA develop regulations to address blocked crossings. Until federal rules are developed, the UTC collects and forwards blocked crossing complaints to the FRA, and works with railroads when there is an imminent safety hazard resulting from a blocked crossing.

Addressing the problems caused by road-rail conflicts is challenging. High costs and the lack of available funding make it difficult to identify, develop, and complete plans and projects to address road-rail conflicts.

Energy products transportation

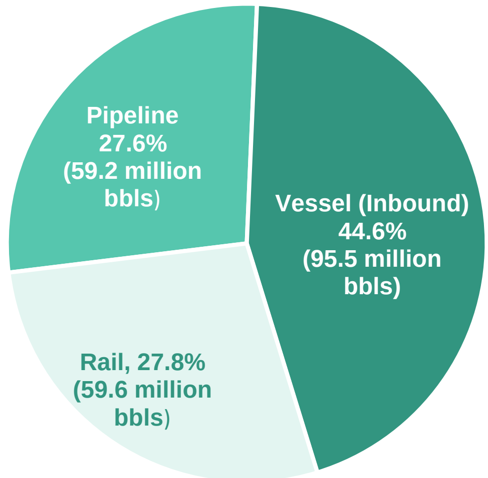
The two primary energy products transported by rail are oil and coal.

Oil

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 9 percent of the oil shipped to Washington moved by rail. In 2018, nearly 28 percent moved by rail. Crude oil transportation by mode is shown in Exhibit 5-11.

Exhibit 5-11 Crude oil transportation volume in Washington state by mode, January 1 – December 31, 2018



Rail routes transporting crude oil enter the state from Idaho near Spokane and from British Columbia near Bellingham. Large segments of the rail routes travel along the I-5 corridor, and cross or run next to major waterways, including the Columbia River and Puget Sound.[46]

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 related to spills. Several explosive derailments involving trains carrying Bakken oil have raised concerns about the volatility of the oil and the potential effect of a derailment in Washington communities. Vapor pressure has been identified as a potential measure of oil volatility.

Coal

While multiple proposals for new export coal terminals in the Pacific Northwest heightened concern about the effects of coal transportation on communities, only one project is still active. The proposed Millennium Bulk Terminals project in Longview was denied required state permits and approvals and is now working through the court system.

Corridor preservation

While abandonment of rail lines has slowed in recent years, some lines are at risk of eventual abandonment. Currently two separate abandonment proceedings are in progress for the Columbia and Cowlitz Railway/Patriot Woods Railroad – one for the Longview to Ostrander Junction (7 miles) and one for the line from Ostrander Junction to the end of the railroad northeast of Longview (21.5 miles).

Once abandoned, a rail line is very difficult to reconstruct. Rail infrastructure is typically removed from abandoned lines and would need to be rebuilt to reinstate rail service. Encroachments on the unused right-of-way can be an impediment to rebuilding a line for rail service. And if the right of way parcels end up in the ownership of multiple parties after abandonment through sale or reversion, recreating the linear corridor could be very challenging. Adjacent property owners sometimes prefer to see rail corridors revert to private ownership.

[46] Washington Department of Ecology, Crude Oil Movement by Rail and Pipeline Quarterly Report: October 1, 2018 through December 31, 2018 fortress.wa.gov/ecy/publications/documents/1908005.pdf

Some rail corridors without rail service have been purchased to preserve the right of way for other transportation purposes. For instance, portions of the Palouse to Cascades State Park Trail were purchased from the railroad by the state of Washington prior to abandonment. Other corridors are railbanked during the formal federal abandonment process. Railbanking is a program that preserves rail corridors not presently needed for rail service. Any qualified private organization or public agency that has agreed to maintain the corridor for future rail use is eligible to negotiate for railbanking. A railbanked corridor is technically not abandoned, which allows the railroad to sell, lease, or donate it to an organization for trail use. If a rail line is formally abandoned, the railroad may lose any rights to possess or transfer parcels of land within the corridor that it held as an easement with use limited to railroad purposes. While an abandoned rail corridor still can be preserved intact, it becomes a more complex and uncertain process because it may be owned by many different people.

While the railroad has the legal right to reestablish rail service on a corridor it railbanked, the interim trail use can become important to the communities it serves and a potential source of conflict if a need for rail service returns. In some communities around the country, multiuse trails have been established alongside rail lines. These “rails-with-trails” projects demonstrate that rail can coexist with other modes of transportation in certain circumstances.

Diesel emissions

Diesel exhaust is considered a hazardous air pollutant by the U.S. Environmental Protection Agency (EPA), and contains several air pollutants, including particulate matter less than 2.5 microns in diameter (PM2.5), nitrogen oxides, volatile organic compounds, and carbon dioxide. PM2.5 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.

Rail is a relatively fuel efficient and therefore cleaner, way to move freight. In 2015, particulate matter emission was estimated to be 0.008 grams per ton-revenue mile for rail, and 0.023 grams for trucks, indicating that rail emission rate for particulate matter is 65% lower than trucks[47]. In 2014, Railroad locomotives accounted for 365 tons of the 8190 tons of PM2.5 contributed by mobile sources in Washington[48]. This is down from 457 tons attributed to locomotives in 2011 out of 10,600 tons attributed to mobile sources in the state.[49]

In 2015, particulate matter emission was estimated to be 65% percent lower for freight trains than trucks.

In June 2008, EPA finalized a three-part program to dramatically reduce emissions from diesel locomotives of all types — line-haul, switch, and passenger rail. The rule cuts particulate matter (PM) emissions from these engines by as much as 90% and oxides of nitrogen (NOx) emissions by as much as 80% when fully implemented. The standards are based on the application of high-efficiency catalytic after-treatment technology for newly manufactured engines built in 2015 and later. Remanufactured locomotives also must meet EPA standards. There also are requirements in place to reduce idling for new and remanufactured locomotives.[50]

[47] AASHTO Freight Rail Bottom Line 2018 Report.
[48] EPA, 2014 National Emissions Inventory (NEI) Data https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data
[49] EPA, 2011 National Emissions Inventory (NEI) Data https://www.epa.gov/air-emissions-inventories/2011-national-emissions-inventory-nei-data
[50] EPA, Regulations for Emissions from Locomotives https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-emissions-locomotives

As railroads acquire new or remanufactured locomotives and retire older locomotives, overall emissions from rail locomotives will continue to decline. In 2017, WSDOT purchased eight new Siemens Charger locomotives to power Amtrak Cascades passenger trains. These diesel-electric locomotives meet EPA's strictest Tier 4 emission standards and reduce PM and NOx emissions by more than 80% over the locomotives they replaced.

Diesel emissions also include greenhouse gases that contribute to climate change. Nationwide, rail accounts for 2% of the greenhouse gases produced by the transportation sector.[51] Some of the technologies that reduce diesel emissions also reduce greenhouse gases.

Fish passage

Rail lines cross streams and rivers in many places around Washington, especially routes that follow shorelines. Some of these crossings can impede fish migration. Culverts, which are generally large pipes that carry water under the tracks, may allow water to flow but do not provide conditions that fish can swim through. The water that flows through culverts may block fish migration because the flow is too swift, too shallow, or has a waterfall into or out of the culvert. Coordinated investments to remove barriers can deliver important benefits, improving fish access for miles both upstream and downstream. When rivers and streams are connected, fish can better access the habitat they need.

While much attention has been given to fish passage barriers on roads and highways in recent years, fish passage barriers have not been fully inventoried on rail lines in Washington. BNSF has started working with WSDOT and the Washington Department of Fish and Wildlife to identify fish passage barriers on its property and determine how to address them.

BNSF works with WSDOT and the Washington Department of Fish and Wildlife to identify fish passage barriers on its property and determine how to address them.

Resiliency

System resilience is the capacity of a system to absorb disturbance and retain its basic function and structure. For the rail 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 rail infrastructure. Natural disasters like landslides, fires, volcanic eruptions, earthquakes, and flooding can affect rail operations in the state. Disturbances can be especially troublesome for the rail system, which has fewer and longer detour options than the highway system.

Landslides are one of the most frequent natural disturbances that affect railroads in Washington. 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. Passenger trains on BNSF lines are subject to a 48-hour moratorium after a landslide. 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.

Climate change has the potential to increase the frequency and intensity of disturbances to the rail system. Washington has developed an integrated climate change response strategy, which identifies several potential risks to transportation infrastructure:

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[51] Fast Facts: U.S. Transportation Sector GHG Emissions https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100WUHR.pdf

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

WSDOT examined climate risks to state transportation assets using climate projections from the University of Washington Climate Impacts Group. The assessment identified fire as a high risk to the state-owned PCC rail system in eastern Washington. More than 140 wooden trestle bridges are on these lines, and some are over 100 years old. These bridges are vulnerable to wildfires. The trestles are made of creosote-coated timber that can burn for weeks. This vulnerability will increase under a scenario that has more wildfires.

Fire is a high risk to the state-owned PCC rail system in eastern Washington.

WSDOT has not assessed climate risks for privately-owned rail lines. However, some of the risk factors that apply to highways also would apply to rail lines. Applying these risk factors, rail lines with high vulnerability are found 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.

Chapter 6 Rail system strategies

Overall, Washington's rail system provides a safe and efficient transportation option to support the movement of people and goods throughout the state. However, there are challenges that must be addressed for the system to continue to function well as demand for rail transportation grows in the future. Though many of those challenges will be the responsibility of the private-sector rail stakeholders who own or operate over rail infrastructure, the public sector also has an interest in ensuring there is a viable system to support movement of people and goods.

The following pages articulate strategies for addressing the issues and needs facing today's rail system. These strategies draw from the analysis of rail system strengths and challenges completed during development of this State Rail Plan, as well as input solicited throughout the effort.

6.1 Freight rail strategies

Class I railroads

Managing capacity to meet future demand

Railroads can use a variety of strategies to deal with freight volume growth

Railroads typically respond to growth in freight demand with a mix of operational strategies and capital improvements including:

- Operation of longer trains
- Schedule and train speed adjustments
- Segregation of traffic by direction and/or type (e.g. separate bulk from intermodal, etc.), where multiple routes are available
- Application of advanced traffic management systems that improve meet/pass planning, management of train speeds and a reduction in headways
- Construction of additional main track, new and/or lengthened passing sidings
- Expansion of industry, yard and terminal facilities
- Installation of signals and/or improvements to existing signal systems, including the installation of Centralized Traffic Control[52]

Building additional infrastructure can help a railroad manage increased volumes, but it is not always the best choice. As private businesses, railroads look to gain benefits that exceed the costs of obtaining them. They calculate the potential financial return on a given capital investment, considering the costs and risks of the investment. If the costs and risks are projected to exceed the expected financial return, railroads rely on other strategies to manage freight volume increases.

Operating longer trains has been a common strategy for moving higher volumes of freight. Longer trains allow more freight to be moved by fewer people, improving productivity. Distributed power, the placement of locomotives across the length of the train rather than only in the front or back of a train is

[52] CTC is a form of railway signaling that consolidates train routing decisions that were previously carried out by local operations.

notable for helping to improve operational performance. The distribution of locomotive power allows the internal forces within longer trains to be safely handled, and is how railroads have been able to move trains of 10,000 feet in length or longer. However, these very long trains can decrease the fluidity of rail operations. Long trains take more time to build and break down, and their sheer length can complicate and slow down operations in terminals as well as along single track main lines. Furthermore, fixing mechanical problems can take more time than they do with shorter trains. Railroads have invested in longer sidings and other infrastructure projects to accommodate longer trains and continue to experiment with even longer trains.

Railroads also can manage the volume of freight by choosing to make business adjustments. These include selective price and service level changes, which directly affect capacity needs. Most commonly, these take the form of pricing actions, service frequency, and managing rail car availability to shippers that do not own their own cars. These decisions can negatively affect shippers and short line connections by increasing their direct and indirect costs.

Building additional infrastructure can help a railroad manage increased volumes, but it is not always the best choice.

One example of a business adjustment is precision scheduled railroading. All of the Class I railroads in the U.S., except for BNSF, have implemented this operating approach. Precision scheduled railroading focuses on streamlining operations with the goal of providing consistent, reliable, predictable service. Supply chains can accommodate reliable six days travel times easier than they can accommodate travel times ranging from five to eight days. Rather than scheduling trains, the railroads develop a schedule for an individual car and develop a plan to achieve that schedule. It requires shippers to better schedule their own shipments and allows cars to avoid classification yards. Transit times are reduced and cars turn faster. The railroads save money by using fewer employees and less equipment. Railroad operating ratios (operating expenses as a percentage of revenue) improve but customers have to be willing to accommodate the railroad to a greater extent.

BNSF can increase east-west capacity if needed

Washington has three primary east-west routes across the state, all owned by BNSF. All of them ultimately funnel into a single route east of Spokane to Idaho. In recent years, BNSF has improved capacity by adding track and implementing operational efficiencies in other corridors within the state. If rail traffic continues to grow on these east-west routes, similar actions are likely to be taken by BNSF. Should rail traffic grow beyond what these measures can accommodate, BNSF may need to address constraints caused by tunnels on Stevens Pass and Stampede Pass. The Stevens Pass tunnel needs to be regularly closed to flush out diesel exhaust fumes, limiting the number of trains that can pass through it each day. The tunnel on Stampede Pass has clearance restrictions limiting the types of rail cars that can pass through it, forcing trains with those cars to use one of the other two routes.

Washington's participation in corridor partnerships can advance shared interests

Continuing existing agreements and initiating new planning initiatives with state and provincial governments, public ports, and railroads are opportunities for continuing to strengthen ties throughout the region. Key issues motivating these ties include corridor-level improvement opportunities and rail lines that cross borders. Examples include corridor planning groups, such as the Great Northern Corridor Coalition, the Inland Pacific Hub project, Pacific Northwest Gateway Coalition, Freight Action Strategy for Seattle-Tacoma (FAST) Corridor Partnership, and the International Mobility and Trade Corridor project. Efforts elsewhere on the west coast to improve transportation corridors can serve as models to maintain and improve upon Washington's current successes. Maintaining and improving reliable rail service could increase the attractiveness of Washington ports for discretionary cargo, and could contribute to increased competitiveness for Washington ports. Importers and exporters have flexibility in their choice of port and could use the ports in British Columbia (Vancouver, Prince Rupert) or California to reach interior markets. In addition, the newly expanded Panama Canal is more competitive for Pacific Rim trade at ports along the U.S. eastern seaboard (including Miami, Savannah, Norfolk and others).

If surface transportation capacity or efficiency is not adequate, Washington ports could become less attractive to ocean carriers, leading to a loss of business and export opportunities. To ensure this does not happen, bottlenecks at intermodal terminals and on the trunk network must be identified and addressed. Addressing these bottlenecks to ensure that corridors serving Washington ports are reliable will require coordination among states, local governments, ports, and the railroads.

Short line railroads

Addressing deferred maintenance and optimizing for economic sustainability

Short line railroads and the state can work together to address deferred maintenance and compatibility with Class I railroads

Short line railroads continue to invest, as they are able, to maintain and improve infrastructure condition. Some short line railroads continue to struggle to overcome decades of deferred maintenance along their right of way. WSDOT will continue to support the short line rail system in Washington by managing the programs that support short line rail freight, such as the Freight Rail Investment Bank (FRIB) program, the Freight Rail Assistance Program (FRAP), and the Grain Train program as directed by the legislature.

WSDOT can continue to work to improve the condition of the PCC rail system

WSDOT is making improvements to the state-owned PCC rail system as funding is made available. As part of the Connecting Washington transportation funding package approved by the state Legislature in 2015, the PCC was allocated $6.7 million every two years through 2031 to undertake rehabilitation and improvement projects. In 2019, WSDOT leveraged this state funding as match to secure a $5.7 million grant through the USDOT Better Utilizing Investments to Leverage Development (BUILD) program.

Some short line railroads continue to struggle to overcome decades of deferred maintenance along their right of way.

Congress can enhance the ability of short lines to invest in their infrastructure by making the Short Line Tax Credit permanent

The Short Line Tax Credit, was first enacted by Congress in 2005 and was extended five times before it expired in 2017. In December 2019 it was extended for five years, retroactively, from 2018 through 2022. The credit, also known by its tax line item reference, 45G, allows a credit of 50 cents for each dollar railroads invest in track and bridge improvements, capped at $3,500 per mile. Congress is currently considering the BRACE Act (Building Rail Access for Customers and the Economy Act of 2019) to permanently extend the 45G tax credit.

River navigation

WSDOT and short line railroads can review the rail analysis in the Columbia River System Operations EIS and provide feedback

The transportation effects of breaching the Lower Snake River dams will be studied in the navigation analysis for the Columbia River System Operations EIS. The analysis will address changes in the distribution of regional economic activity, which is affected by changes in transportation costs. The EIS also will assess how changes in transportation could affect air pollution emissions and congestion levels on the roads and railroads. Separately, the Washington State Governor's Office is leading a stakeholder engagement process to explore the potential effects to Washington of retaining, breaching, or removing the Lower Snake River dams. Both studies are scheduled to be completed in 2020.

6.2 Passenger rail strategies

Long distance

On-time performance

Amtrak can work with host railroads to improve on-time performance

Amtrak can address poor on-time performance by working with host railroads to address freight train interference and infrastructure deficiencies. While Amtrak has limited funds for infrastructure improvements on host railroads, a cooperative assessment of delays could identify small projects that could make Amtrak long distance trains more reliable.

The federal government can require performance guarantees when awarding grants for infrastructure improvements

Host railroads can be held accountable to financial partnerships. The Federal Railroad Administration has tied infrastructure grants to on-time performance level guarantees, with the funded improvements providing host railroads the ability to reach an agreed level of reliability.

Amtrak can address poor on-time performance by working with host railroads to address freight train interference and infrastructure deficiencies.

Equipment replacement

Amtrak can refurbish existing equipment until new equipment is delivered

Replacing aging rail cars and locomotives will continue to be a priority for Amtrak moving forward. Passenger rail car fleet replacement for long distance trains can be expensive, reflecting customization and the relatively small quantities purchased by Amtrak. Replacement of rail cars is usually spread out over a period of years, with procurements focused on specific types of equipment. To keep the interiors attractive to passengers until the cars are replaced, Amtrak periodically refreshes them with new materials and improved components.

Intercity

On-time performance

WSDOT can continue to track the cause of Amtrak Cascades delays

Tracking the cause of delays helps inform strategies for improving on-time performance. In 2016, WSDOT developed the Amtrak Cascades Performance Database to monitor and track service outcomes related to on-time performance and travel times. WSDOT can continue to use and improve this system to develop approaches to reduce delays.

Signatories to the Amtrak Cascades Service Outcome Agreement can work together to meet performance targets

WSDOT, Amtrak, FRA, and infrastructure owner BNSF entered into a legally binding Service Outcome Agreement (SOA) for Amtrak Cascades when WSDOT invested nearly $800 million in American Recovery and Reinvestment Act (ARRA) and High-Speed Intercity Passenger Rail (HSIPR) funds to improve the corridor. The agreement requires an on-time performance of 88 percent and a defined threshold of BNSF-responsible delay minutes on specific segments of the rail line. The Amtrak Cascades SOA requires that BNSF fully mitigate the effects of any changes in freight traffic volumes and operations on passenger train performance. Specifically, BNSF is required to develop and implement a corrective action plan when not meeting the service outcome goal. In 2018, only 56% of Amtrak Cascades trains were on time. WSDOT, BNSF, and Amtrak have been working together to improve on-time performance towards achieving the 88% target, and will continue to do so.

Implementation of preclearance could reduce delays for Amtrak Cascades trains entering the United States

WSDOT is working with U.S. Customs and Border Protection, Canada Border Services Agency, and the British Columbia Ministry of Transportation and Infrastructure to implement preclearance, which would allow U.S. Customs and Border Protection to conduct all immigration and custom inspection activities at Pacific Central Station in Vancouver, British Columbia, potentially eliminating the second southbound customs inspection stop at the border. This change could reduce scheduled travel time for southbound trains by 10 minutes if the inspection stop is discontinued and eliminate additional delay risks associated with the stop at the border.

Equipment needs

WSDOT can work with Amtrak and other states to acquire passenger rail cars

Earlier this year WSDOT began working with Amtrak and other states on a multi-year process to acquire new passenger rail cars to replace aging equipment in their fleets. By coordinating to acquire similar passenger rail cars, Amtrak and the states can enjoy economies of scale with a large order.

Planning for future demand

WSDOT can prepare a Service Development Plan to define future Amtrak Cascades improvements

The state can continue to use an incremental approach to achieving this long-term vision for Amtrak Cascades, focusing on enhancements and expansion efforts that provide immediate public benefits. During the planning process, already slated for 2020, WSDOT will conduct a detailed analysis of the state's needs, update service goals, and develop an incremental plan for achieving them. An incremental approach allows WSDOT to reach service goals over an extended period in the face of uncertain transportation funding. By preparing a Service Development Plan, WSDOT will inform decision makers and citizens, describe a multi-year plan to follow, and help to further qualify for federal funding opportunities.

East-west intercity rail service

Further study is needed to determine if an east-west intercity service is warranted. A more up-to-date and in-depth study would help to determine if the line would be beneficial and feasible, or if other solutions should be evaluated instead. Preliminary studies like this are used to provide insight into the potential direct and indirect impacts the service would have for Washington.

WSDOT can prepare for long-term needs by continuing to plan for an Ultra-High-Speed Ground Transportation system

The next step for studying Ultra-High-Speed Ground Transportation (UHSGT) is developing governance structure recommendations. This work will explore options for effectively managing an UHSGT system across two states and two countries. Establishing a governance structure for the project would provide a framework for developing and analyzing detailed route alternatives. Future planning for both Amtrak Cascades and any UHSGT system needs to be closely coordinated to ensure both systems work and complement each other effectively and efficiently.

Commuter rail

Planning for future demand

Sound Transit can make modifications to allow longer trains

One way to accommodate more passengers is to make trains longer. In addition to making the trains longer by adding passenger cars, longer trains can require infrastructure improvements like longer platforms. Maintenance base capacity for a larger fleet of equipment also needs to be considered.

Sound Transit can implement station access improvements to accommodate more riders

Station access is another factor affecting the ability of Sounder to meet ridership demand south of Seattle. Parking facilities at Sounder stations fill up early. As a result, the earlier morning trains tend to be more crowded than later trains as people arrive early to secure a parking place. Managing the availability of parking spaces by allowing people to reserve space could distribute ridership more evenly, making better use of existing seating capacity. Adding parking spaces by constructing more or larger parking facilities could also encourage riders to use later, less crowded trains, but at a higher cost. Other station access improvements can help meet future Sounder ridership demand. Improving infrastructure around stations for pedestrians, bicyclists, transit riders, and drop-off passengers make it easier for people to get to stations.

Extending the route could improve rider access to Sounder

Sound Transit has funding from Sound Transit 3 to extend Sounder South from Lakewood to DuPont, adding two more stations. These stations could redistribute where riders board trains, freeing up space for new riders.

Sound Transit can negotiate with BNSF to add more trips

Adding additional trips also would increase the capacity of Sounder to carry more passengers. However, Sound Transit would need to negotiate with BNSF to determine the cost of adding trips on its line between Seattle and Tacoma. Additional infrastructure, such as more double-track or triple-track mainline and additional or longer sidings, could be needed on the BNSF line, as well as the line south of Tacoma owned by Sound Transit.

6.3 Integrated rail system strategies

Multimodal connectivity for freight rail

Land use

Local jurisdictions can ensure compatible land uses adjoin rail lines

The *FHWA Freight and Land Use Handbook* outlines possible solutions to address the problem of industrial land around rail lines being converted to incompatible uses. Arguably, the most important tool is outreach. Local planning organizations regularly include the public in their planning processes. WSDOT encourages regional and local planning authorities to incorporate the needs of freight and industrial use in their plans. State law requires Seattle and Tacoma to include a Container Ports Element in their respective comprehensive plans to address transportation and land use near rail and other port infrastructure. In 2017, the Legislature amended the Growth Management Act to allow “freight rail dependent uses” and gave Clark and Okanogan counties authority to allow these uses next to short line railroads.[53]

While some areas around rail should be preserved for future industrial growth, it is equally important to designate land use buffers between these areas and residential developments. For example, a warehouse can be built between a rail yard and housing development to prevent noise and odors from disturbing residents. Many cities have tax incentives to encourage industrial redevelopment near rail to prevent infill of industrial areas, preserve jobs, and protect residents.

Washington ports

Ports and railroads can invest in improvements that make operations more efficient

To stay competitive, Washington ports can continue to work with the railroads to ensure that trains can move efficiently in and out of port facilities. This can include rail infrastructure improvements within port terminals or on the railroads that provide access to them. The state or ports may choose to partner with railroads on investments that provide important public benefits.

Public agencies can coordinate planning to ensure freight can easily move to and from rail terminals

WSDOT, regional planning organizations, and local jurisdictions can work together with ports to ensure that freight can easily move between container ports, warehouse districts, and rail intermodal terminals. Initiatives like the Puget Sound Gateway Program will improve highway access between Northwest Seaport Alliance (NWSA) and railroad terminals in Seattle and Tacoma with warehouses from Kent to Puyallup. Considering regional connections to rail terminals when planning for new warehouse districts is important for freight mobility and maintaining the competitiveness of NWSA ports.

Northwest Seaport Alliance can continue exploring the viability of an inland seaport

Some ports outside of Washington have adopted inland or dry port systems as a way to reduce truck movements in and out of the port. An inland seaport is a container terminal where international containers arrive on a train at an inland location approximately 100 to 400 miles from a marine terminal where they originated. The contents are then loaded into domestic containers and continue by rail to a further destination or are transferred into domestic containers or trucks and distributed to the local region. From inland seaports, international containers also are returned to a marine port loaded with

[53] Washington State Legislature, SB 5517 - Concerning rail dependent uses for purposes of the growth management act and related development regulations, app.leg.wa.gov/billsummary?BillNumber=5517&Chamber=Senate&Year=2017

goods for export. This model could alleviate congestion at marine ports and in surrounding metropolitan areas, reduce the number of long distance truck moves from inland locations to marine ports, and bring jobs to the inland port areas. However, it also likely would increase truck traffic in the community around the inland port. Northwest Seaport Alliance has been exploring the possibility of establishing an inland seaport terminal that would move containers to and from NWSA terminals by rail. There is already a precedent for this type of rail service. Currently, Northwest Container Service partners with Union Pacific to move containers from Portland, Oregon to NWSA terminals in Seattle and Tacoma and BNSF offers a similar service. However, Portland is a much larger market for inbound and outbound containers than any potential inland seaport location in Washington. Data is needed to understand the potential positive and negative effects of an inland seaport proposal for Washington state.

First/last mile connectors

WSDOT and other agencies can use the Freight and Goods Transportation System to focus freight connectivity investments

WSDOT studies and classifies freight corridors using the Freight and Goods Transportation System (FGTS). The forthcoming edition of this biannual report includes a detailed list of critical first/last mile freight connectors. WSDOT and other government organizations use the FGTS to identify problems, suggest improvement projects, and apply for and direct funding to freight corridors and connectors.

Regional and local agencies can include intermodal freight connections in their planning activities

Intermodal connections are critical for moving freight between modes. It is important that cities, counties, ports, and tribal governments work together with their MPO and RTPO partners in identifying these routes in plans to ensure their importance to freight supply chains is recognized regionally. WSDOT will continue to work with partners to include intermodal connections in planning activities.

Railroads and public agencies can continue to improve intermodal connector routes

Improvements to connector routes are typically the responsibility of the owner or operator, such as WSDOT, local governments, and private companies. Local jurisdictions and railroads can work together on these improvements.

Multimodal connectivity for passenger rail

Station access

WSDOT can work with local jurisdictions and transit agencies to improve connectivity at Amtrak Cascades stations

WSDOT is interested in working with local jurisdictions and transit agencies to improve connectivity at Amtrak Cascades stations within the state. While no state funds are currently dedicated to this purpose, WSDOT can support grant applications for projects. Appendix C includes suggestions for connectivity improvements at each station. WSDOT is developing analytical methods for identifying and prioritizing bicycle and pedestrian improvements as part of the forthcoming Active Transportation Plan that could be used in the future to identify connectivity improvements at stations.

WSDOT can consider access to Amtrak stations when planning additional Travel Washington intercity bus routes

WSDOT is completing an update to the Travel Washington Intercity Bus Plan. Part of the study is evaluating potential new or revised routes. Ensuring timed connections to other modes, such as

Amtrak, will be a consideration in planning new or revised routes.

Passenger rail operators can use technology to improve the connectivity experience for passengers

WSDOT also is interested in opportunities to use technology to improve connections with other modes. Potential opportunities could include joint ticketing with Amtrak and local transit agencies or developing a way to notify bus drivers on local transit routes serving Amtrak stations about train status so they can decide to wait for passengers connecting from a late train.

Sound Transit could continue to invest in station access improvements at Sounder stations

Sound Transit has been working to improve access to Sounder stations as it expands its system. These investments include improvements to parking, walking and cycling routes, transfers from partner transit services, and pick-up and drop-off areas at stations. Sound Transit could continue to make similar investments in the future.

Regional and local planning can identify passenger rail stations as multimodal hubs

Regional and local planning organizations can designate passenger rail stations as multimodal hubs and plan land uses around the stations that support multimodal activity as much as possible. As plans are periodically reviewed, planners can consider opportunities to optimize multimodal connections and supportive land uses around rail stations.

Schedule coordination

Local transit agencies can consider passenger rail coordination when planning schedules and additional service

Local transit agencies can align their schedules with passenger rail schedules as much as possible. When expanding service hours to existing routes, agencies can consider better coordinating routes serving the rail station with the arrival and departure of passenger trains. Because they serve shared stations, Amtrak and Sounder trains need to be carefully scheduled, which provides opportunities to optimize connectivity between the different passenger rail services.

Shared passes

WSDOT and Sound Transit can explore expanding the RailPlus program.

The Sound Transit/Amtrak Cascades RailPlus shared pass program leverages existing intercity rail service to provide commuter rail passengers more travel options by filling seats that otherwise would be empty. While intercity passenger trains won't have the capacity to carry as many people as a dedicated commuter rail train, they can be particularly useful in off peak periods when commuter rail demand is lower. Expanding the current program to Sounder South, to serve the Tukwila and Tacoma Dome stations during weekdays, would expand travel choices for passengers in both the peak and off-peak periods.

Rail system in communities

At-grade rail crossing safety and trespassing

Railroads and public agencies can partner on education initiatives

Education is a key strategy for addressing at-grade rail crossing safety and trespassing. It is important to continuously teach and remind people of all ages to maintain a safe distance away from railroad tracks, always be alert for trains when crossing or near rail lines, and keep in mind that trains require much more distance to stop than cars and trucks. WSDOT needs to continue its rail safety outreach activities, as well as continue to support Operation Lifesaver involvement throughout the state.

Public agencies and railroads can cooperate on at-grade crossing modifications and maintenance

Public agencies and railroads can work together, in coordination with the UTC, to ensure at-grade crossings have appropriate, working warning devices. In some cases, grade separation projects can be constructed, providing safety benefits in addition to mobility benefits.

Communities can identify safer alternate routes for pedestrians

Communities with recurring trespassing incidents on rail lines can evaluate their infrastructure for pedestrians and bicyclists to identify gaps in these networks that could be addressed to create safer routes. Where low-volume rail activity occurs, railroads and public agencies are encouraged to explore the viability of creating a “rail with trail” facility may help fill a gap in the pedestrian/bicyclist network to benefit the railroad and the public.

Railroads can work with communities to address homeless encampments

Many local jurisdictions and non-profit organizations have programs helping the homeless in communities served by railroads. Railroads can work with these groups to help people experiencing homelessness who are living on railroad property get the resources they need to find safer shelter options.

Rail crossing conflicts in communities

Local jurisdictions can take the lead on grade separation projects in their communities

To address grade crossing incidents, local jurisdictions can take the lead to plan grade separation projects. State and federal funds are available for these projects, but the amount of available funding is limited relative to the demand.

Projects can continue to be identified and prioritized statewide

In 2016, the Legislature directed the Joint Transportation Committee (JTC) to conduct a study evaluating the effects of prominent road-rail conflicts and to develop a corridor-based prioritization process for addressing them on a statewide level. The study produced an initial set of recommendations to assist in developing solutions and to prioritize investments. In 2017, the Legislature then directed the Freight Mobility Strategic Investment Board (FMSIB) to update the JTC’s Study of Road-Rail Conflicts in Cities.[54] FMSIB updated the prior work, developed a corridor-based project prioritization process, and developed a prioritized statewide list of projects to alleviate road-rail conflicts. FMSIB also provided the following recommendations.

- Implement ongoing efforts to continuously identify and recommend funding for road-rail conflict needs throughout the state
- Prioritize road-rail projects based substantially on the evaluation criteria developed through the Phases 1 and 2 study process
- Prior to providing design or construction funding to projects, ensure that the project sponsor has provided verifiable status of project development and committed funding
- Before providing funding to project sponsors, require that the project sponsor coordinate with other existing road-rail conflict funding programs

[54] http://www.fmsib.wa.gov/roadRail.cfm

The Legislature can provide funding to continue this work.

Confirming project readiness can direct funds to projects ready to use them

Implementation of a vetting process to ensure that projects receiving state funds for design or construction work can ensure that funds are going to project sponsors who are ready to proceed. This avoids committing funds that will not result in construction for extended periods of time.

Energy products transportation

Railroads and public agencies can work together to prepare for potential oil spills

In 2015, 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 address these new risks. These initiatives include advanced notice of oil transfer, railroad contingency planning, geographic response plans, and spill response equipment cache grants. A Subsequently the Legislature amended the state laws to require scaling of oil spill planning requirements based on the volume and type of oils that railroads move and later required that railroads take action to address oils that may sink or submerge after they are spilled into water. The success of these policy initiatives will require cooperation among stakeholders and continued funding.

Washington can regulate vapor pressure in tank cars transporting crude oil by rail

In 2019 the Washington Legislature passed a law[55] that prohibits an oil handling facility from loading or unloading crude oil from a rail tank car if the oil's vapor pressure is nine pounds per square inch (PSI) or greater if the facility was constructed or permitted after January 1, 2019, or the volume of crude transported to the facility by rail in a calendar year increases 10% over the calendar year 2018. Vapor pressure is used as a measure of oil volatility.

This latter prohibition goes into effect two years after this threshold is reached. ESSB 5579 also authorizes penalties up to $2,500 per day per rail tank car for violations. Advance notice information provided to Ecology must include additional, new information concerning the type and vapor pressure of crude oil received from a rail tank car. Once Ecology develops rules and makes the data available, the UTC will receive and use rail oil transfer data to inform development of its annual work plan and inspection activities.

Corridor preservation

WSDOT encourages consideration of rail corridor preservation for future uses

Rail line owners are encouraged to work with qualified private organizations or public agencies that agree to maintain corridors for future rail use. Preserving these corridors keeps them intact for future transportation uses, including a return to rail service if needed. These corridors also can be useful as utility corridors, like fiber optic lines or electricity transmission.

Organizations can use statewide gap analysis to evaluate rail lines in abandonment proceedings for future trail use

WSDOT is preparing an Active Transportation Plan that will identify gaps in the state network of pedestrian and bicycle trails. This network analysis could help determine if rail lines entering the

[55] Washington State Legislature, ESSB 5579
https://app.leg.wa.gov/billsummary?year=2019&billnumber=5579&initiative=false

abandonment process can address an identified need for a trail.

Diesel emissions

Railroads can continue to upgrade their fleets with cleaner locomotives

Class I railroads are purchasing new locomotives that meet EPA air quality standards to replace older, less efficient locomotives. Some of these older locomotives have been purchased by short lines to replace even less efficient locomotives. As a result, the overall locomotive fleet is becoming cleaner.

Railroads can explore different technologies to reduce locomotive emissions

Cleaner alternatives to diesel engines for rail locomotives could emerge as new technologies develop. Engines that use cleaner fuels could become viable.

Electrification is a potential way to reduce locomotive emissions. The infrastructure required for conventional electric locomotive technology in use around the world is not considered a viable investment by private freight railroads in the United States. However, development of battery technology could make electric propulsion more affordable in the future by eliminating the cost of overhead wire. While low-horsepower locomotives using batteries have been used in rail yards, technology limitations have kept them from being used on trains traveling long distances. With recent improvements in battery technology, BNSF is currently working with Wabtec and other partners to develop and test a battery-electric high-horsepower road locomotive in California.

Until cleaner technologies are available, the overall emissions from railroad locomotive will gradually decline as new locomotives built to current standards replace older locomotives.

Fish passage

Railroads and public agencies can coordinate fish passage improvement projects to provide better benefits for fish

Since rail lines and highways often parallel each other, there may be locations where both create barriers to fish passage on a waterway. Railroads and public agencies can coordinate projects to address fish passage barriers that are part of both the roadway and railway infrastructure to further improve fish habitat.

Resiliency

WSDOT and BNSF can continue to address landslide prone areas that affect Amtrak Cascades service

The mitigation measures that WSDOT and BNSF have partnered to build between Seattle and Everett have proved successful at reducing the impact of landslides on Amtrak Cascades service. Additional areas in Washington along the Amtrak Cascades route are prone to landslide disruptions and would benefit from landslide mitigation. Continuing to invest in mitigation measures would benefit Amtrak Cascades and BNSF. Sound Transit also benefits from measures implemented between Seattle and Everett.

Railroads can assess their resilience to natural disturbances

Owners of rail lines in Washington can assess their resiliency to natural disturbances. Projects that reduce risk can be eligible for funding through the Freight Rail Investment Bank (FRIB) and the Freight Rail Assistance Program (FRAP), both administered by WSDOT.

Chapter 7 Rail investments and initiatives

This chapter provides an overview of how railroads and other stakeholders plan to implement investment options and operational changes needed to meet the challenges described earlier in this document. Government funding programs designed to help fund these investments are described in detail as well.

An illustrative list of rail projects have been identified by WSDOT through a stakeholder outreach and project validation process, which is shown in Appendix A. Most projects are unfunded or have secured only partial funding, and they are included to illustrate the examples of rail improvements identified. The illustrative list is not prioritized and does not capture nor represent the full set of investments needed to achieve future growth scenarios.

7.1 Freight rail

This section highlights planned investments and options intended to improve the rail system and prepare for the near future.

Class I

Near-term (5-Year: 2019-2024)

BNSF has stated that it intends to invest in system preservation through on-going maintenance efforts and slope stability projects. In 2019, BNSF plans to spend $175 million on capital expenditures in Washington. Much of this will be spent on preservation work, including approximately 820 miles of track surfacing and/or undercutting work, as well as the replacement of about 50 miles of rail and close to 130,000 ties.

In addition to system preservation work, BNSF plans to implement mainline capacity expansion projects on the Bellingham, Scenic, Fallbridge, Lakeside, and Spokane subdivisions. The railroad also will be working to increase terminal queuing capacity on the Seattle Subdivision and has plans for slope stability projects on the Bellingham, Scenic, and Seattle subdivisions. BNSF also plans to continue implementing various at-grade crossing mitigations on all of its subdivisions in Washington.

Class I railways continue to explore operational improvements to increase efficiency and accommodate growth. These improvements included optimizing train schedules and traffic management; operating longer trains; and reducing conflicts by implementing directional running (operating trains in one direction on a line and in the opposite direction on a parallel route).

Long-term (20-year: through 2040 and beyond)

The two Class I railroads operating in the state, BNSF and Union Pacific, are private companies and share few details about their long-term investment plans with the public. Their plans are market dependent, reflecting where they foresee future business opportunities. The variability of annual growth across the growth scenarios in Chapter 3 illustrates how much influence political and market forces have on rail volumes in Washington. Rail investments are costly, and railroads must coordinate investments in response to changes in political and market forces. As such, freight railroad planners typically plan projects on a 2-3 year horizon. The categories of long-term investments listed below are a list of potential investments rather than definitive plans.

Long-term investments in Class I railroads are typically maintenance and capacity projects. These can include, but are not limited to:

- Adding additional main tracks and lengthening sidings
- Improving track conditions and geometry to allow for more efficient movement of trains
- Resolve bottlenecks through clearance and weight capacity increases
- Replacing worn ties and other infrastructure
- High-value projects such as replacing bridges and expanding tunnels
- Ongoing slope stabilization and track maintenance work
- Improving connections to ports and branch lines
- Safety improvements to reduce grade crossing and trespassing incidents

BNSF has indicated that the following projects are under consideration.

- Burlington – Skagit River Rail Bridge Replacement
- Connell – Connell Rail Interchange
- Port of Tacoma – Bullfrog Junction Connection
- Port of Vancouver – North Connection
- Stampede Pass – Clear for Double Stacks
- Sumner – Staging Tracks
- Tukwila – Alternative Access to BNSF South Seattle Intermodal Facility

Union Pacific is considering the Bullfrog Junction Connection project also, as well as other connectivity improvements at the Port of Tacoma.

Class III

Near-term (5-year: 2019-2024)

Most short line railroads focus nearly all their infrastructure investments on preservation. The recent push to upgrade infrastructure to handle 286,000-pound railcars has put even more pressure on their limited funds. Short lines invest in heavier rail and tie programs, transload facility development, and improved interchange conditions. Many short line railroads have a long list of unfunded projects, but due to insufficient capital, project implementation plans remain tied to potential government grants and loans. Projects currently funded by the Freight Rail Investment Bank and Freight Rail Assistance Program, both administered by WSDOT, are listed below in Exhibit 7-1 and Exhibit 7-2. Short line railroads around the state are pursuing similar projects without funding from these programs.

Most short line railroads focus nearly all their infrastructure investments on preservation.

WSDOT

Exhibit 7-1 Freight Rail Investment Bank 2019-2021 projects

Applicant	Project	Amount
Port of Everett	South Terminal Modernization [a]	$6,157,000
Tacoma Rail	Tote Yard (track upgrade)	$400,000
Tacoma Rail	Mazda (track upgrade)	$240,000
Port of Benton	Berry's Bridge, Yakima Bridge, Jadwin Crossing	$250,000
TOTAL		**$7,047,000**

[a] Not a short line rail project

Exhibit 7-2 Freight Rail Assistance Program 2019-2021 projects

Grant Recipient	Project	Amount
Central Washington Railroad	Sunnyside to Granger Track Rehabilitation	$ 650,000
Puget Sound & Pacific Railroad	Hoquiam Bridge (repair) [a]	$ 840,320
Port of Benton	Berry's Bridge, Yakima Bridge, Jadwin Crossing	$ 1,500,000
Columbia-Walla Walla Railway	Aggregate Hopper Cars (purchase) [a]	$ 300,000
Columbia Basin Railroad	Wheeler to Moses Lake Rehabilitation	$ 700,000
Washington Eastern Railroad	Milepost 11-24, 37-57 (track upgrade) [a]	$ 780,730
Rainer Rail	Blakeslee to Chehalis Bridges (upgrade)	$ 440,000
Pend Oreille Valley Railroad	Usk to Newport Track Rehabilitation	$ 600,000
Spokane Spangle & Palouse Railway	Upgrade Line from Marshall to Oakesdale [a]	$ 750,000
Tacoma Rail	MVD Track Rehabilitation [a]	$ 1,100,000
TOTAL		**$7,661,050**

[a] Project deferred in response to the passage of I-976

Palouse River and Coulee City (PCC) Rail System

The Legislature has allocated $6.7 million every two years through 2031 to undertake rehabilitation and improvement projects on the PCC. This funding is being augmented with a $5.3 million USDOT BUILD grant. Work in 2020 will include track rehabilitation on three line segments:

- LaCrosse to Endicott – 8 miles
- Marshall to McCoy – 5 miles
- Geiger Spur to Davenport – 16 miles

In addition, eight bridges will be replaced, and two will be rehabilitated between Marshall and McCoy.

Long-term (20-year: through 2040 and beyond)

Short line railroads continue to invest, as they are able, to maintain and improve infrastructure condition. Some short line railroads continue to struggle to overcome decades of deferred maintenance along their right of way. Future projects likely will be similar to those made in the past and may include:

- Performing regular inspection-based maintenance to support the longevity and reliability of infrastructure and equipment
- Replacing worn and outdated infrastructure

- Continuing to upgrade tracks to handle new generations of heavier rail cars
- Developing transload facilities to serve additional customers and enlarging rail yards to accommodate unit trains

WSDOT can continue to support the short line rail system in Washington through programs such as the Freight Rail Investment Bank (FRIB) program, the Freight Rail Assistance Program (FRAP), and the Grain Train program.

Palouse River and Coulee City (PCC) Rail System

WSDOT will continue to update and implement the 2015 PCC Rail System Strategic Plan. Long-term investments to the PCC likely will be similar to those made by other short lines in the state. Exhibit 7-3 shows the inventory of investments needed to make the most used portions of the PCC system capable of handling 286,000-pound cars in trains operating up to 25 miles per hour (FRA Class II track). WSDOT will continue to address priority projects on the PCC as funding becomes available over the coming years.

WSDOT invests in short line railroads through programs such as the Freight Rail Investment Bank program, the Freight Rail Assistance Program and the Grain Train program.

Exhibit 7-3 PCC system priority projects by branch line

CW Branch	Begin	End	Cost
Priority 1 Project - Cheney to Geiger Spur	MP 1	MP 7.9	**COMPLETE**
Priority 2 Project - Geiger Spur to Davenport	MP 7.9	MP 41.74	$27,880,000
Priority 3 Project - Davenport to Wilbur	MP 41.74	MP 74.44	$22,660,000
Priority 4 Project - Wilbur to Coulee City	MP 74.44	MP 108.4	$16,180,000
CW Branch Total			**$66,720,000**
P&L Branch	**Begin**	**End**	**Cost**
Priority 1 Project - Bridge Replacement & Repair	MP 10.5	MP 29.5	**IN PROGRESS**
Priority 2 Project - Marshall to Garfield	MP 1	MP 50	$24,010,000
Priority 3 Project - Garfield to Palouse	MP 50	MP 59.2	$17,910,000
P&L Branch Total			**$41,920,000**
PV Hooper Branch	**Begin**	**End**	**Cost**
Priority 1 Project - Hooper Jct to Endicott	MP 26.47	MP 57.9	$21,560,000
Priority 2 Project - Winona to St. John	MP 0	MP 18.3	$12,110,000
Priority 3 Project - Endicott to Mockonema	MP 57.9	MP 72.5	$7,940,000
PV Hooper Branch Total			**$41,610,000**
Total PCC System			**$150,250,000**

7.2 Passenger rail

Long distance

Near-term (5-year: 2019-2024)

On-time performance

In Washington, the top three reasons for passenger train delays are slow speed orders (mandated slowdowns for maintenance and inspections), and freight and passenger train interference. Amtrak highlights its service improvement strategies for FY 20-24 in its 2019 *Five Year Service Line Plan.* Poor on-time performance resulting from freight train interference is listed as a paramount issue. The plan calls on policymakers to continue to give Amtrak trains preference on host railroad tracks to reduce delay resulting from conflicts with freight trains. Amtrak evaluates plans to continue to work with host railroads to understand both sides of this issue and find solutions. Amtrak has stated support for the Department of Justice’s right to initiate enforcement actions when other solutions fail, but would like to supplement this power by creating a private right for action against host railroads.

Equipment replacement

Amtrak outlines its plan to address its aging fleet of locomotives and passenger cars in its Equipment Asset Line Plan.

Amtrak plans to acquire 75 to 175 diesel locomotives to replace the current P-40/P-42 fleet used on long distance routes like the Empire Builder and the Coast Starlight. On December 20, 2018 Amtrak announced the award of a contract to Siemens for a base order of 75 *Charger* locomotives, with options for up to 100 additional units. Deliveries are forecast to begin in the second half of 2021, with all units delivered by the end of 2024.

The *Superliner* passenger cars used on Amtrak long distance trains in Washington are being reviewed for refresh by Amtrak’s Product Development & Customer Experience group. Mechanical features will be assessed for refresh once the Superliner Life Extension Study that is currently underway is completed. This study will help Amtrak refine its plans for the remaining service life of these cars prior to replacement. Refresh work will include passenger seating, LED lighting, and surfaces. Upgrades to restrooms and plumbing systems may require more substantial work.

Station improvements

While Amtrak does not typically own station buildings in Washington, it does have responsibility for some of the infrastructure. In the near-term, Amtrak will be replacing the second platform at Centralia in 2020. New second platforms are also planned at Kelso and Olympia, but have not been scheduled yet.

Long-Term (20-Year: through 2040 and beyond)

Amtrak currently plans to replace its fleet of Superliner rail cars, used in Washington on the Empire Builder and Coast Starlight trains, between 2026 and 2031.

Intercity

Near-term (5-year: 2019-2024)

New Equipment

In 2019, WSDOT was awarded a $37.5 million Federal-State Partnership for State of Good Repair grant from the FRA to procure new passenger rail cars as part of Amtrak’s national equipment replacement contract. The new passenger rail cars are expected to be delivered from the selected manufacturer in the mid-2020s. Oregon DOT is also participating in Amtrak's national equipment replacement procurement.

New passenger rail cars to replace the three WSDOT-owned Talgo Series 6 trainsets are expected to be delivered in the mid-2020s, at a cost of approximately $75 million.

In the short-term, prior to delivery of the new equipment, Amtrak is working to identify temporary passenger equipment to replace the Talgo Series 6 trainsets currently in service.

New passenger rail cars to replace the three WSDOT-owned Talgo Series 6 trainsets are expected to be delivered in the mid-2020s, at a cost of approximately $75 million.

On-time performance

Tracking the cause of delays helps inform strategies for improving on-time performance. In the case of Amtrak Cascades, WSDOT, Amtrak, FRA, and infrastructure owner BNSF entered into a legally binding Service Outcome Agreement (SOA) when WSDOT invested nearly $800 million in American Recovery and Reinvestment Act (ARRA) and High-Speed Intercity Passenger Rail (HSIPR) funds to improve the corridor. The agreement requires an on-time performance of 88 percent and a defined threshold of BNSF-responsible delay minutes on specific segments of the rail line. The Amtrak Cascades SOA requires that BNSF fully mitigate the effects of any changes in freight traffic volumes and operations on passenger train performance. Specifically, BNSF is required to develop and implement a corrective action plan when not meeting the service outcome goal. In 2018, only 56% of Amtrak Cascades trains were on time. WSDOT, BNSF, and Amtrak have been working together to improve on-time performance towards achieving the 88% target and will continue to do so.

BNSF is implementing delay mitigation strategies to reduce host railroad responsible delay minutes. WSDOT, BNSF, and Amtrak started an on-time performance workshop in 2019 to identify and implement strategies for improving on-time performance.

Federal preclearance program

Modifications will be necessary at Pacific Central Station to accommodate customs inspection activities. Once preclearance is implemented at Pacific Central Station, the scheduled travel time for southbound trains would be reduced by 10 minutes and reliability will be improved if the stop for customs inspection in Blaine can be eliminated.

Planning for Future Demand

Three different planning efforts are looking at different ways to meet the growing demand for intercity passenger rail in Washington. One is studying future improvement to the existing Amtrak Cascades service, another is assessing the viability of establishing new intercity passenger rail service between Seattle and Spokane, while a third is focused on ultra-high speed service between Vancouver, Seattle and Portland. These planning studies are expected to be completed within the next five years and could guide long-term investments.

Amtrak Cascades improvements

WSDOT received grant funding from FRA in 2019 to start a Service Development Plan for Amtrak Cascades between Portland, Oregon and Vancouver, British Columbia. The goal of this work is to perform an alternatives analysis to identify a wide range of reasonable operational strategies and capital investment options that would improve the capacity, reliability, safety, and competitiveness of Amtrak Cascades. It builds upon the future ridership forecasts in this Rail Plan to identify what can be done to reach service improvement goals. The alternatives analysis will evaluate strategies and options to improve rail safety, service delivery options, travel times, passenger amenities, trip reliability, and on-time performance, without degrading freight service, incrementally through 2040. This work will be the starting point for environmental review and completion of a Service Development Plan.

East-west intercity rail service study

In 2019, the Washington State Legislature provided funding for the state's Joint Transportation Committee to conduct a study of an east-west intercity passenger rail corridor between Seattle and Spokane, with intermediate stops in Auburn, Cle Elum, Ellensburg, Yakima, Toppenish, and the Tri-Cities. The study will analyze potential ridership demand and provide a list of infrastructure improvements.

Ultra-high-speed ground transportation

WSDOT is continuing to study Ultra-High-Speed Ground Transportation. The next phase will study governance in greater detail. This phase will explore options for a multi-jurisdictional authority to effectively procure, administer, own and operate an UHSGT system across two U.S. States and one Canadian Province, It also will establish potential future tasks include robust public engagement, refinement of alignment and station locations, and a more detailed funding and financing strategy.

Long-term (20-year: through 2040 and beyond)

Addressing future demand

Over the long-term, depending on the results of planning work completed within the next few years and the availability of funds, projects identified during planning could move forward.

Amtrak Cascades

Once WSDOT completes a Service Development Plan for Amtrak Cascades, it will have an implementation strategy, including identification of specific infrastructure needs, to achieve the level of service described in the 2006 *Long-Range Plan for Amtrak Cascades*. WSDOT plans to continue using an incremental approach to increasing Amtrak Cascades service. If funded, improvements needed to implement one or more additional trips could be completed by 2040.

East-west intercity rail service

After the Legislature's Joint Transportation Committee completes its study of an east-west intercity passenger rail between Seattle and Spokane, the Legislature may choose to fund more detailed planning for this service. Depending on the results of the planning work and availability of funds, passenger service could be added to all or part of the Seattle-Spokane corridor by 2040.

Ultra-high-speed ground transportation

Additional tasks over the long term could include a range of project initiation and development activities such as risk assessment, environmental analysis and conceptual engineering, including construction activities such as final design and right of way acquisition.

Commuter

Near-term (5-year: 2019-2024)

Sound Transit is currently planning to accommodate growing ridership on its Sounder South service.

The first step for the Sounder South capacity expansion program is creation of a strategic plan to identify projects, service and completion dates. Planning for the first round of projects could begin as early as 2020, and all expansion program improvements will be complete by 2036.

Sound Transit is scheduled to begin a five-year overhaul project of all Sounder train cars beginning in 2020.

Growth plans include lengthening train sets up to ten cars from the current seven car maximum and extending platforms to accommodate the longer trains. All told, this could add 40% more capacity to the existing service. Sound Transit also may consider track and signal upgrades to add additional trips.

Sound Transit will build a new Sounder maintenance base at the site of its existing rail yard between Steilacoom Boulevard Southwest and 100th Street Southwest in the City of Lakewood. The base will contain maintenance bays, material storage areas, and offices and facilities for employees. The maintenance base in Lakewood is expected to open in 2023.

Long-term (20-year: through 2040 and beyond)

In order to meet demand on the route between Seattle and Lakewood, Sound Transit plans to add more equipment and extend the route south to two more stations. The long-term plan for Sounder includes extending commuter rail service south to Tillicum and DuPont. The new stations will serve the residents of south Pierce County as well as Joint Base Lewis-McChord, a major military installation. Project planning will commence in 2025 and service is scheduled to start in 2036.

Pending the results of current planning work, Sound Transit may work with BNSF to increase the number of Sounder South trips. Adding additional trips would likely require infrastructure investments on the portion of the route owned by Sound Transit south of Tacoma.

Additional improvements to Sounder service and station access depend on funding availability.

In order to meet demand on the route between Seattle and Lakewood, Sound Transit plans to add more equipment and extend the route south to two more stations.

7.3 Integrated rail system

Multimodal connectivity for freight rail

Land use

Clark County is currently developing development codes that would allow freight rail-dependent development adjacent to the county's short line Chelatchie Prairie Railroad. The proposed development regulations include a list of industrial activities that would be permitted in the railroad overlay. The uses are primarily manufacturing and span a wide range of business sectors including: agriculture and forestry; construction; manufacturing; wholesale trade; and transportation and warehousing.

Washington ports

Washington is home to over 70 port districts, many of which own their own rail facilities. Each seaport in the state is unique, but most have plans to expand rail facilities at their terminals. For example, the Port of Everett is completing its South Terminal Modernization Project, which is strengthening a wharf to provide roll-on/roll-off cargo berthing while constructing additional rail sidings to increase on-terminal storage capacity. This project has received loans from the Freight Rail Investment Bank program administered by WSDOT.

Development plans for the Port of Longview on the Columbia River include realigning and expanding its rail corridor, adding new sidings, and building two new inbound and outbound tracks on the Barlow Point Terminal Railway. NWSA also is considering plans to align the North and South Intermodal Yards in Tacoma, which will increase the capacity of the rail yard and add additional train staging capacity to accommodate longer trains.

Inland ports also are making rail system investments. The Port of Moses Lake is working on the Northern Columbia Basin Railroad Project. The project restores rail service to the Port of Moses Lake/Grant County International Airport (GCIA) and provides new rail service to over 2,000 acres of industrial-zoned lands adjacent to the airport and along the Wheeler Industrial Corridor in Moses Lake.

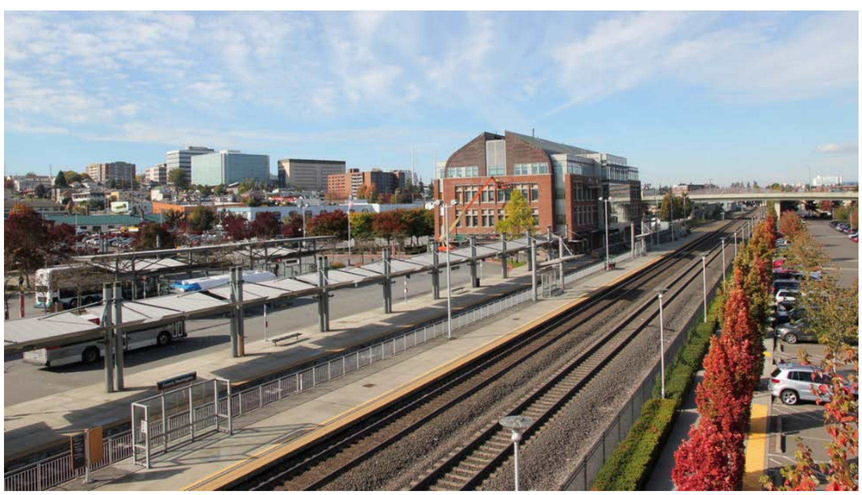
Over the long-term, ports across the state likely will continue to pursue funding opportunities to increase rail capacity and improve the fluidity of cargo transfers between ships and rail.

First/last mile connectors

BNSF and the City of Tukwila have been collaborating to plan access improvements to the BNSF South Seattle intermodal facility.

Multimodal connectivity for passenger rail

Sound Transit is planning to add parking and improve access at Sumner, Puyallup, Auburn, and Kent. Sound Transit is also evaluating access improvements at Lakewood, South Tacoma, Edmonds, and Mukilteo. In addition, Sound Transit has a System Access Fund. The fund allocates $100 million for projects that make it easier and more convenient for people to get to Sound Transit and partner transit services. These projects can include things like safe sidewalks, protected bike lanes, shared use paths, improved bus-rail integration, and new pick-up and drop-off areas. Sound Transit recently allocated approximately $20 million of System Access Funds to projects. Projects in this initial allocation of funds that would improve access to Sounder stations are listed below in Exhibit 7-4. Stations at Edmonds, Everett, and Tukwila are shared with Amtrak Cascades and would benefit both services. Sound Transit plans to continue awarding System Access Funds through 2025.



Bus bays at Everett station

Exhibit 7-4 Sound Transit System Access Fund projects for Sounder stations

Jurisdiction	Project	Amount	Phase
City of Everett	Everett Station Nonmotorized Access Improvements	$1,900,000	Construction
City of Edmonds	Citywide Bicycle Improvements	$1,850,000	Design, Construction
City of Auburn	Regional Growth Center Access Improvements	$1,625,000	Design, Construction
City of Kent	W James Street at 2nd Avenue N Pedestrian Crossing	$273,683	Design, Construction
City of Tukwila	Tukwila Station Nonmotorized Connectivity and Safety (for pedestrian signal on SR 181, improvements on Longacres Way, and Longacres Way/trail crossing)	$2,064,000 [a]	Construction
City of Kent	W James Street at 2nd Avenue N Pedestrian Crossing	$273,683	Design, Construction
City of Auburn	Regional Growth Center Access Improvements	$1,625,000	Design, Construction
City of Puyallup	Bike Lane Expansions on W Stewart Avenue & 4th Street NW (for bike lanes on 4th Street NW)	$155,995 [a]	Design, Construction
City of Sumner	Rivergrove Community Pedestrian Bridge	$452,000	Design
City of Sumner	Sounder Safe Sidewalk/Bike Programmatic Enhancements (for bike lanes on Academy Street)	$875,000 [a]	Design, Construction
City of Lakewood	111th Street SW/112th Street SW Improvements	$1,040,000	Design, Construction

[a] *Indicates partial award in support of specific project elements*

Rail system in communities

Technology and safety

Use of Positive Train Control will continue to be refined and monitored throughout the Pacific Northwest to help reduce the number of train-related incidents.

At-grade rail crossing safety and trespassing

The UTC leads and WSDOT, the Washington State Patrol, the Washington Traffic Safety Commission, and other stakeholders participate in Washington Operation Lifesaver. It is part of a national nonprofit program known as Operation Lifesaver, Inc. Washington Operation Lifesaver participates in community outreach events to spread awareness of railroad safety. It also provides volunteer speakers and trained instructors who offer free rail safety education programs. Its efforts are consistent with the Strategic Highway Safety Plan: Target Zero, which emphasizes education as one of five approaches to implementation (including engineering, enforcement, leadership/policy, and emergency medical services). WSDOT also created its own award-winning rail safety campaign — *Stay Back from the*

Tracks — to educate Washington communities.

Grade crossing protection improvements can make crossings safer. These improvements can include signage, signals, gates, and barriers. Projects at state-owned at-grade crossings are included in WSDOT's Highway Safety Improvement Program. WSDOT also selects a limited number of grade crossing protection improvement projects for funding through the Federal Highway Administration's Section 130 program. The projects most recently funded by this program are listed in Exhibit 7-5. The UTC also funds grade crossing safety and trespass prevention projects through its Grade Crossing Protective Fund grant program.

Exhibit 7-5 Washington Rail Crossing Projects Funded by FHWA Section 130 Program (2017 Funding)

Project Location	Project Name	FHWA Funding
Arlington	67th Avenue NE	$393,500
Bellingham	"F" Street	$690,000
Bellingham	Harris Avenue	$350,000
Centralia	Locust	$365,000
Centralia	Maple	$276,200
Franklin County	Haley Road	$95,000
Mount Vernon	4th Street N / Riverside Drive	$1,447,947
Snohomish County	240th Street SE	$417,619
Spokane County	Wellesley Avenue	$1,009,598
Spokane County	Brooks	$1,045,094
Spokane County	Espanola	$666,317
Tacoma	6th Avenue	$1,106,752
Town of Garfield	2nd Street & 3rd Street	$388,750
Walla Walla County	Port Kelly Road	$586,300
Walla Walla County	Dodd Road	$481,030
Wenatchee	9th Street	$1,321,165

Rail crossings in communities

Several grade separation projects will be constructed in communities around Washington in the near-term. The City of Seattle is completing a grade separation of South Lander Street over BNSF south of downtown. The $100 million project is expected to be complete late in 2020. The City of Spokane Valley is completing design work for the Barker Road grade separation over a BNSF line, which will replace the current Barker Road crossing. The City of Spokane Valley plans also to petition to close the Flora Road at-grade crossing to the west. Construction is anticipated to begin in 2020 or 2021 and is estimated to cost $25 million. The Port of Ridgefield is planning to complete the final phase of the Pioneer Street Rail Overpass late in 2020. The project will provide a grade separated route connecting downtown Ridgefield with the waterfront along the Columbia River. The final phase is estimated to cost $11.3 million and will replace at-grade crossings on Division Street and Mill Street. Additional grade separation projects anticipated to be completed in the near-term are listed in Exhibit 7-6.

Exhibit 7-6 Funded grade separation projects [56]

Project	Lead Agency	Location	Cost
I-5 @ SR 529 Interchange Improvements	WSDOT	Marysville	$84,400,000
South Lander Street Grade Separation	City of Seattle	Seattle	$100,000,000
I-5/Mounts Rd to Thorne Lane Corridor Improvements	WSDOT	Lakewood and Dupont	$482,430,000
River S Bridge Replacement	U.S. Fish & Wildlife Service	Ridgefield	$8,759,600
Pioneer St Rail Overpass	Port of Ridgefield	Ridgefield	$14,923,000
SR 14 / Bingen Point Access Improvements	Port of Klickitat	Klickitat	$22,900,000
Barker Road / BNSF Grade Separation	City of Spokane Valley	Spokane Valley	$18,738,000

Numerous other grade separation projects have been proposed in communities around the state. Only a few are in design and awaiting construction funding. These projects are the most likely to be completed in the long-term. Exhibit 7-7 lists these projects.

Exhibit 7-7 Unfunded grade separation projects in design phase [57]

Project	Lead Agency	Location	Cost
McKittrick Street Grade Separation	City of Wenatchee	Wenatchee	$25,000,000
South 228th Union Pacific Grade Separation	City of Kent	Kent	$40,100,000
Canyon Road Improvements, Pioneer Way E to 52nd St E / 62nd Ave E	Pierce County	Fife	$62,720,190
Regional Beltway Phase II	City of Union Gap	Union Gap	$17,950,000

Oil transport

The Department of Ecology adopted amendments to Chapter 173-186 WAC, Oil Spill Contingency Plan – Railroad on December 12th, 2019 that:

- Established three types of railroads for planning and scaled requirements according to the type of volume of oil moved. (Exhibit 7-8)
- Established requirements for citing Spill Management Teams in contingency plans, including entities providing wildlife rehabilitation and recovery services.
- Enhanced requirements for readiness for spills of oils that may weather and sink.

[56] FMSIB, Road-Rail Conflicts Study fmsib.wa.gov/roadRail.cfm
[57] ibid

- Updated drill requirements to reflect legislative direction.

The rule will go into effect on January 18th, 2020.

Exhibit 7-8 Proposed planning requirements for railroads moving oil in Washington state [58]

Railroad Type	Contingency Plan Requirements	Washington Railroads
Type A: Crude oil railroads	A comprehensive oil spill plan and three drills per year	• BNSF • Union Pacific • Tacoma Rail
Type B: Railroads moving 49 or more tank cars per year of oil that is not crude oil	A comprehensive oil spill plan and one drill every three years	• Puget Sound & Pacific • Columbia Basin
Type C: Railroads moving less than 49 tank cars per year of oil that is not crude oil	A basic oil spill plan and no required drills	• Central Washington • Great Northwest • Portland Vancouver Junction

Corridor preservation

In the near-term, WSDOT expects to complete its Active Transportation Plan that will identify gaps in the state network of pedestrian and bicycle trails. This network analysis could help local communities determine whether a rail line entering the abandonment process can address an identified statewide need for a trail.

Resiliency

WSDOT is working with BNSF to make the route used by Amtrak Cascades more resilient to landslides. These improvements will benefit the movement of freight as well. Continuing work started in 2014, WSDOT was awarded a $2,035,000 CRISI grant from FRA in 2019 for a project to construct landslide mitigation measures at two locations in Mukilteo.

WSDOT plans to continue working with BNSF to make Amtrak Cascades service more resilient by addressing landslide prone locations as funding allows.

[58] Department of Ecology fortress.wa.gov/ecy/publications/documents/1908014.pdf

Chapter 8 Rail funding sources

8.1 Federal

Federal Railroad Administration

The Federal Rail Administration manages grant and loan programs. The goals of the programs are to develop safety improvements and encourage the expansion and upgrade of passenger and freight rail infrastructure and services.

The FAST Act is a long-term surface transportation authorization enacted by Congress in 2015. Surface transportation acts have traditionally included only funding for federal-aid highways and transit (such as ferry, bus, and light rail). The FAST Act was the first surface transportation act that included heavy rail programs by including more than $10 billion for intercity passenger and freight rail grants over five years. A total of $2.2 billion has been authorized to be appropriated for the fiscal years 2016-2020 for three competitive rail development grant programs administered by FRA:

Consolidated Rail Infrastructure and Safety Improvements Program (CRISI). The purpose of this grant program is to improve the safety, efficiency, and reliability of passenger and freight rail systems. Eligible activities include a wide range of capital, regional and corridor planning, environmental analyses, research, workforce development, and training projects. In February 2019, FRA announced $56,933,567 in grant funding for 18 projects in 16 states under the CRISI program. Washington was awarded grants for two projects on the Pacific Northwest Rail Corridor. A $2,035,000 WSDOT project will construct landslide mitigation measures at two locations in the city of Mukilteo. A second grant for $500,000 will allow WSDOT to conduct service planning to develop a range of reasonable alternatives for potential infrastructure investments to improve Amtrak Cascades service.

Federal-State Partnership for State of Good Repair. The purpose of this grant program is to reduce the state of good repair backlog on publically owned or Amtrak-owned infrastructure, equipment, and facilities. Eligible activities include capital projects to (1) replace existing assets in-kind or with assets that increase capacity or service levels; (2) ensure that service can be maintained while existing assets are brought into a state of good repair; and (3) bring existing assets into a state of good repair. In August 2019, FRA awarded a $37.5 million Federal-State Partnership for State of Good Repair grant to WSDOT for procurement of at least three sets of passenger rail cars for the Amtrak Cascades service.

In August 2019, FRA awarded a $37.5 million Federal-State Partnership for State of Good Repair grant to WSDOT to procure at least three sets of passenger rail cars for the Amtrak Cascades service.

Restoration and Enhancement Grants. The purpose of this grant program is to provide operating assistance to initiate, restore, or enhance intercity passenger rail transportation. Grants are limited to three years of operating assistance per route and may not be renewed.

The FRA also established the Railroad Trespassing Enforcement Grant Program to pay for extra law enforcement presence in areas at high risk for incidents and fatalities. The program has a total of $150,000 in funding available to state, county, and municipal law enforcement agencies to pay officer wages related to additional trespassing enforcement activities.

Federal Transit Administration

The FAST Act reauthorized funding of FTA formula grants through 2020, therefore providing more stability and predictability in funding for transit agencies. In addition to competitive grant programs, the FTA formula funds can be used for commuter rail projects and operations that include:

- Rural Areas – 5311
- Tribal Transit Formula Grants – 5311(c)(2)(B)
- Urbanized Area Formula Grants – 5307
- State of Good Repair – 5337
- Rural Transportation Assistance Program – 5311(b)(3)

Sound Transit has used FTA funds for some Sounder commuter rail projects in the past.

Federal Highway Administration

The Railway-Highway Crossings (Section 130) program provides funds to eliminate hazards at railway-highway crossings. (23 USC 130). The funds are set-aside from the FHWA Highway Safety Improvement Program (HSIP) apportionment for each state. WSDOT allocates the funding from this program for Washington projects such as: the installation of new crossing protective devices, upgrade of existing crossing signal devices, railroad crossing closures and bicycle/pedestrian crossing improvements. Fifty percent of a state's apportionment is dedicated for the installation of protective devices at crossings. The remainder of the funds can be used for any hazard elimination project, including protective devices. In 2017, 16 projects were funded through this program for a total of $10,640,272. (Exhibit 7-5 has a list of these projects.)

US Department of Transportation

USDOT administers competitive funding programs that are not mode-specific.

Build America Bureau

Established by the FAST Act, the Fostering Advancements in Shipping and Transportation for the Long-term Achievement of National Efficiencies (FASTLANE) grant program was a competitive and nationwide program specific to freight projects. It provided dedicated, discretionary funding for projects that address critical freight issues. Funding was authorized from 2016 to 2020, averaging $900 million annually. In 2016, FASTLANE was administered by FHWA. The program now is being administered by the Build America Bureau as the Infrastructure for Rebuilding America (INFRA) program. INFRA advances the pre-existing grant program, by updating project criteria, leveraging capital and allowing innovation in project delivery. Projects in Washington that received funding to date from this program are shown in Exhibit 8-1.

In 2017, 16 projects in Washington state were funded through the Railway-Highway Crossings (Section 130) program for a total of $10,640,272.

Exhibit 8-1 FASTLANE/INFRA awards for rail projects in Washington state

Year	Project	Owner	FASTLANE Funding	Total Project Cost
2016	South Lander Street Grade Separation and Railroad Safety	City of Seattle	$45 million	$140 million
2016	Strander Boulevard Extension and Grade Separation Phase 3	City of Tukwila	$5 million	$38 million
2017	Northern Columbia Basin Railroad	Port of Moses Lake	$9.9 million	$32 million

The Better Utilizing Investments to Leverage Development (BUILD) Transportation Discretionary Grants Program was created in 2018. It is a continuation of the Transportation Investment Generating Economic Recovery (TIGER) grant program. The program is a competitive and nationwide program, which leverages matching funding from private sector partners, states, local governments, metropolitan planning organizations and transit agencies. Projects in Washington that received funding to date from this program are shown in Exhibit 8-2.

Exhibit 8-2 TIGER and BUILD awards for rail projects in Washington state

Fiscal Year	Amount	Sponsor	Purpose
2019	$11,300,000	Spokane International Airport	Construct a rail-truck transload facility at the airport.
2018	$5,677,000	WSDOT	Make improvements to all three branches of the Palouse River and Coulee City short line rail system
2017	$9,020,149	City of Spokane Valley	Eliminated two at grade crossings (removed 1 and separated the other)
2016	$10,000,000	Port of Everett	Modernized port and converted some truck trips to rail
2013	$10,000,000	Sound Transit	Replaced single track wooden trestle and bridge over Tacoma tidelands to add four round trips for Sounder Seattle-Lakewood service and to assist Amtrak Cascades in adding two round trips between Seattle-Portland
2012	$10,000,000	WSDOT	Relocated 7.5 miles of railroad for the US 395 North Spokane Corridor project

Surface Transportation and Innovative Finance Bureau

The FAST Act reorganized Federal loan and discretionary programs under the new Surface Transportation and Innovative Finance Bureau within USDOT. The Bureau houses the following programs:

Transportation Infrastructure Finance and Innovation Act. The act provides Federal credit and financing assistance with flexible repayment terms to projects of national and regional significance, including rail transit programs. The FAST Act reauthorized TIFIA, but with funding levels significantly lower than Moving Ahead for Progress in the 21st Century Act (MAP 21).

Railroad Infrastructure Financing and Improvement Act. The FAST Act expanded eligible projects for Railroad Rehabilitation and Improvement Financing to include transit-oriented and station development. The FAST Act also shortens review time and allows joint public-private ventures to encourage more applications to apply. As of May 31, 2015, the program has executed 35 loans for approximately $2.7 billion nationally.

National Highway Freight Program. Section 1116 of the FAST Act created the formula-funded National Highway Freight Program, which funds projects that support the movement of goods on the National Highway Freight Network, including rail crossings, with $1.2 billion annually in funding. The National Highway Freight Program provides Washington an estimated $89 million from federal fiscal years 2016 to 2020. WSDOT identifies freight projects eligible for NHFP funds using requirements set forth by the Washington State Legislature. Up to 10 percent of these funds may be put toward improvements to freight rail or ports.

8.2 State

The Washington State Legislature appropriates biennial budgets to these three state agencies that implement rail programs – WSDOT, Freight Mobility Strategic Investment Board, and the Utilities and Transportation Commission. The sources of the funds is primarily fees, permits, and licenses. State gas taxes cannot be used for rail programs.

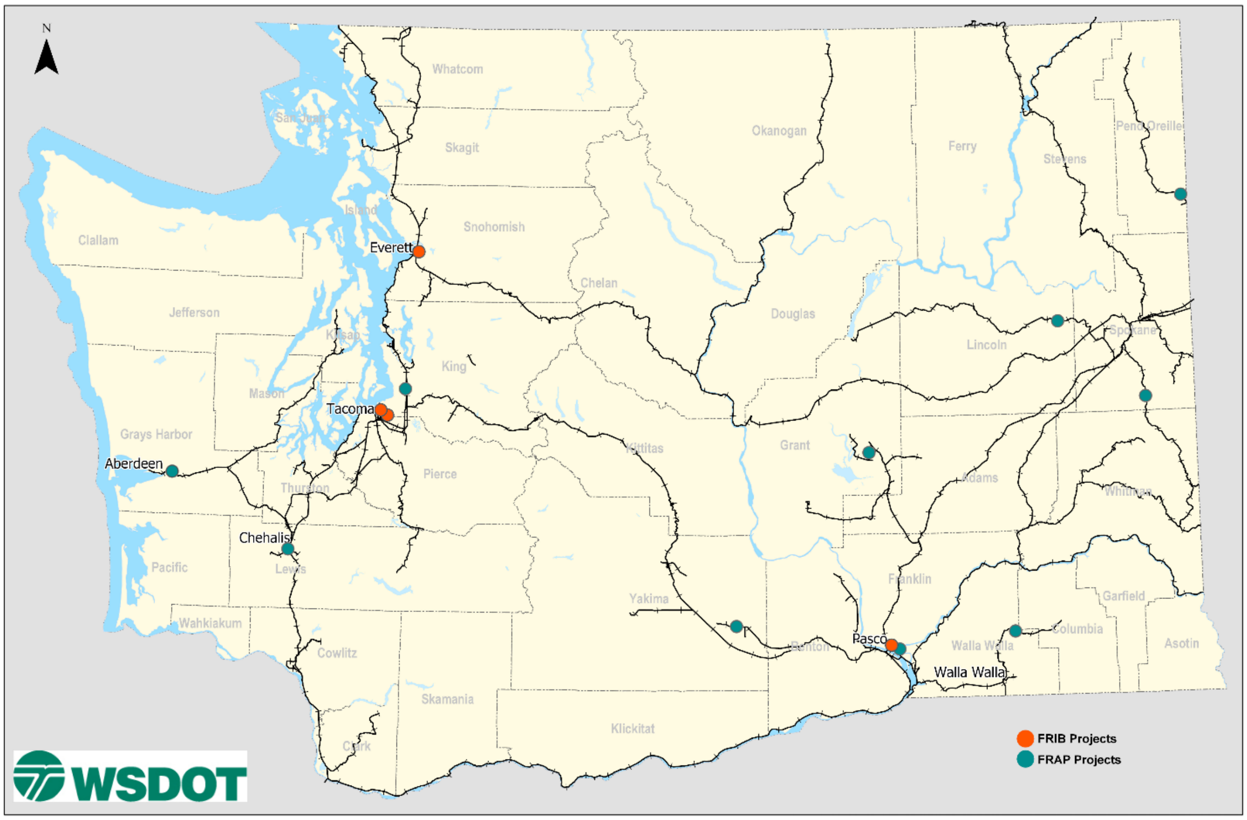
Washington State Department of Transportation

WSDOT’s rail operations program is responsible for implementing rail passenger service, funding state-sponsored Amtrak service between Vancouver, British Columbia and Portland, Oregon, and maintaining state-owned passenger rail equipment. The state's freight rail program analyzes trends, issues, and potential needs of Washington's freight rail system and oversees operation of state-owned rail lines in eastern Washington.

WSDOT’s rail capital program provides support, administration, coordination, and planning for both passenger rail and freight rail improvements. This program receives state funding; as well as federal grants. The program is responsible for implementing capital projects that support intercity passenger rail service growth, travel time savings, and schedule reliability. These include track improvements, acquisition of passenger rail equipment, and other investments. It is also the program that manages infrastructure investments on the state-owned short line rail system. The rail capital program also funds both a grant and loan program for railroad infrastructure projects across the state. These grant and loan programs support investment in the rest of the rail system through the Freight Rail Investment Bank (loan program) and the Freight Rail Assistance Program (grant program). The loan program is available for publicly owned railroads, port districts, rail districts, and local governments. The grant program is available to those in the public and private sectors.

Grant and loan applications to WSDOT fall into three broad categories: Critical infrastructure including bridges/tunnels, improvement and maintenance of existing infrastructure, and business development. The WSDOT Rail, Freight, and Ports division ranked and evaluated proposed projects through a benefit-cost analysis process. Funding was directed to projects expected to be most beneficial to Washington and those showing the greatest potential to be successful. Projects that directly increased existing rail transportation were ranked higher than those that were forecasted as being primarily beneficial to the applicant, such as repairing rail equipment or storing cars. During the 2019-2021 biennium, ten short line railroad projects are receiving Freight Rail Assistance Program (FRAP) grants. Projects funded during this biennium are listed in Chapter 7 and shown below in Exhibit 8-3. They include repairs to a historic swing bridge, replacement of worn ties, purchases of equipment, as well as rail and tie upgrades to accommodate 286,000 pound rail cars.

Exhibit 8-3 FRIB/FRAP 2019-2021 project locations



Freight Mobility Strategic Investment Board (FMSIB)

The Freight Mobility Strategic Investment Program is a competitive grant program administered by FMSIB. FMSIB issues a call for projects every two years to maintain a 6-year list of active projects. These freight corridor projects are cross-jurisdictional and often serve cities, counties, port districts, and freight carriers, including railroads and trucking companies. FMSIB's grant program also can help fund WSDOT projects. There are six active projects that were awarded a total of $29,650,000. Four are grade separation projects and two are rail-only projects.

Utilities and Transportation Commission (UTC)

The UTC administers the Grade Crossing Protective Fund (GCPF). The fund provides grants to railroad companies, local governments, and other agencies that propose to make safety improvements at a railroad crossing or along a railroad right-of-way. Funding also is available for safety improvements at passive (no lights and gates) public railroad crossings and for implementing other rail safety projects.

The selection process includes the severity of the hazard, the safety benefits resulting from the project, the total costs to implement a project, geographic diversity and funds available for the program.

From 2017 to 2019, UTC awarded nearly $1,140,000 to install or improve active warning devices at three crossings along oil routes:

- $295,311 to the City of Millwood to install active warning devices at the Marguerite Street crossing in Millwood;
- $406,060 to Skamania County to upgrade active warning devices at the Butler Road crossing near Stevenson; and
- $438,174 to Snohomish County to install active warning devices at the 48th Avenue NW crossing near Stanwood.

The commission also awarded nearly $344,000 to improve safety for pedestrians and drivers around railroad tracks:

- $990 to the Port of Chehalis to complete signage upgrades at 21 crossings on its rail line in Chehalis;
- $8,520 to Yakima County to upgrade to LED lighting at the Barkes Road, Lateral A Road, and Wesley Road crossings in Yakima County;
- $19,084 to the City of Bingen to upgrade the active warning devices at the Walnut Street crossing in Bingen;
- $20,000 to the City of Kent to install fencing near S. Willis Street and E. James Street in Kent to prevent pedestrian access to tracks;
- $36,784 to the City of Auburn to install mountable median barriers with delineators, upgrade existing street lighting to LEDs, and install new street lights at the C Street SW crossing in Auburn;
- $40,597 to Cascade & Columbia River Railroad Company for upgrades to the train detection system at the 4th Street crossing in Tonasket;
- $50,000 to the City of Tacoma to assist in paying for installation of pedestrian signals and gates at the McCarver Street crossing;
- $77,096 to Central Washington Railroad to upgrade train detection at the W. Second Street and Grandridge Road crossings in Grandview and Division Street and Sunnyside Avenue crossings in Granger; and
- $90,840 to Puget Sound & Pacific Railroad to upgrade train detection, replace batteries and battery chargers, and update signal plans and software at the E. Heron Street, Chehalis Street, Newell Street, and Tyler Road crossings in Aberdeen.

Chapter 9 Conclusion

The State Rail Plan is not an end point. Instead, the plan is meant to guide and inform public investment and action on the rail system. It highlights critical needs facing the system and outlines a series of recommendations to address them.

Next steps include:

- Delivering funded capital projects to improve rail service
- Incorporating results of the State Rail Plan into other state and regional plans
- Collaborating with stakeholders and partners to refine and focus investment priorities
- Initiating scoping and project development to prepare for future funding opportunities

Also, WSDOT maintains the ability to issue a technical update to this plan as appropriate prior to developing the next State Rail Plan.

The State Rail Plan is meant to guide and inform public investment and action on the rail system, highlighting critical needs facing the system and outlining recommendations to address them.

Appendix A: Illustrative list of investments

The 2014 state rail plan provided an illustrative listing of rail-related improvements that were identified and programmed through various state and regional plans. The project lists were the result of an organized and rigorous planning process. Over the five years since development of those lists, project priorities and funding has changed. This appendix provides an updated illustrative list of rail-related improvements reflecting state and regional priorities. This list is not fiscally constrained and not prioritized, and is intended to illustrate the needs for rail improvement in Washington state. Some of these projects are partially funded, while others may still be in the early planning stage and unfunded. The order of the projects listed is not indicative of their relative merit or potential funding priority.

Methodology

To update the 2014 illustrative rail project list, WSDOT sent a request for rail project information in August 2018 to all metropolitan planning organizations and regional planning organizations and encouraged them to coordinate with local jurisdictions. For validation purpose, projects must meet the following criteria:

- Included in the current Statewide Transportation Improvement Program; or
- Adopted in an official plan, such as a Regional Transportation Plan, TIP, or comprehensive plan for a city, county; or
- Vetted through an appropriate public process, such as a regional planning process.

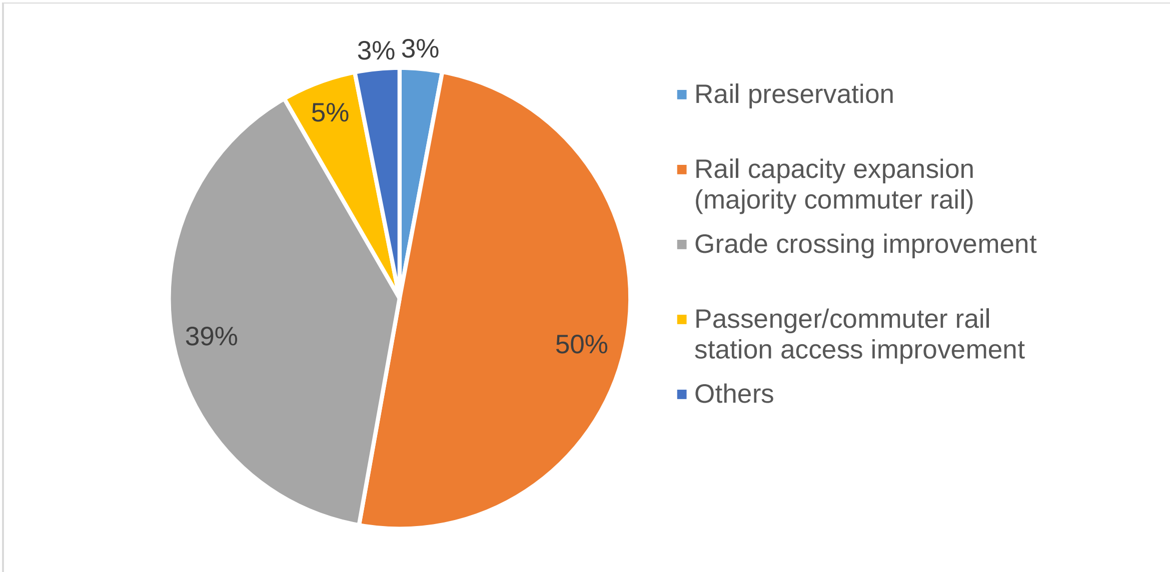
Five MPOs and RTPOs responded and submitted rail project information to WSDOT by October 2018. WSDOT reviewed received project information for consistency with screening criteria, and updated the illustrative list by including active and new projects and removing completed or obsolete projects. WSDOT also reviewed other publicly available sources and applied the same criteria to identify rail projects for inclusion, such as FMSIB road/rail conflict study phase 2, and 2017 Freight System Plan. The updated list also includes projects from Amtrak for station improvements.

List structure

There are a total of 74 projects included in the illustrative project list. For each project, available information is provided on the following elements: project name, project location, lead organization, source, brief description, project type, and expected completion year, project cost, funding source and amount, and submitting organization. All projects are categorized into five types: rail preservation, rail capacity expansion, grade crossing improvement, passenger/commuter rail station access improvement, and others, with a total cost estimated at $3.7 billion[59]. Exhibit A-1 shows the cost share by project types, with rail capacity expansion accounting for 50% of the total cost, and grade crossing improvements accounting for 39%.

[59] This number only accounts for projects with a cost estimate provided.

Exhibit A-1 cost share of illustrative rail projects by types



These projects are at various phases of development, which range from being under construction in 2019 to conceptual planning phase, with costs and completion timelines still to be determined. Projects are also at various phases of funding status, with some partially funded and others unfunded.

Exhibit A-2 Illustrative Rail Project List in Washington State

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
1	BNSF Rail Bridge over Skagit River	Skagit County	City of Burlington	Skagit 2040 Regional Transportation Plan	BNSF Skagit River bridge replacement for flood risk reductions. Project would add additional set of railroad tracks over the river.	Rail capacity expansion	2040	$98.8		Skagit Council of Governments
2	Grant County Port District No. 1 (Port of Quincy) Industrial Park No. 4 Intermodal Terminal Infrastructure Expansion Project	Quincy, Grant County, WA	Port of Quincy (Grant County Port District No. 1)	2014 Washington State Rail Plan	Improvements to the Grant County Port District No. 1 Intermodal Yard/Terminal at Industrial Park No. 4 to include the installation of over 6,000 feet of rail track extension within the Intermodal Yard/Terminal and also east of Industrial Park No. 4, turnouts, and rail appurtenances; the construction of a rail track bridge over a U.S. Bureau of Reclamation major canal and irrigation wasteway; improvements to the intersection of the rail track extension and County Road “O” NW to the east of Industrial Park No. 4; the placement of approximately 34,000 tons of granular material over three acres of the Port District’s Intermodal Yard to accommodate the expansion of container storage facilities; and the purchase of accompanying properties east of the current intermodal terminal for rail track right-of-ways.	Rail Capacity Expansion and Other (Improve Short-Haul and Long-Haul Intermodal Capacity)	If funding is successfully obtained, the expected completion year is 2023.	$20	The Port of Quincy has submitted funding and grant requests to the Washington State Legislature and to USDOT	Quad County Regional Transportation Planning Organization

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
3	Port of Warden - Rail Infrastructure Expansion - Phase 2	Grant County, Warden WA	Port of Warden	2015 Connecting Washington funding package	The project would provide additional rail infrastructure for industrial, food processing and agricultural rail shipper(s) including infrastructure shuttle / unit train operations.	Rail Capacity Expansion and Other	Phase 1 is nearly completed, while Phase 2 would be completed by 2021, depending on if funding for Phase 2 is available.	$3	Phase 1 funded from Washington State Legislative Transportation Package. Phase 2 will be requested in 2019-2021 biennium from Washington State Transportation Budget.	Quad County Regional Transportation Planning Organization
4	Connell Rail Interchange	Downtown Connell, where the Columbia Basin Railroad line intersects with the BNSF line.	City of Connell & Port of Moses Lake	BFCG 2017 Regional/Metropolitan Long Range Transportation Plan	Rail congestion and safety issues are caused by the current facilities, which are outdated, inefficient, and undersized. This project will improve multi-modal safety and freight mobility, resulting in greater regional economic development. The current interchange serves as a pinch-point for rail transportation, and causes vehicle traffic delays in the downtown. The project site provides access to a three-county region, predominantly agriculture and industry. The improvements aim to improve safety, reduce rail congestion, and promote industrial and economic growth in the three county region	Rail capacity expansion	2019 if funded	$28.7	Local--------$.1 million; FMSIB (pending)-----$2.0 million; Connecting WA ---$10.0 million; Federal Request----$16.6 million	Benton-Franklin Council of Governments

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
5	Pines Rd / BNSF Grade Separation Project	Spokane Valley	City of Spokane Valley	STIP	Realign Pines Rd (SR 27) to go under the BNSF mainline railroad tracks and reconstruct the intersection of Pines and Trent Ave (SR 290). Benefits include reduced travel time, improved rail and roadway safety, reduced noise pollution, and economic benefits from improved access to nearby land and businesses.	Grade crossing improvement	2024	$29	City funded $2.4M to-date for PE and RW, anticipating increase in 2019 to $3.2M total city funding. Applications pending to CRISI, BUILD, and 2018 SRTC Call for Projects.	Spokane Regional Transportation Council
6	Sullivan Road Bridge	Spokane Valley	City of Spokane Valley	MTP	Reconstruct and widen the Sullivan Rd bridges over the BNSF railroad tracks @ Trent Ave. Benefits include improved roadway travel times and maintaining roadway and rail safety benefits of the grade separation.	Grade crossing improvement	2030	$27	Unfunded	Spokane Regional Transportation Council
7	Park Rd / BNSF Grade Separation Project	Spokane Valley	City of Spokane Valley	MTP	Railroad grade separation project raising Park Rd over the BNSF railroad tracks and developing and constructing an at grade intersection on Trent Ave (SR 290). Benefits include reduced travel time for roadway users, improved rail and roadway safety, reduced noise pollution, and economic benefits by improving access to nearby land and businesses.	Grade crossing improvement	2030	$25	Unfunded	Spokane Regional Transportation Council
8	Trunk Rail Extension Phase 2	Spokane, WA	Spokane Airports	TBD	Continue rail development on non-aeronautical property	Others	TBD	$2	TBD; TBD	Spokane Regional Transportation Council

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
9	Fish Lake Trail Rail Crossing	Spokane	City of Spokane	City of Spokane Comp Plan (p. 4-40)	The Fish Lake Trail leaves West Spokane and runs south to Queen Lucas Lake, which is 1.5 miles north of the trail's ultimate planned destination, Fish Lake Regional Park. The remaining 2.5 miles of the trail will cross active railroad tracks and connect to Fish Lake Park and Cheney's trail. A safe way to get people across the tracks is needed and bridges will most likely be the safest solution.	Grade crossing improvement	2040	$6	Unfunded	Spokane Regional Transportation Council
10	Spokane Tribe Rail Spur	Spokane County	Spokane Tribe	Tribal Site Plan	The Spokane Tribe of Indians is actively planning for a green industrial park on 155 acres of fee land located adjacent to an active rail line and the City of Airway Heights. At present, a fee to trust process has been established with the Bureau of Indian Affairs to convert the fee parcels to trust parcels in an effort to leverage the economic competitive advantages associated with tribal sovereignty. Visions of a rail spur or rail siding are actively being explored by the Spokane Tribe as the industrial park planning process continues.	Grade crossing improvement	2022	$0.5	Unfunded	Spokane Regional Transportation Council
11	70th Avenue E Railroad Crossing	From: Approximately 600` north of the tracks To: Approximately 600` south of the tracks	Fife	PSRC RTP (Project ID: 5577)	70th Avenue E grade separated (4-lane) crossing of the UP tracks. Segments of 70th Avenue E, north and south of the railroad crossing have been improved to a 5-lane roadway.	Grade crossing improvement	2025	$26.2		Puget Sound Regional Council

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
12	SODO Rail Corridor Grade Separation	From: S Dearborn St; To: S Spokane St	Seattle DOT	City of Seattle Freight Master Plan, September 2016; PSRC RTP(Project ID: 5252)	Improve access to manufacturing and industrial center and Port of Seattle facilities. May include non-motorized grade separation to increase safety and reduce modal conflicts.	Grade crossing improvement	2035	$145	City of Seattle / partnerships	Puget Sound Regional Council
13	Edmonds Street Waterfront Connector (formerly Edmonds Street Flyover)	From: Edmonds St. @ Sunset Ave. To: SR-104 @ Railroad St.	Edmonds	PSRC RTP(Project ID: 5581); Edmonds Capital Improvements Plan	This project consists of the addition of a grade-separated crossing over the railroad tracks as an extension of Edmonds Street, connecting to Brackett`s Landing north park. This project will provide on-going access for pedestrians and bicycles. Emergency vehicles can utilize the Connector and off-load passenger vehicles from the ferry would be able to utilize the overpass during an extended closure of the railroad tracks crossings.	Grade crossing improvement and Others (multimodal)	2027	$29.9		Puget Sound Regional Council
14	Williams Ave S and Wells Ave S Conversion Project	Williams Ave S and Wells Ave S at the intersections with Houser Way S.	Renton	PSRC TIP (ID: REN-40)	The project will also include railroad crossing safety improvements on Williams Ave S and Wells Ave S at the intersections with Houser Way S.	Grade crossing improvement	2020	$6.3		Puget Sound Regional Council
15	Taylor Way Rehabilitation		Tacoma	PSRC TIP (TAC-107)	Improvements include reconstructing the roadway surface to heavy haul standards (Fife to E. 11th St.), widening the SR 509/Taylor Way intersection to include dedicated thru and turn lanes, removing or upgrading existing railroad crossings…	Other	2022	$19.7		Puget Sound Regional Council

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
16	6th Avenue		Tacoma	PSRC TIP (TAC-116)	Construct railroad crossing improvements at the 6th Avenue and Titlow Beach rail crossing.	Grade crossing improvement	2020	$1.2		Puget Sound Regional Council
17	Park Avenue North Extension	Extend Park Ave N to the north of Logan Ave N	Renton	Renton TIP, TIP No.20	The project will also include railroad crossing safety improvements on Park Ave N at the 757 Ave crossing north of Logan Ave N.	Grade crossing improvement	2021	$7.5		Puget Sound Regional Council
18	4th Ave S Viaduct Replacement (4th Ave S grade crossing over Union Pacific Railroad Argo Yard)	From: S Industrial Way; To: S Dawson St	Seattle DOT	City of Seattle Freight Master Plan, September 2016	Replace the viaduct structure spanning the UP yard at the conclusion of its service life, which is expected to occur within the 20-year planning timeframe (by 2035). The new structure will increase vertical clearance above the railroad tracks to improve safety and rail operations. Columns and pier walls will be removed to increase and optimize rail yard functionality and operations.	Rail preservation	2035	$55	City of Seattle/partnerships	Puget Sound Regional Council
19	1st Ave S Viaduct Replacement (Grade crossing over UP Argo Yard)	From: S Andover St; To: S Hudson St	Seattle DOT	City of Seattle Freight Master Plan, September 2016	Replace the existing viaduct structure spanning the UP rail yard at the end of its useful life span.	Rail preservation	2035	$55	City of Seattle/partnerships	Puget Sound Regional Council
20	East Marginal Way S / S Hanford Street Intersection Improvements	E Marginal Way S / S Hanford St	Seattle DOT	City of Seattle Freight Master Plan, September 2016	Rebuild intersection of East Marginal Way S / S Hanford St and improve access to Whatcom storage tracks adjacent to and serving Port terminals. Upgrade the signal, improve the railroad crossing pavement, and install railroad crossing gates for safety at the track crossings.	Grade crossing improvement	2025	$2	City of Seattle/partnerships	Puget Sound Regional Council

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
21	East Marginal Way S / 8th Ave S / S Myrtle St Intersection Improvements	From: E Marginal Way S/S Myrtle St; To: 8th Ave S	Seattle DOT	City of Seattle Freight Master Plan, September 2016	Improve intersection roadway geometry adjacent to three UP crossings, upgrade drainage, and rehabilitate pavement at railroad tracks.	Grade crossing improvement	2025	$5.6	City of Seattle/partnerships	Puget Sound Regional Council
22	S Hanford St Reconstruction	From: E Marginal Way S; To: 1st Ave S	Seattle DOT	City of Seattle Freight Master Plan, September 2016	Rebuild the segment of S Hanford St between the East Marginal Way S and 1st Ave S to Heavy Haul route standards, including new pavement at railroad crossings. May include rail crossing gates or other devices.	Grade crossing improvement	2035	$8.6	City of Seattle/partnerships	Puget Sound Regional Council
23	W Galer St Interchange Ramp	From: Alaskan Way W, To: Elliot Ave W	Seattle DOT	City of Seattle Freight Master Plan, September 2016	Construct ramp to improve access around BNSF mainline tracks and storage yard.	Rail capacity expansion	2035	$23	City of Seattle / partnerships	Puget Sound Regional Council
24	SR 509 Arrival/Departure Tracks		NW Seaport Alliance	2017 Washington State Freight System Plan	Extend a number of SR-509 rail corridor tracks 1,300' east, construct a new rail bridge across Wapato Creek, and relocate utilities.	Rail capacity expansion	2028	$45		Puget Sound Regional Council
25	North Intermodal Rail Yard Alignment		NW Seaport Alliance	2017 Washington State Freight System Plan	Align North and South Intermodal Yards, which will increase capacity of the rail yard and add additional train staging capacity to accommodate longer trains	Others	2028	$50		Puget Sound Regional Council
26	Terminal 5 Rail Improvements		NW Seaport Alliance	2017 Washington State Freight System Plan	Expansion of intermodal rail yard capacity on T-5—almost doubling the number of containers that can be loaded on a train on the terminal. Would provide additional train staging tracks and a new rail switch to improve access	Others	2028	$40		Puget Sound Regional Council

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
27	54th Avenue E Railroad Undercrossing	From: Approximately 400` north of the tracks To: Approximately 600` south of the tracks	Fife	City of Fife Comprehensive Plan	54th Avenue E grade separated (2-lane) crossing under the UP tracks, with pedestrian and bicycle facilities.	Grade crossing improvement	2027	$52		Puget Sound Regional Council
28	156th St NE RR Overcrossing		Marysville	Marysville Comprehensive Plan, 6 year TIP project #57	Construct a new railroad overcrossing at 156th St NE and the Burlington Northern Santa Fe mainline west of the future interchange improvement at I-5/156th St NE as funded by Connecting Washington.	Grade crossing improvement	2030	$12.4		Puget Sound Regional Council
29	172nd St NE Railroad Crossing Improvements		Marysville	Marysville Comprehensive Plan, 6 year TIP project #34	Widen 172nd St NE (SR531) to 2/3 lane roadway with pedestrian/bicycle facilities and railroad crossing improvements in accordance with the Lakewood Neighborhood Master Plan.	Grade crossing improvement	2021	$1.9	WSDOT FRA Safety $ (amount unknown)	Puget Sound Regional Council
30	Puyallup Station Improvements	Sounder Station @ Puyallup	Sound Transit	PSRC RTP and TIP (RTP ID: 4084; TIP ID: RTA-88)	Design (100%) and right-of-way for approximately 670 new parking stalls, along with sidewalk and bicycle improvements, pedestrian lighting and a pedestrian bridge from the garage over 5th Street NW to the Sounder Station platform.	Passenger / commuter rail station access improvement	2021	$66.3		Puget Sound Regional Council
31	Auburn Station Improvements		Sound Transit	PSRC RTP and TIP (RTP ID: 4081; TIP ID: RTA-91)	Design (100%) for approximately 500 new parking stalls, transit speed and reliability improvements, and pedestrian and bicycle improvements such as new or enhanced crosswalks, sidewalks, bicycle lanes and/or secure bicycle parking.	Passenger / commuter rail station access improvement	2023	$37		Puget Sound Regional Council

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
32	Kent Station Access Improvements	Sounder Station @ Kent	Sound Transit	PSRC RTP (RTP ID: 2644)	Construct capital improvements to facilitate access to Kent Station for pedestrians, bicyclists, and drivers. Improvements include additional parking facilities (+/- 450 spaces), pedestrian access improvements, bicycle route improvements and bicycle storage.	Passenger / commuter rail station access improvement	2023	$35.3		Puget Sound Regional Council
33	Sumner Station Improvements	Sounder Station @ Sumner	Sound Transit	PSRC RTP and TIP (RTP ID: 4083; TIP ID: RTA-89)	Station access improvements. Construct a new, approximately 623-stall parking garage at the current station parking site. Project also include sidewalk and lighting improvements	Passenger / commuter rail station access improvement	2022	$50.5		Puget Sound Regional Council
34	Sounder extension to DuPont	From: Lakewood Station To: Southwest of Dupont Station	Sound Transit	PSRC RTP (Project ID: 2533)	Extend Sounder commuter rail service from Lakewood to DuPont with new stations at Tillicum and DuPont. Includes new parking facility at Tillicum station (+/- 125 spaces) and additional trackage for train operation and storage (extent dependent upon service plan).	Rail capacity expansion	2036	$374.7		Puget Sound Regional Council
35	Sounder South Capital Improvements Program	From: King Street Station To: DuPont Station	Sound Transit	PSRC RTP (Project ID: 4087)	This project establishes a program of capital elements for improving South Sounder access, capacity and service in response to increases in demand. Program elements may include platform extensions, easement acquisition, track and signal upgrades, fleet expansion, and other infrastructure that facilitates adding capacity and expanding access to the system by pedestrians, bicycles, buses, private and other vehicles.	Rail capacity expansion and Passenger / commuter rail station access improvement	2036	$1,077		Puget Sound Regional Council
36	Seaport Modernization		Port of Everett	Port of Everett CIP	Includes rail upgrades, dock strengthening, warehouse relocation, new cargo handling equipment and new dredging investments	Rail capacity expansion and Others	2020	$57.2		Puget Sound Regional Council

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
37	Lenora St / BNSF Rail Line Overcrossing		Everett	Everett Comprehensive Plan Appendix A-3; Everett 6 year TIP project #33	This project will create a grade separated crossing and eliminate conflicts of vehicles and pedestrians. It will also improve a bottom out clearance on the vertical curve over the tracks.	Grade crossing improvement		$2.3		Puget Sound Regional Council
38	East Everett Avenue / BNSF Overcrossing		Everett	Everett Comprehensive Plan Appendix A-3, Everett 6 year TIP project #35	Grade separation project	Grade crossing improvement		$17.2		Puget Sound Regional Council
39	Chestnut St. / Eclipse Mill Road Improvements from Pacific to 36th		Everett	Everett Comprehensive Plan Appendix A-3, Everett 6 year TIP project #37	Crossing Improvements and/or possible grade separation.	Grade crossing improvement		$4.3		Puget Sound Regional Council
40	Grove St RR Overcrossing		Marysville	Marysville Comprehensive Plan, 6 year TIP project #58	The Grove Street Overcrossing project would span the Burlington Northern Santa Fe railway track on Grove Street from State Avenue to Cedar Avenue. The tracks run between, and nearly parallel to, Interstate 5 and State Avenue/State Route 529. The tracks impede the east-west flow of traffic into and through the downtown core, serving to compound the lack of sufficient traffic capacity between State Route 9 and Interstate 5. The City desires to alleviate congestion and increase overall east/west connectivity along key corridors in its downtown.	Grade crossing improvement	2028		$850,000 for 30% PE ($500k State + $350K City)	Puget Sound Regional Council

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
41	Zehnder Street BNSF Crossing at-grade improvements		Sumner	Sumner Transportation Plan	Zehnder Street, Pease Ave to Wood Ave RR Crossing Improvements. Project will study, design, and construct at-grade railroad crossing improvements to improve safety at the complex intersection	Grade crossing improvement				Puget Sound Regional Council
42	Holgate St. Rail Crossing Improvements	From: Occidental Ave. To: 4th Ave S.	Seattle DOT	Seattle Freight Master Plan p. 93	Develop a nonmotorized grade separation over the Burlington Northern mainline tracks, plus operational tracks supporting AMTRAK and BNSF SIG Yard. S Holgate St is the designated location for the final leg of the Region's Mountains to Sound Greenway. Evaluate dynamics at crossing following completion of S Lander St Grade Separation construction.	Grade crossing improvement	2035	$50	City of Seattle/partnerships	Puget Sound Regional Council
43	Railroad Crossing Delay Warning System (Crossings at S Holgate St, S Lander St, and S Horton St)	At Grade Crossings on: S Holgate St, S Lander St, & S Horton St	Seattle DOT	City of Seattle Freight Master Plan, September 2016	Use detection equipment to collect crossing blockage, both duration and time of day, data on various railroad crossings to understand traffic impact s resulting from blocked railroad crossings and mitigating delays.	Grade crossing improvement	2020	$0.5	City of Seattle	Puget Sound Regional Council
44	Pedestrian overpass between Old Town Business District and Ruston Way		Tacoma	Tacoma Transportation Master Plan TMP #292	Grade separated pedestrian link over the rail lines	Grade crossing improvement		$40		Puget Sound Regional Council
45	Vertical separation of railroad and roadway	S 56th and Washington St	Tacoma	Tacoma Transportation Master Plan TMP #105	Separates rail crossing and roadway	Grade crossing improvement		$22.5		Puget Sound Regional Council

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
46	Vertical separation of railroad and roadway	Pine St and S Tacoma Way	Tacoma	Tacoma Transportation Master Plan TMP #25	Separates rail crossing and roadway	Grade crossing improvement		$22.5		Puget Sound Regional Council
47	Vertical separation of railroad and roadway	S 74th St and S Tacoma Way	Tacoma	Tacoma Transportation Master Plan TMP #109	Separates rail crossing and roadway	Grade crossing improvement		$22.5		Puget Sound Regional Council
48	Lander Street Grade Separation	From: 1st Ave S; To: 4th Ave S	Seattle DOT	City of Seattle Department of Transportation (FAST 2)	Roadway overpass over BNSF railroad tracks connecting First Ave S and Fourth Ave S. Project is fully funded and currently under development. Final project costs TBD.	Grade crossing improvement	2020	$100	City of Seattle, Port of Seattle, FMSIB, TIB, PSRC, FASTLANE/INFRA, Connecting Washington, NHFP, BNSF, King County	Puget Sound Regional Council
49	South 212th St Grade Separation	@ BNSF and UP Rail Line	Kent	RTP 1563; FMSIB	This project will construct RR grade separation at the BNSF and UP rail line. Benefits will mostly accrue to roadway users, but there may be community and rail safety benefits from the grade separation.	Grade crossing improvement	2025	$99	FMSIB - $10M; Unfunded - $89 M.	Puget Sound Regional Council

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
50	South 228th St BNSF /UP Grade Separation	@ BNSF and UP Rail Line	Kent	RTP 3643; FMSIB	This project to grade separate S. 228th St from railroad mainline traffic. It will decrease congestion, enhance safety, improve mobility, and provide connection to 40M sq. ft of industrial space. Benefits will mostly accrue to roadway users, but there may be community and rail safety benefits from the grade separation.	Grade crossing improvement	2020	$60.1	City - $15.9M; FMSIB - $7.75 M; STP (PSRC) - $10.2 M; TIB - $3.5 M; Ports - $1.19 M; Connecting WA - $15 M; Railroad - $971,400; Other - $5.7 M.	Puget Sound Regional Council
51	Willis St (SR 516) Grade Separations	@ BNSF and UP Rail Line	Kent	RTP 5289; FMSIB	Grade separate Willis St from BNSF and UP to provide link through the warehouse/industrial center of Kent. Project will reduce delays, eliminate at-grade conflicts and allow increased train speeds. Benefits will mostly accrue to roadway users, but there may be community and rail safety benefits from the grade separation.	Grade crossing improvement	2025	$87.5	FMISB - $3.25 M; Kent - $2 M; Federal - $3.12 M; Unfunded (anticipated) - $79.13 M.	Puget Sound Regional Council
52	Strander Blvd./SW 27th St Extension	From: West Valley Hwy To: Naches Ave.	Tukwila	PSRC RTP and TIP(Project ID: 4164; TIP ID: TUK-59)	Design and construction of a railroad bridge at the UP (UP) railroad tracks and a four lane, grade-separated roadway connecting SW 27th St (in Renton) to Strander Blvd (in Tukwila). The project will also include a flyover bridge connection to the Tukwila Commuter Rail Station and a new bridge for the regional Interurban Trail.	Grade crossing improvement	2026	$86		Puget Sound Regional Council

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
53	Canyon Road East Regional Connection	Pioneer Way East to 70 Avenue East	Pierce County	Pierce County 2019-2024 TIP; RTP 135; RTP 4475	Construct an arterial roadway extension of Canyon Road from 1000' south of its current terminus at Pioneer Way connecting into 52 Street East and then across the Puyallup River connecting into 70 Avenue East in the City of Fife. The project includes a new grade separated crossing of the BNSF mainline, a new bridge over Clarks Creek and a new bridge across the Puyallup River. The project will increase safety and capacity for roadway freight and goods movement and provide a more direct route between the Port of Tacoma and the Frederickson Manufacturing and Industrial Center (MIC) and the Sunrise/Thun Field employment centers.	Grade crossing improvement	2026	$213	Federal - $7.1 M; FMSIB - $5.0 M; Pierce County - $36.5 M; Unfunded - $164.4 M	Puget Sound Regional Council
54	Sumner Connection		Port of Seattle	Port of Seattle Century Agenda	Construct connection between the UP and BNSF main lines in the Sumner area using partial existing right-of-way. Allows UP trains to operate over BNSF for the full distance between Black River and Reservation (Tacoma). BNSF trains to and from the Tideflats would operate over UP between Fife Yard and Sumner, and UP could directly access Stampede Pass. Requires agreement between BNSF and UP to permit co-production over their respective lines.	Other				Puget Sound Regional Council
55	Duwamish Corridor Concept		Port of Seattle	Port of Seattle Century Agenda	Create a connection between the UP Argo yard and the BNSF Harbor Island line using a combination of UP and BNSF trackage. Requires agreement between BNSF and UP to permit co-production over their respective lines. Project was originally proposed in the Port of Seattle's January 1997, Intermodal Rail Access Study.	Other				Puget Sound Regional Council

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
56	Double-end Pierce County IMX Yard		Port of Tacoma	Port of Tacoma Strategic Plan 2012-2022	Double end Pierce County Terminal intermodal yard to improve productivity, efficiency and connectivity to the overall rail system in the Tideflats. Key benefit will be the ability to allow concurrent train movements in area rather than single movements.	Other				Puget Sound Regional Council
57	Double-end Washington United Terminals IMX Yard		Port of Tacoma	Port of Tacoma Strategic Plan 2012-2022	Connect northerly end of the Washington United Terminals IMX yard to rail line on the west side of the Port of Tacoma Yard.	Other				Puget Sound Regional Council
58	McKittrick Street Grade Separation, Wenatchee	Hawley St		FMSIB Road-Rail Conflicts Study Phase 2	Following the 2015 Sleepy Hollow wildfire that destroyed 70+ acres of industrial property in the area, the city completed a redevelopment plan that relocates access across BNSF from Hawley Street south one block to McKittrick Street. The project provides for grade separated access to the industrial uses along the river.	Grade crossing improvement		$25		
59	Regional Beltway Phase II, Union Gap	New Crossing		FMSIB Road-Rail Conflicts Study Phase 2	New grade separation over BNSF rail line as part of the WSDOT Connecting WA funded South Union Gap Interchange Project. Connects to future Beltway project that is 30% designed and has recently received funding to purchase ROW. Expected construction in mid-2020's.	Grade crossing improvement		$18	Secured fund $400,000	
60	Division Street Crossing Safety & ADA Improvements, Cashmere	Division St		FMSIB Road-Rail Conflicts Study Phase 2	Construct ADA compliant railroad pedestrian/bike crossing surfaces, install a four-quadrant gate Signal system with pedestrian gates, and update signs and markings.	Grade crossing improvement		$1.5		

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
61	Miller St Grade Separation, Wenatchee	N Miller St		FMSIB Road-Rail Conflicts Study Phase 2	One component of constructing a bypass corridor for SR 285, to connect downtown Wenatchee and the North Wenatchee waterfront district directly to the Olds Station industrial area and US 2.	Grade crossing improvement		$30		
62	BNSF Wenatchee Switchyard Relocation, Wenatchee	Orondo St		FMSIB Road-Rail Conflicts Study Phase 2	Relocating BNSF switchyards and operations Outside city limits. Project is a substitute for two grade separations. Includes new railroad siding and train control and a maintenance and operations building.	Grade crossing improvement		$32		
63	Bridge Street Non-Motorized Grade Separation, Wenatchee	Bridge St		FMSIB Road-Rail Conflicts Study Phase 2	New pedestrian extension west from the existing Columbia River pedestrian bridge to connect with Wenatchee Avenue in the vicinity of Bridge Street.	Others		$4		
64	32nd Street/Russell, Washougal	32nd St/Russell		FMSIB Road-Rail Conflicts Study Phase 2	Washougal is currently working through an alternatives analysis for either an overpass at 27th Street or an underpass at 32nd Street. Once the alternatives analysis is completed, the actual project will be defined.	Grade crossing improvement		$17.9	Secured fund $863,000	
65	College Way Railroad Grade Separation, Mount Vernon	College Way-SR 538		FMSIB Road-Rail Conflicts Study Phase 2	Grade-separated crossing over or under BNSF railroad line.	Grade crossing improvement		$22.7		
66	Cook Road Reconstruction, Skagit County	Cook Rd		FMSIB Road-Rail Conflicts Study Phase 2	Grade-separated crossing over or under BNSF railroad line.	Grade crossing improvement		$15.5		
67	Jones Road/John Liner Railroad Undercrossing, Sedro-Woolley	Jones Road		FMSIB Road-Rail Conflicts Study Phase 2	New BNSF undercrossing and new arterial from E Jones Road to John Liner Road.	Grade crossing improvement		$7.7		

No	Project Name	Project Location	Lead Organization	Source	Brief Description	Project Type	Expected Completion Year	Project Cost (millions)	Funding Source and Amount(s)	Submitting Organization
68	Railroad Overpass Project, Burlington	Gilkey Road		FMSIB Road-Rail Conflicts Study Phase 2	Construct overcrossing over BNSF rail tracks to connect east/west sides of city.	Grade crossing improvement		$17		
69	Bell Road - SR 548, WSDOT	Bell Road - SR 548		FMSIB Road-Rail Conflicts Study Phase 2	Construct overcrossing over BNSF rail tracks as part of improvements to the I-5 Exit 274 interchange and SR 548.	Grade crossing improvement		$13.4	Secured fund $550,000	
70	East Aberdeen Mobility Improvements, Aberdeen			FMSIB Road-Rail Conflicts Study Phase 2	Improvements to SR 12 to provide improved access to adjoining commercial properties. Could result in four of seven at-grade crossings being closed.	Grade crossing improvement		$30		
71	Industrial Rail Corridor Expansion		Port of Longview	2017 Washington State Freight System Plan	Relocate rail corridor to the north to accommodate three new through tracks, six new sidings, and to allow for increased train clearance lengths.	Rail capacity expansion		$62.6		
72	Barlow Point Terminal Railway Entry Development		Port of Longview	2017 Washington State Freight System Plan	New rail infrastructure development from the terminus of the BNSF Reynolds Lead into the Barlow Point property to include two inbound and two outbound tracks.	Rail capacity expansion		$43		
73	Berth 4 Terminal Redevelopment Project (including rail infrastructure support)		Port of Longview	2017 Washington State Freight System Plan	Redevelopment of facilities into a leased terminal. Project development will be in coordination with private development and may include storage, dock construction, and rail infrastructure improvements.	Rail capacity expansion		$20		
74	Amtrak Centralia Station	Centralia	Amtrak	ADA Stations Program Fiscal Year 2019 Plan	Provide an accessible route from the public right of way to the Platform. Construct a new platform with associated ramps, stairs, railings, and signage. Provide platform city identifier signs.	Passenger/commuter rail station access improvement		$4.7	Secured fund $4.7 million	Amtrak

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Appendix B: Existing and future demand forecasting results of intercity passenger rail and freight rail transportation

This appendix is intended to provide an overview of demand forecasting methdology and present detailed forecast results for Amtrak Cascades intercity passenger rail service and freight rail transportation. This appendix supplements the Amtrak Cascades system-level ridership forecast in Chapter 4 by providing forecast results disaggreated at station and region levels. This appendix also supplements the statewide freight rail demand forecast in Chapter 3 by presenting freight rail commodity flow forecast by trade types, freight rail tonnage and train volume forecast at corridor level.

1.0 Existing and future demand of Amtrak Cascades intercity rail service

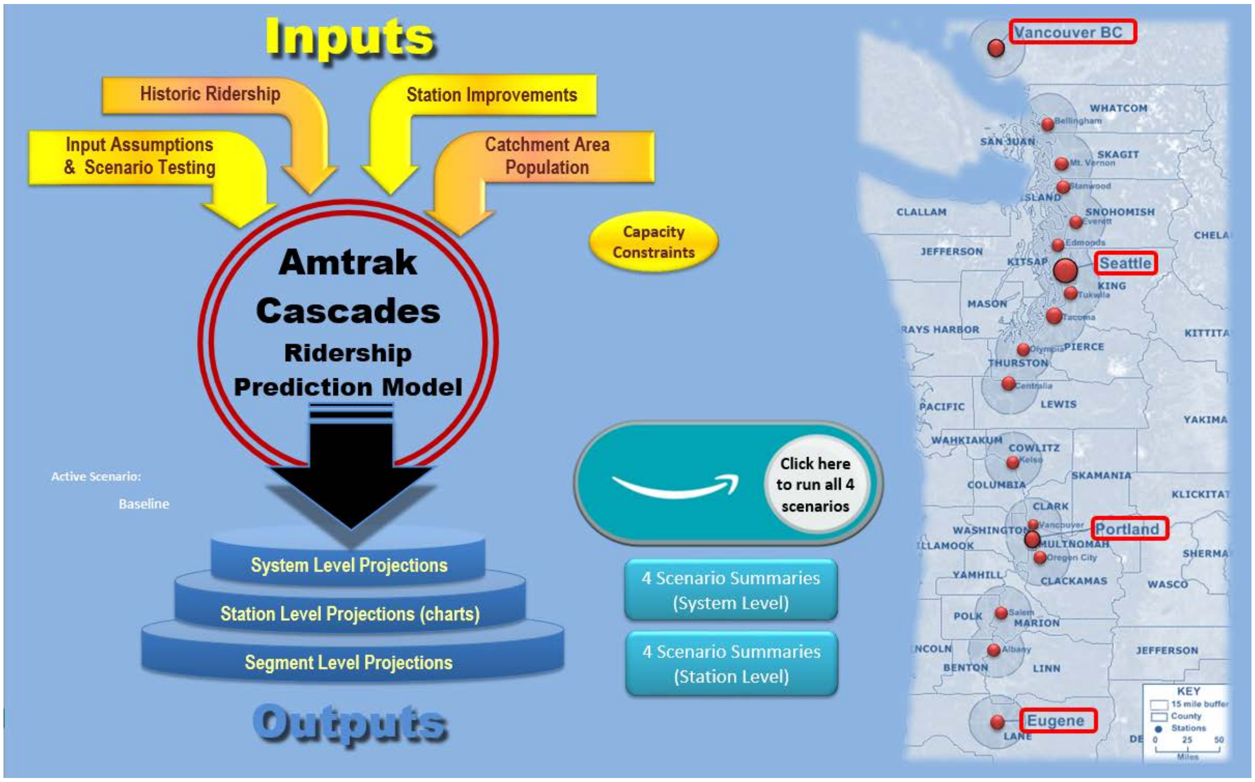
This section starts with an overview of ridership forecast modeling methdology and assumptions, followed by 2018 Amtrak Cascades station ridership and 2040 projections under various growth scenarios by metropolitan/regional transportation planning organizations (MPO/RTPO) and by Oregon and British Columbia.

1.1 Modeling Assumption and Methodology

The Amtrak Cascades riderhip forecast model is a spreadsheet based linear multiple regression model which predicts annual ridership at station level first, and then sums up station level ridership to create the system ridership for the entire Cascades Corridor from Vancouver, BC to Eugene, Oregon. The model uses the following key variables as inputs:

- **Service levels:** number of daily train trips and travel times by three segments (Vancouver BC to Seattle, Seattle to Portland, and Portland to Eugene)
- **On-time performance:** annual on-time performance by Washington segment (Vancouver BC to Portland) and Oregon segment (Portland to Eugene)
- **Station catchment area population:** the population within a 30-minute driving distance of each station

Exhibit 1-1 Amtrak Cascades ridership forecast model



The forecast model uses historical observed data from 1996 through 2018 to estimate model coefficients, and produces annual riderhsip projections for various scenarios between 2019 and 2040. Four growth scenarios were established to forecast future ridership under various service alternatives, ranging from no improvement to a full set of service enhancements. These scenarios were developed in consultation with ODOT to ensure consistency with its plans for future service between Portland and Eugene. The service level assumptions for Seattle to Portland service under high growth scenario are aligned with the assumptions adopted in WSDOT's previous rail planning efforts — such as the 2006 Long Range Plan, 2014 State Rail Plan, and 2017 Fleet Management Plan — to ensure consistency.

Exhibit 1-2 shows the current service level in base year 2018 and detailed service level assumptions in future year 2040 by each scenario. The baseline scenario assumes maintaining status quo and no improvements beyond what is currently programmed. The low growth assumes a small increase in reliability, service frequency, and minor reduction in travel time. Moderate growth assumes moderate service enhancement by adding additional trips and reducing travel time across the corridor. The highest growth assumes the most aggressive set of service improvements, with significant reduction in travel time, much more frequent service, longer trains, and much higher reliability.

Exhibit 1-2 Amtrak Cascades scenarios for demand forecasting

Scenarios	Frequency and Travel Time by Segments			Reliability	Train Capacity (seats)
	Vancouver BC to Seattle	Seattle to Portland	Portland to Eugene		
2018	2 daily round trips with a travel time of 245 minutes	4 daily round trips with a travel time of 210 minutes	2 daily round trips with a travel time of 155 minutes	56%	268
Baseline scenario 2040	2 daily round trips with a travel time of 240 minutes	6 daily round trips with a travel time of 200 minutes	2 daily round trips with a travel time of 155 minutes	88%	268
Low growth scenario 2040	2 daily round trips with a travel time of 240 minutes	8 daily round trips with a travel time of 190 minutes	2 daily round trips with a travel time of 155 minutes	90%	300
Moderate growth scenario 2040	3 daily round trips with a travel time of 230 minutes	8 daily round trips with a travel time of 190 minutes	4 daily round trips with a travel time of 145 minutes	90%	300
High growth scenario 2040	4 daily round trips with a travel time of 157 minutes	13 daily round trips with a travel time of 150 minutes	6 daily round trips with a travel time of 140 minutes	95%	300

1.2 Cascades existing and future ridership forecast results by station and region

Exhibit 1-3 shows the Amtrak Cascades 2018 ridership and forecasted 2040 ridership under various growth scenarios by stations and MPO/RTPO/neighboring state or province. Exhibit 1-4 shows station ridership growth by percentage from 2018 to 2040.

In 2018, a total of 802,000 riders traveled on Amtrak Cascades, with 33% of riders getting on/off stations in Oregon state, 10% in British Columbia, and the remaining 57%getting on/off in Washington state.

System-level ridership is forecasted to range from 1.28 million passengers in 2040 for the baseline scenario to over 2.5 million for the high growth scenario, representing a range of 60% to 214% growth over 2018 ridership. The percent growth of station-level ridership varies due to differences in service assumptions including trip frequency and travel time, reliablity and varying population growth across different regions, which are key driving factors affecting pasenger rail demand.

Exhibit 1-3 Amtrak Cascades existing and future ridership forecast by station and various scenarios

MPO/RTPO/ neighboring state	Station Name	2018 Base Year	2040 Baseline	2040 Low Growth	2040 Moderate Growth	2040 High Growth
Oregon	Eugene	24,600	35,400	35,700	58,900	82,700
	Albany	9,900	14,500	14,600	24,000	33,800
	Salem	20,200	29,200	29,400	48,600	68,300
	Oregon City	6,000	9,300	9,300	15,400	21,700
	Portland	205,700	308,200	348,600	477,100	717,000
Southwest Washington Regional Transportation Council (RTC)	Vancouver, WA	38,400	61,100	75,800	75,800	113,500
Cowlitz-Wahkiakum Council of Governments (CWCOG)	Kelso/ Longview	13,400	21,000	26,100	26,100	39,000
Thurston Regional Planning Council (TRPC)	Centralia	10,800	18,900	23,400	23,400	35,000
	Olympia/ Lacey	26,700	42,500	52,700	52,700	78,900
Puget Sound Regional Council (PSRC)	Tacoma	41,700	71,600	88,900	88,900	133,000
	Tukwila	16,400	26,000	32,300	32,300	48,300
	Seattle	249,500	400,900	475,200	491,900	705,700
	Edmonds	10,800	15,100	15,200	20,400	27,700
	Everett	11,000	15,300	15,300	20,600	27,900
	Stanwood	2,600	3,400	3,400	4,500	6,200
Skagit Council of Governments (SCOG)	Mt. Vernon	8,600	11,900	12,000	16,100	21,800
Whatcom Council of Governments (WCOG)	Bellingham	25,500	33,200	33,200	44,800	60,700
British Columbia	Vancouver, BC	79,900	164,100	164,900	189,800	296,800
Total		**801,700**	**1,281,600**	**1,456,000**	**1,711,300**	**2,518,000**

Exhibit 1-4 Amtrak Cascades station ridership growth by percentage under various scenarios

MPO/RTPO/ neighboring state	Station Name	Percentage share of 2018 total ridership	Percentage change from 2018 to 2040 ridership			
			Baseline Growth	Low Growth	Moderate Growth	High Gowth
Oregon	Eugene	3.1%	44%	45%	139%	236%
	Albany	1.2%	46%	47%	142%	241%
	Salem	2.5%	45%	46%	141%	238%
	Oregon City	0.7%	55%	55%	157%	262%
	Portland	25.7%	50%	69%	132%	249%
Southwest Washington Regional Transportation Council (RTC)	Vancouver, WA	4.8%	59%	97%	97%	196%
Cowlitz-Wahkiakum Council of Governments (CWCOG)	Kelso/ Longview	1.7%	57%	95%	95%	191%
	Centralia	1.3%	75%	117%	117%	224%
Thurston Regional Planning Council (TRPC)	Olympia/ Lacey	3.3%	59%	97%	97%	196%
Puget Sound Regional Council (PSRC)	Tacoma	5.2%	72%	113%	113%	219%
	Tukwila	2.0%	59%	97%	97%	195%
	Seattle	31.1%	61%	90%	97%	183%
	Edmonds	1.3%	40%	41%	89%	156%
	Everett	1.4%	39%	39%	87%	154%
	Stanwood	0.3%	31%	31%	73%	138%
Skagit Council of Governments (SCOG)	Mt. Vernon	1.1%	38%	40%	87%	153%

MPO/RTPO/ neighboring state	Station Name	Percentage share of 2018 total ridership	Percentage change from 2018 to 2040 ridership			
			Baseline Growth	Low Growth	Moderate Growth	High Gowth
Whatcom Council of Governments (WCOG)	Bellingham	3.2%	30%	30%	76%	138%
British Columbia	Vancouver, BC	10.0%	105%	106%	138%	271%
Total		**100.0%**	**60%**	**82%**	**113%**	**214%**

Exhibits 1-5 through 1-10 show the 2018 and 2040 projected Amtrak Cascades station ridership for six MPO/RTPOs in Washington state, which are direclty served by Amtrak Cascades intercity rail service. The station ridership represents the average number of annual riders getting on at a station and riders getting off at the same station, which is calculated as the sum of ons and offs divided by two.

Exhibit 1-5 Amtrak Cascades ridership by stations, 2018 and 2040 scenarios – RTC

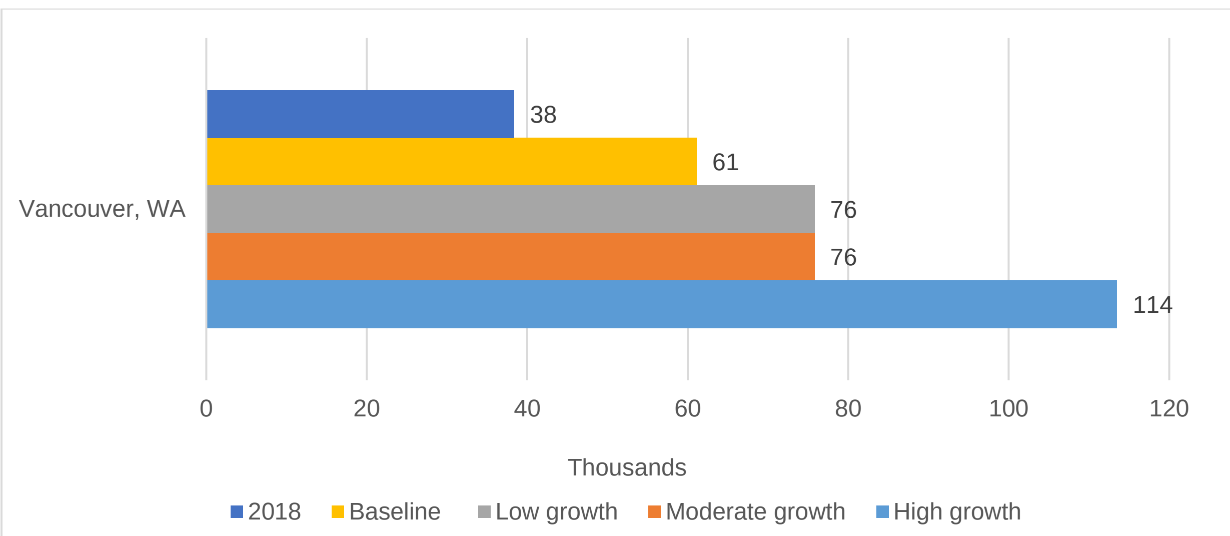


Exhibit 1-6 Amtrak Cascades ridership by stations, 2018 and 2040 scenarios – CWCOG

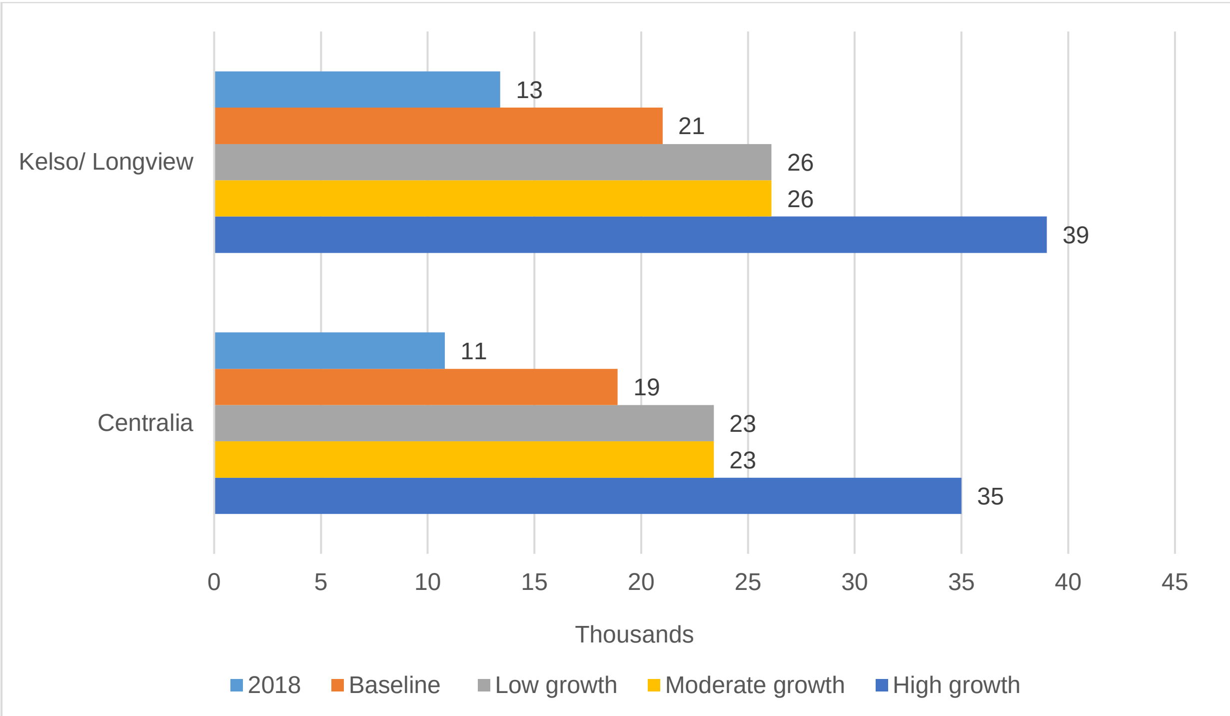


Exhibit 1-7 Amtrak Cascades ridership by stations, 2018 and 2040 scenarios – TRPC

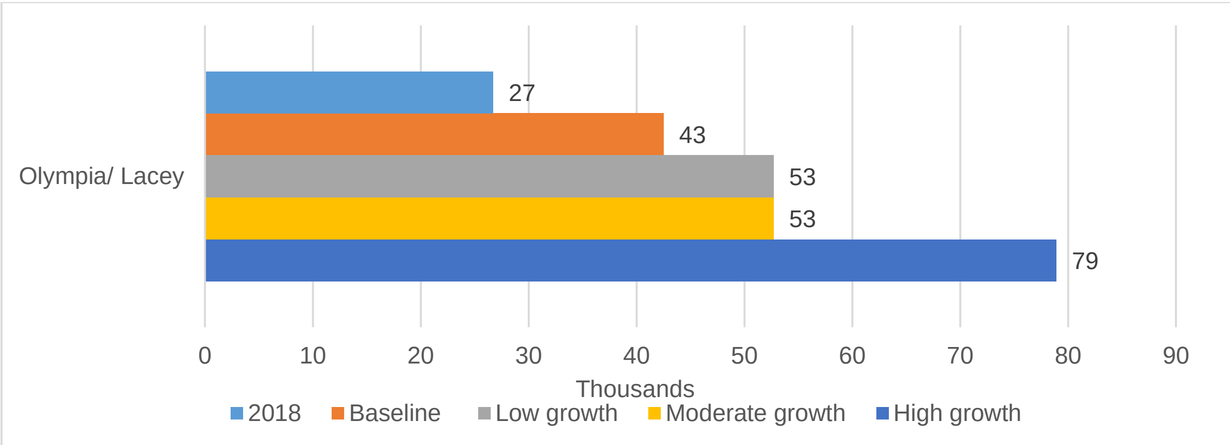


Exhibit 1-8 Amtrak Cascades ridership by station, 2018 and 2040 scenarios – PSRC

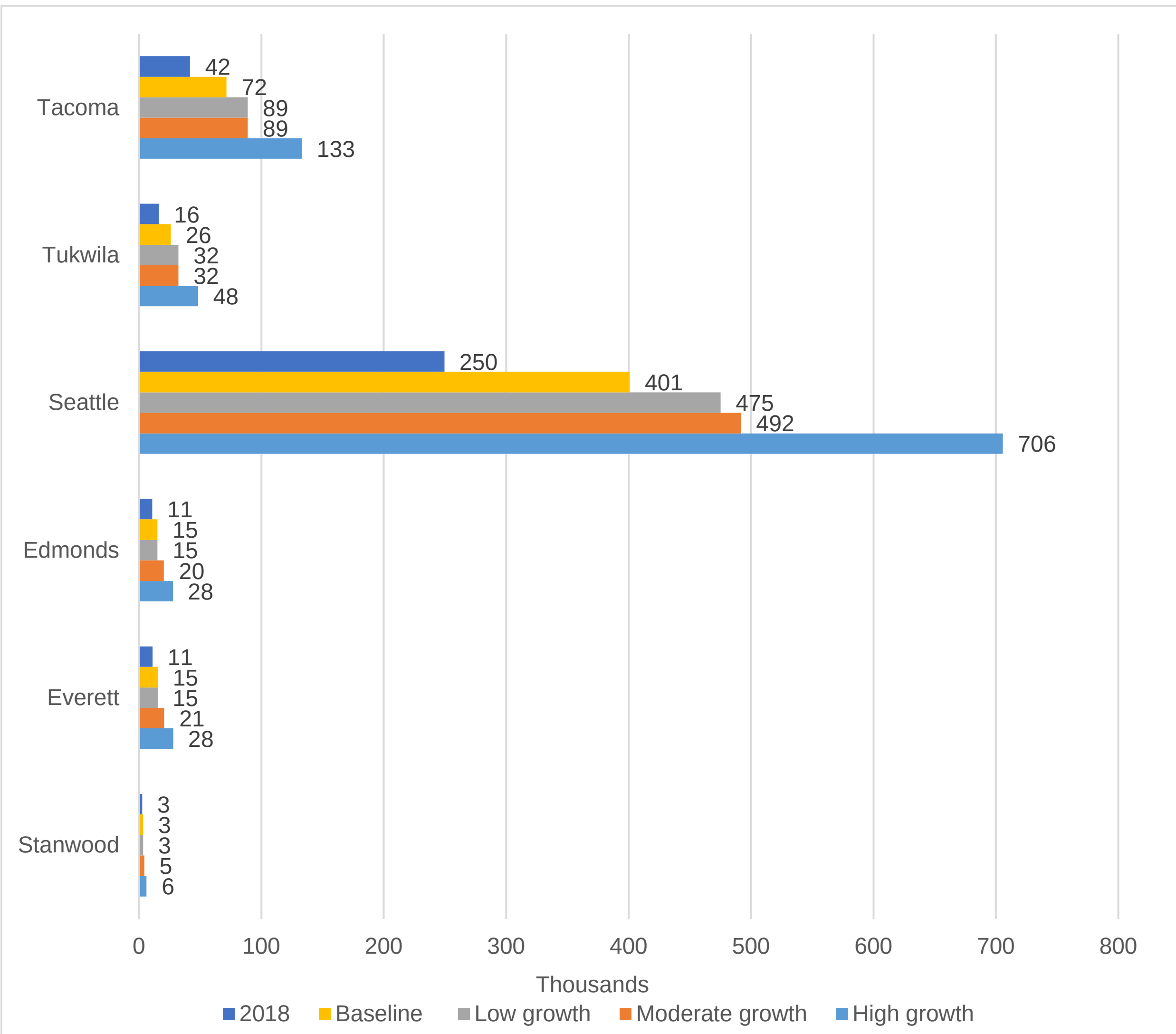


Exhibit 1-9 Amtrak Cascades ridership by stations, 2018 and 2040 scenarios – SCOG

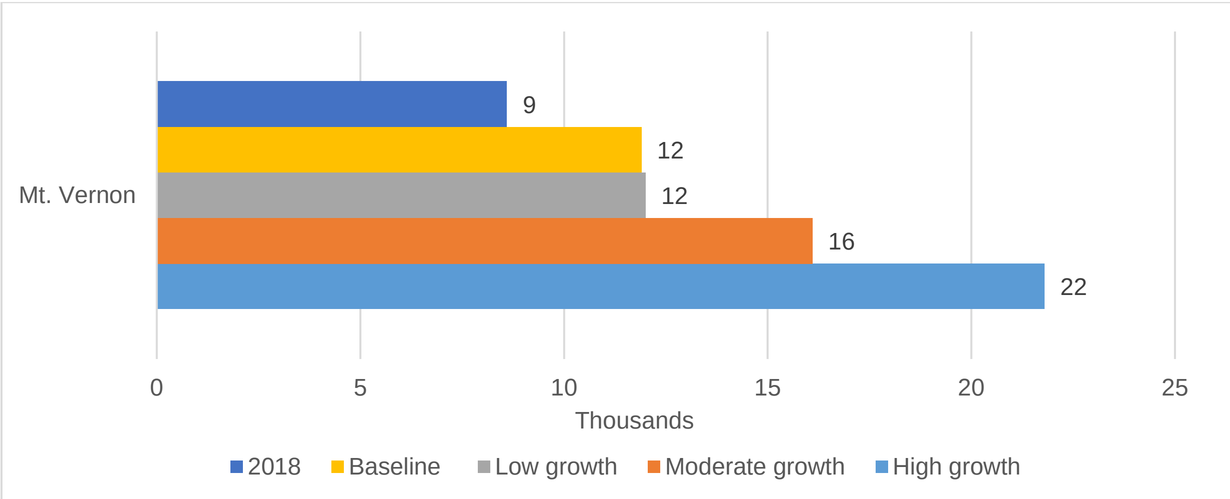
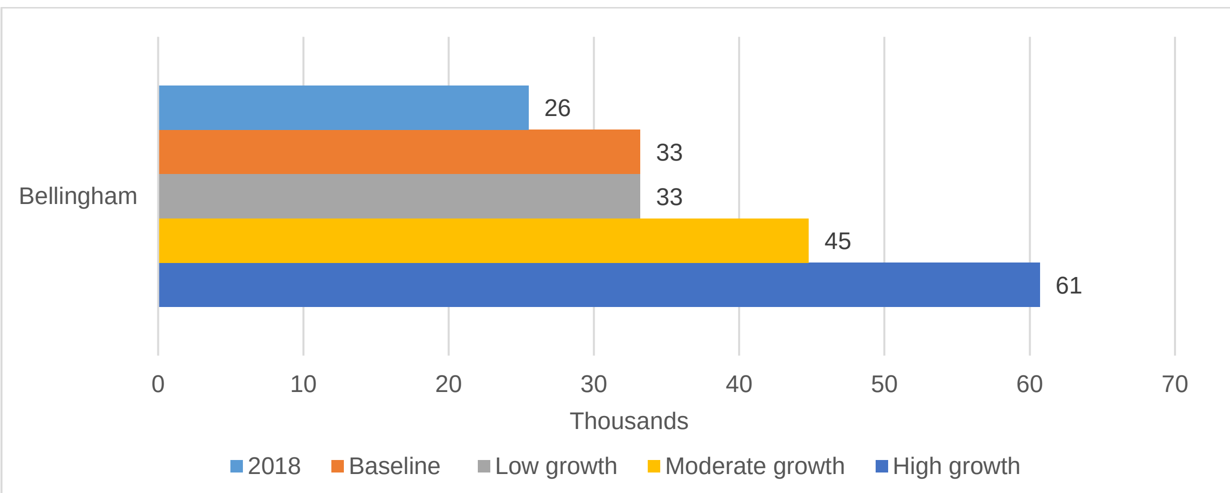


Exhibit 1-10 Amtrak Cascades ridership by stations, 2018 and 2040 scenarios – WCOG



2.0 Freight rail commodity flow and train volumes

This section starts with an overview of freight rail modeling data sources and methodology. It then presents freight rail commodity flow and train volumes for base year 2016 and future year 2040 under various growth scenarios.

2.1 Data sources and methodology

The primary data sources utilized to develop the freight rail forecast are the Surface Transportation Board's 2016 Carload Waybill data, FHWA Freight Analysis Framework (FAF) version 4 forecast, Regional Economic Models, Inc. (REMI) model for Washington state forecast, and Oak Ridge National Laboratory rail network. Additional key inputs include 2016 freight train counts provided by the railroads and rail import and export volume data from the largest Washington ports.

The 2016 base year modeling framework includes three modules:

- Enhance the raw Waybill origin-destination flow database by identifying and adjusting Washington port-related flows, North American Free Trade Agreement (NAFTA) related flows, and other flows on Washington's rail system
- Assign enhanced Waybill OD flows to the rail network by identifying station locations of origin, destination and interchange, and using TransCAD software to conduct an all-or-nothing assignment of freight rail tonnages
- Convert link level annual tonnage flow outputs to average daily train volumes

Extensive quality checks were performed to ensure correctness and consistency of the results with source data. Freight rail volumes were adjusted based on rail import and export data from major ports and freight train volume results were calibrated with 2016 freight rail train counts provided by railroads.

The 2040 moderate freight rail flow forecast was developed using a two-step approach:

- Link FAF4 growth rates by commodity, modes, origin, and destination to 2016 waybill freight rail flows (enhanced database from the base year modeling results) to develop interim 2040 moderate growth freight rail flow forecast. Due to the fact that the growth rates in the FAF4 database over the period 2012-2020 showed high variability, the annualized growth rates over 2020-2040 were used and extrapolated to 2016 for developing the 2040 forecast.

- Adjust FAF4 growth rates based on comparison with REMI economic forecasts for Washington and apply the adjustment factors to the interim 2040 moderate growth freight rail flow database by commodity and direction to develop the final moderate growth forecast.

In order to effectively plan for the rapidly changing environment and better address uncertainties in the driving factors of freight and economic growth, two alternative scenarios, low growth scenario and high growth scenario, were also developed to supplement the moderate growth forecast scenario. Exhibit 2-1 provides an overview of the three scenarios. Scenario planning analysis was performed to establish alternative future scenarios using information on trends and evolving practices for key industries using the rail system in Washington, and Economic and international trade trends that could significantly change the status quo. Alternative growth rates were developed and applied to 2016 base year freight rail flow to forecast 2040 freight rail demand for low growth and high growth scenarios.

The future scenarios do not consider the potential effects of Columbia River System Operations EIS[60] process on future freight rail demand because no definitive data is currently available. CRSO EIS development is a five-year federal process to develop a range of reasonable alternatives for long-term river system operations. Nothing has been decided yet and the subsequent results of EIS decisions are unknown at this point.

Exhibit 2-1 Freight rail demand forecast scenarios

Low growth scenario	Moderate growth scenario	High growth scenario
• Driven by a significant decline in export volumes and the resulting cumulative effects • Assumes that tariffs imposed by the U.S. and other nations have a substantial, lasting effect on international trade and suppress export activity • Assumes high potential negative effects on agricultural imports/exports and international containerized trade, and declined energy exports	• Driven by growth in industries requiring long-haul movement of heavy commodities • Assumes no long-term effects from tariff and trade tensions • Based on FHWA's FAF 4[61] growth rates and long-term macroeconomic forecasts derived from REMI model[62]	• Driven by robust growth in export volumes • Assumes that tariffs imposed by the U.S. and other nations have little to no effect on international trade volumes and/or are removed with minimal or no lingering effects • Assumes high potential growth in energy exports caused by proposed bulk shipment facilities for coal and oil, and robust potential growth in international containerized trade and agricultural imports and exports

2.2 Freight rail commodity flow

[60] Columbia River System Operations EIS website nwd.usace.army.mil/CRSO/
[61] FHWA Freight Analysis Framework version 4.4.1 forecast: https://ops.fhwa.dot.gov/freight/freight_analysis/faf/
[62] Economic forecasts including population and gross domestic product from WSDOT purchased REMI economic model.

This section analyzes the top commodities moved by rail in 2016 and those expected to be moved in 2040. It is important to understand which industries are dependent on rail and which will continue to be in the future. Exhibit 2-2 and 2-3 present the top rail commodities by tonnage in 2016 and their 2040 projections in tons for the low growth scenario, moderate growth scenario, and high growth scenario. Exhibit 2-4 shows 2016 and 2040 share of statewide tonnage by rail commodity, and Exhibit 2-6 shows the percentage change from 2016 to 2040 for those commodity groups.

When measured in weight, cereal grains and agricultural products are expected to stay as the top commodities moved by rail in the state, regardless of the forecast scenario.

Under the low growth scenario and the moderate growth scenario, coal shipments are expected to decline by half, as inbound shipments to Washington state to the Centralia Power Plant and through shipments to Portland General Electric are expected to cease within the next decade. What coal volumes remain are modest exports through Washington ports, as well as US-produced coal going to Canada for export. Under the high growth scenario, coal and crude petroleum are projected to grow 375% and 97% by 2040 respectively, as it is assumed that new high-capacity facilities for crude oil export and at least one facility for coal exports will be constructed and operating at full capacity by 2040.

Rounding out the top four commodities in 2016 is mixed freight, a category for which the specific commodity is not identified. This commodity class is handled almost entirely in intermodal service. In 2016, 10.6 million tons of mixed freight were handled in intermodal service. Most intermodal traffic, including containerized imports and exports, moves as mixed freight, accounting for 58%of all intermodal traffic on a tonnage basis. On an overall tonnage basis, mixed freight accounted for 9% of all traffic, while all intermodal traffic accounted for 15%. Mixed freight is expected to grow through 2040 under all three scenarios, displaying particular sensitivity to trade policy.

Exhibit 2-2 2016 and 2040 forecasted rail flows in Washington by commodities

Commodity	2016 Rail Tonnage (millions)	2040 Low Scenario Rail Tonnage (millions)	2040 Moderate Scenario Rail Tonnage (millions)	2040 High Scenario Rail Tonnage (millions)
Cereal grains	26.0	17.3	57.1	71.7
Other ag prods.	16.9	11.5	50.5	63.3
Coal	11.9	5.7	5.7	56.7
Mixed freight	10.7	10.9	14.6	22.7
Wood products	9.2	7.1	15.8	15.9
Crude Petroleum Oil	7.5	7.7	7.7	14.7
Animal feed	5.9	5.8	9.9	11.8
Petroleum and Coal Products	4.6	4.5	4.5	5.5
Waste/scrap	4.5	6.1	6.6	7.9
Fertilizers	3.5	3.0	5.2	6.5
Other	21.5	30.9	38.7	44.8

Total	**122.0**	**110.4**	**216.2**	**321.4**

Exhibit 2-3 Top rail commodities by tonnage, 2016 and forecasted 2040 scenarios

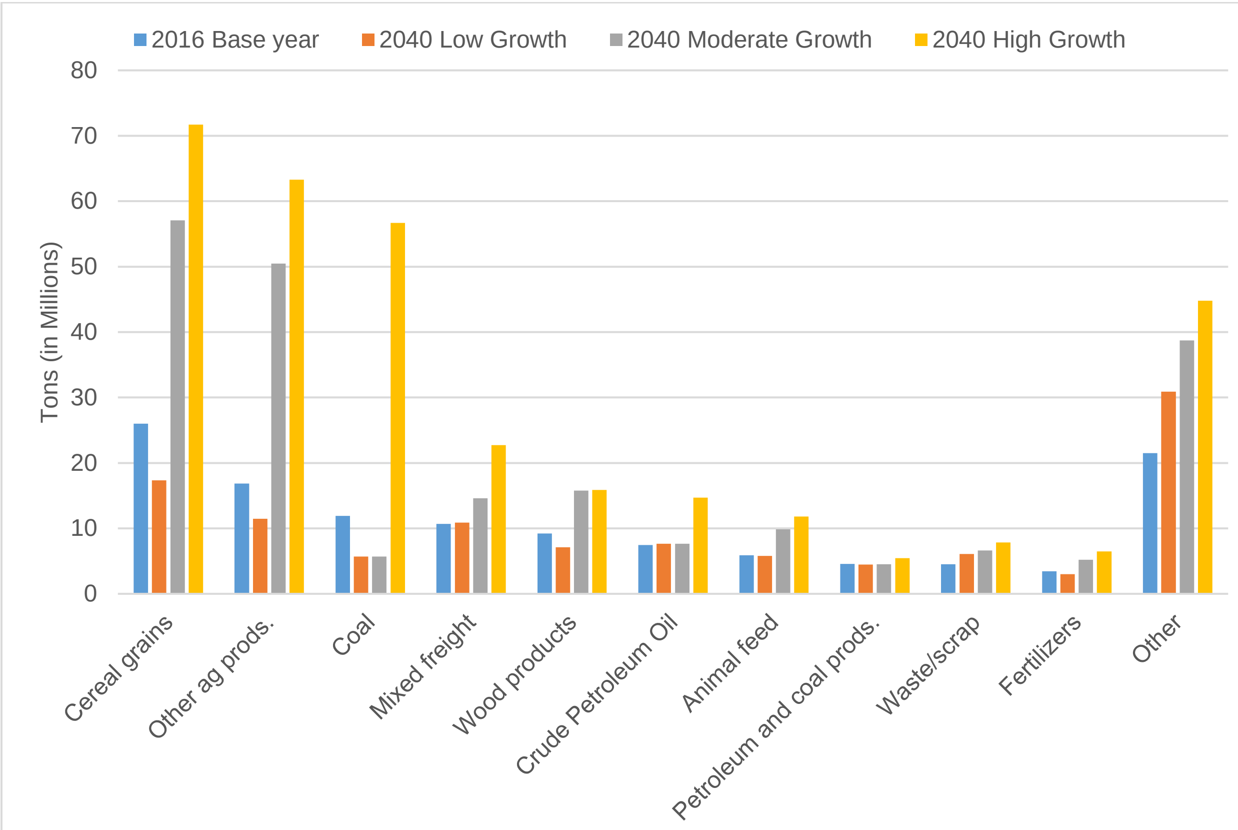


Exhibit 2-4 2016 and 2040 share of statewide tonnage by commodity and scenarios

Commodity	2016 Base year	2040 Low Scenario	2040 Moderate Scenario	2040 High Scenario
Cereal grains	21%	16%	26%	22%
Other ag prods.	14%	10%	23%	20%
Coal	10%	5%	3%	18%
Mixed freight	9%	10%	7%	7%
Wood products	8%	6%	7%	5%
Crude Petroleum Oil	6%	7%	4%	5%
Animal feed	5%	5%	5%	4%
Petroleum and Coal Products	4%	4%	2%	2%
Waste/scrap	4%	6%	3%	2%
Fertilizers	3%	3%	2%	2%
Other	18%	28%	18%	14%

Total	**100%**	**100%**	**100%**	**100%**

Exhibit 2-5 Freight rail flow change from 2016 to 2040 by commodities and growth scenarios

Commodity	2040 Low Scenario	2040 Moderate Scenario	2040 High Scenario
Cereal grains	-33%	120%	176%
Other ag prods.	-32%	199%	275%
Coal	-52%	-52%	375%
Mixed freight	2%	37%	113%
Wood products	-23%	71%	72%
Crude Petroleum Oil	2%	2%	97%
Animal feed	-1%	68%	101%
Petroleum and Coal Products	-1%	-1%	20%
Waste/scrap	35%	47%	74%
Fertilizers	-13%	51%	87%
Other	44%	80%	109%
Total	**-10%**	**77%**	**163%**

A breakdown of 2016 and 2040 freight rail traffic into Port and NAFTA related imports and exports, domestic, and through flow is shown in exhibit 2-6. Exhibit 2-7 through 2-10 provide more details for total import, total export and domestic flow by commodities. These exhibits reveal that the significant changes are largely influenced by bulk commodity exports from Washington ports. Most other types of movements see similar volumes across each scenario, although all types of international movements decrease in the Low Growth scenario. In particular, these exports from Washington ports are anticipated to see a 38% reduction in traffic from over 39 million tons to just over 24.5 million tons, accounting for the majority of the decrease in international traffic.

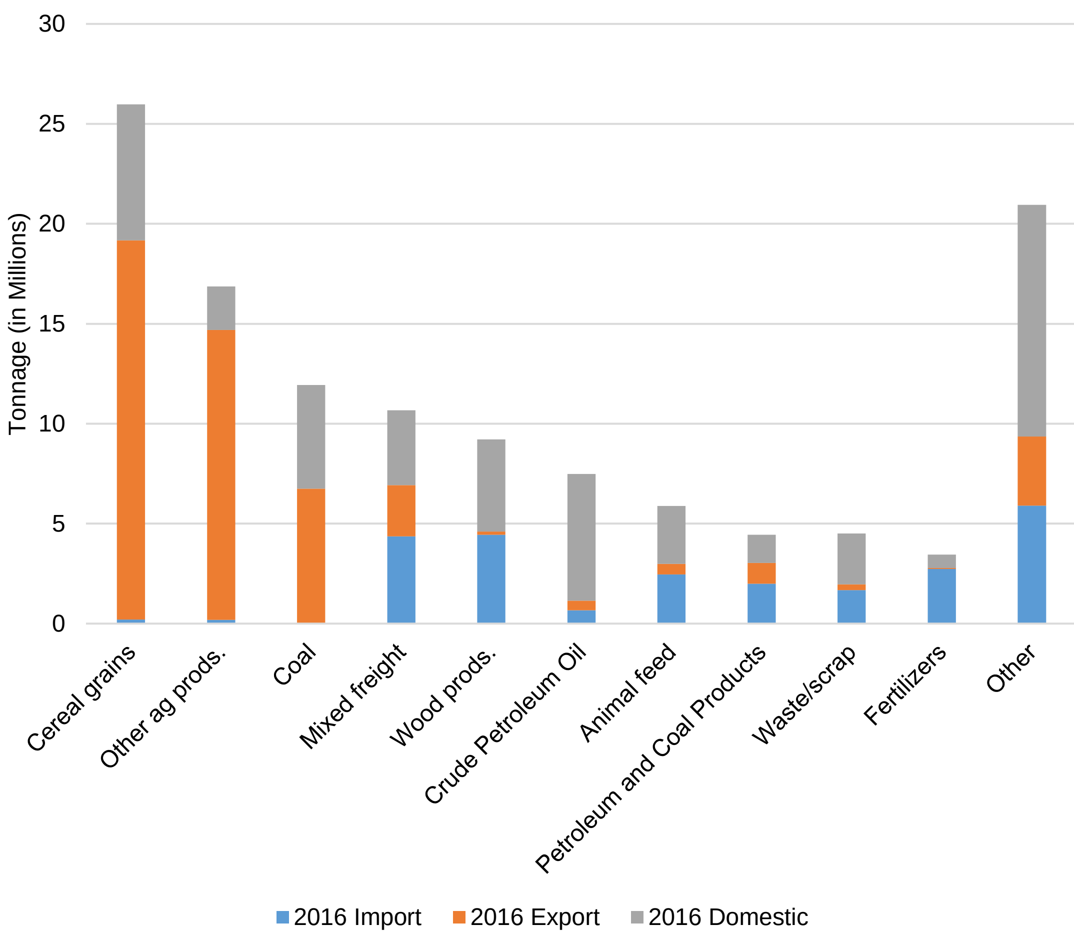
Exhibit 2-6 Annual rail flows in Washington by trade type, 2016 and 2040 scenarios

Movement Type	2016 Rail Tonnage (millions)	2040 Low Scenario Rail Tonnage (millions)	2040 Moderate Scenario Rail Tonnage (millions)	2040 High Scenario Rail Tonnage (millions)
Domestic	48.9	55.9	57.4	62.5
WA Ports Import [a]	7.5	7.1	11.1	18.8
NAFTA U.S. Import [b]	17.2	14.7	32.5	37.5
WA Ports Export [c]	39.3	24.5	105.8	190.2
NAFTA U.S. Export [d]	8.5	7.5	8.7	11.5
NAFTA Through [e]	0.7	0.7	0.7	0.8
Total	**122.0**	**110.4**	**216.2**	**321.4**

Source: 2016 Enhanced Carload Waybill Sample, FAF4 Forecast with Adjustments.

a. Washington Ports import consists of traffic originating outside of the NAFTA countries that is handled through a Washington port with final destination anywhere in the US.
b. Imports to Canada and Mexico from WA Ports (after importing) are included under WA Ports Import; these are not considered as NAFTA U.S. Export.
c. Washington port exports consists of traffic originating anywhere in the US, including Washington, and exported from a Washington port.
d. Exports from Canada and Mexico to WA Ports (for exporting) are included under WA Ports Export; these are not considered as NAFTA U.S. Import.
e. A limited amount of Canada-Mexico trade partner flows pass through Washington.

Exhibit 2-7 Top commodities in Washington by rail tonnage, split by import, export, and domestic, 2016



3294 **Exhibit 2-8 Top commodities in Washington by rail tonnage, split by import, export, and domestic,**
3295 **2040 Low Growth Scenario**

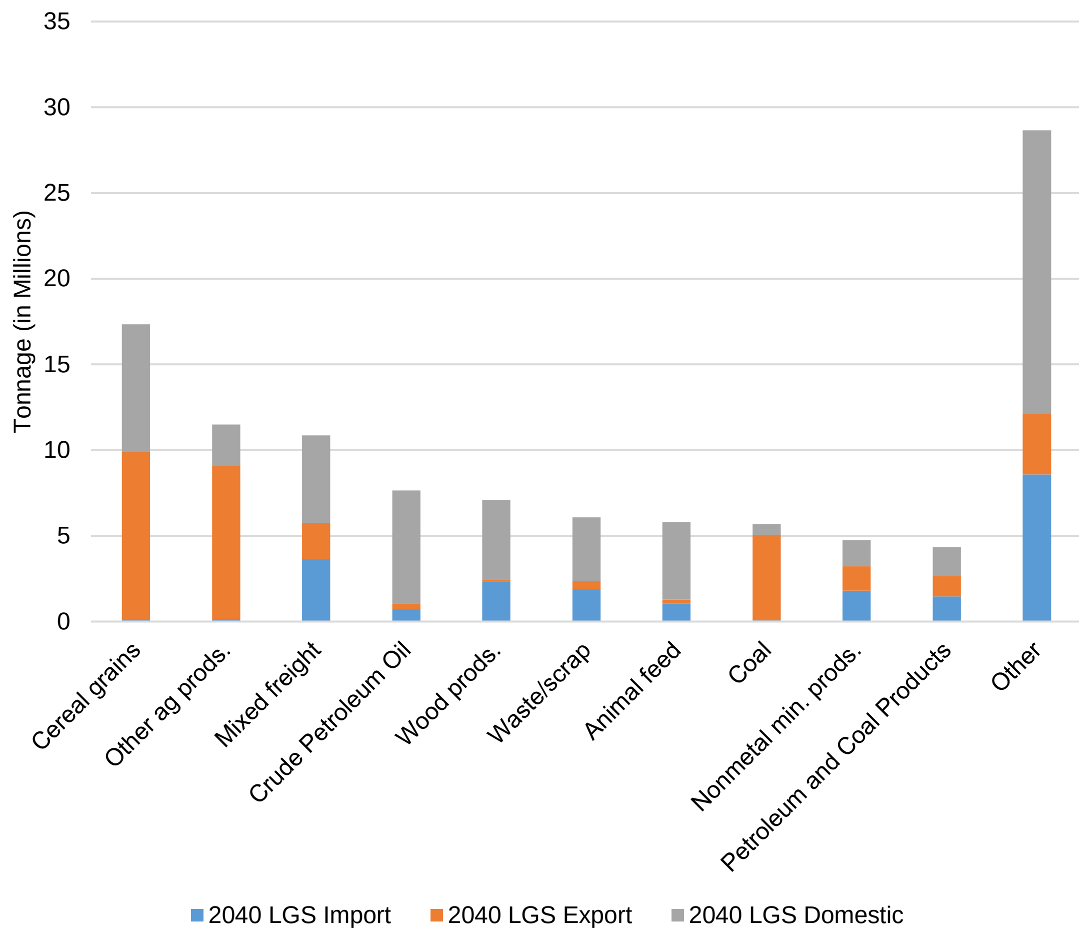


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Exhibit 2-9 Top commodities in Washington by rail tonnage, split by import, export, and domestic, 2040 Moderate Scenario

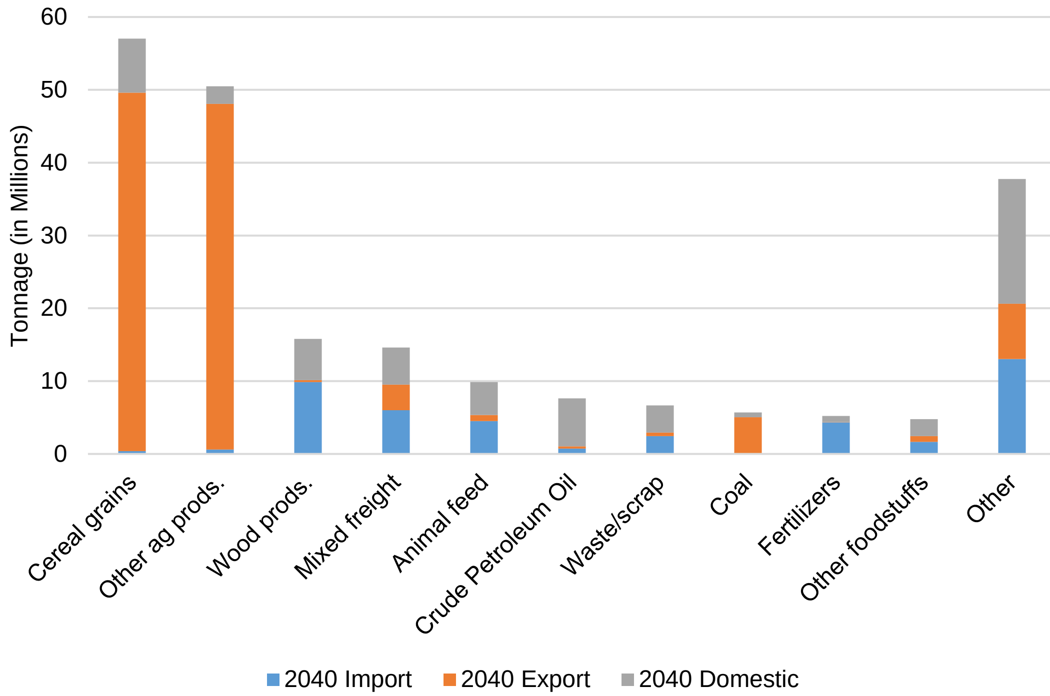
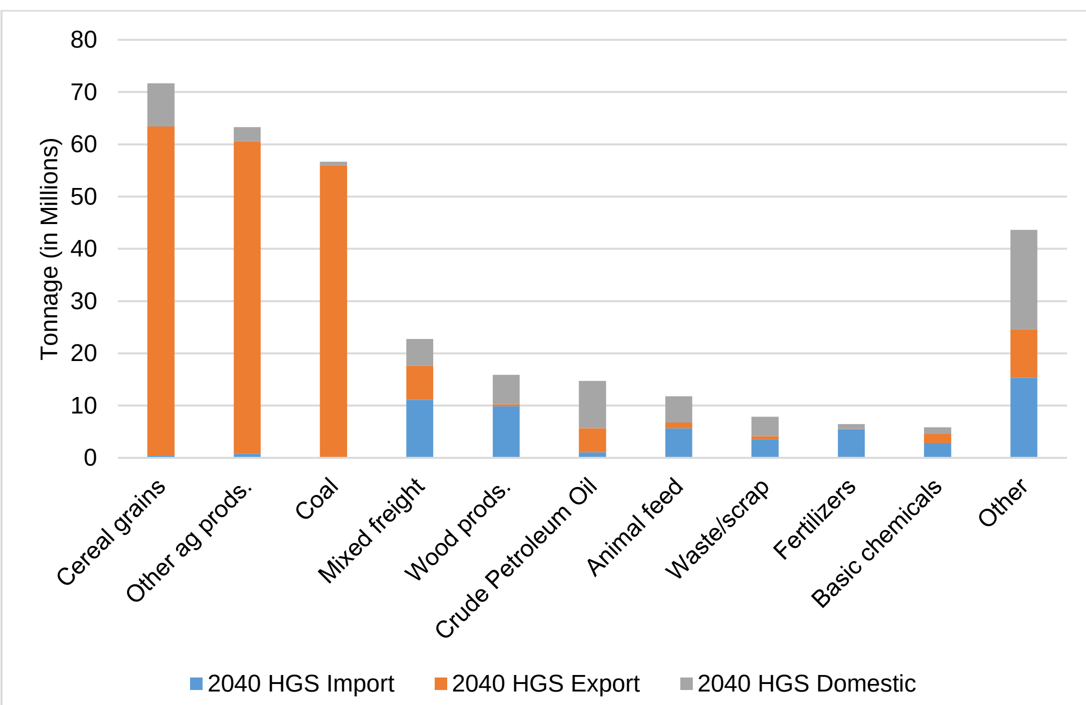


Exhibit 2-10 Top commodities in Washington by rail tonnage, split by import, export, and domestic, 2040 High Growth Scenario



2.3 Freight rail tonnage and train volumes by corridor

Exhibits 2-11 and 2-12 show the 2016 freight tonnage and daily train volumes, while exhibit 2-13 and 2-14 show the moderate growth forecasted annual tonnage flow and average daily train volumes on Washington's rail system in 2040. To estimate the future number of freight trains, several forms of productivity gains in train operations were expected to occur. These include: (1) continued increase in load limits for rail cars; (2) continued refinement of car designs to optimally use the available clearance envelope; and (3) lengthening of trains. In this analysis, only the productivity gain effect of increases in load limits for rail cars was considered due to the lack of sufficient data to predict future productivity gains resulted from the other two drivers. It was assumed that load limit would increase from 286,000-pounds to 315,000-pounds, the benefits of which would accrue to bulk and general merchandise type rail cars. Tons per car assumptions for bulk and general merchandise rail cars in 2016 were increased by a factor of 1.128[63]. For all other rail car types, no productivity gain was assumed.

By 2040 the rail line east of Spokane used by BNSF and UP, where the state's east-west rail corridors converge, is projected to carry over 90 daily trains. More than 64 daily freight trains are projected to move on the rail line between Longview and Vancouver, and 84 total daily freight trains along the Columbia River route east of Vancouver. Up to 58 daily freight trains are projected to move along the I-5 corridor in the Seattle-Tacoma area.

The effects on daily train volumes from the alternative scenarios are shown in Exhibit 2-15 for low growth, and Exhibit 2-16 for high growth scenarios. Exhibit 2-17 summarizes the daily train totals by railway corridor. With the change in train volumes being almost non-existent under the low growth scenario, significantly fewer freight trains would be operated across the network as a result of the productivity gains previously discussed. Thus, 44 trains would use BNSF's longstanding bottleneck between Spokane and Sandpoint, Idaho, while the traffic on the corridor between Tacoma and Vancouver, WA, would decline to 28 trains from the 65 trains forecast in the moderate growth scenario, and the 35 trains operated in 2016.

With the high growth scenario, existing bottlenecks would worsen, and new ones would arise. East of Spokane, BNSF's main line is projected to handle 102 trains daily, while the I-5 Corridor between Tacoma and Vancouver increases to 104 trains, BNSF's corridor subdivision along the Columbia River between Vancouver, WA, and Pasco would increase to 88 trains, and Stevens Pass, between Everett and Spokane would increase to 34 trains. In all of these instances, these traffic volumes could only be handled with substantial investments by the host railroads.

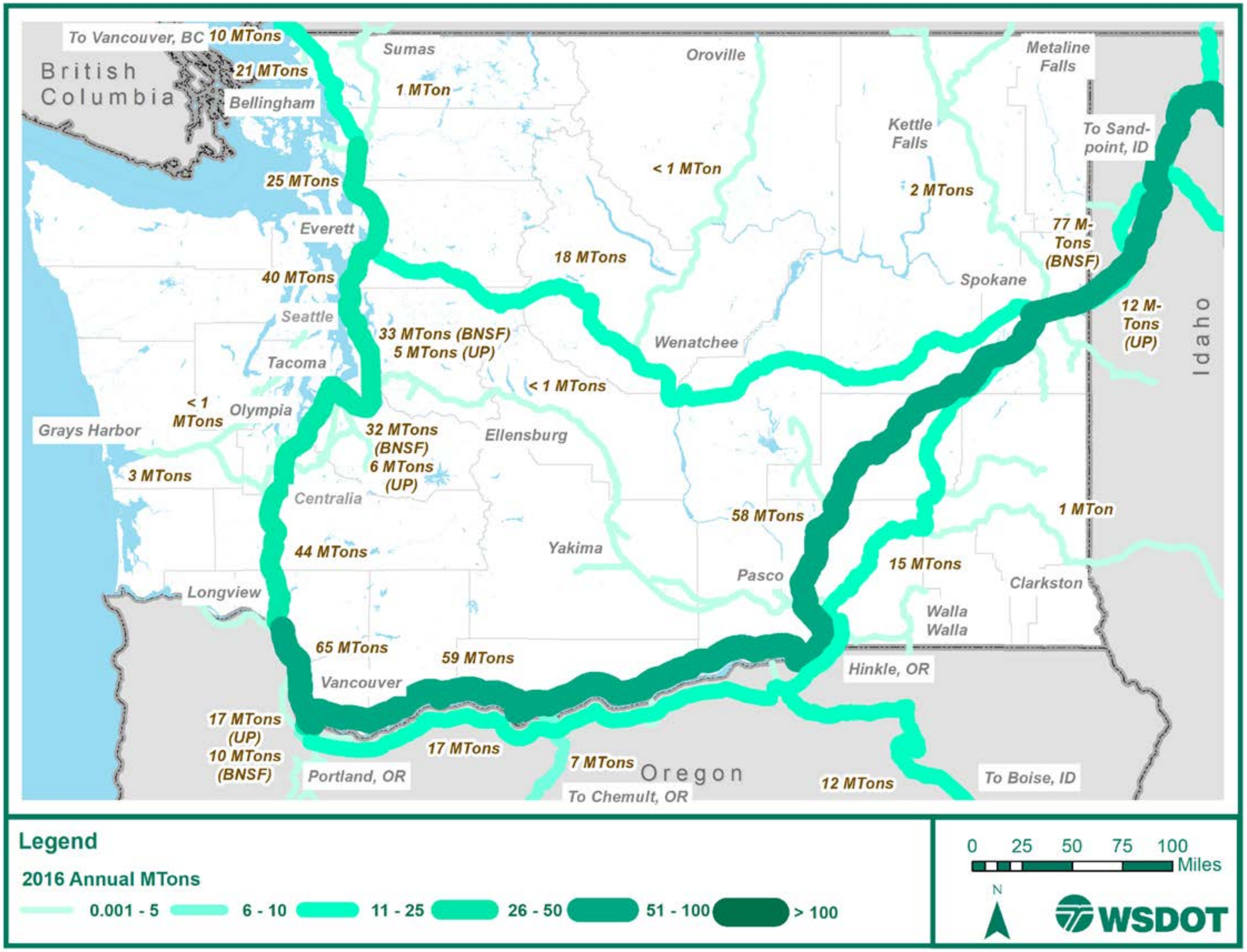
A rail system capacity analysis was also performed by combining the freight rail demand and passenger rail demand forecasts developed for low, moderate and high growth scenarios to examine how rail traffic growth would affect rail system performance if no additional capacity or operational improvements were made to the rail network in Washington state. Analysis results

[63] This factor was derived by assuming a tare weight of rail car as 60,000 pounds and taking a ratio of the payload on a 315,000-pound rail car and the payload on a 286,000-pound rail car. In other words, 1.128 is 315,000 minus 60,000 divided by 286,000 minus 60,000.

are expressed by level of service and can be found in chapter 5. Note that this analysis is developed to serve the needs of Washington State Rail Plan and different from the rail capacity analysis completed in 2017 Marine Cargo Forecast[64], which utilized different data sources, modeling approach and assumptions, and future forecast scenarios.

[64] Washington Public Ports Association & the Freight Mobility Strategic Investment Board, washingtonports.org/mcf

Exhibit 2-11 base year annual rail tonnage flows in Washington, 2016



Source: WSDOT's 2016 Enhanced Waybill Sample and Freight Rail Modeling.

Exhibit 2-12 Base year average daily freight train volumes in Washington, 2016

Source: WSDOT's 2016 Enhanced Waybill Sample and Freight Rail Modeling.

Note: The train volumes shown in the map are rounded up values to the nearest even number to account for forward and return moves.

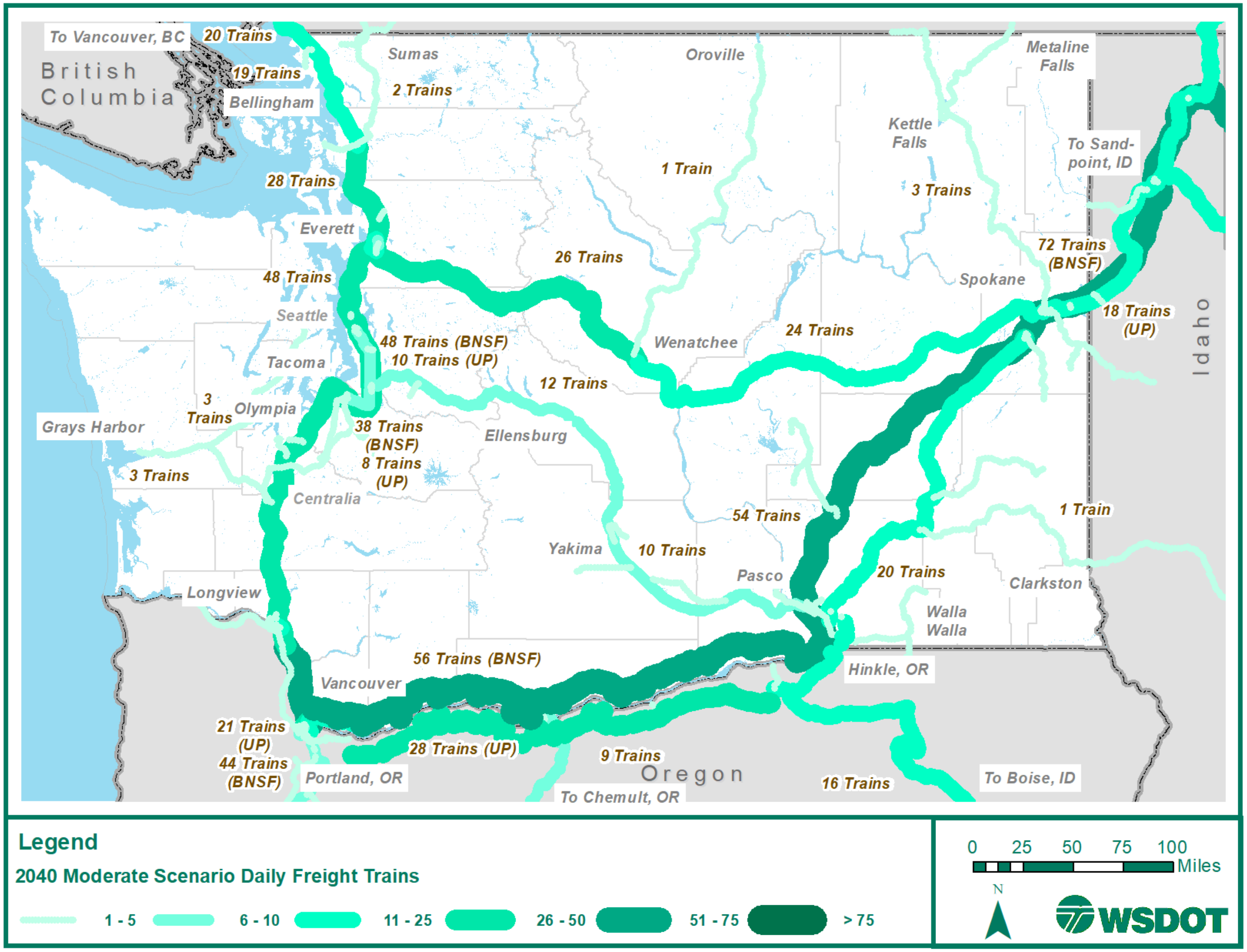
3351 **Exhibit 2-13 Moderate growth scenario forecast annual rail tonnage flows in Washington, 2040**

3352

3353 Source: WSDOT's 2040 Forecasted Enhanced Waybill Sample and Freight Rail Modeling.

3354

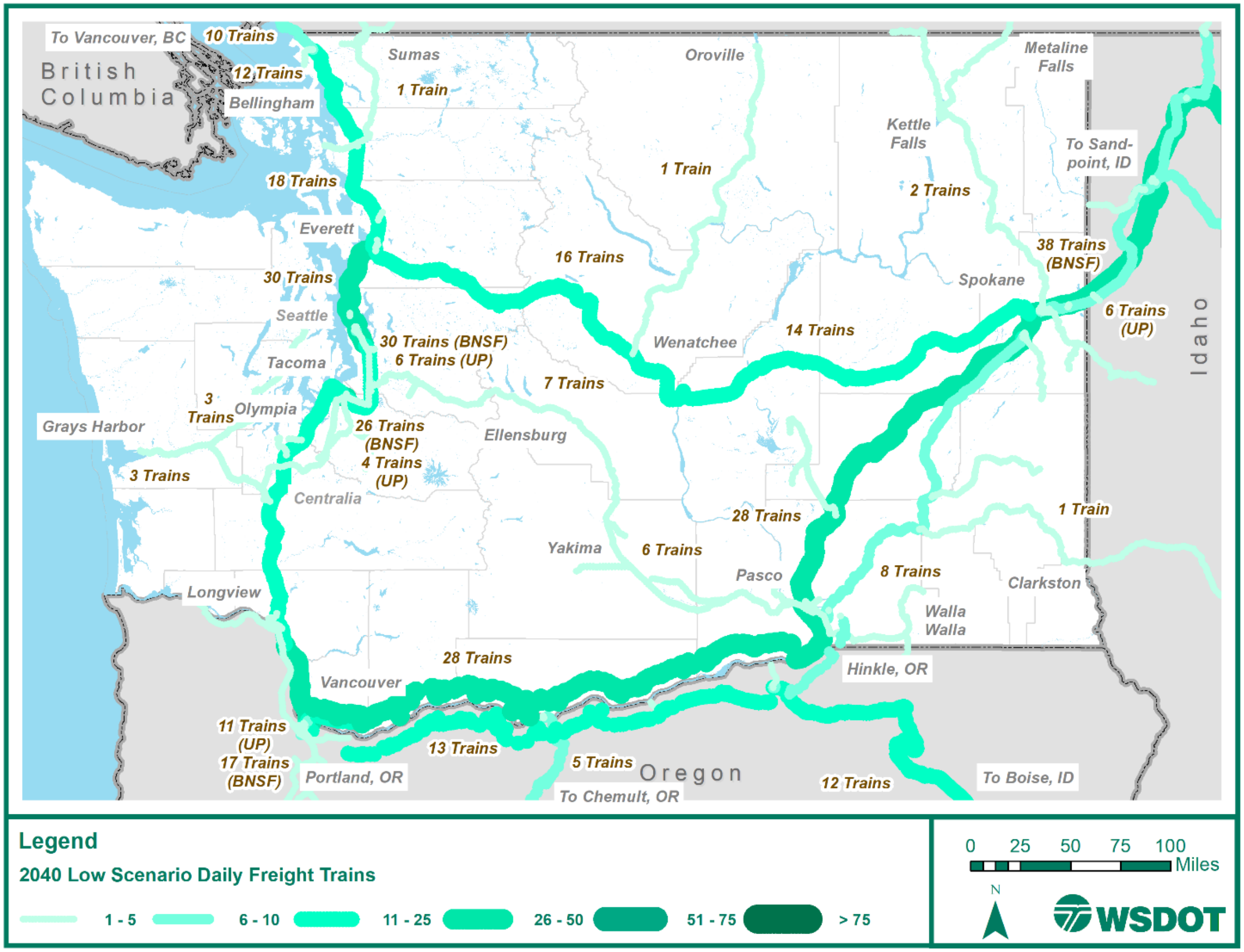
Exhibit 2-14 Moderate growth scenario forecasted year average daily freight train volumes in Washington, 2040



Source: WSDOT's 2040 Forecasted Enhanced Waybill Sample and Freight Rail Modeling.

Note: The train volumes shown in the map are rounded up values to the nearest even number to account for forward and return moves.

Exhibit 2-15 Low growth scenario forecasted year average daily freight train volumes in Washington, 2040



Source: WSDOT's 2040 Forecasted Enhanced Waybill Sample and Freight Rail Modeling.

Note: The train volumes shown in the map are rounded up values to the nearest even number to account for forward and return moves.

Exhibit 2-16 High growth scenario forecasted year average daily freight train volumes in Washington, 2040

Source: WSDOT's 2040 Forecasted Enhanced Waybill Sample and Freight Rail Modeling.

Note: The train volumes shown in the map are rounded up values to the nearest even number to account for forward and return moves.

Exhibit 2-17 Daily trains by railway subdivision, 2016 and 2040 scenarios

Corridor	2016				2040 Low Growth Scenario				2040 Moderate Growth Scenario				2040 High Growth Scenario			
	BNSF	UP	Other	Total	BNSF	UP	Other	Total	BNSF	UP	Other	Total	BNSF	UP	Other	Total
Auburn-Pasco	5	3	0	**8**	5	1	1	**7**	8	2	0	**10**	10	1	1	**12**
Everett-Vancouver, BC, Canada	17	2	1	**20**	16	1	1	**18**	23	4	1	**28**	27	4	1	**32**
Hinkle, ID-Lakeside	1	9	0	**10**	1	7	0	**8**	1	19	0	**20**	1	23	0	**24**
Pasco-Lakeside	34	0	0	**34**	28	0	0	**28**	54	0	0	**54**	86	0	0	**86**
Vancouver-Pasco	33	1	0	**34**	27	1	0	**28**	54	1	1	**56**	86	1	1	**88**
Seattle-Tacoma (BNSF)	28	5	1	**34**	26	4	1	**31**	39	8	1	**48**	48	11	1	**60**
Seattle-Tacoma (UP)	1	5	0	**6**	1	5	0	**6**	1	9	0	**10**	1	11	0	**12**
Tacoma-Vancouver (BNSF/UP Shared Use Segment)	24	11	0	**35**	19	9	0	**28**	44	21	0	**65**	72	32	0	**104**
Seattle-Everett	31	2	1	**34**	27	2	1	**30**	43	4	1	**48**	52	5	1	**58**
Everett-Spokane	14	2	1	**17**	15	1	0	**16**	23	3	0	**26**	31	3	0	**34**
Lakeside - Spokane (BNSF/UP Shared Use Segment)	37	7	0	**44**	33	5	0	**38**	59	13	0	**72**	88	16	0	**104**
Spokane-Sandpoint, ID (BNSF)	37	6	1	**44**	32	5	1	**38**	58	13	1	**72**	87	15	0	**102**
Spokane-Sandpoint, ID (UP)	0	8	0	**8**	0	6	0	**6**	0	18	0	**18**	0	22	0	**22**
Portland, OR-Vancouver (BNSF/UP Shared Use Segment)	9	13	0	**22**	10	12	0	**22**	12	24	0	**36**	13	33	0	**46**
Fallbridge-Chemult, OR	6	0	0	**6**	6	0	0	**6**	8	0	0	**8**	8	0	0	**8**
Other Rail (Non-Class I)	44	15	6	**65**	37	13	4	**54**	68	28	14	**110**	107	37	17	**161**

Source: WSDOT's 2016 and 2040 Forecasted Enhanced Waybill Sample and Freight Rail Modeling.

Appendix C: Passenger rail multimodal connectivity analysis and candidate improvements

Overview

This memorandum presents a multimodal connectivity analysis, identification of gaps in the multimodal network, and candidate access improvements for the fourteen passenger rail stations that are served by Amtrak Cascades in Portland, Oregon; Washington; and Vancouver, British Columbia Canada. Additionally, system-wide candidate improvements are identified that are applicable to other Amtrak rail stations in Washington. Multimodal connectivity to these rail stations can enhance the passenger experience, may attract additional riders to intercity passenger rail, and increases the capacity for access to the stations without the need to increase the parking supply. This analysis focuses on alternatives to single-occupant vehicle (SOV) access and does not evaluate opportunities to increase the parking supply, manage parking demand, or make improvements to the roadway network for SOV access to intercity passenger rail.

An analysis of existing conditions at these stations (summarized in the memorandum, *7.1.b Amtrak Cascades Rail Stations Existing Conditions Memo*), served as the foundation for the connectivity analysis. Additionally, the results of an on-board survey of the travel behavior of Amtrak Cascades passengers provided insights to inform both the connectivity analysis and the candidate access improvements (summarized in the memorandum, *2.3.5 Final Amtrak Cascades Onboard OD Survey Memorandum*).

As used in this memorandum, “connectivity” refers to the collective influence of land use and transportation factors on the options for passengers to access or leave the rail stations. The connectivity analysis evaluates station area land use context, availability of transportation services, and station area transportation infrastructure to identify the strengths and weaknesses of existing station access. Data was collected with respect to ten evaluation measures, which were then rated and aggregated to create access scores for land use, mobility options, connectivity, and ultimately an overall access score for each station. Gaps and significant variations in station accessibility were used to identify candidate access improvements. The connectivity factors evaluated for the State Rail System Plan Update are similar to the “access to transit” elements of the Regional Transit Access and Parking Strategy identified in the Puget Sound Regional Council’s 2018 Regional Transportation Plan.

Summary folios for each station are included as attachments to this memorandum. The station folios include: key information from the existing conditions analysis; a narrative overview of the station context and multimodal access; a quantified connectivity analysis that yields an access “score” for each station; candidate improvements; and photo documentation to present a complete picture of the current status and potential future of multimodal access to the station.

Key findings from the on-board passenger survey

More than 1,000 Amtrak Cascades passengers were surveyed in July 2018 to gather information about travel origins & destinations; trip purpose; mode of access to stations; frequency of Amtrak Cascades use; and reasons for using Amtrak Cascades. Key findings from the survey were:

- Most respondents came from someplace other than work or home (49%), or they came from home (46%) before getting on the train.
- It took most participants (73%) 30 minutes or less to get to the train station.
- Nearly a third (31%) of participants were dropped off at the train and another quarter (25%) took an Uber or Lyft there.
- Most respondents boarded the train in Portland (36%) or Seattle (27%).
- About 70% of respondents' final destination was Portland (40%) or Seattle (29%).
- Half (50%) of respondents took this trip to visit friends and relatives.
- Most (60%) respondents were traveling alone.
- Most (54%) respondents were not frequent riders (rode less than once per month), and a third (34%) were first-time Amtrak Cascades riders.
- Most respondents ride Amtrak Cascades to avoid traffic (60%) and/or to be able to do other things like read or sleep (56%).
- Most respondents were either first time Amtrak Cascades riders (38%) or have been riding Amtrak Cascades for more than 5 years (32%).

Overview of evaluation criteria and measures

Based on the information from the existing conditions analysis and the passenger survey, three categories of influence were identified as key connectivity considerations:

1. Land Use
2. Mobility
3. Connected Transportation System

These evaluation categories are described further below.

Land use

The land use context of each passenger station is an important influence on station access mode choice. Stations located in a mixed-use or urban context are likely to be close enough to trip generators such as employment centers, residential density, or cultural/recreational opportunities to be within walking distance or accessible via a relatively short trip via transit, taxi or rideshare. Land use evaluation measures included both the zoning and land use context and the presence of the "attractors," as described further in Table 1 below.

Mobility

The availability of mobility options, such as transit service to stations or station areas, access to services such as Uber and Lyft (transportation network companies) and services provided for people with mobility impairments or economic barriers to travel (paratransit and human services transportation providers) are important influencers on mode of access that is included in the connectivity evaluation. The availability of parking for private automobiles is also addressed in the analysis of existing conditions.

Connected transportation network

Finally, the transportation infrastructure within station areas is an important influence on mode choice. This category was measured based on the sidewalk and bicycle network serving station areas; the presence of railroad crossings as a potential barrier to station access; and the quality of wayfinding (directional information/signage) at stations and station areas. Other barriers to station access, such as highways that impact the connectivity of the street network, are also noted in the station overview narratives.

Connectivity analysis: methodology

The connectivity analysis featured the development of an overall connectivity "score" for each station that considers the quantitative and qualitative evaluation of the measures. The evaluation and scoring methodologies are described in Figure 1 and Table 1 below.

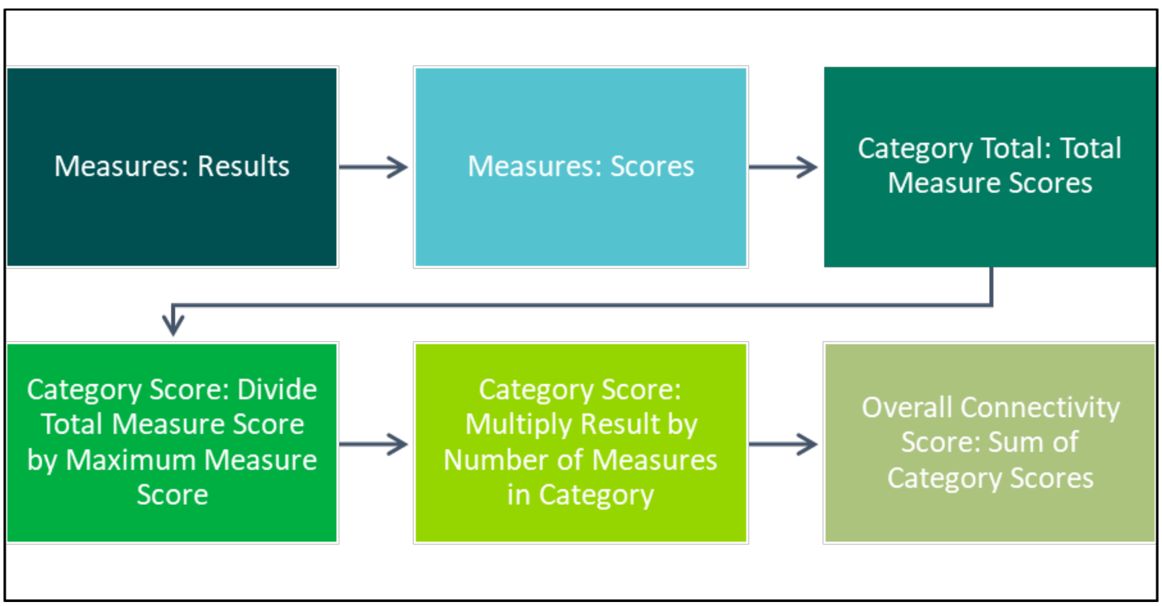


Figure 1: Connectivity Analysis Methodology

Table 1. Multimodal analysis evaluation categories, measures, data sources & scoring methodology					
Category	**Measure**	**Source of data**	**Scoring methodology**	**High**	**Low**
Land use	**Station context**	**Google maps & field assessment**	The land use context within the station area was evaluated based on the predominant land use (such as Urban Center/Main Street; Industrial; Rural) and the quantity of trip generators/attractors within 3/4 mile of the station (such as, parks, hospitals, colleges, convention facilities, event facilities, and cultural facilities). The evaluation was scored as follows: 3 Points: Urban or "Main Street" Settings with Significant Attractors; 2 Points: Settings with Significant Attractors but Fewer Supportive Land Uses 1 Point: Rural Setting 0 Points: Industrial Setting	3 points = Urban or "Main Street" Setting with Attractors	0 points = Industrial
	Zero-car households	**Census**	Zero-car households were geospatially mapped and then reviewed for density of zero car households in census blocks within a 3/4-mile radius of the station. The evaluation was scored as follows: Surrounding census tracks with low vehicle availability (over 20% zero car households) = 3 points. Surrounding census tracks with medium vehicle availability (5 to 20% zero-car households) = 2 points. Surrounding census tracks with high vehicle availability (0 to 5% zero-car households) = 1 point.	3 points = High number of zero car households	1 point = Low number of zero car households
Mobility	**Transit service**	**WSDOT station asset inventory and local transit agency schedules**	The number of connecting transit routes (bus, commuter rail, street car, ferries, and light rail) within a 1/2 mile. The evaluation was scored as follows: 3 points: over 12 transit connections 2 points: 5 to 11 transit connections 1 point: up to 4 transit connections	3 points = 12 or more transit connections	1 point = Up to 4 transit connections
	Private transportation connection options	**Field assessment**	The number of private transportation connection options (Uber/Lyft, bike share/scooter share) within a 1/2 mile were identified and assigned 0 to 3 points based on quantity.	3 points = 4 or more options	1 point = 0 to 2 options
	Human services transportation	**Statewide and Metropolitan Planning Organization human service transportation plans**	Human Service Transportation Plans were reviewed for 3 factors: if travel training is part of the plan; does the plan include Amtrak Cascades; and what lead time is required to fulfill a request for paratransit services. Results were totaled and points are between 1 and 3.	3 points = 3 factors	1 point = 1 factor

Table 1. Multimodal analysis evaluation categories, measures, data sources, & scoring methodology (continued)

Category	Measure	Source of data	Scoring methodology	High	Low
Connected transportation network	**At-grade railroad crossings**	**WSDOT (from local cities/towns) and Parsons**	The number of pathways that require an at-grade railroad crossing within a 1/2 mile of the station was identified. Scores are inverse to the number of at-grade crossings, with the maximum of three points assigned when there are no at-grade crossings.	3 points = 0 crossings	0 = 3 or more crossings
	Sidewalks	**WSDOT station asset inventory and field assessment**	Sidewalks were geospatially mapped within a 1/4-mile radius of the station and assigned 0 to 3 points based on coverage and connectivity of sidewalks to the station, based on review of GIS data and site visits.	3 points = "High" (Station fully connected to sidewalk network)	1 point = "Low" (Sidewalks are missing on routes that connect directly to station)
	Bicycle Facilities	**WSDOT stationa inventory, field assessment & local/regional bicycle plans**	Bicycle facilities were geospatially mapped within a 1/2-mile radius of the station and assigned 0 to 3 points based on the coverage and connectivity of bicycle facilities connecting to station area, based on review of GIS data and site visits.	3 points = "High" (Station fully connected to bicycle network)	1 point = "Low" (Bicycle facilities are missing on routes that connect directly to station)
	Drop-off/pick-up areas	**Field assessment**	The drop-off/pick-up areas were assessed for signing, striping and designated ADA areas and assigned 0 to 3 points based on the number of these factors achieved.	3 points = meets all three factors	1 point = meets only one factor
	Wayfinding	**Field assessment**	Wayfinding was assessed for: branded Amtrak presence at station; wayfinding signs at the station, and wayfinding signs in the vicinity, and assigned 0 to 3 points based on the number of these factors achieved.	4 points = meets all three factors	2 point = meets only one factor

A sample connectivity evaluation for the Vancouver, Washington station is shown in Table 2. The table includes the evaluation categories and measures, the maximum points available in each category and the maximum score (which is equal to the number of measures in the category), the points assigned based on the evaluation results, and the score achieved, which was calculated as:

*(points assigned/maximum points) * measures*

Table 2. Sample Connectivity Evaluation:	Vancouver, WA				
Categories & measures	**Measures**	**Maximum points**	**Maximum score**	**Points**	**Score**
LAND USE	2	6	2	4	**1.3**
Station location context & attractors		3		1	
Zero car household		3		3	
MOBILITY	3	9	3	3	**1.0**
Transit service		3		0	
Private transportation connection options		3		1	
Human services transportation		3		2	
CONNECTED TRANSPORTATION NETWORK	5	15	5	5	**1.7**
At-grade railroad crossings		3		1	
Sidewalks		3		1	
Bicycle facilities		3		1	
Drop-off/pick-up areas		3		0	
Wayfinding		3		2	
Station connectivity - TOTAL	10	30		12	**4.0**

The connectivity evaluations were completed for each of the Amtrak Cascades stations and are included in the attached station folios.

Key findings: connectivity

Significant improvements to connectivity are planned at several of the station areas, particularly those within the Sound Transit (Central Puget Sound Regional Transit Authority) district in sections of King, Pierce and Snohomish counties; or in other major metropolitan areas (Portland, Oregon/Vancouver, Washington; Vancouver, British Columbia).

At most station areas, significant changes to land use designations are not anticipated. Vancouver, Washington's waterfront redevelopment plans could have an influence on the land use context of the Vancouver Station. The built environment within the Tacoma and Everett station areas is likely to evolve as a result of the influence of regional light rail transit to these station areas. These potential changes are likely to come near the end of or beyond the planning horizon for the State Rail Plan (2040).

Table 3 provides a summary overview of connectivity evaluation of the Amtrak Cascades stations.

	Station	Land Use	Mobility	Connected Transportation Network	Connectivity
1	Portland, OR	High	High	High	High
2	Vancouver, WA	Medium	Low	Low	Low
3	Kelso-Longview	High	Low	Low	Medium
4	Centralia	High	Medium	Low	Medium
5	Olympia-Lacey	Low	Medium	Low	Low
6	Tacoma	High	High	High	High
7	Tukwila	Low	Low	Medium	Medium
8	Seattle	High	High	High	High
9	Edmonds	Medium	Low	Medium	Medium
10	Everett	High	High	Medium	High
11	Stanwood	Low	Medium	Medium	Medium
12	Mount Vernon	Medium	High	Medium	Medium
13	Bellingham	Medium	Medium	Medium	Medium
14	Vancouver, BC	High	Medium	High	High
Maximum Score		2	3	5	10

Legend	
Low Score	Low
Medium Score	Medium
High Score	High

Table 3. Summary of Amtrak Cascades Station Connectivity Analysis

Overview of candidate station access improvements

Methodology

The connectivity analysis categories and evaluation measures used to generate a connectivity score for each of the Amtrak Cascades passenger rail stations were used with the information from the memorandum, *7.1.b Amtrak Cascades Rail Stations Existing Conditions Memo* to identify gaps in the station area that affect mobility. Candidate improvements were then developed to guide the identification of opportunities for improvement for each of the measured influences on station mode of access choices. The resulting set of systemwide candidate improvements have the potential to enhance connectivity to any of the Washington Amtrak passenger rail stations. For each of the Amtrak Cascades stations included in this evaluation, the existing conditions analysis and connectivity scores were used to identify potential station-specific application of the systemwide candidate improvements.

Systemwide candidate improvements

Typical strategies and investments that could be applied to improve multimodal access at any intercity passenger rail station in the state of Washington are identified in Table 5. Where applicable, location-specific candidate improvements for stations served by Amtrak Cascades are identified in the station folio attachments to this memorandum.

WSDOT will work with stakeholders to improve access and connectivity to Amtrak Cascades stations. Local jurisdictions, transit agencies, Amtrak and railroads could consider addressing these opportunities when implementing their capital improvement and service development plans. Some of the opportunities identified also may be addressed in these existing plans.

Table 5. Systemwide candidate improvements

Categories & measures	Candidate improvements - systemwide
LAND USE	
Station location context & attractors	Local jurisdictions may have opportunities to modify land use regulations near station areas to allow or encourage transit-oriented uses. Local jurisdictions and institutions may have opportunities to encourage site uses/facilities that are transit and multimodal attractors near stations through economic development efforts.
Zero-car households	Local jurisdictions could prioritize multimodal improvements in the areas that have households with low vehicle availability, recognizing that these areas present opportunities to maximize non-SOV access to stations.

Table 5. Systemwide candidate improvements (continued)	
Categories & measures	**Candidate improvements - systemwide**
MOBILITY	
Transit service	Local transit agencies may have funded or un-funded plans to provide additional transit service to station areas, which may include additional routes, increased frequency, extended span of service, and coordination of schedules. Local agencies and WSDOT can encourage local transit agencies to connect service to Amtrak Cascades passenger stations.
Private transportation connection options	Local jurisdictions may have opportunities to allow private transportation providers to serve station areas.
Human services transportation	WSDOT could identify recommended best practices for Human service transportation plans/providers serving station areas, such as travel trainings for targeted groups.
CONNECTED TRANSPORTATION NETWORK	
At-grade railroad crossings	WSDOT and local jurisdictions may have the opportunity to work with the railroads to coordinate railroad crossing improvements that include: signing, striping, ADA compliance, sidewalks, grade separated structures for pedestrian/bicycle use, upgrade warning devices, enhance crossings, etc.
Sidewalks	Local jurisdictions could prioritize sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations within their capital improvement plans and long-range plans.
Bicycle facilities	Local jurisdictions could prioritize bicycle facility improvements within 1/2-mile radius of stations within their capital improvement plans and long-range plans.
Drop-off/pick-up areas	WSDOT, Amtrak, other owners of stations and/or local jurisdictions could enhance signs and markings to designate or more clearly identify existing designated areas for drop-off/pick-up, either on-site or on-street at station areas.
Wayfinding	WSDOT, Amtrak, other owners of stations/and or local jurisdictions could complete wayfinding analysis and install additional wayfinding at stations, station vicinity, and station access routes.

3534

Station-level gaps and candidate improvements

The attached station folios for Amtrak Cascades passenger rail stations identify gaps in the multimodal network and candidate improvements at the station level that may help to address these gaps. In many cases, local agencies (municipalities, transit agencies and other jurisdictions within station areas) may have more detailed land use, transportation and capital improvement plans that may serve as a source of candidate projects.

Definitions of terms used in this technical memorandum

Built environment: Per the U.S. Environmental Protection Agency, "The built environment touches all aspects of our lives, encompassing the buildings we live in, the distribution systems that provide us with water and electricity, and the roads, bridges, and transportation systems we use to get from place to place. It can generally be described as the man-made or modified structures that provide people with living, working, and recreational spaces."

HAWK: A HAWK beacon (High-Intensity Activated crossWalK beacon) is a traffic control device used to stop road traffic and allow pedestrians to cross safely. The purpose of a HAWK beacon is to allow protected pedestrian crossings, stopping road traffic only as needed. At certain locations, the signal can automatically detect the presence of pedestrians waiting to cross and will activate the signal.

Leading pedestrian interval: A leading pedestrian interval (LPI) typically gives pedestrians a 3–7 second head start when entering an intersection with a corresponding green signal in the same direction of travel. LPIs enhance the visibility of pedestrians in the intersection and reinforce their right-of-way over turning vehicles, especially in locations with a history of conflict (source: National Association of City Transportation Officials, Urban Street Design Guidelines).

Mixed-use: Mixed-use is development that blends a combination of residential, commercial, cultural, institutional, or industrial uses, where those functions are physically and functionally integrated.

Multi-use path: Also known as a shared use path; a path that is intended to accommodate both cyclists and pedestrians and is physically separated from motor vehicular traffic with an open space or barrier.

Other station elements: Other station elements are comprised of grade separated pedestrian crossings, parking areas, auto pick-up/drop-off areas, bus pick-up/drop-off areas, and pedestrian at-grade railroad crossings. Figures that present these individual elements at each station area are provided in the December 13, 2018 memorandum, *Amtrak Cascades Rail Stations Existing Conditions Memorandum with Station Report Cards*.

Transportation network company (TNC): Transportation network companies (TNC) are ride hailing or ride sharing companies that are supported by a computer or mobile application to connect passengers with drivers. Lyft and Uber are examples of TNCs.

Bike share: Bike share is another shared mobility option that provides bicycles on a shared use basis for customers to use for a fee that is usually determined by time of use or mileage. Bike share systems can be owned and operated by public agencies and private companies. Originally, many bike share systems required a docking system, a specific location where to unlock and lock bikes, but today's location system technology provides many options for dockless systems.

Human services transportation plan: Human services transportation plans are federally required and can be "prepared through a process consistent with the applicable metropolitan or statewide planning process. The Coordinated Public Transit-Human Services Transportation Plan means a locally developed, coordinated transportation plan that identifies the transportation needs of individuals with disabilities, seniors and people with low incomes, provides strategies for meeting those needs, and prioritizes transportation services for funding and implementation." For more information, see: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/C9070_1G_FINAL_circular_4-20-15%281%29.pdf

Bicycle Facilities: Bicycle facilities are used in this technical memorandum to include any type of: bike route, bike boulevard, bike lane, buffered bike lane, protected one- or two-way bike lane/cycle track, bike box, two-stage turn queue bike box, shared-use path, multi-use path/trail, underpass/bridge.

Portland, Oregon

Union Station

800 NW 6th Ave

Portland, OR 97209

Station overview

Union Station in Portland, Oregon is an iconic station that is connected within a short walking distance to multiple transit options that include: bus, long-distance bus routes, street car and light rail routes. The station is located in an active part of Old Town/Chinatown and is adjacent to the Willamette River. The station is owned and maintained by the City of Portland.

Union Station served approximately 412,000 passengers in 2017. Trip purpose and mode of access data gathered from a 2018 on-board passenger survey is summarized in Figures 1 and 2. (The on-board survey reached over 1,000 Amtrak Cascades passengers, producing statistically significant results for the corridor. However, at the station level, results may not be statistically significant, particularly at stations with lower ridership.)

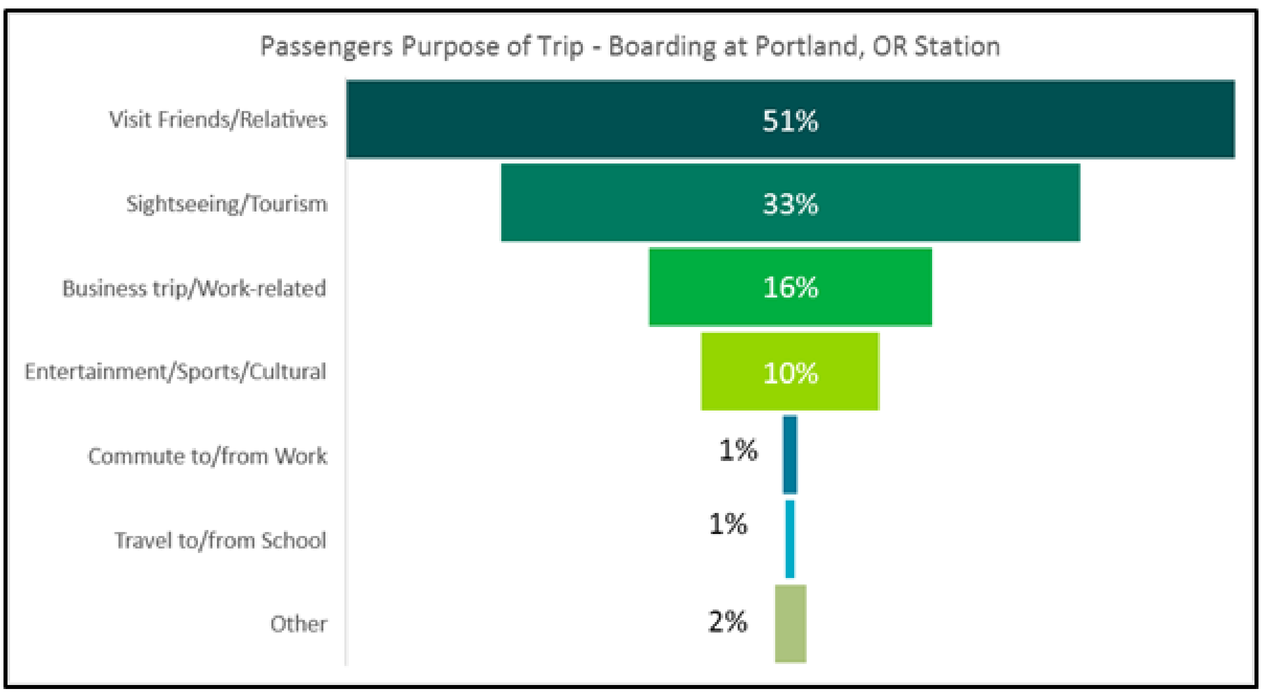


Figure 2: Survey Results-Trip Purpose

Note: Survey respondents had the option of selecting more than one response.

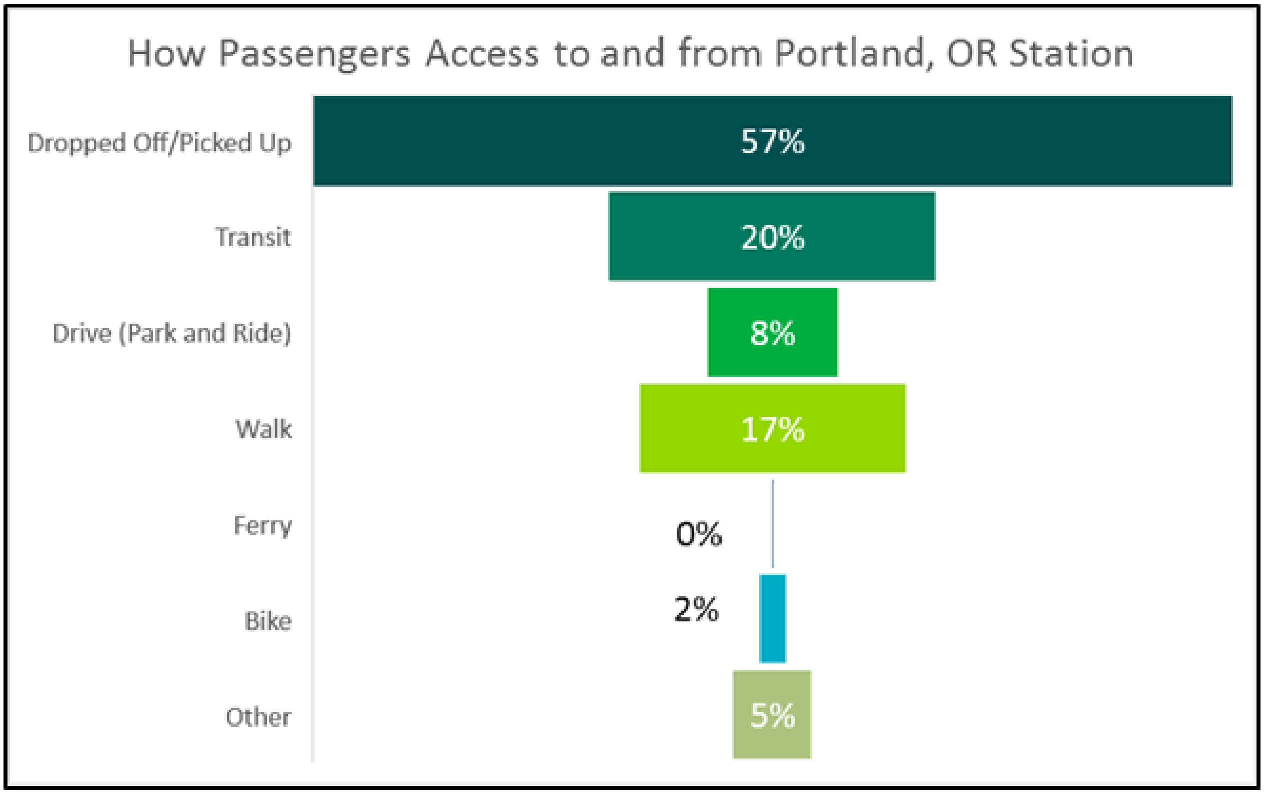


Figure 3: Survey Results-Mode of Access
Note: Survey respondents had the option of selecting more than one response.

Parking and drop-off/pick-up

Union Station offers a surface parking lot with 25 short term (paid) parking spaces, 100 long term (paid) parking spaces, and dedicated accessible parking spaces. The station features a clearly delineated pick-up/drop-off area with a dedicated taxi stand. No specific accommodation in the pick-up/drop-off area has been made for transportation network companies or human services transportation providers.

Walk and transit access

From a pedestrian standpoint, Portland Union Station is highly integrated into the pedestrian and transit environment. From the primary station entrance to 6th Avenue, the sidewalk network surrounding the station appears complete. The primary impediment to pedestrian travel is the railroad tracks themselves. This is mitigated by a pedestrian overpass connecting the station area to Naito Parkway.

Within Union Station, important services are indicated with historical neon signage. However, pedestrian orientated wayfinding signage surrounding the station is minimal, especially given the proximity of TriMet light rail, the Portland Streetcar and the Greyhound Terminal. There are several wayfinding signs oriented towards automobile travel, guiding drivers to the station.

Several alternative modes of travel are available at or near Portland Union Station. TriMet light rail is accessible within a block of the station itself. TriMet light rail has direct connection to Portland International Airport, the primary passenger air connection in Oregon. There are also nearby Portland Streetcar stops. The Greyhound terminal is located on an adjacent block to Union Station.

Bicycle access

While the City of Portland has substantial bicycle infrastructure, most of the streets surrounding Portland Union Station do not have any bicycle specific improvements. A notable exception is the adjacent Broadway Bridge over the Willamette River and its approaches. There is bike parking (racks) at Union Station. While there have been few improvements made to the immediate street network surrounding the station, these roads are generally low volume and connect to improved facilities within a few blocks. As a result, bicycle access to this station is high, and can be seen in Figure 3.

Portland Union Station Bicycle Connections

From PDX by Bicycle, 2017 from https://www.portlandoregon.gov/transportation/39402

Figure 4: Bicycle Facilities-Vicinity of Union Station

Connectivity analysis

As shown in Table 1, analysis of land use, mobility and transportation network measures for the Portland station yielded a connectivity score of 8.7, of a possible 10 points, indicating limited gaps in the existing connectivity of the station.

The station achieved high or medium sub-scores in all categories.

Table 1. Connectivity Evaluation: Portland

Categories & Measures	Measures	Maximum Points	Maximum Score	Points	Score
LAND USE	**2**	**6**	**2**	**6**	**2.0**
Station Location Context & Attractors		3		3	
Zero Car Household		3		3	
MOBILITY	**3**	**9**	**3**	**7**	**2.3**
Transit Service		3		2	
Private Transportation Connection Options		3		3	
Human Services Transportation		3		2	
CONNECTED TRANSPORTATION NETWORK	**5**	**15**	**5**	**13**	**4.3**
At-Grade Railroad Crossings		3		3	
Sidewalks		3		3	
Bicycle Facilities		3		3	
Drop-off/Pick-up Areas		3		2	
Wayfinding		3		2	
Station Connectivity - Total	**10**	**30**	**10**	**26**	**8.7**

Candidate improvements

Based on the results of the connectivity evaluation and the field visits, Figure 4 and Table 2 identify candidate pedestrian, bicycle, multimodal and railroad crossing improvements that can be expected to enhance connectivity to Union Station and promote increased safety for all travel modes. These candidate improvements, including potential project examples and/or locations, were identified based on the systemwide candidate improvement types, analysis of existing connectivity gaps, and site visits. These representative examples may include facilities owned by Amtrak, railroads or local agencies. Amtrak, railroads and local agencies can consider implementing improvements to their facilities and operations, similar to these representative examples, as they develop their capital improvement and service plans.

Table 2. Opportunities to Enhance Connectivity at Union Station (Portland)

Type	Gaps	Candidate Improvement*	Potential Project Examples/Locations*
Multimodal	Designated drop-off/pick-up area	Signage, striping, and additional designated drop-off/pick-up area for accessible/disabled transportation, either on-site or on-street at station areas	Improve signage and markings at station frontage
Multimodal	Wayfinding signs	Install additional wayfinding signs in station area	Locations to be determined
Pedestrian	Complete sidewalks (curb, gutter, ramps)	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	Sidewalk ramp upgrades to current accessibility guidelines

*Local jurisdictions, transit agencies, Amtrak and railroads could consider addressing these opportunities when implementing their capital improvement and service development plans; some of the opportunities identified may also be addressed in these existing plans.

Supporting information - connectivity analysis

The summary results and connectivity score for the Portland station are supported by geospatial representations of four measured criteria (attractors, zero car households, sidewalks, and bicycle facilities) presented in the figures below and in Table C-1. Multimodal Connectivity Analysis: Observed Data & Assignment of Points.

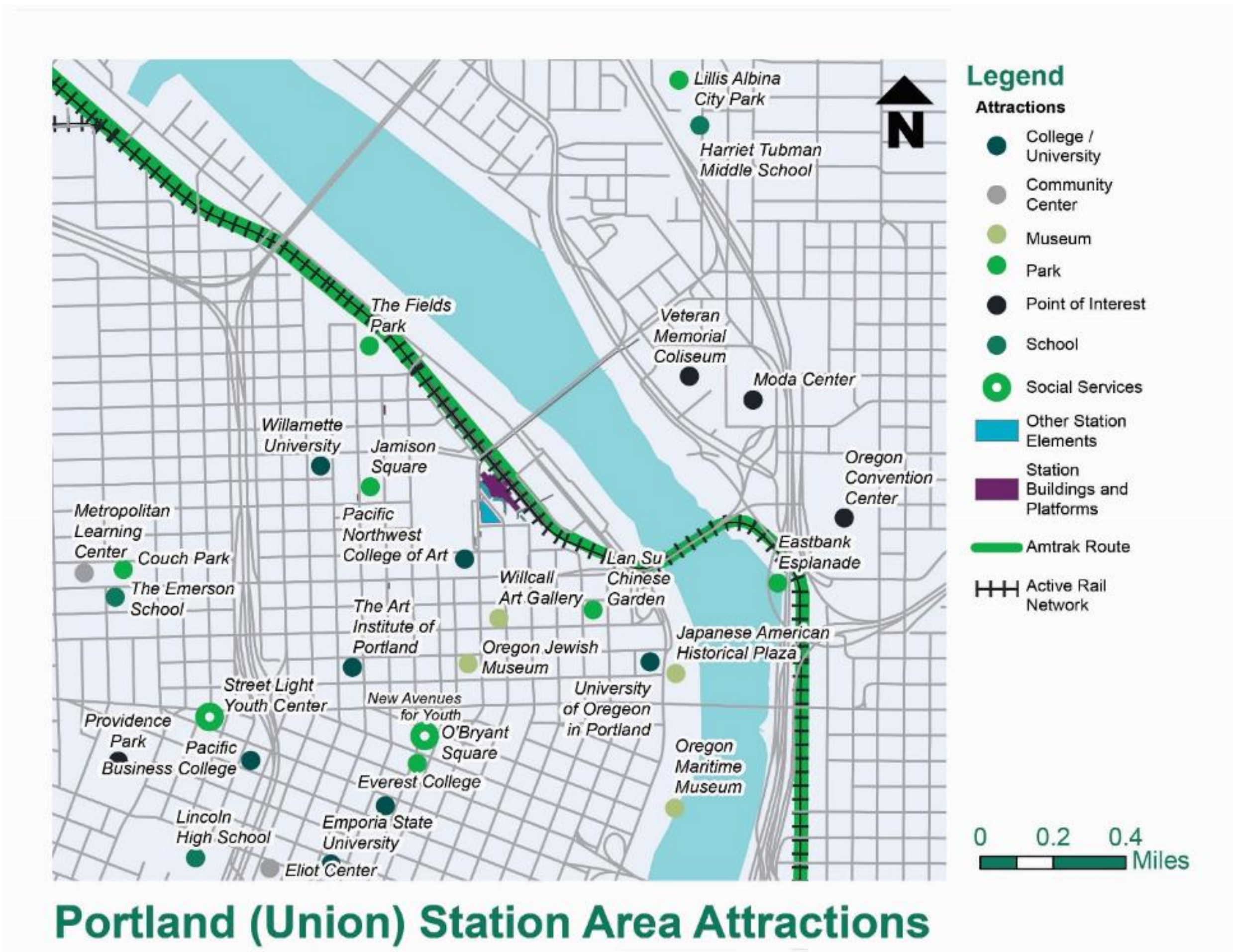


Figure 4: Station Context-Attractors

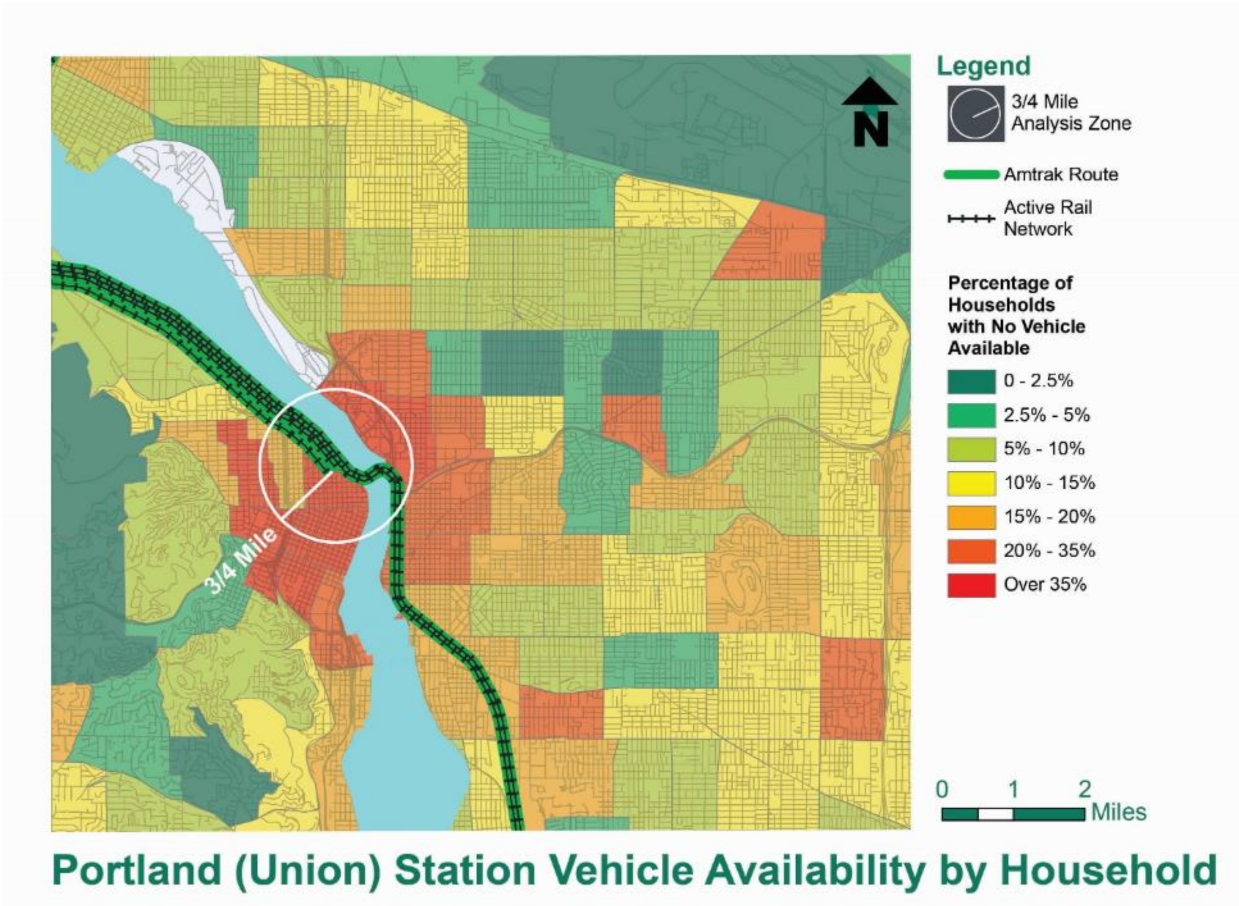


Figure 5: Zero-Car Households

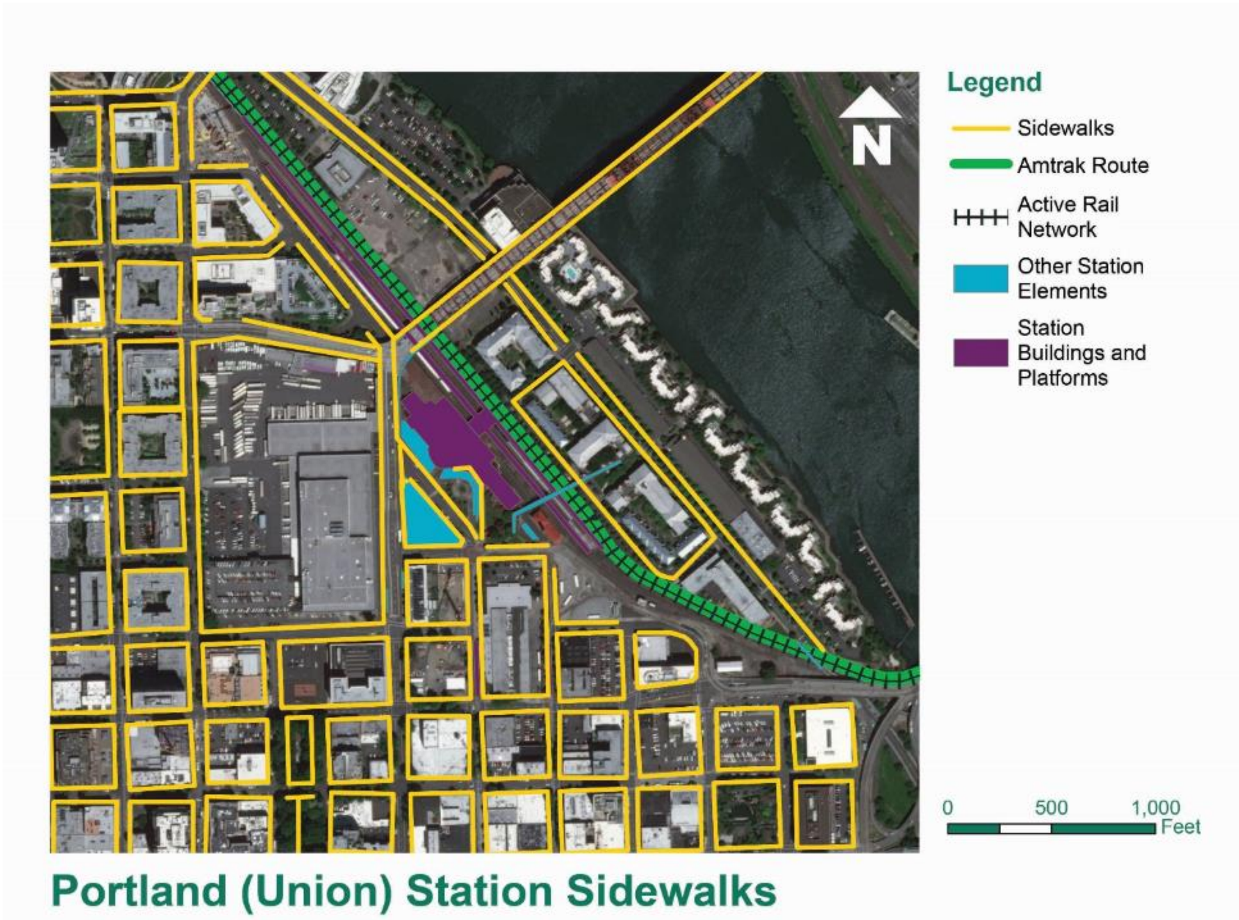


Figure 6: Sidewalks

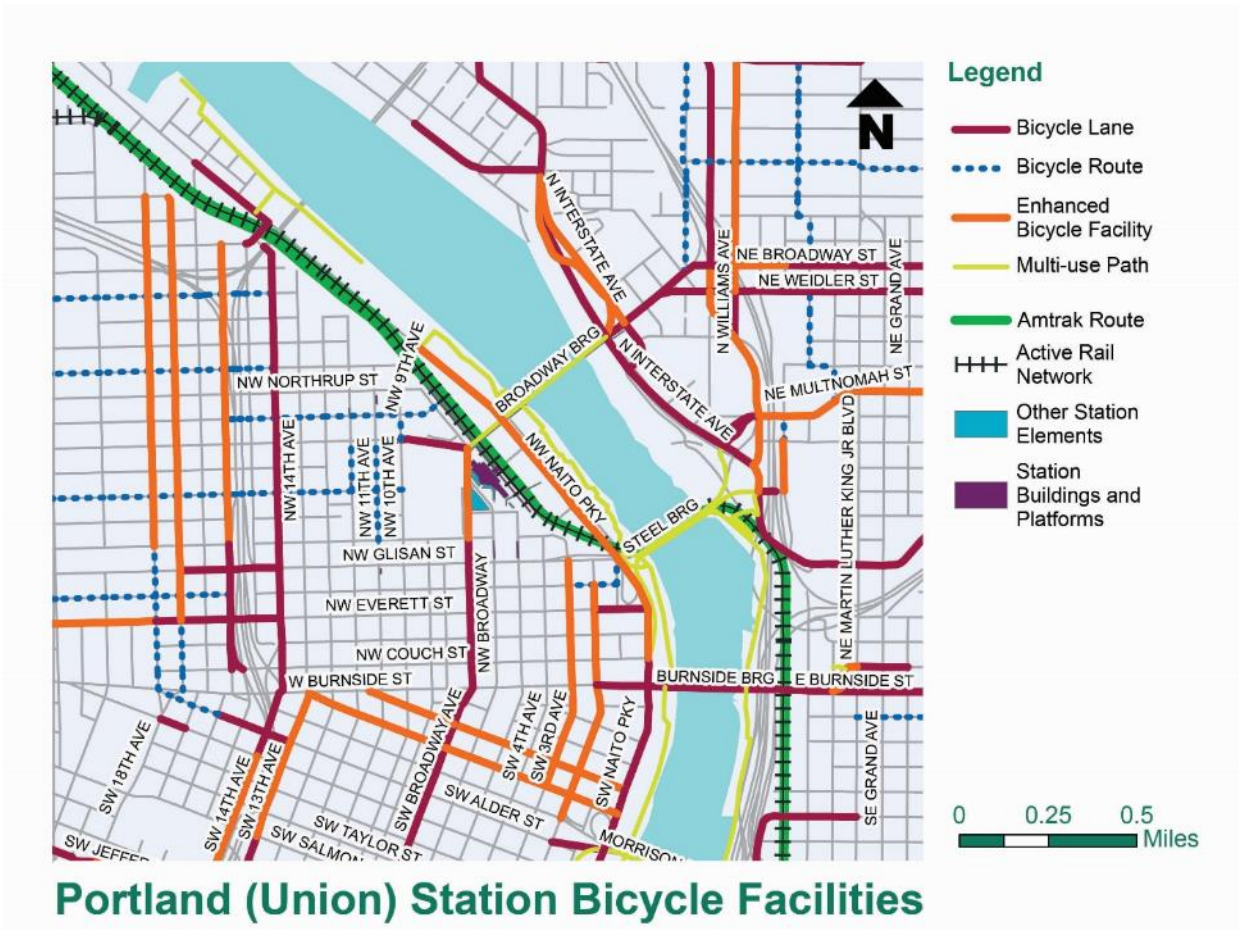


Figure 7: Bicycle Facilities

Supporting information - photo documentation

Site visits were conducted in Portland on October 10, 2018 to inventory assets at the station and assess multimodal connections.

Photo 1: Pedestrian grade-separated crossing over station platforms.

Photo 2: Bikeshare station in front of train station

Photo 3: 6th Ave & Hoyt St (northbound) TriMet Light Rail Station area adjacent to Union Station

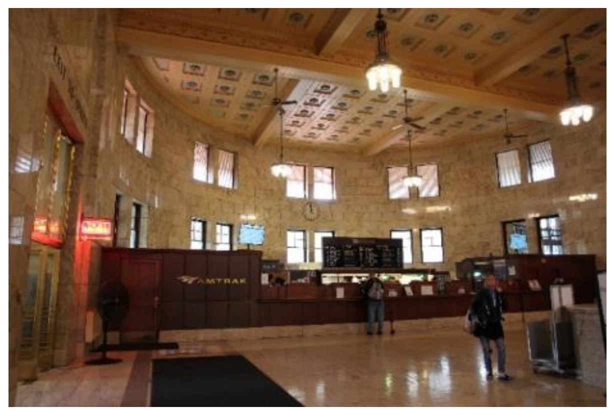


Photo 4: Ticketing counter inside Union Station

Photo 5: Pick-up/drop-off zone in front of station. Note the taxi stand.

Photo 6: Amtrak red cap service provider.

Vancouver, WA

Vancouver Station
1301 West 11th Street
Vancouver, WA 98660

Station overview

Vancouver Station is located in a commercial and industrial area of Vancouver, Washington. The station, owned by the City of Vancouver, is located just over a half mile from the downtown area and within one mile of the Waterfront Development Project area, where private investors are adding jobs, restaurants, shops, housing, and a hotel next to the new Vancouver Waterfront Park that opened in September 2018.

Vancouver Station served approximately 74,000 passengers in 2017. Trip purpose and mode of access data gathered from a 2018 on-board passenger survey is summarized in Figures 1 and 2. (The on-board survey reached over 1,000 Amtrak Cascades passengers, producing statistically significant results for the corridor. However, at the station level, results may not be statistically significant, particularly at stations with lower ridership.)

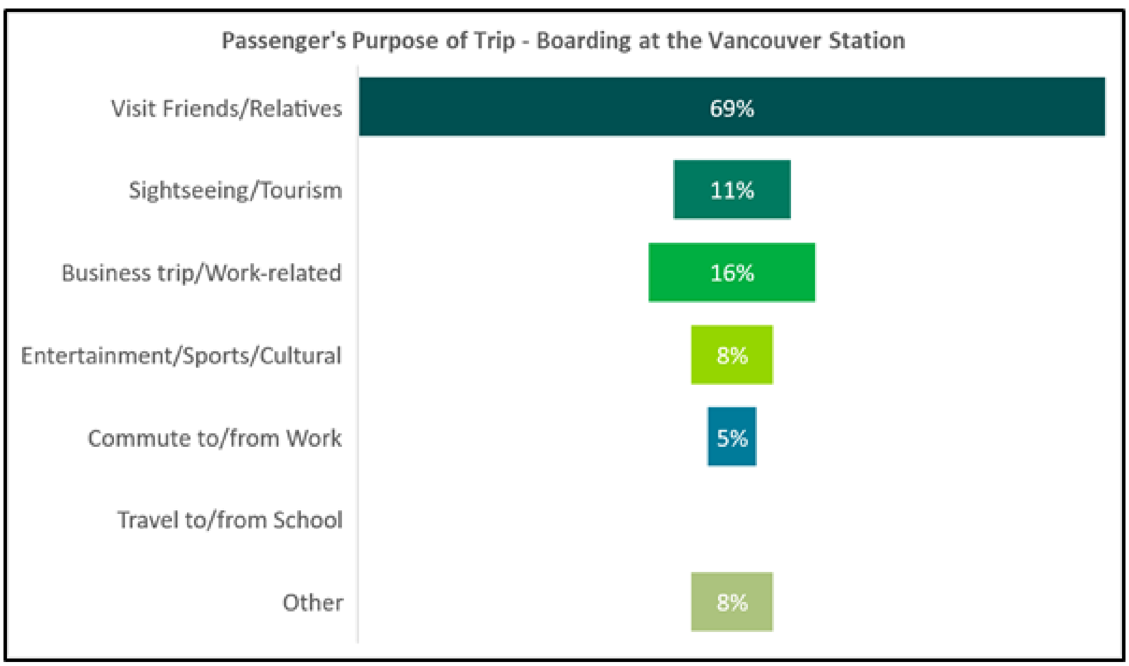


Figure 5 Survey Results-Trip Purpose

Note: Survey respondents had the option of selecting more than one response.
No trips were recorded as travel to/from school.

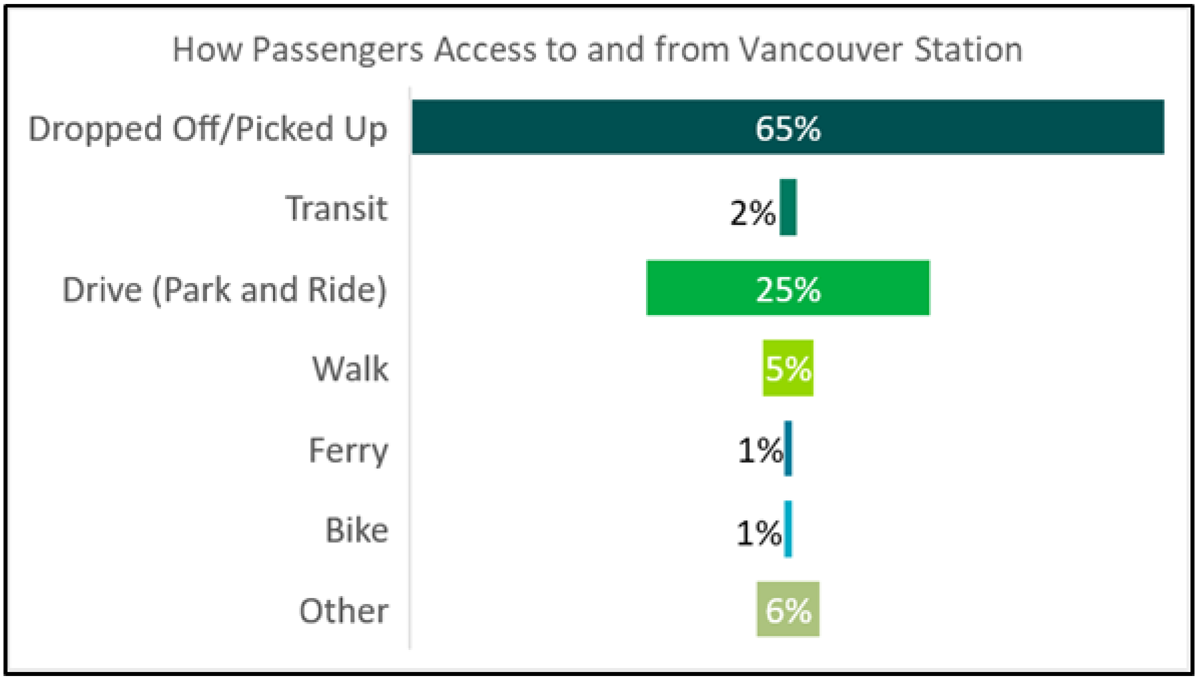


Figure 6: Survey Results-Mode of Access

Note: Survey respondents had the option of selecting more than one response.

The location of the station, beyond an easy walking distance from the urbanized center city area, is a key factor in evaluating the accessibility of the station and identifying candidate improvements for improving connectivity. The station is surrounded by rail lines that see high volumes of trail traffic. As a result, access is frequently blocked by long, slow-moving freight trains transitioning from one route to another or entering/leaving the yard north of the station.

Parking and drop-off/pick-up

As noted on the Vancouver Station map and verified from field visits, the station does have a surface parking lot with 10 short term parking spaces and 45 long term parking spaces. The parking lot has dedicated accessible parking spaces. It does not have a clearly delineated area for drop-off/pick-up use (for taxi, transportation network companies, or human services transportation).

Walk and transit access

From a pedestrian standpoint, the Vancouver Station area has some deterrents. The two-main entry/exit points of the station are 11th Street and Hill Street. 11th Street does not have sidewalks on either side, nor are there any pedestrian improvements at the railroad crossing. Hill Street has a sidewalk on one side of the road, but the sidewalk ends about 450 feet away from the station when it connects to 8th Street.

The wayfinding signs are mainly oriented to people driving cars, with icons and arrows that indicate where to turn for the Amtrak station. There are wayfinding signs at the station for pedestrians, but the signs are placed in the parking lot and not connected to sidewalks.

The primary transit provider in Vancouver, Washington is C-Tran. While several C-Tran routes terminate near the Vancouver Courthouse, approximately ½-mile from the Vancouver Amtrak station, no buses stop in the immediate station area.

Bicycle access

Like the walkability near this station, there are no bicycle facilities connecting to the station. It is noted in the Cycling the City of Vancouver bike map that 11th Street is a 'Shared Roadway/Difficult Connection that has lower traffic street with sight distance limitation and higher speeds. From the City's bike map, there are a limited number of nearby streets that have bicycle lanes. Additionally, the station does not have bicycle parking (racks or lockers) available. Bicycle access to this station is shown in Figure 3.

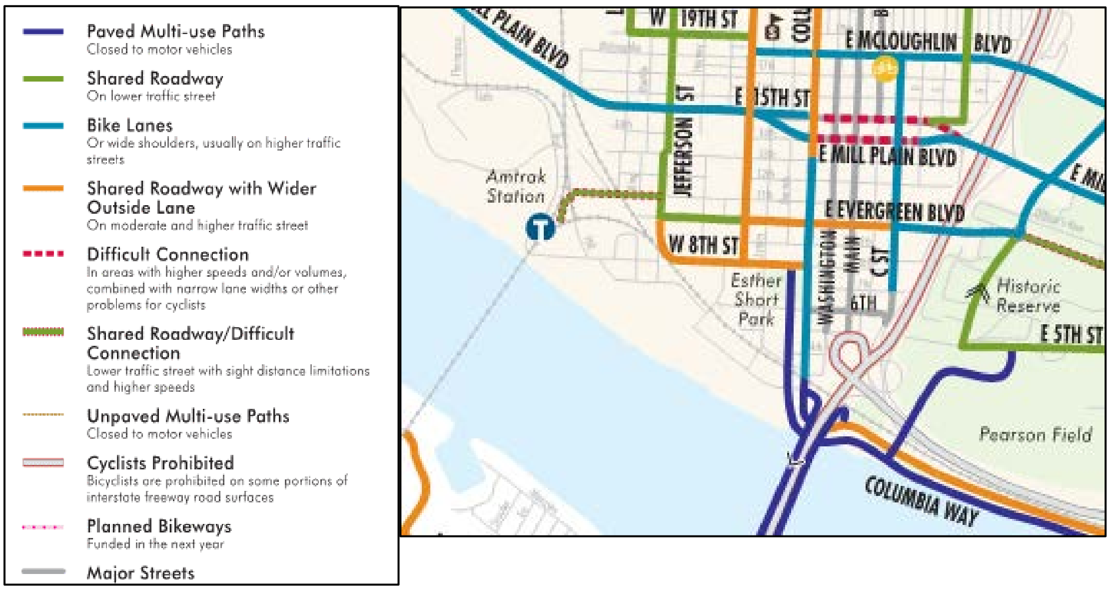


Figure 7: Station Area Bicycle Facilities

Connectivity analysis

As shown in Table 1, analysis of land use, mobility and transportation network measures for the Vancouver station yielded a connectivity score of 4.0, of a possible 10 points, indicating significant gaps in the existing connectivity of the station.

The station achieved a high sub-score in one category: zero-car households (an indicator of demand for transit). The analysis also highlights access issues surrounding the Vancouver station that include: a high number of at-grade railroad crossings, low availability of connecting sidewalks and bicycle routes, and a non-existent drop-off/pick-up area for customers. Photos 1, 2, and 5 highlight these issues.

Table 1. Connectivity Evaluation:	**Vancouver, WA**				
Categories & Measures	**Measures**	**Maximum Points**	**Maximum Score**	**Points**	**Score**
LAND USE	2	6	2	4	**1.3**
Station Location Context & Attractors		3		1	
Zero Car Household		3		3	
MOBILITY	3	9	3	3	**1.0**
Transit Service		3		0	
Private Transportation Connection Options		3		1	
Human Services Transportation		3		2	
CONNECTED TRANSPORTATION NETWORK	5	15	5	5	**1.7**
At-Grade Railroad Crossings		3		1	
Sidewalks		3		1	
Bicycle Facilities		3		1	
Drop-off/Pick-up Areas		3		0	
Wayfinding		3		2	
Station Connectivity-Total	10	30	10	12	**4.0**

Candidate improvements

Based on the results of the connectivity analysis and field visits, Figure 4 and Table 2 identify candidate pedestrian, bicycle, multimodal and railroad crossing improvements that can be expected to enhance connectivity to the Vancouver Amtrak station and promote increased safety for all travel modes. These candidate improvements, including potential project examples and/or locations, were identified based on the systemwide candidate improvement types, analysis of existing connectivity gaps, and site visits. These representative examples may include facilities owned by the State, Amtrak, railroads or local agencies. WSDOT will further evaluate the viability of the opportunities identified here to improve state facilities for better access to Amtrak Cascades stations. Amtrak, railroads and local agencies can consider implementing improvements to their facilities and operations, similar to these representative examples, as they develop their capital improvement and service plans.

Figure 8: Candidate Improvements

Table 2. Opportunities to Enhance Connectivity at Vancouver, WA Station

Type	Gaps	Candidate Improvement*	Potential Project Examples/Locations*
Bicycle	Station bicycle parking	Bicycle facility improvements within 1/2-mile radius of station	Install bike racks at station
Bicycle	Bicycle lanes	Bicycle facility improvements within 1/2-mile radius of station	Add a bicycle lane to connect to existing bicycle lane on Jefferson at Evergreen
Multimodal	Designated drop-off/pick-up area	Signing, striping, and additional designated drop-off/pick-up area for accessible/disabled transportation, either on-site or on-street at station areas	Repurpose existing parking spaces for curbside drop-off/pick-up
Multimodal	Wayfinding signs	Install additional wayfinding signs in station area	Locations to be determined
Pedestrian	Complete sidewalks (curb, gutter, ramps)	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	11th Street
Pedestrian and Bicycle	Pedestrian and bike connections to Waterfront Redevelopment area	Pedestrian and bike improvements on station to waterfront routes	Hill Street and 8th Street to Jefferson Street
Railroad Crossing	Consistent signing, striping, crossing gates, and crossing surface.	Railroad crossing improvements	11th Street and Hill Street
Transit	Direct local transit service connections.	Additional transit service to station area	New or modified transit routes

*WSDOT will work with stakeholders to improve access and connectivity to Amtrak Cascades stations. Local jurisdictions, transit agencies, Amtrak and railroads could consider addressing these opportunities when implementing their capital improvement and service development plans; some of the opportunities identified may also be addressed in these existing plans.

Connectivity analysis – supporting information

The summary results and connectivity score for the Vancouver station are supported by geospatial representations of four measured criteria (attractors, zero car households, sidewalks, and bicycle facilities) presented in the figures below and in Table C-1. Multimodal Connectivity Analysis: Observed Data & Assignment of Points.

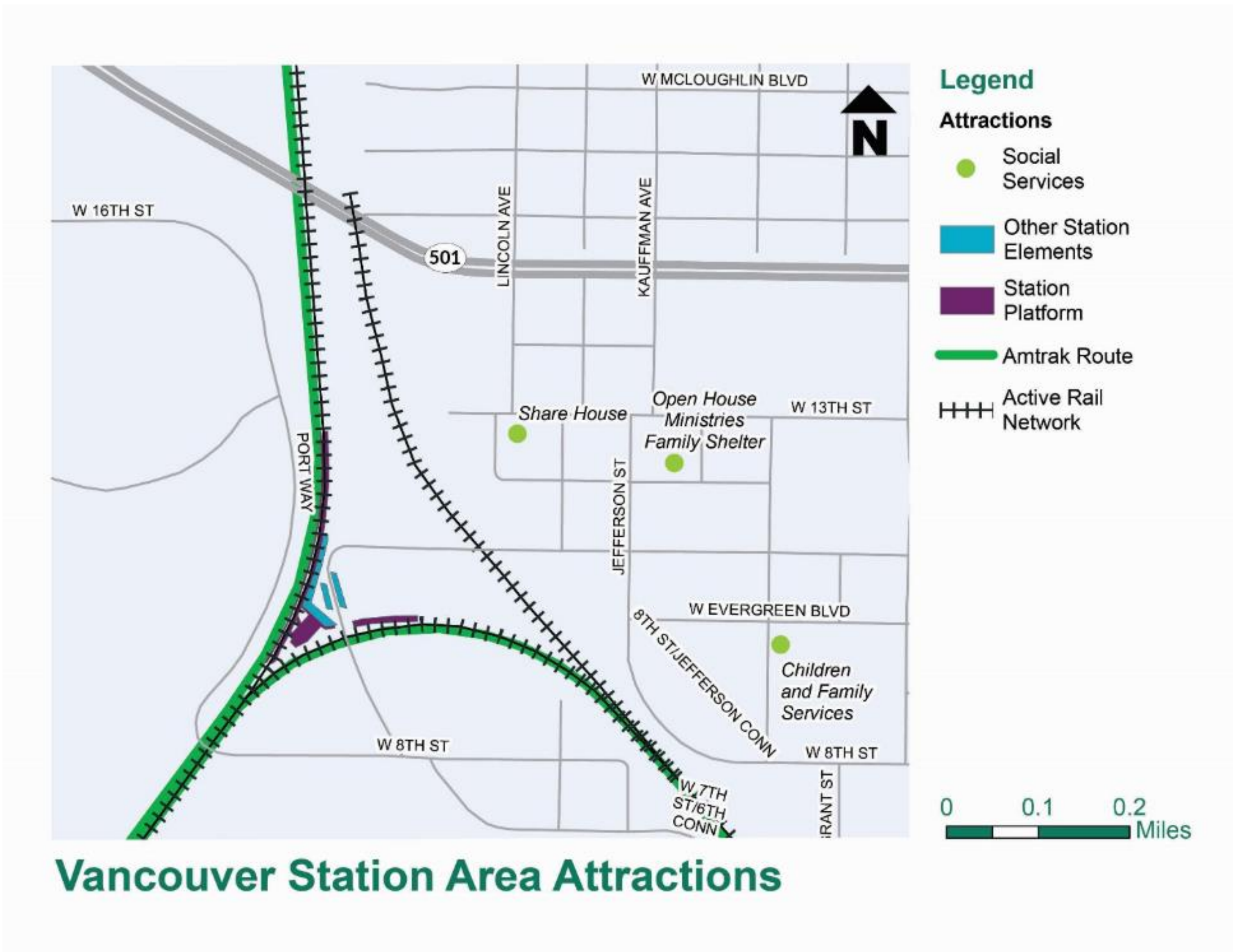
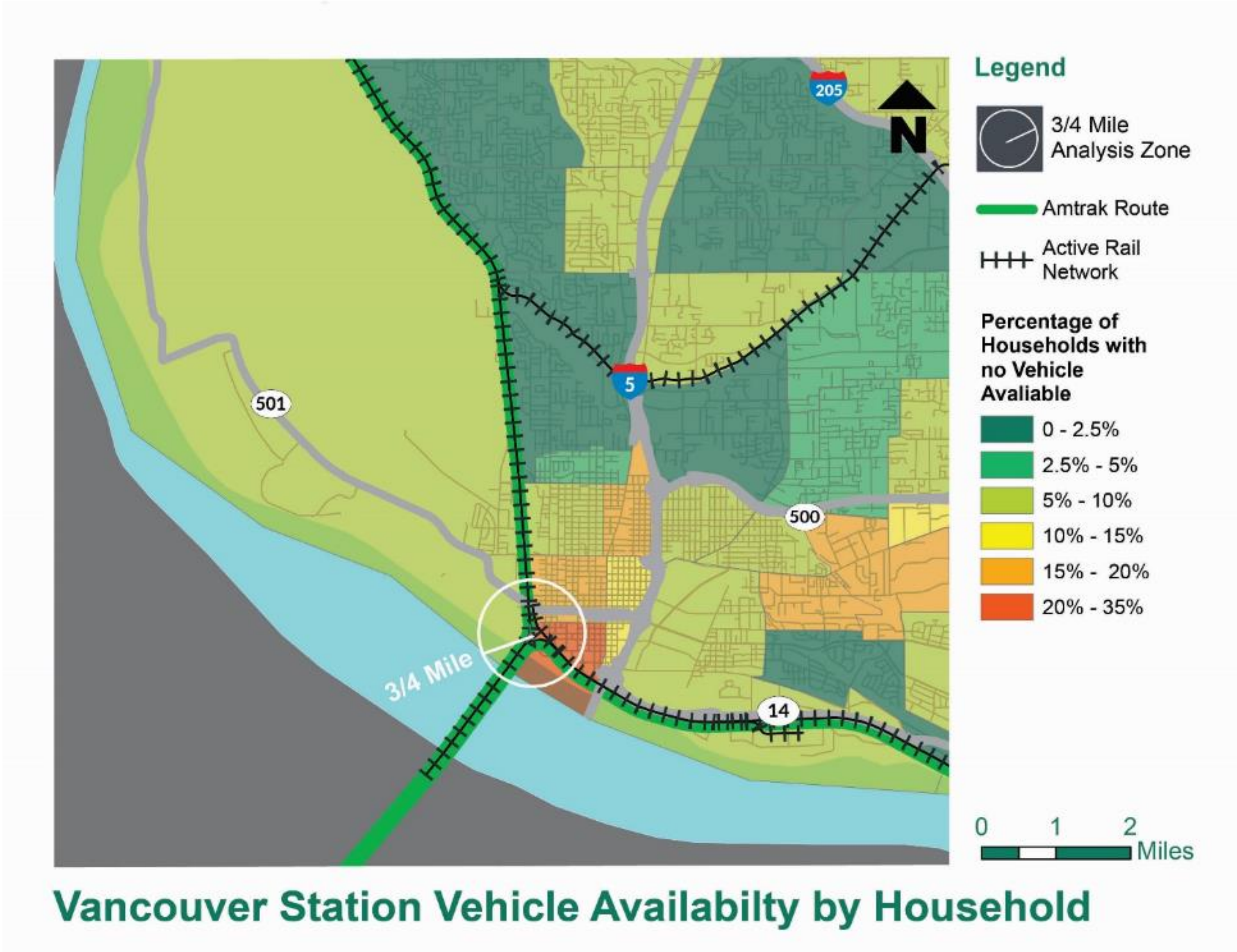


Figure 5: Station Context-Attractors



3799

3800 **Figure 6: Zero-Car Households**

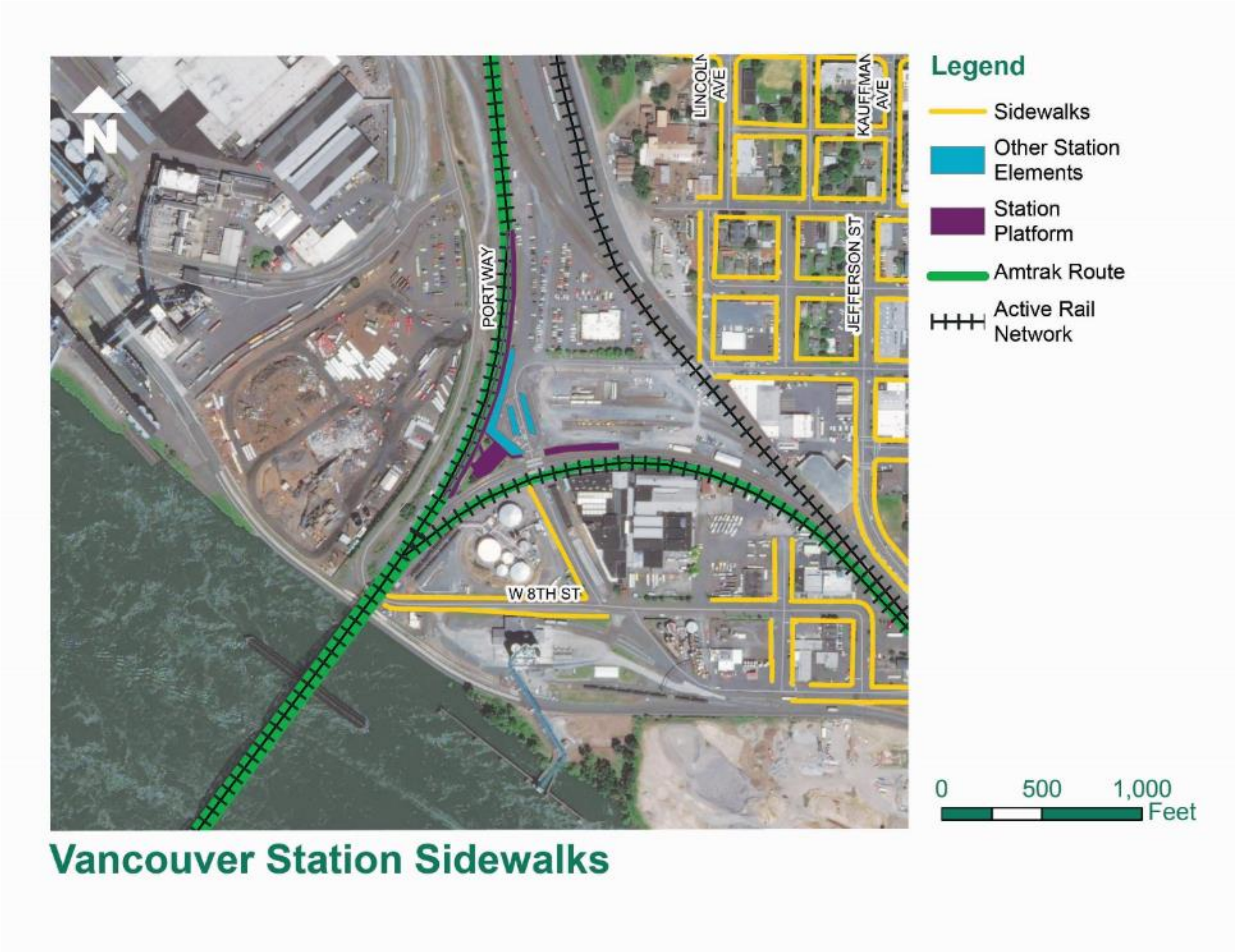
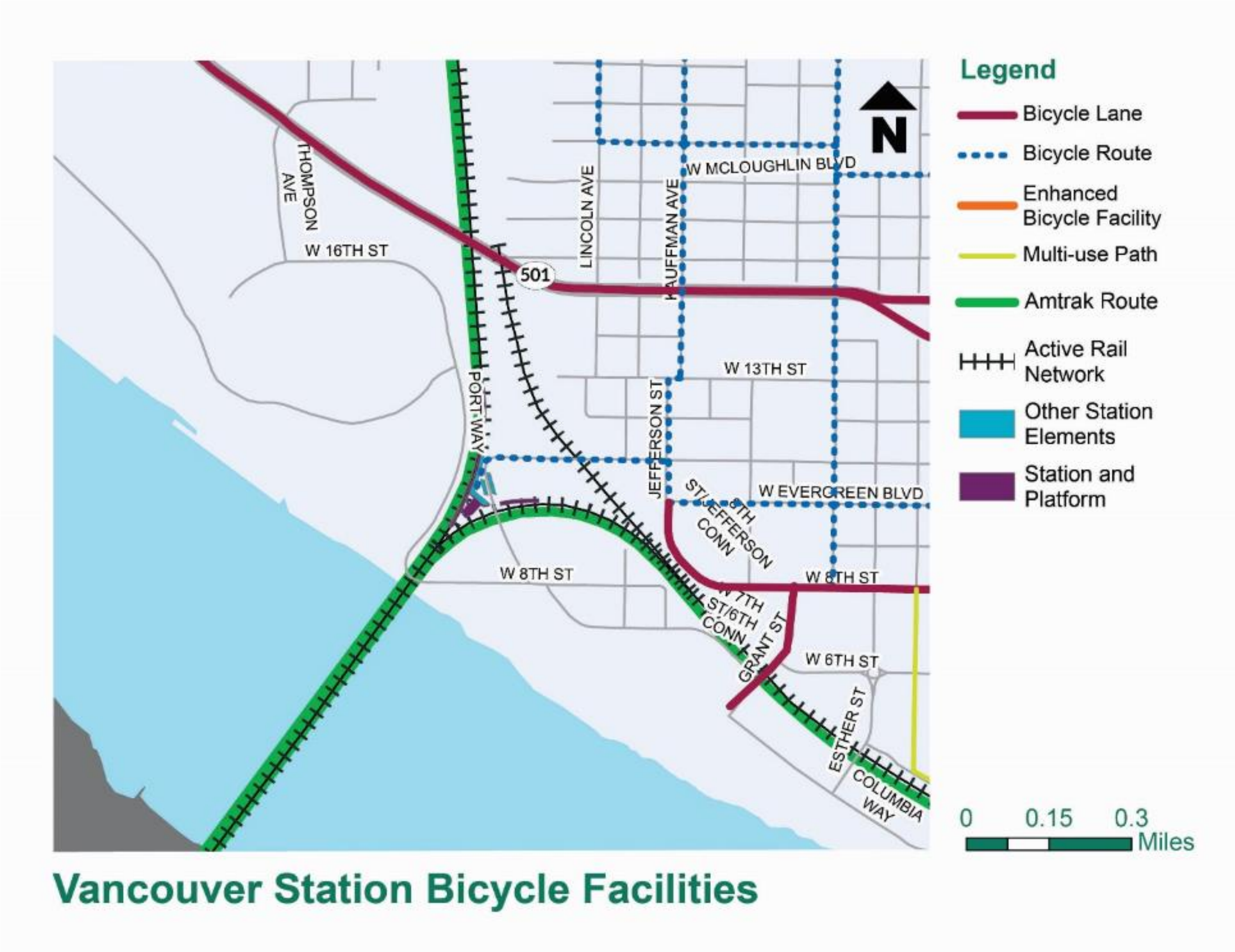


Figure 7: Sidewalks



3804

3805 **Figure 8: Bicycle Facilities**

3806

Supporting information - photo documentation

Site visits were conducted in Vancouver, WA on October 10, 2018 to inventory assets at the station and assess multimodal connections.

Photo 1: Corner of Hill and 8th Street. Sidewalk in poor condition with no connectivity.

Photo 2: 11th Street from station. No sidewalks, but wayfinding signs have been installed.

Photo 3: Amtrak Empire Builder Platform

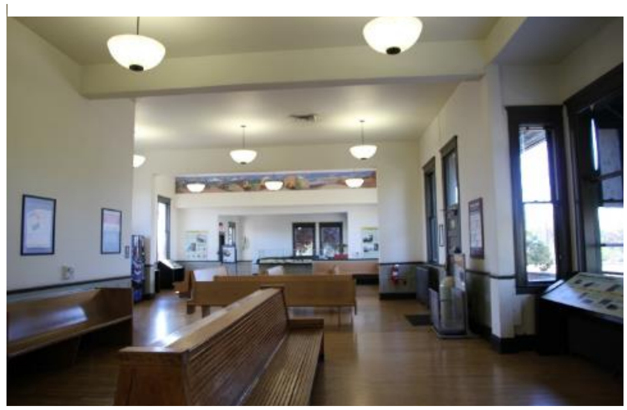


Photo 4: Interior of Amtrak Station

Photo 5: Railroad Crossing of Hill Street

Photo 6: Railroad Crossing of 11th Street

Kelso, WA

Kelso Multimodal
Transportation Center
501 South First Avenue
Kelso, WA 98626

Kelso-Longview, WA

Multimodal Transportation Center

Connectivity Score

6.3

Station overview

The Kelso Multimodal Station connects directly to the downtown/main street area of Kelso, Washington. The City of Kelso is the owner and operator of the station, which is used to support the local bus system and offers public meeting facilities. The station is also known for its volunteers that provide customer service at the station.

The station served approximately 26,000 passengers in 2017. Trip purpose and mode of access data gathered from a 2018 on-board passenger survey is summarized in Figures 1 and 2. (The on-board survey reached over 1,000 Amtrak Cascades passengers, producing statistically significant results for the corridor. However, at the station level, results may not be statistically significant, particularly at stations with lower ridership.)

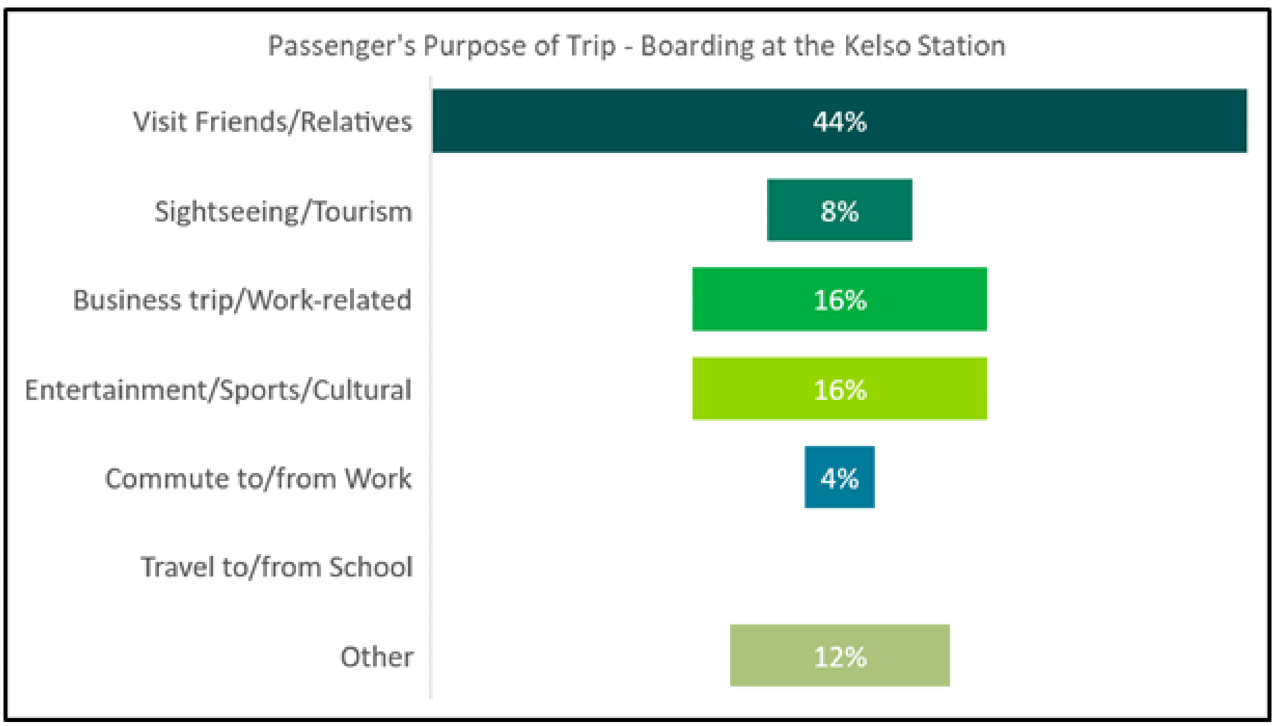


Figure 9: Survey Results-Trip Purpose

Note: Survey respondents had the option of selecting more than one response.

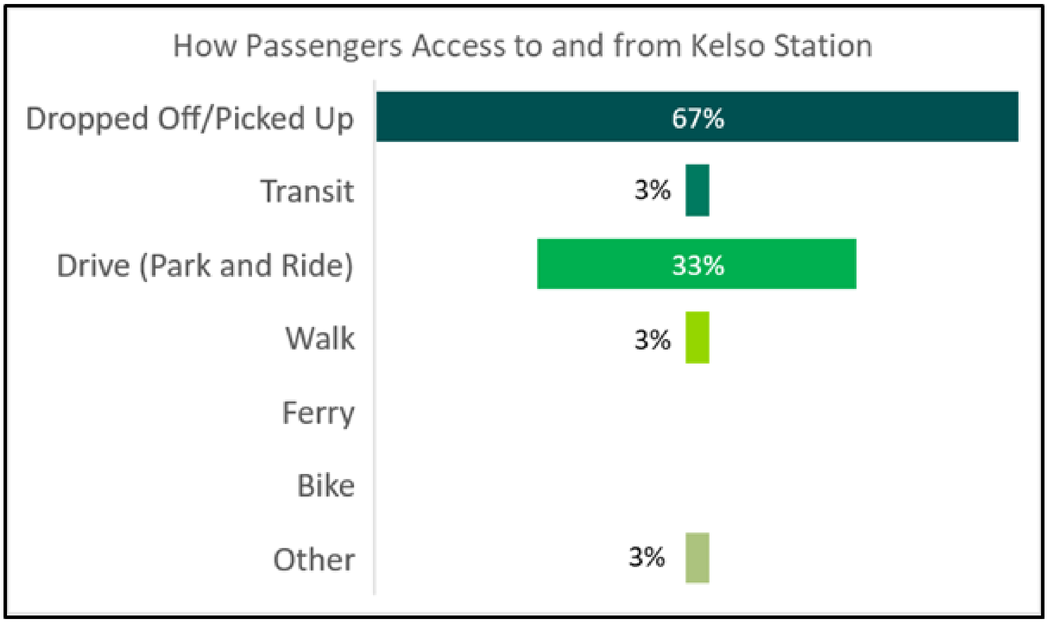


Figure 10: Survey Results-Mode of Access

Note: Survey respondents had the option of selecting more than one response.

Parking, and drop-off/pick-up

A surface parking lot at the station provides 10 parking spaces, including dedicated accessible parking spaces. Additionally, yellow curb markings in front of the station extend approximately 200 feet and can be used for drop-off/pick-up by taxi, transportation network companies, or human services transportation providers. However, there is no signage that indicates this use of the designated curb space.

Walk and transit access

From a pedestrian standpoint, the Kelso Station is very accessible. The two-main entry/exit points of the station connect to 1st Avenue and Ash Street. At this connection point, the City has improved the intersection with colored pavers and ADA compliant ramps. The street parallel to the station, Pacific Avenue, has marked crosswalks at every block that are supported by sidewalks. Additionally, pedestrian lighting is integrated into the station, on 1st Avenue, Ash Street, and Pacific Avenue.

The wayfinding signs are oriented to people driving cars, with icons and arrows that indicate where to turn for the Amtrak station. No wayfinding signs for people at the station were observed.

Access to local/regional bus service is integrated into the station. There are bus stops outside of the station connected by sidewalks.

Bicycle access

The Cowlitz River Trail, a shared use path that is separated from the train tracks by a fence, is the only bicycle facility providing a connection to the station. Access to this trail is not immediately adjacent to the station, and no wayfinding signs are posted. While there are no other existing bicycle facilities, the Cowlitz-Wahkiakum Council of Governments Bicycle and Pedestrian Assessment report indicates that there are many proposed bike improvements in Kelso connected to the Amtrak station area.

Connectivity analysis

As shown in Table 1, analysis of land use, mobility and transportation measures for the Kelso station yielded a connectivity score of 6.3, of a possible 10 points, indicating significant gaps in the existing connectivity of the station.

The station achieved high sub-scores in three categories: station location context, zero car households, and the connecting sidewalks. The analysis also highlights deficiencies of the Kelso Multimodal Station that include: low availability of bicycle routes and facilities, unclear areas for drop-off/pick-up, a low number of attractors, and low-quality wayfinding signs and information.

Table 1. Connectivity Evaluation Workbook:	**Kelso/Longview**				
Categories & Measures	**Measures**	**Maximum Points**	**Maximum Score**	**Points**	**Score**
LAND USE	**2**	**6**	**2**	**6**	**2.0**
Station Location Context & Attractors		3		3	
Zero Car Household		3		3	
MOBILITY	**3**	**9**	**3**	**4**	**1.3**
Transit Service		3		1	
Private Transportation Connection Options		3		1	
Human Services Transportation		3		2	
CONNECTED TRANSPORTATION NETWORK	**5**	**15**	**5**	**9**	**3.0**
At-Grade Railroad Crossings		3		3	
Sidewalks		3		3	
Bicycle Facilities		3		1	
Drop-off/Pick-up Areas		3		1	
Wayfinding		3		1	
Station Connectivity-Total	**10**	**30**	**10**	**19**	**6.3**

Candidate improvements

Based on the results of the connectivity analysis and the field visits, Figure 3 and Table 2 identify candidate pedestrian, bicycle, multimodal and railroad crossing improvements that can be expected to enhance connectivity to the Kelso Amtrak station and promote increased safety for all travel modes. These candidate improvements, including potential project examples and/or locations, were identified based on the systemwide candidate improvement types, analysis of existing connectivity gaps, and site visits. These representative examples may include facilities owned by the State, Amtrak, railroads or local agencies. WSDOT will further evaluate the viability of the opportunities identified here to improve state facilities for better access to Amtrak Cascades stations. Amtrak, railroads and local agencies can consider implementing improvements to their facilities and operations, similar to these representative examples, as they develop their capital improvement and service plans.

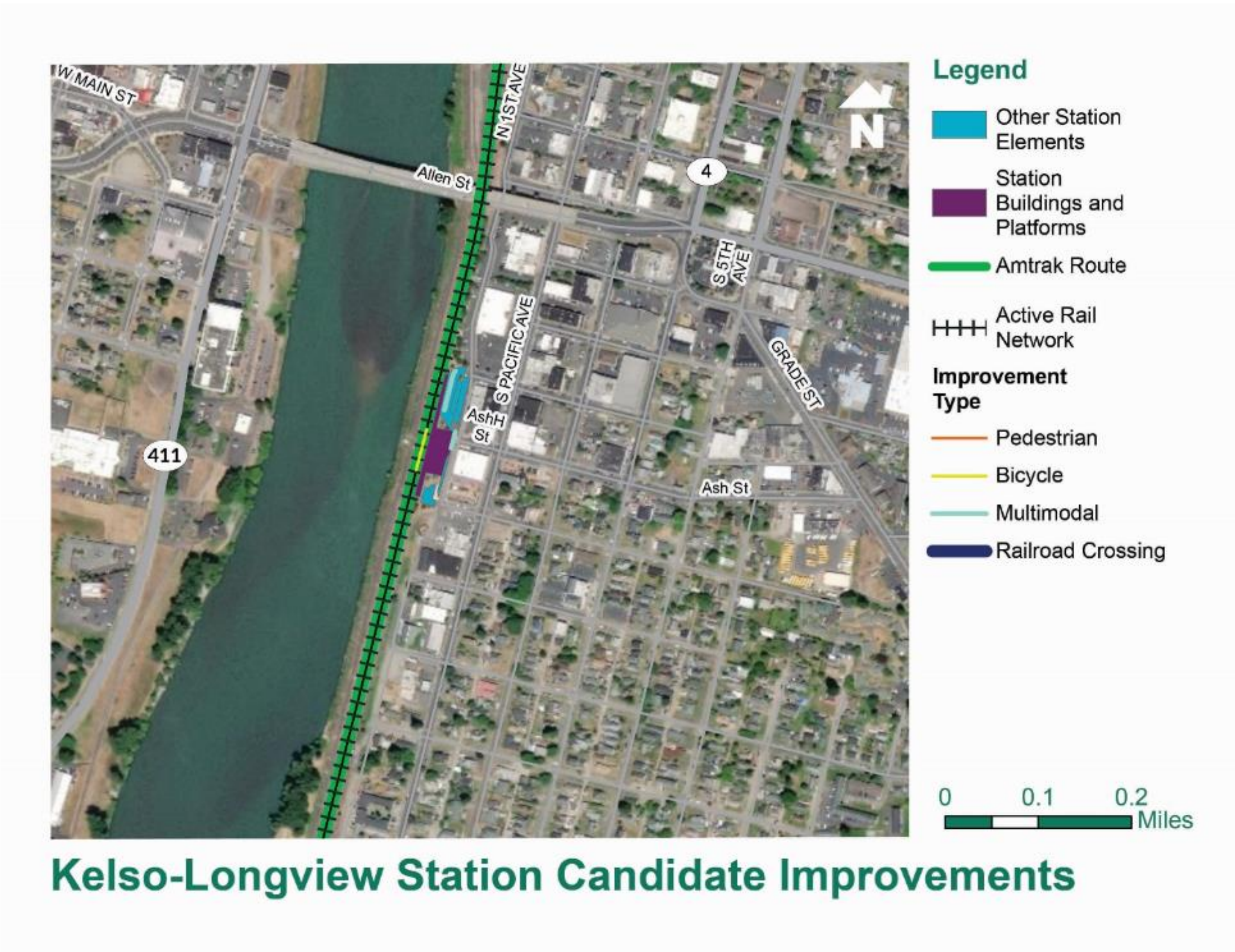


Figure 11: Candidate Improvements

3883

Table 2. Opportunities to Enhance Connectivity at Kelso/Longview			
Type	**Gaps**	**Candidate Improvement***	**Potential Project Examples/ Locations***
Bicycle	Station area access to the Cowlitz River Trail	Bicycle facility improvements within 1/2-mile radius of station	Improve access to Cowlitz River Trail
Multimodal	Designated drop-off/ pick-up area	Signing, striping, and additional designated drop-off/pick-up area for accessible/disabled transportation, either on-site or on-street at station areas	Front of station
Multimodal	Wayfinding signs	Install additional wayfinding signs in station area	Locations to be determined
*WSDOT will work with stakeholders to improve access and connectivity to Amtrak Cascades stations. Local jurisdictions, transit agencies, Amtrak and railroads could consider addressing these opportunities when implementing their capital improvement and service development plans; some of the opportunities identified may also be addressed in these existing plans.			

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Supporting information - connectivity analysis

The summary results and connectivity score for the Kelso station are supported by geospatial representations of four measured criteria (attractors, zero car households, sidewalks, and bicycle facilities) presented in the figures below and in Table C-1. Multimodal Connectivity Analysis: Observed Data & Assignment of Points.

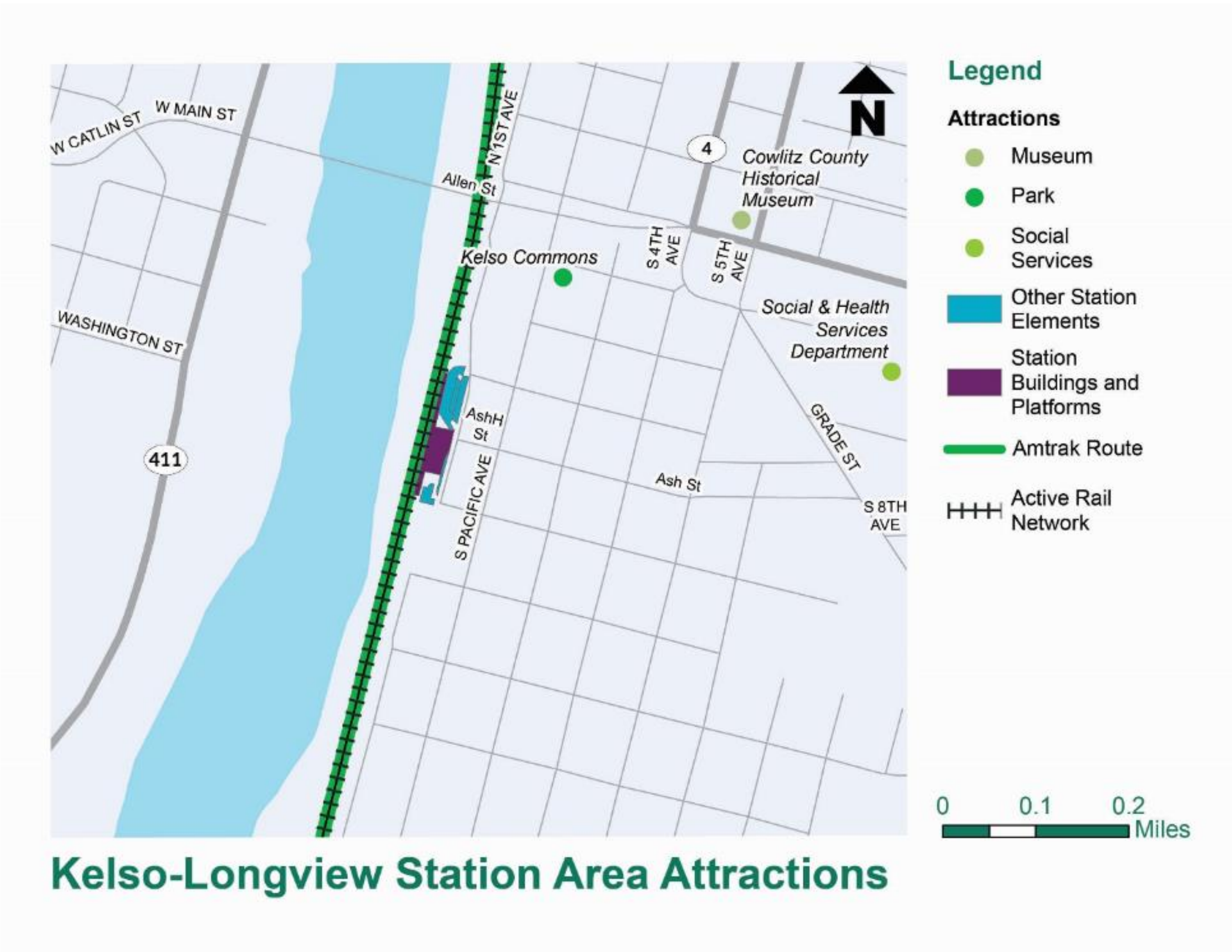
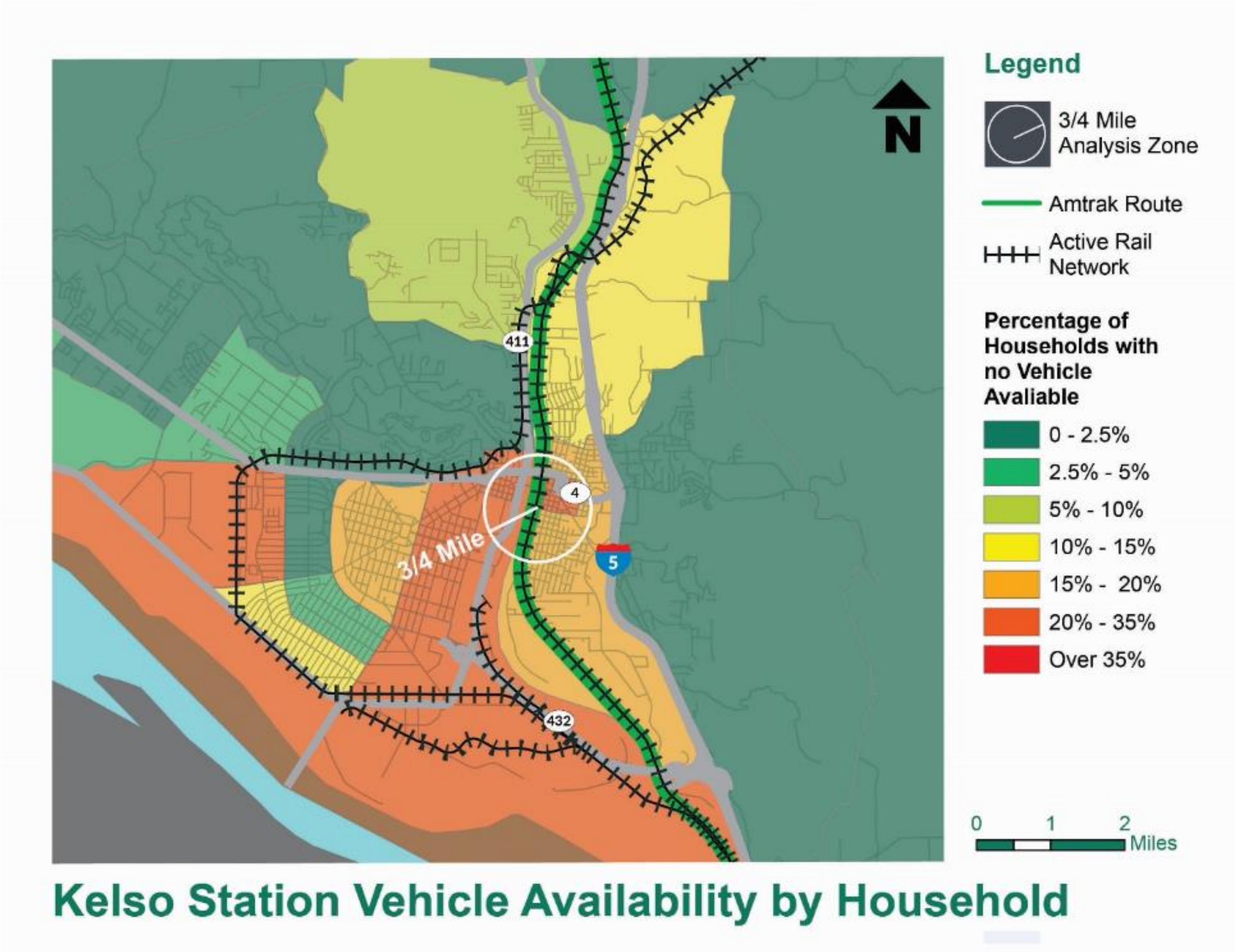


Figure 12: Station Context: Attractors



3895

3896 **Figure 13: Zero-Car Households**

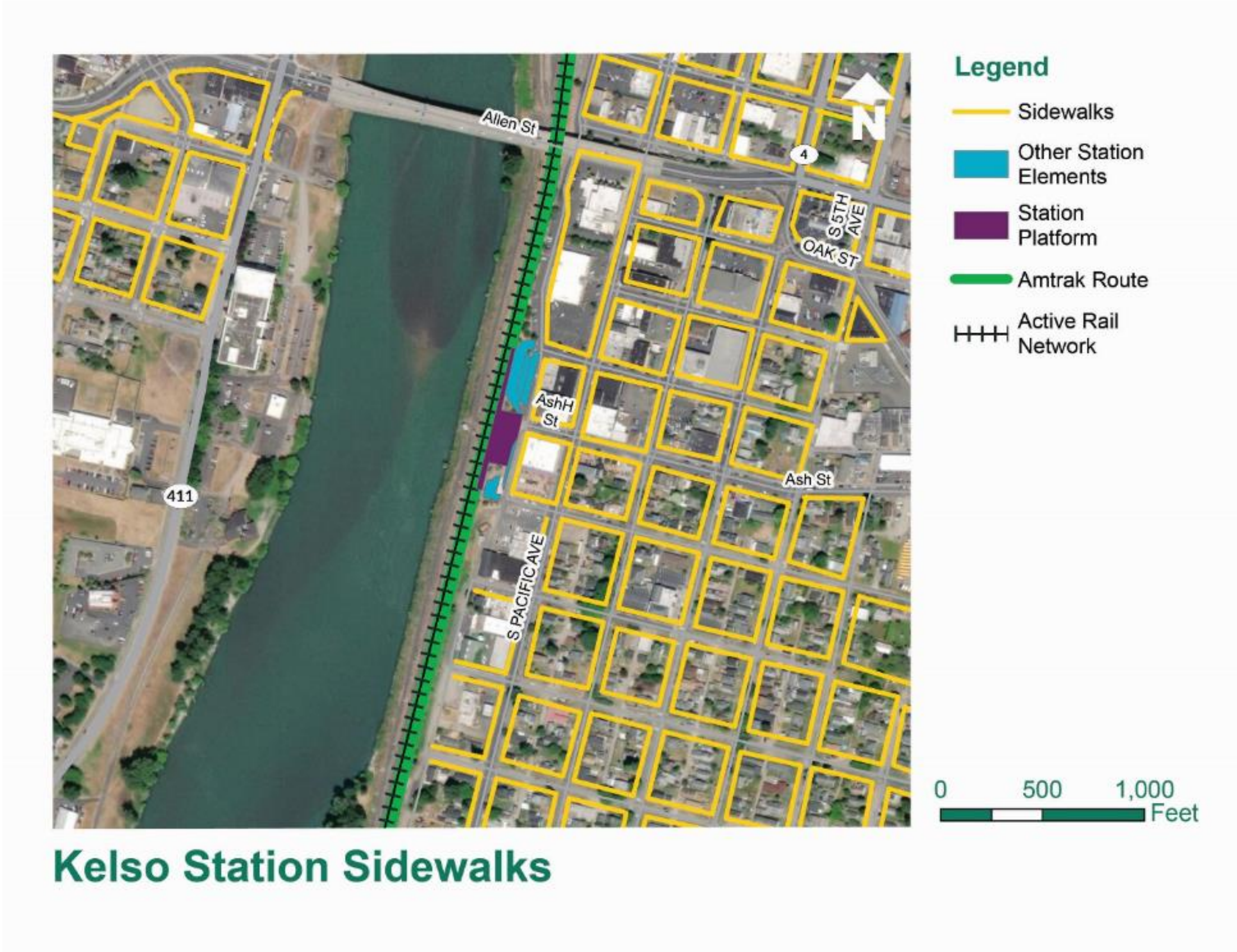


Figure 14: Sidewalks

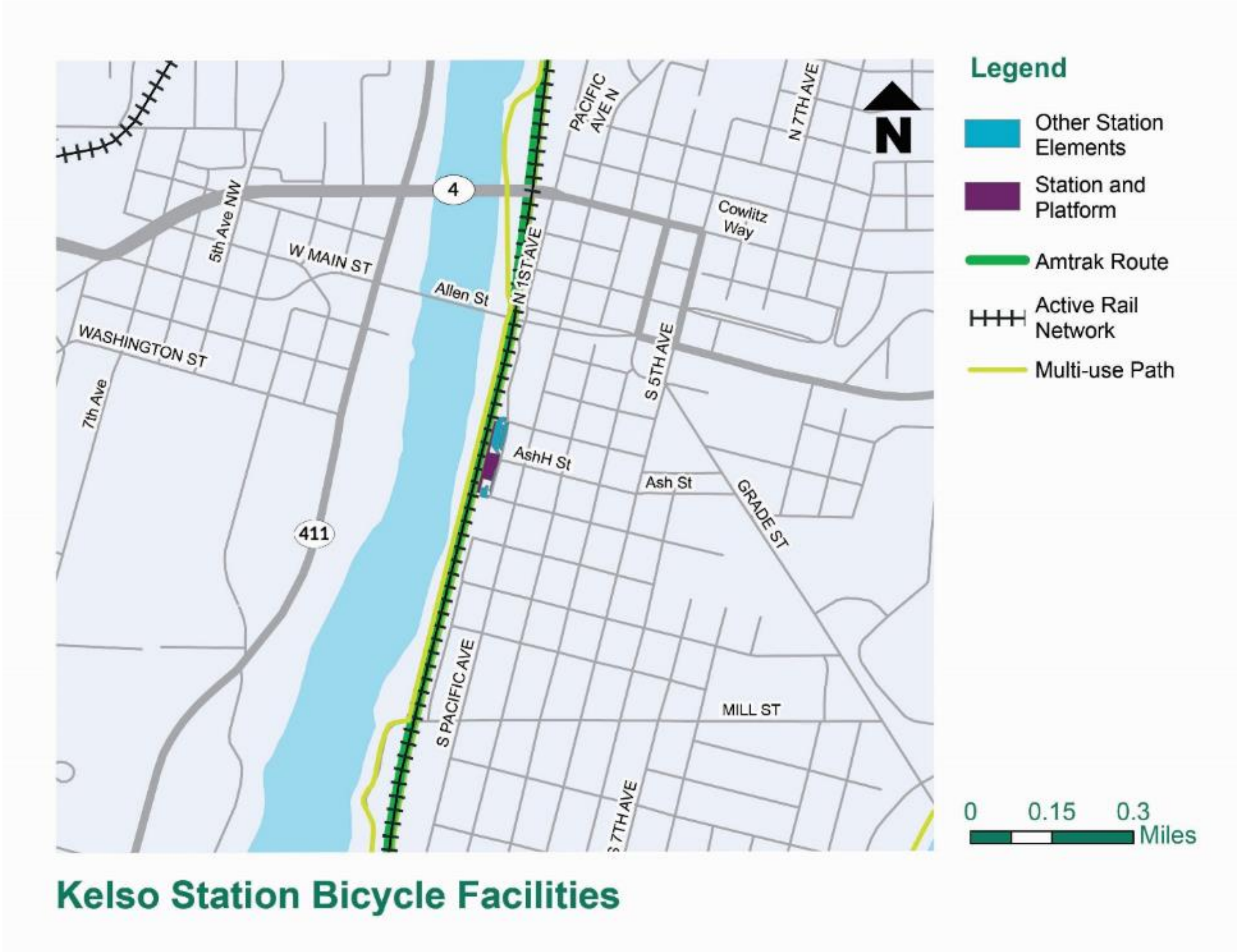


Figure 15: Bicycle Facilities

Supporting information - photo documentation

Site visits were conducted in Kelso on July 25, 2018 and October 10, 2018 to inventory assets at the station and assess multimodal connections.

Photo 1: Kelso Station information board.

Photo 2: Pedestrian crosswalks and sidewalks.

Photo 3: Local bus stop adjacent to the Station.

Photo 4: Kelso platform, railroad tracks.

Photo 5: Kelso Station transit parking signage.

Centralia, WA

Centralia Station

210 Railroad Ave

Centralia, WA 98531

Station Overview

The Centralia Station serves both Amtrak trains and local bus service and is owned by the City of Centralia. This station is also used for special/community events. The station connects directly to downtown Centralia, Washington which has numerous antique shops, eateries, and commercial businesses.

The station served approximately 22,000 passengers in 2017. Trip purpose and mode of access data gathered from a 2018 on-board passenger survey is summarized in Figures 1 and 2. (The on-board survey reached over 1,000 Amtrak Cascades passengers, producing statistically significant results for the corridor. However, at the station level, results may not be statistically significant, particularly at stations with lower ridership.)

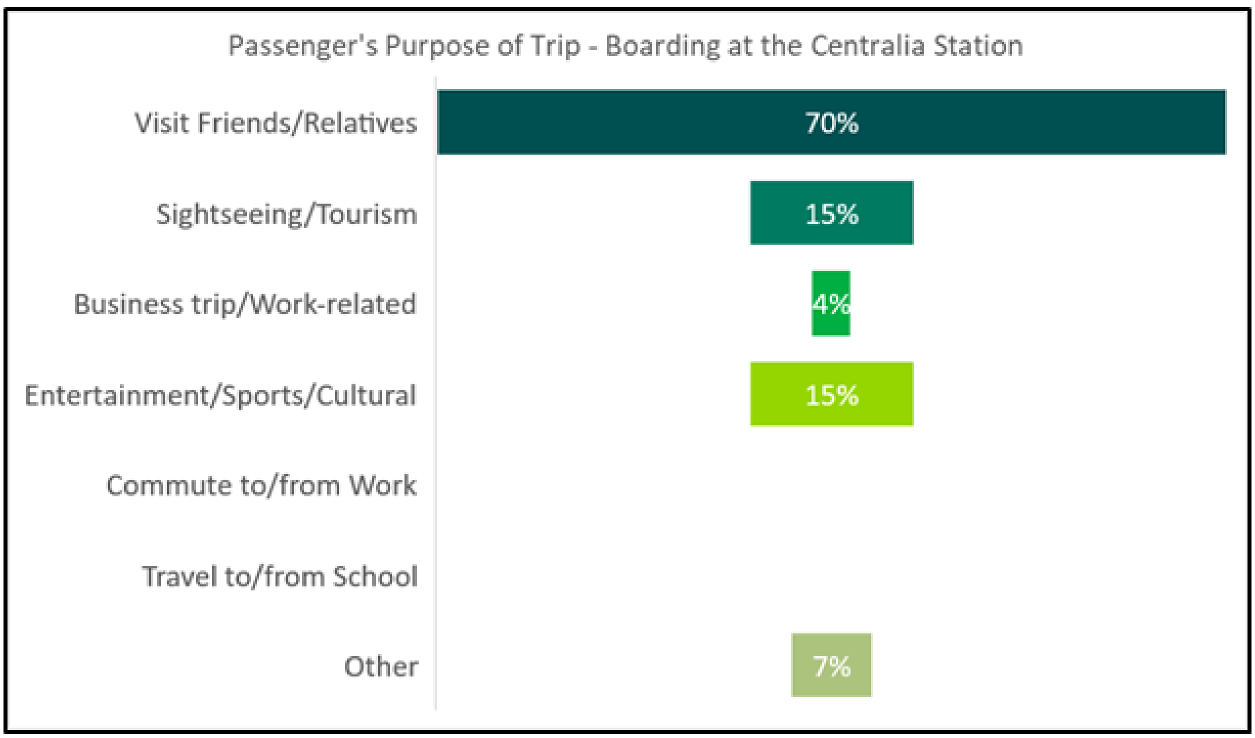


Figure 16: Survey Results-Trip Purpose

Note: Survey respondents had the option of selecting more than one response.

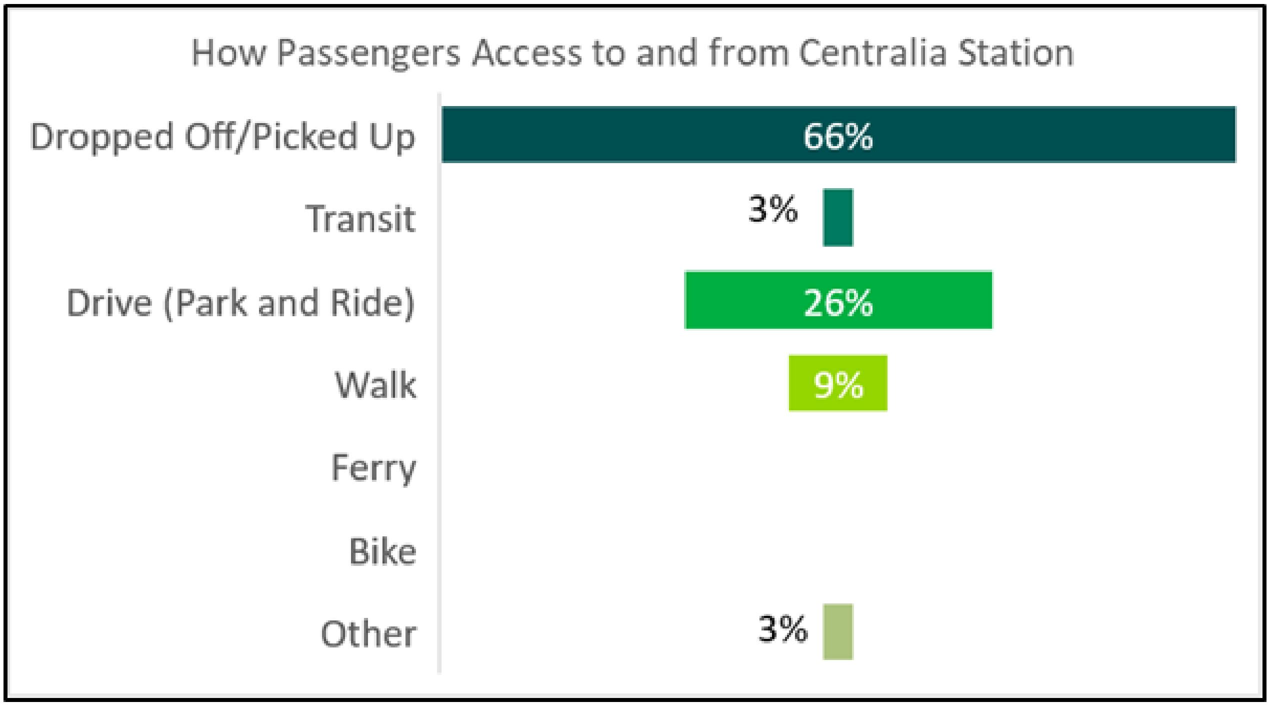


Figure 17: Survey Results-Mode of Access

Note: Survey respondents had the option of selecting more than one response.

Parking, and drop-off/pick-up

Twenty-five parking spaces, including dedicated accessible parking spaces, are provided in surface parking lots at the station. A curb designation extends for about 375 feet in front of the station; this area is used for drop-off/pick-up (use for taxi, transportation network companies, or human services transportation), and bus services. There is signage that indicates that it is for a bus stop/parking, but the signage does not designate it as a drop-off/pick-up zone.

Walk and transit access

From a pedestrian standpoint, the Centralia Station is very accessible, as it connects to the downtown area, with more restricted access connecting to the east side of the station to the residential area. The station faces the back end of the commercial/downtown area on Railroad Avenue, which acts like an alley for the far side of the street. There are sidewalks on one side of this street, the side that is closest to the station. The west side of the street is mainly used for parking, utilities, and trash pick-up/commercial delivery. Pine Street and Magnolia Street directly connect to downtown and have sidewalks and lighting; these streets do not cross the tracks to the east of Centralia Station. Maple Street and Main Street frame the station on the north and south sides of the station parking lots and connect to a residential area on the east side of the railroad tracks. Maple Street does not have sidewalks, nor marked pedestrian crosswalks over the railroad tracks. Main Street does have sidewalks and marked at-grade pedestrian crosswalks over the railroad tracks.

The wayfinding signs are oriented to people driving cars, with icons and arrows that indicate where to turn for the Amtrak station. Even though the station profile indicated that there are wayfinding signs at the station for users, none were observed. Access to local/regional bus service is integrated into the station. There is a signed area for buses.

Bicycle access

People using bicycles to access the Centralia station have limited options. Although the Cowlitz-Wahkiakum Council of Governments Bicycle and Pedestrian Assessment Report (in conjunction with Lewis County and the Regional Transportation Planning Organization) indicates there are existing ‘Active Transportation Facilities,’ this report does not distinguish between sidewalks and bicycle facilities. The results of a site visit indicated there are no connecting bicycle facilities. Bicycle parking racks are provided at the station.

Connectivity analysis

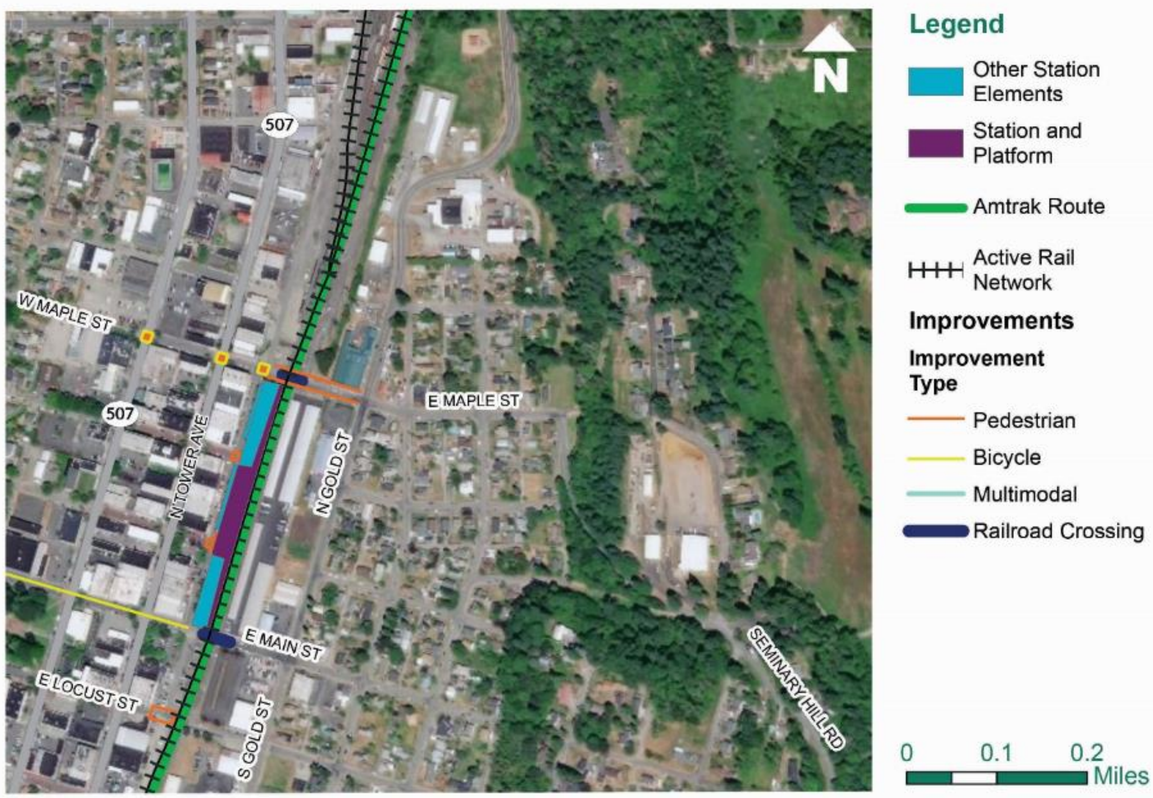
As shown in Table 1, analysis of land use, mobility and transportation network measures for Centralia Station yielded a connectivity score of 6.0, of a possible 10 points, indicating significant gaps in the existing connectivity of the station.

The station achieved higher sub-scores in the three categories: the context of station location, the connection to the regional human services transportation plan, and connected sidewalks. The analysis also highlights deficiencies surrounding the Centralia station that include: a high number of at grade railroad crossings, low availability of connecting bicycle routes and unclear drop-off/pick-up demarcation for customers.

Table 1. Connectivity Evaluation:	Centralia				
Categories & Measures	**Measures**	**Maximum Points**	**Maximum Score**	**Points**	**Score**
LAND USE	**2**	**6**	**2**	**6**	**2.0**
Station Location Context & Attractors		3		3	
Zero-Car Households		3		3	
MOBILITY	**3**	**9**	**3**	**5**	**1.7**
Transit Service		3		1	
Private Transportation Connection Options		3		1	
Human Services Transportation		3		3	
CONNECTED TRANSPORTATION NETWORK	**5**	**15**	**5**	**6**	**2.0**
At-Grade Railroad Crossings		3		0	
Sidewalks		3		3	
Bicycle Facilities		3		1	
Drop-off/Pick-up Areas		3		1	
Wayfinding		3		1	
Station Connectivity-Total	**10**	**30**	**10**	**17**	**5.7**

Candidate improvements

Based on the results of the connectivity analysis and the field visits, Figure 3 and Table 2 identify candidate pedestrian, bicycle, multimodal and railroad crossing improvements that can be expected to enhance connectivity to the Centralia Amtrak station and promote increased safety for all travel modes. These candidate improvements, including potential project examples and/or locations, were identified based on the systemwide candidate improvement types, analysis of existing connectivity gaps, and site visits. These representative examples may include facilities owned by the State, Amtrak, railroads or local agencies. WSDOT will further evaluate the viability of the opportunities identified here to improve state facilities for better access to Amtrak Cascades stations. Amtrak, railroads and local agencies can consider implementing improvements to their facilities and operations, similar to these representative examples, as they develop their capital improvement and service plans.



Centralia Station Candidate Improvements

Figure 18: Candidate Improvements

Table 2. Opportunities to Enhance Connectivity at Centralia Station			
Type	**Gaps**	**Candidate Improvement***	**Potential Project Examples/Locations***
Bicycle	Bicycle lanes	Bicycle facility improvements within 1/2-mile radius of station	Main Street-upgrade facility from bike route to bike lanes
Multimodal	Designated drop-off/ pick-up area	Signage, striping, and additional designated drop-off/pick-up area for accessible/disabled transportation, either on-site or on-street at station areas	Railroad Avenue (front of station) signage/striping improvements
Multimodal	Wayfinding signs	Install additional wayfinding signs in station area	Locations to be determined
Pedestrian	Complete sidewalks (curb, gutter, ramps)	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	Locust Street and Railroad Avenue
Pedestrian	Pedestrian Crossings	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	Maple Street, from railroad tracks to Pearl Street: pedestrian warning improvements (rapid flashing beacons, etc.)
Railroad Crossing	Consistent signing, striping, crossing gates, and crossing surface.	Railroad crossing improvements	Main Street, Maple Street
Transit	Direct local transit service connections.	Additional transit service to station area	New or modified transit routes
*WSDOT will work with stakeholders to improve access and connectivity to Amtrak Cascades stations. Local jurisdictions, transit agencies, Amtrak and railroads could consider addressing these opportunities when implementing their capital improvement and service development plans; some of the opportunities identified may also be addressed in these existing plans.			

4008

Supporting information - connectivity analysis

The summary results and connectivity score for the Centralia station are supported by geospatial representations of four measured criteria (attractors, zero car households, sidewalks, and bicycle facilities) presented in the figures below and in Table C-1. Multimodal Connectivity Analysis: Observed Data & Assignment of Points.

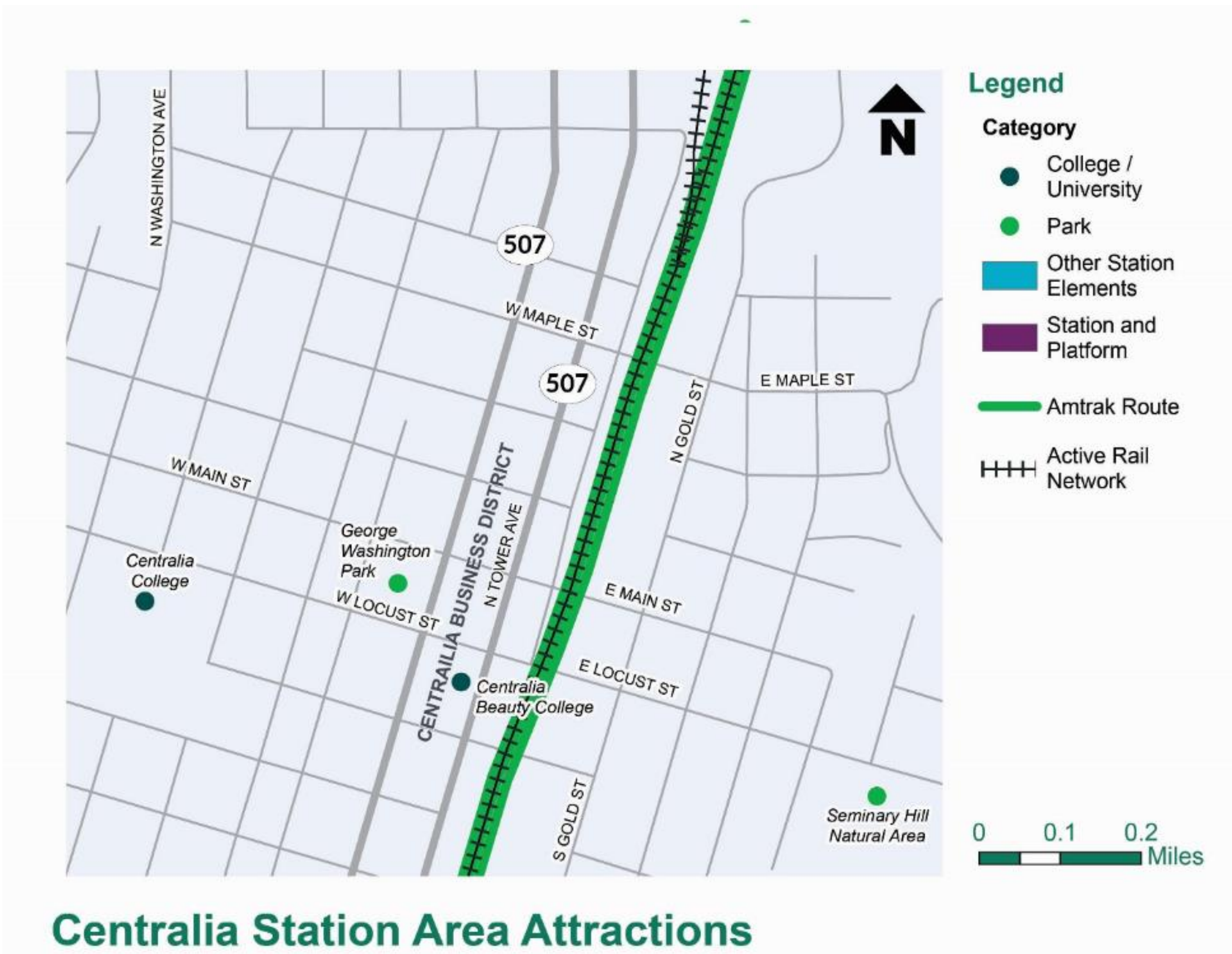
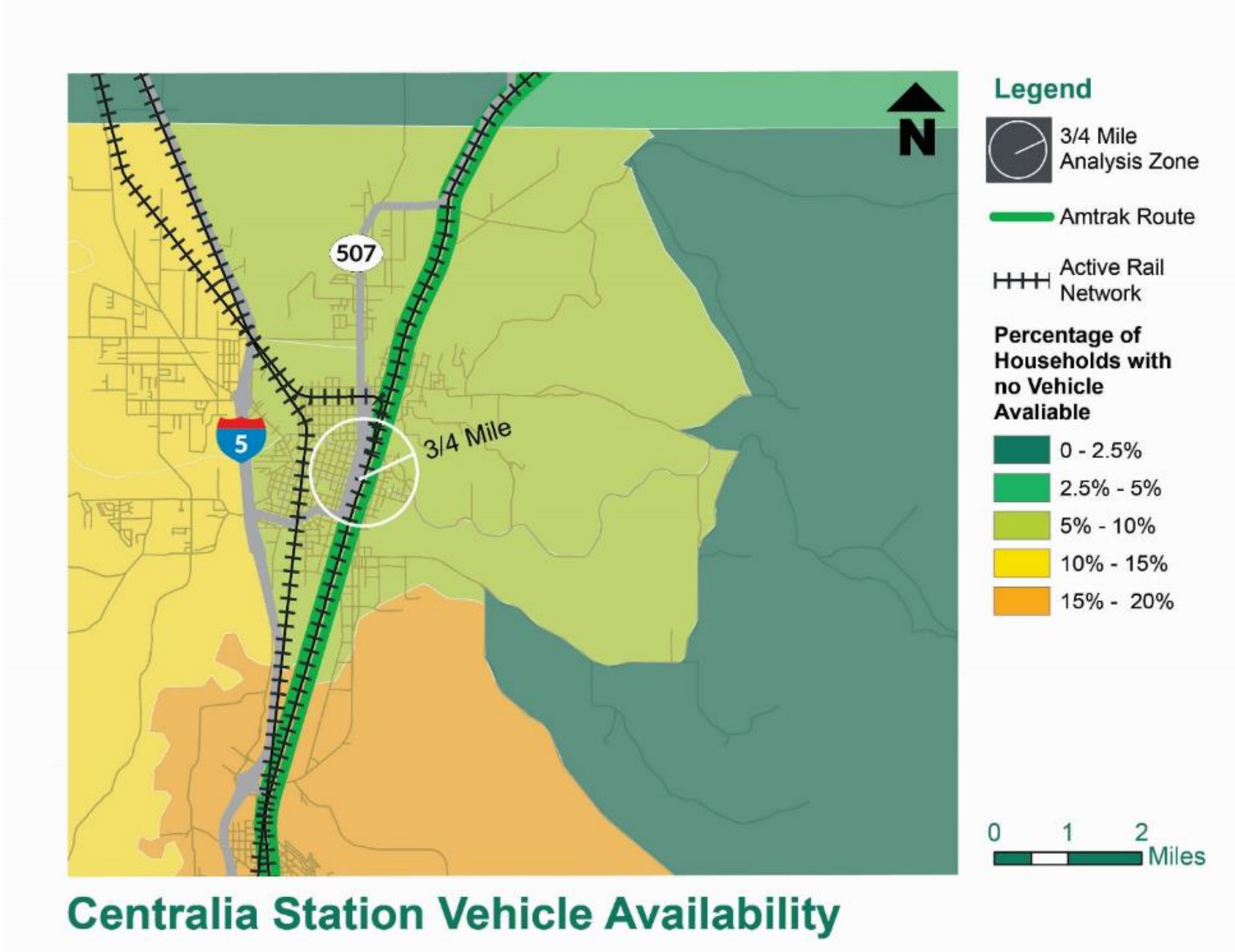


Figure 19: Station Context - Attractors



4019

4020 **Figure 20: Zero-Car Households**

Figure 21: Sidewalks

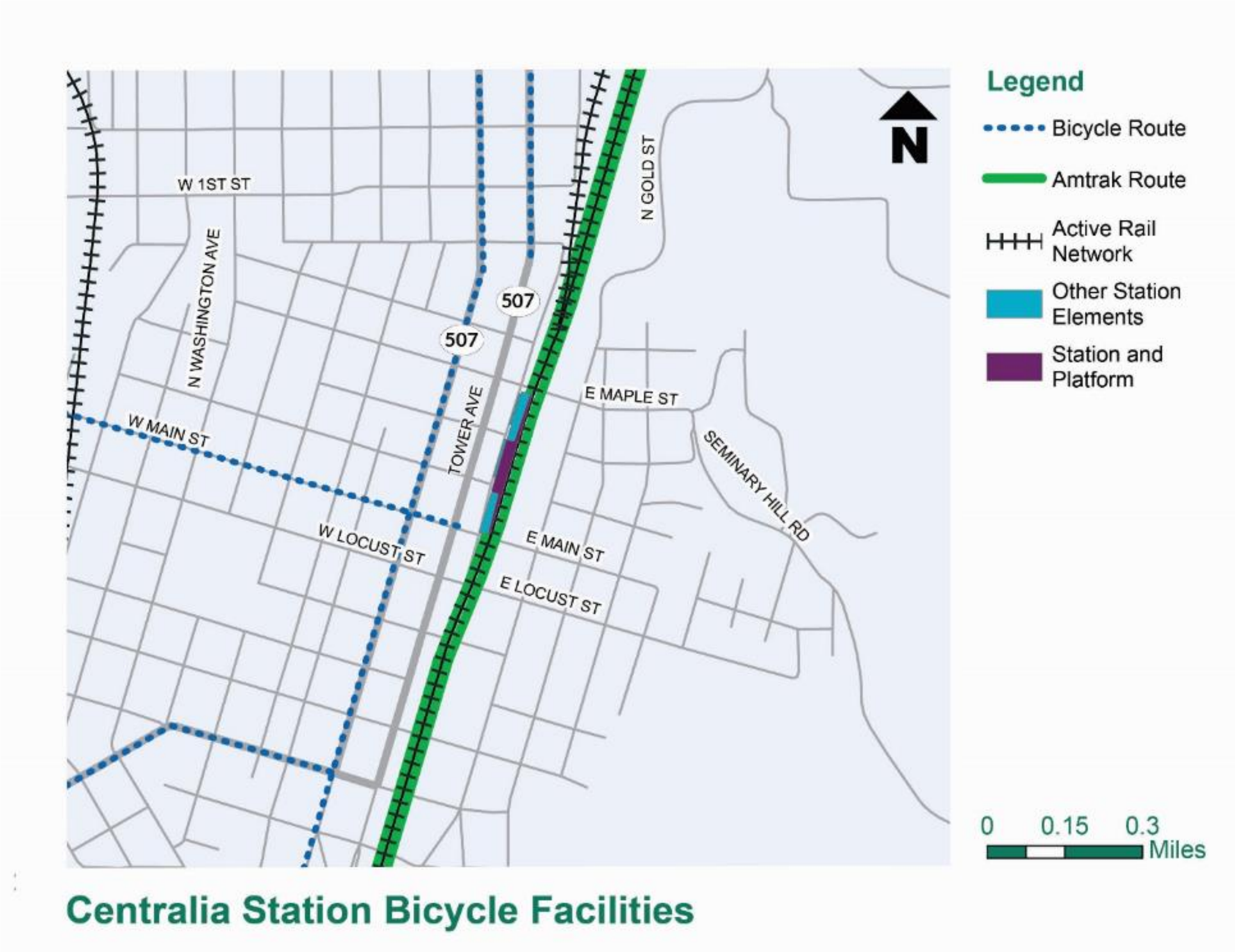


Figure 22: Bicycle Facilities

Supporting information - photo documentation

Site visits were conducted on October 10, 2018 to inventory assets at the station and assess multimodal connections.

Photo 1: Centralia Station frontage to Railroad Ave.

Photo 2: Centralia's wide sidewalks.

Photo 3: Amtrak Cascades train arriving at Centralia Station.

Photo 4: Interior of Amtrak Station

Photo 5: Striped pedestrian crosswalk.

Photo 6: Local bus stop with striped curb north of the station building on Railroad

Olympia - Lacey, WA

Centennial Station

6600 Yelm Hwy SE

Lacey, WA 98513

Olympia-Lacey, WA

Centennial Station

Connectivity Score

4.7

Station overview

Centennial Station, serving the Olympia, Washington area, is located outside the Lacey City limits in Thurston County, Washington. The station is owned by Intercity Transit and managed by a group of at least sixty volunteers that support the Amtrak Cascades and Coast Starlight customers. Unlike most Cascades stations in Washington, which are typically located near the center of urban areas or town centers, the station is located on the fringe between rural and developed land uses. Access to the station is from a two-lane highway with no dedicated bike or pedestrian features.

The station served approximately 52,000 passengers in 2017. Trip purpose and mode of access data gathered from a 2018 on-board passenger survey is summarized in Figures 1 and 2. (The on-board survey reached over 1,000 Amtrak Cascades passengers, producing statistically significant results. However, at the station level, results may not be statistically significant, particularly at stations with lower ridership.)

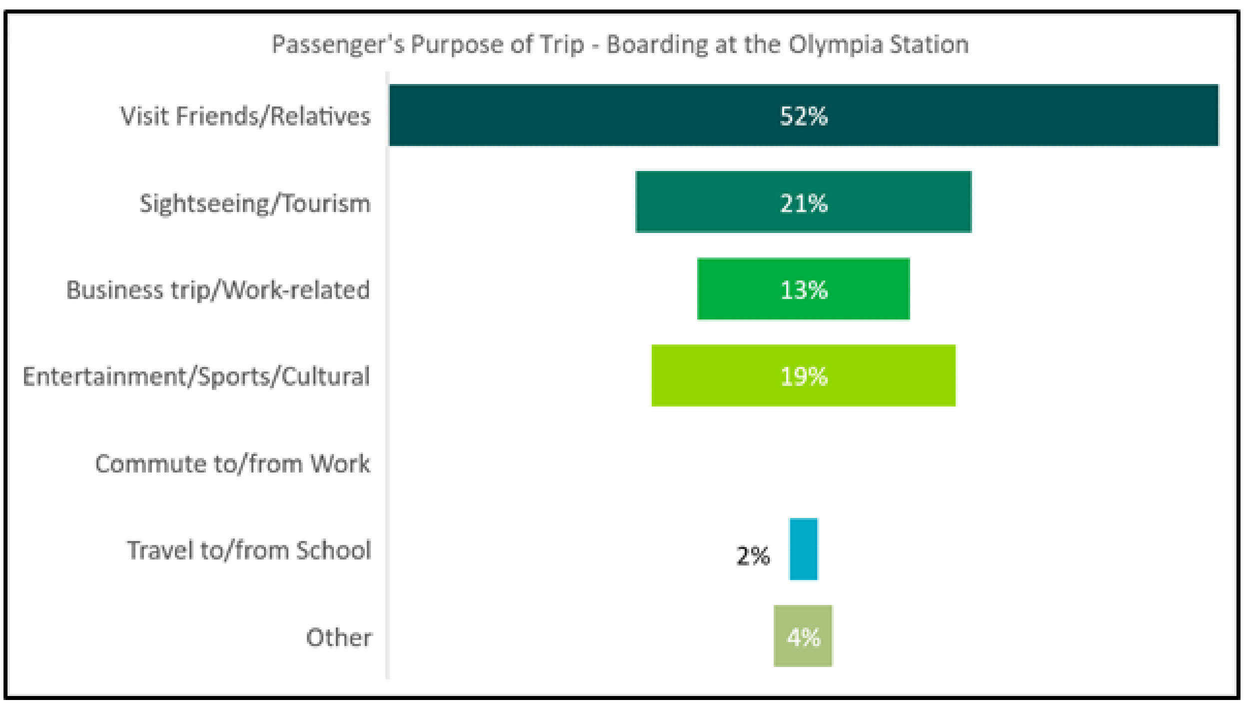


Figure 23: Survey Results-Trip Purpose

Note: Survey respondents had the option of selecting more than one response

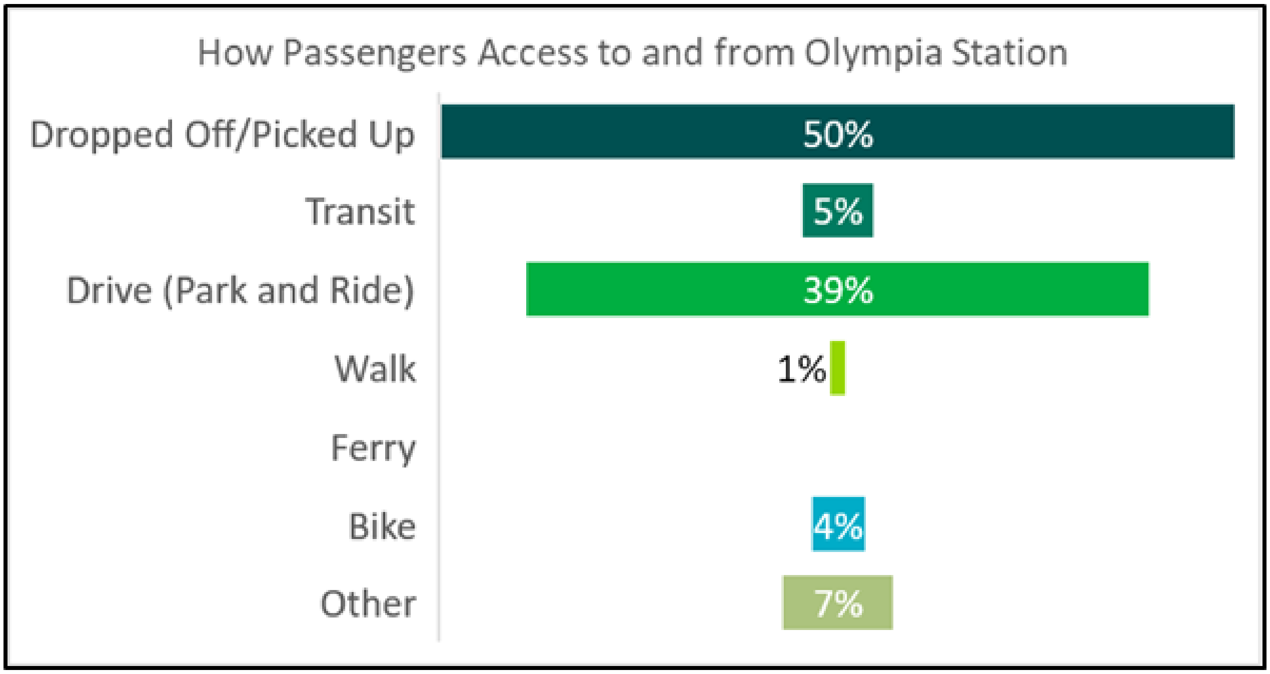


Figure 24: Survey Results-Mode of Access

Note: Survey respondents had the option of selecting more than one response.

Parking and drop-off/pick-up

The station has 98 parking spaces, including dedicated accessible parking spaces, are provided in a surface parking lot. Additionally, yellow curb markings in front of the station delineate an area used for drop-off/pick-up by taxi, transportation network companies, human services transportation providers and transit (bus) service.

Walk and transit access

From a pedestrian standpoint, Centennial Station is not accessible. The station only offers a single roadway connection to Yelm Highway. Neither the access road nor Yelm Highway has sidewalks in the station area.

Wayfinding signs are oriented to people driving cars, with icons and arrows that indicate where to turn for the Amtrak station.

Connections to local and regional bus service are integrated into the station. There is a designated bus stop location with a bus shelter.

Bicycle access

People using bicycles to access the Olympia station have limited options. The Yelm Highway has no designated bicycle lane near the station but does have wide shoulders that allows access for bicyclists that are ‘fearless and confident’ riders. This shoulder becomes restricted on the roadway overpass of the railroad tracks. Bicycle racks have been provided adjacent to the Intercity Transit shelters at the station.

Connectivity analysis

As shown in Table 1, analysis of land use, mobility and transportation network measures for the station yielded a connectivity score of 4.7, of a possible 10 points, indicating significant gaps in the existing connectivity of the station.

The station achieved a high sub-scores only for its human services transportation access and for the lack of at-grade railroad crossings. The analysis highlights deficiencies surrounding the Lacey-Olympia station that include: lack of supportive land uses; low availability of connecting sidewalks and bicycle routes; a lack of connecting transit routes; auto-oriented wayfinding signs, and an unclear drop-off/pick-up area for customers.

Table 1. Connectivity Evaluation:	**Olympia-Lacey**				
Categories & Measures	**Measures**	**Maximum Points**	**Maximum Score**	**Points**	**Score**
LAND USE	**2**	**6**	**2**	**2**	**0.7**
Station Location Context & Attractors		3		1	
Zero-Car Households		3		1	
MOBILITY	**3**	**9**	**3**	**5**	**1.7**
Transit Service		3		1	
Private Transportation Connection Options		3		1	
Human Services Transportation		3		3	
CONNECTED TRANSPORTATION NETWORK	**5**	**15**	**5**	**7**	**2.3**
At-Grade Railroad Crossings		0		3	
Sidewalks		3		1	
Bicycle Facilities		3		1	
Drop-off/Pick-up Areas		3		1	
Wayfinding		3		1	
Station Connectivity-Total	**10**	**30**	**10**	**14**	**4.7**

Candidate improvements

Based on the results of the connectivity evaluation and the field visits, Figure 3 and Table 2 identify candidate pedestrian, bicycle, multimodal and railroad crossing improvements that can be expected to enhance connectivity to the Olympia Centennial Station and promote increased safety for all travel modes. These candidate improvements, including potential project examples and/or locations, were identified based on the system-wide candidate improvement types, analysis of existing connectivity gaps, and site visits. These representative examples may include facilities owned by the State, Amtrak, railroads or local agencies. WSDOT will further evaluate the viability of the opportunities identified here to improve state facilities for better access to Amtrak Cascades stations. Amtrak, railroads and local agencies can consider implementing improvements to their facilities and operations, similar to these representative examples, as they develop their capital improvement and service plans.

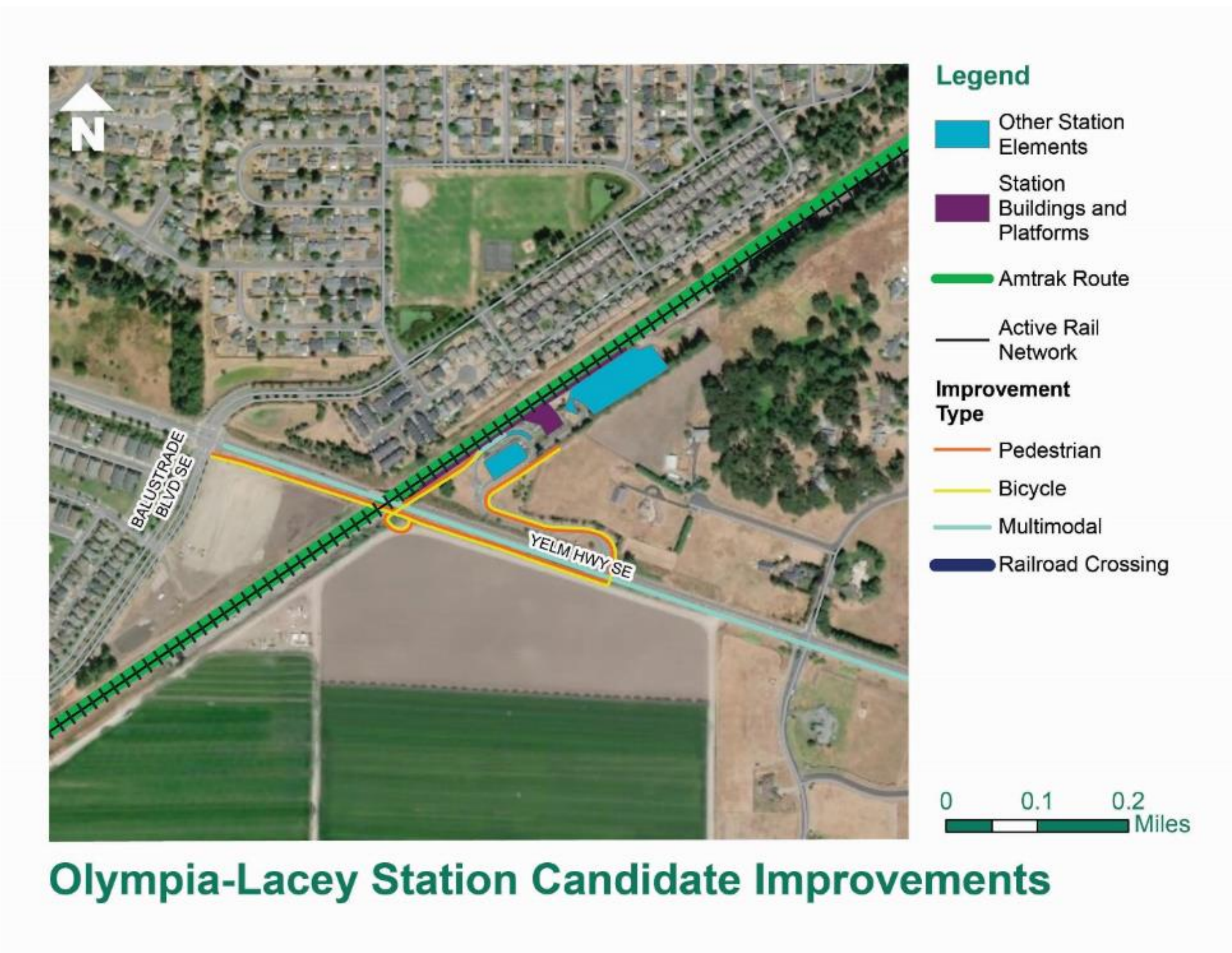


Figure 25: Candidate Improvements

Table 2. Opportunities to Enhance Connectivity at Olympia-Lacey

Type	Gaps	Candidate Improvement*	Potential Project Examples/Locations*
Bicycle & Pedestrian	Sidewalks, bicycle lanes, and direct multimodal connections from Yelm Highway to the Amtrak station.	Pedestrian and bicycle facility improvements within 1/2-mile radius of station	Yelm Highway & station driveway
Multimodal	Designated drop-off/pick-up area	Signage, striping, and additional designated drop-off/pick-up area for accessible/disabled transportation, either on-site or on-street at station areas	Front of station
Multimodal	Wayfinding signs	Install additional wayfinding signs in station area	Locations to be determined

*WSDOT will work with stakeholders to improve access and connectivity to Amtrak Cascades stations. Local jurisdictions, transit agencies, Amtrak and railroads could consider addressing these opportunities when implementing their capital improvement and service development plans; some of the opportunities identified may also be addressed in these existing plans.

Supporting information - connectivity analysis

The summary results and connectivity score for the Olympia- Lacey station are supported by geospatial representations of four measured criteria (attractors, zero car households, sidewalks, and bicycle facilities) presented in the figures below and in Table C-1. Multimodal Connectivity Analysis: Observed Data & Assignment of Points.

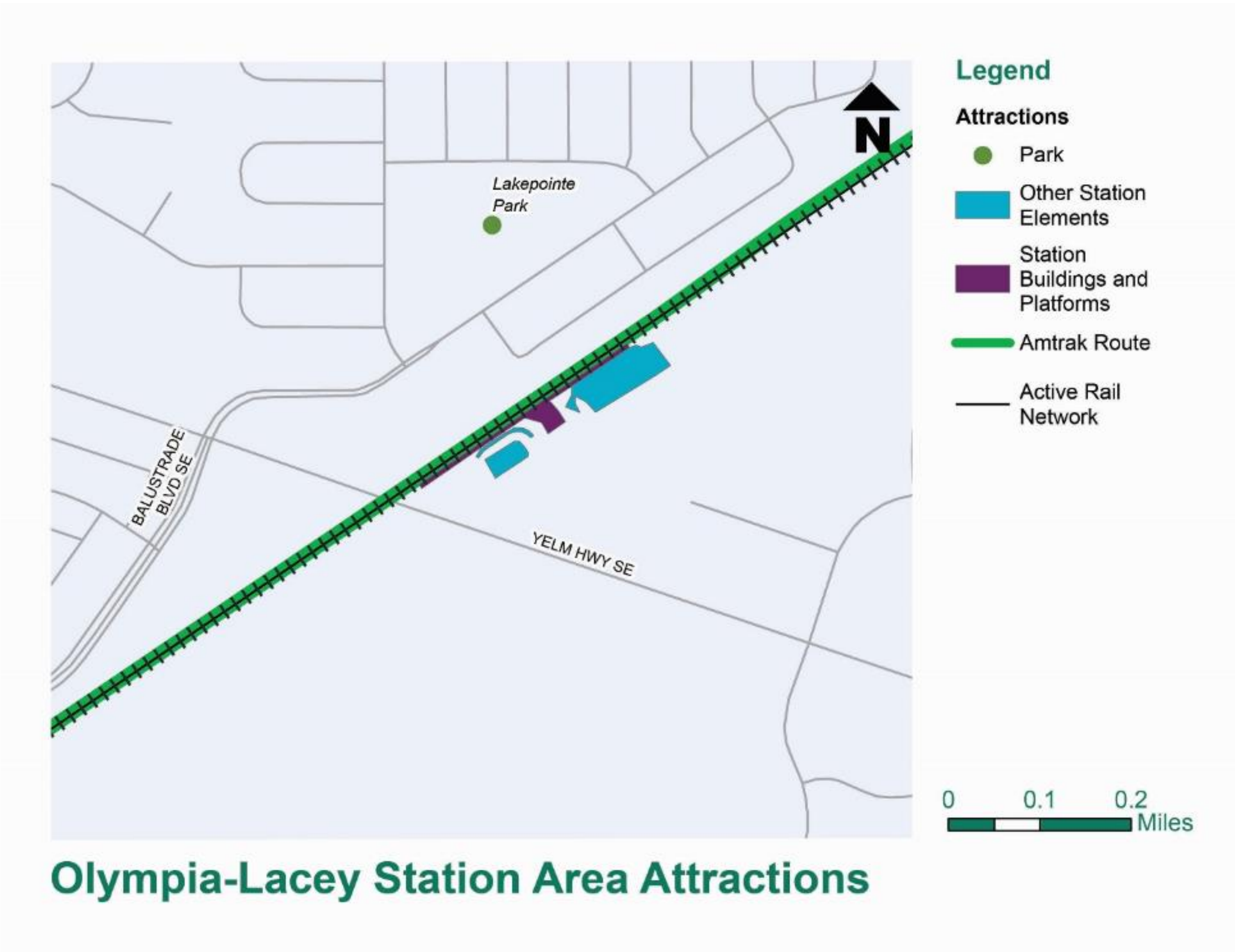
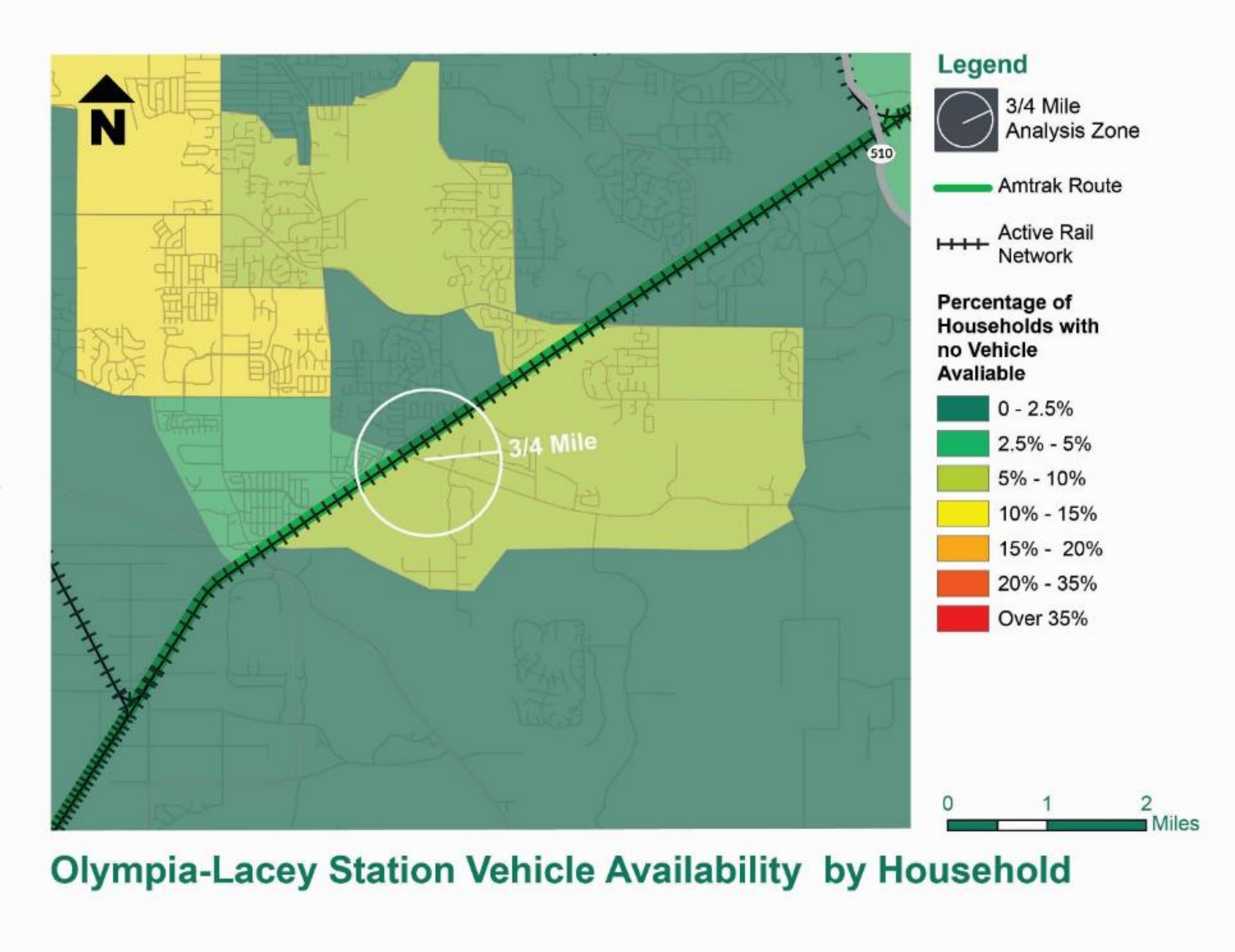


Figure 26: Station Context: Attractors



4134

4135 **Figure 27: Zero-Car Households**

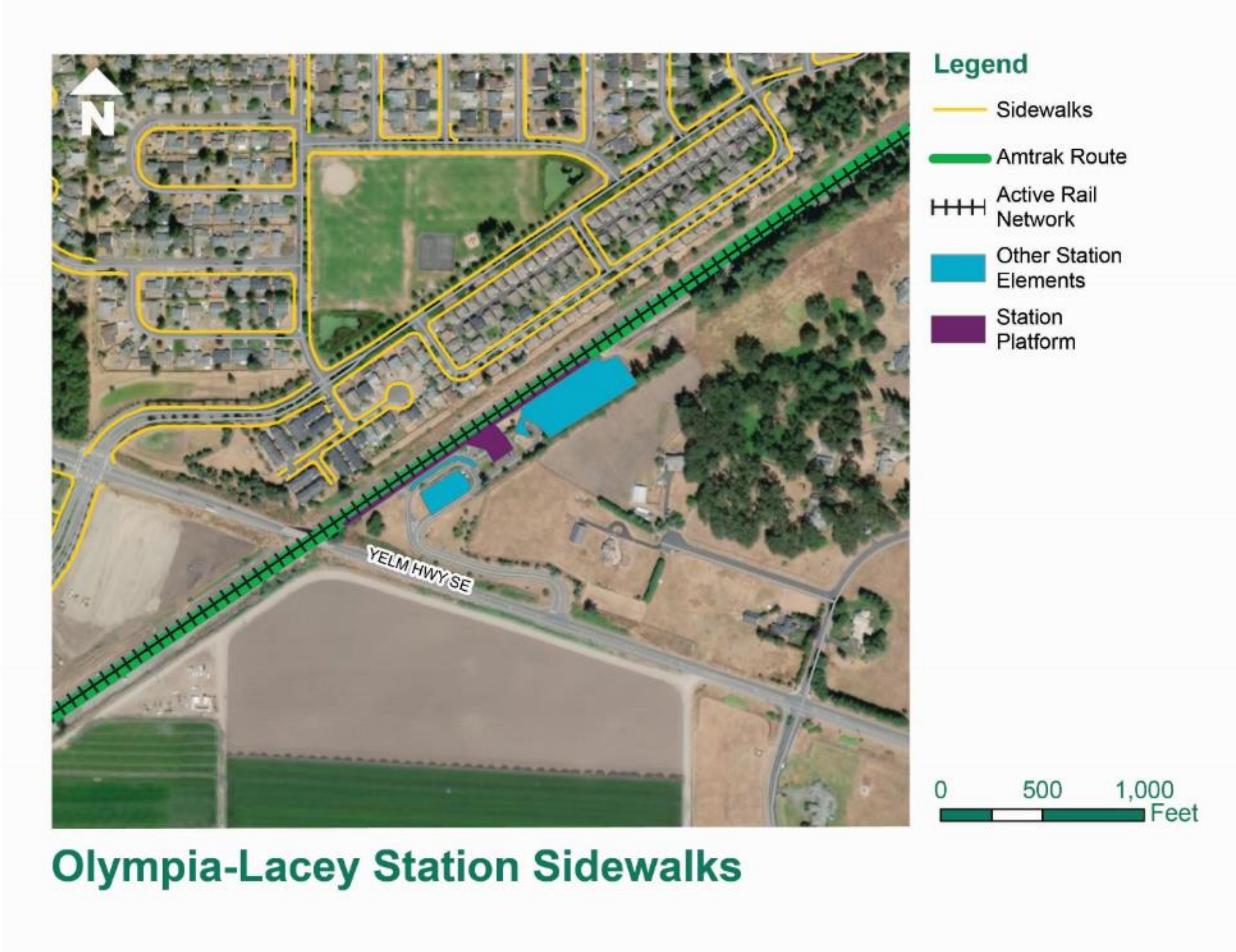
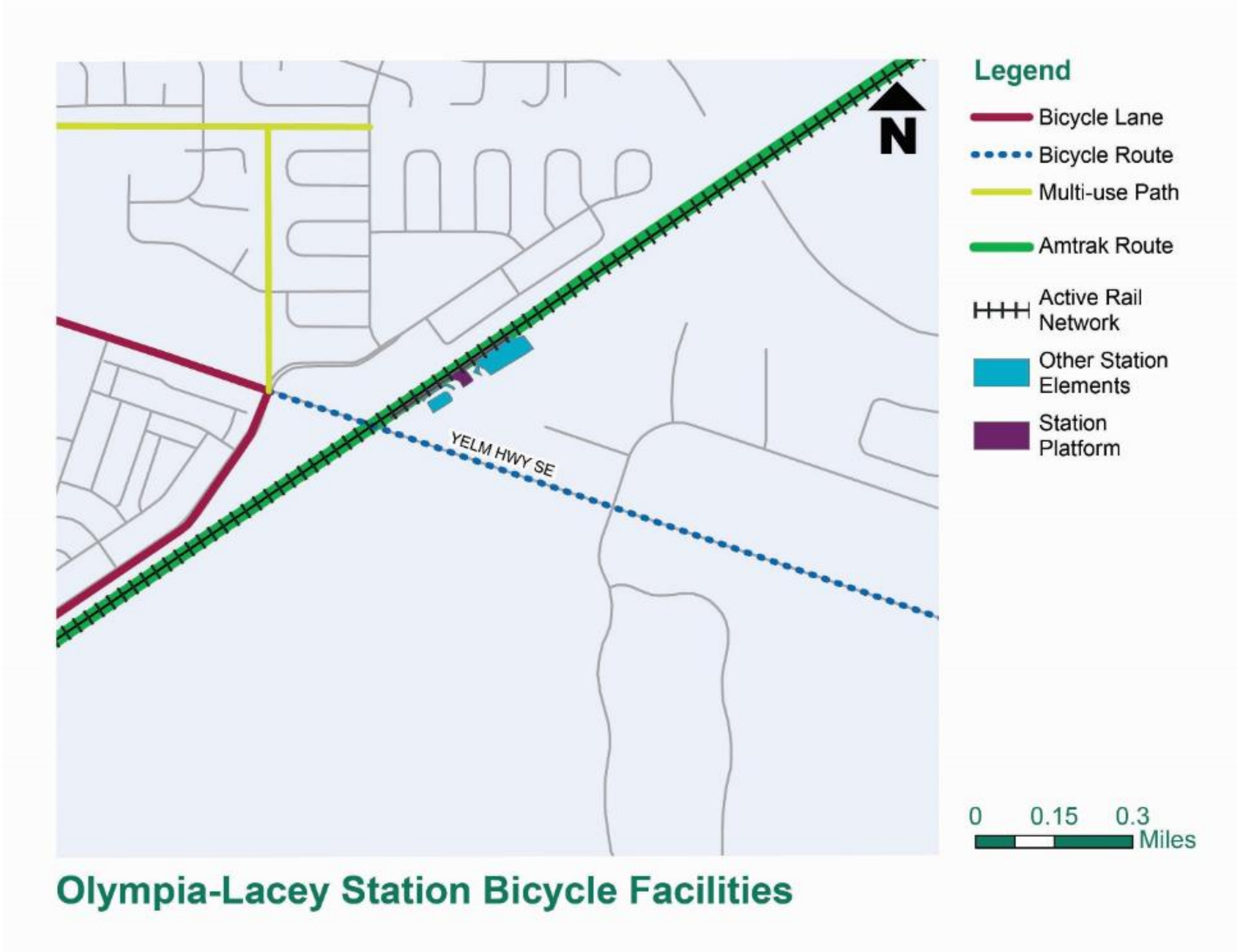


Figure 28: Sidewalks



4139

4140 **Figure 29: Bicycle Facilities**

4141

Supporting information - photo documentation

Site visits were conducted in Olympia on October 10, 2018 to inventory assets at the station and assess multimodal connections.

Photo 1: Local bus stop shelters and bike rack.

Photo 2: Yellow marked curb for bus routes with wide sidewalks.

Photo 3: Olympia-Lacey Station exterior.

Photo 4: Olympia-Lacey Station interior.

Tacoma, WA

Tacoma Dome Station

422 E 25th St

Tacoma, WA 98421

Tacoma, WA

Tacoma Dome Station

Connectivity Score

8.0

Station overview

Amtrak Cascades service to Tacoma, Washington has been provided from a station located on Puyallup Avenue, but will be moving to Tacoma Dome Station at Freighthouse Square soon. Existing conditions and connectivity were analyzed with respect to the new Tacoma Dome Station location.

The station served approximately 88,000 passengers in 2017. Trip purpose and mode of access data gathered from a 2018 on-board passenger survey is summarized in Figures 1 and 2. (The on-board survey reached over 1,000 Amtrak Cascades passengers, producing statistically significant results for the corridor. However, at the station level, results may not be statistically significant, particularly at stations with lower ridership.)

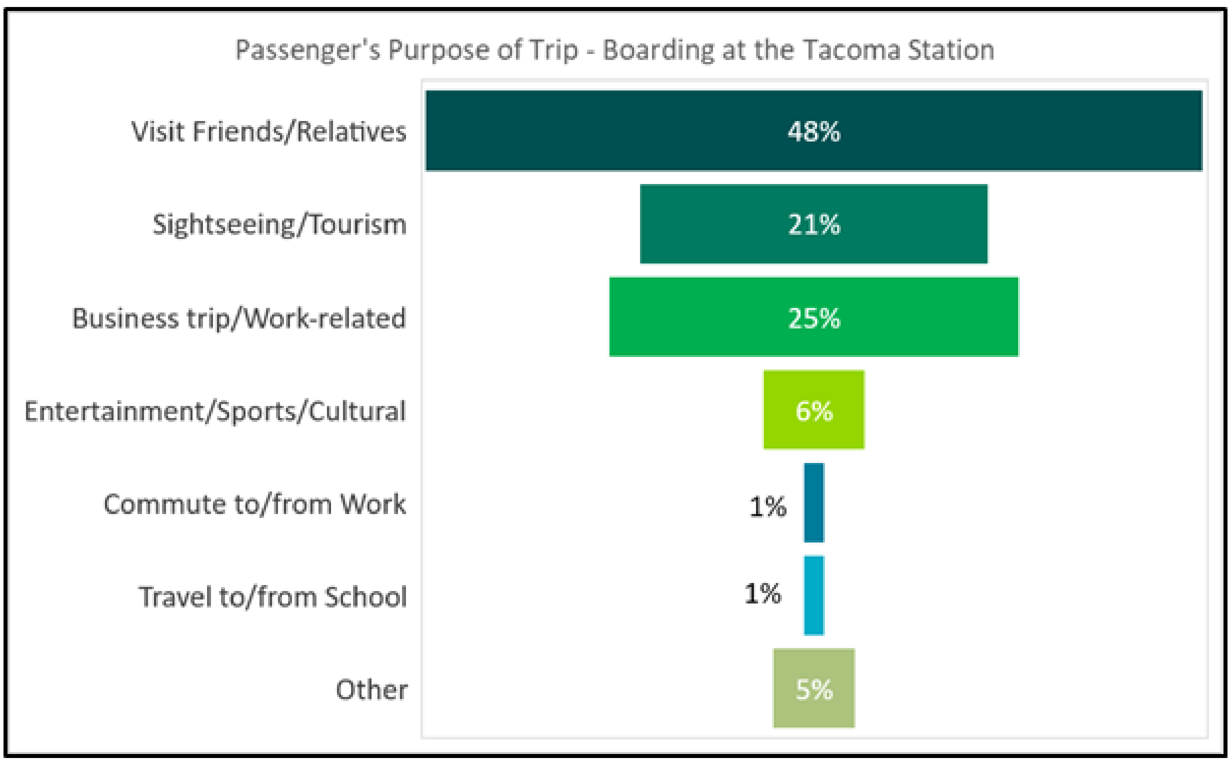


Figure 30: Survey Results-Trip Purpose

Note: Survey respondents had the option of selecting more than one response.

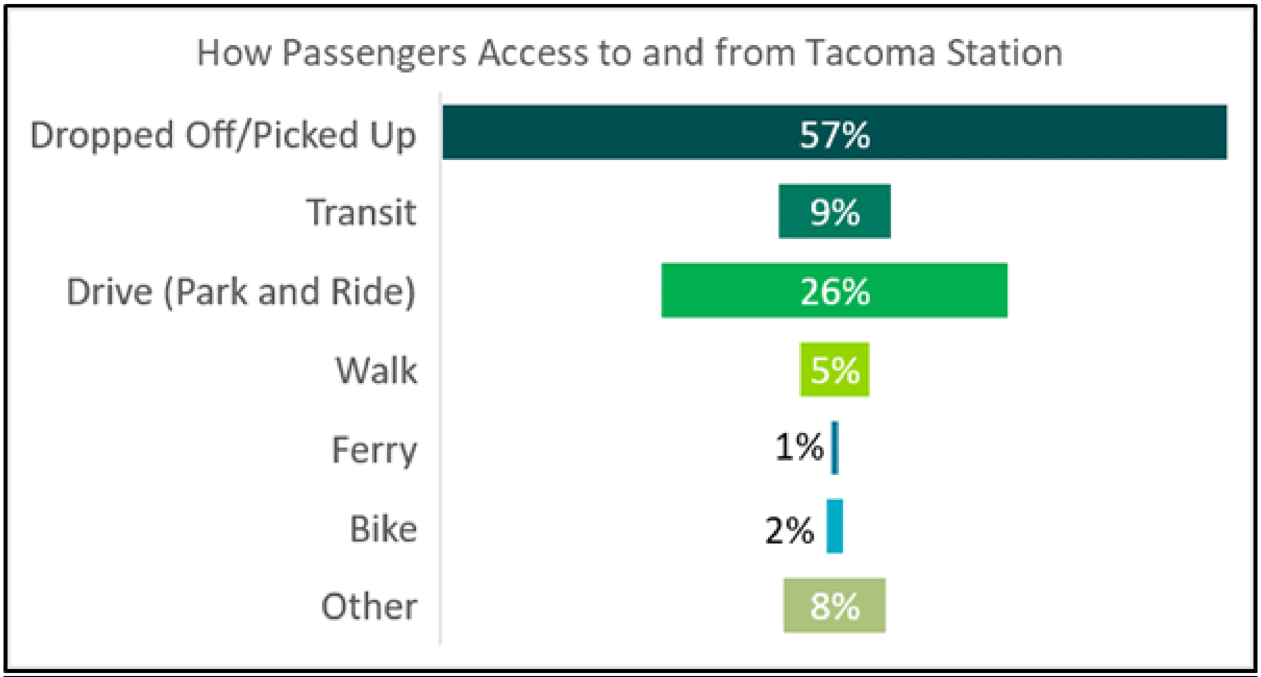


Figure 31: Survey Results-Mode of Access

Note: Survey respondents had the option of selecting more than one response.

Parking and drop-off/pick-up

At the new Tacoma Dome station, dedicated long-term parking will not be provided; the large Pierce Transit parking garages across the street from the station do not allow parking for more than 24 hours. There are currently surface lots within the station area that provide paid parking available to the public for short or long-term use. A designated drop-off/pick-up zone is provided in front of the new station on E 25th Street.

Walk and transit access

From a pedestrian standpoint, there is a well-connected sidewalk network for access to downtown Tacoma and the Tacoma Dome. Interstate 5 is a barrier to pedestrian access from neighborhoods south of the station area, and the pedestrian environment to the east of the station reflects its low-density industrial character.

Connections to regional and local transit will be enhanced by the move to the Tacoma Dome Station. The platform and station will be shared with Sounder commuter rail service which serves a corridor from Lakewood to downtown Seattle. Sound Transit plans to increase Sounder service and extend the service south to DuPont by 2036.

The Tacoma Link streetcar connects Tacoma Dome Station to major attractions in downtown Tacoma. It stops across the street from the station entrance on E 25th Street. Sound Transit is currently constructing a 2.5-mile extension to the Hilltop neighborhood (service planned for 2022) and a further extension to Tacoma Community College is planned for completion by 2039.

Intercity, regional express and local bus services are all available within a block of the Tacoma Dome Station.

Sound Transit is expanding its Link Light Rail system south to Tacoma from Seattle, with a station near Tacoma Dome Station. It plans to begin service here by 2030.

Bicycle access

People using bicycles to access the Amtrak Tacoma station have limited options. There are no east/west bicycle lanes in the area. There is a north/south bicycle lane on D Street. There are no bicycle racks or lockers at the station itself, but they are available at the parking garage across E 25th Street from the station.

Connectivity analysis

As shown in Table 1, analysis of land use, mobility and transportation network measures for the Tacoma station yielded a connectivity score of 8.0, of a possible 10 points, indicating only minor gaps in the existing connectivity of the station.

The station achieved high or medium sub-scores in all categories, with particular strengths in the areas of station land use context and transit service.

Table 1. Connectivity Evaluation:	Tacoma				
Categories & Measures	**Measures**	**Maximum Points**	**Maximum Score**	**Points**	**Score**
LAND USE	**2**	**6**	**2**	**4**	**1.3**
Station Location Context & Attractors		3		2	
Zero Car Household		3		2	
MOBILITY	**3**	**9**	**3**	**8**	**2.7**
Transit Service		3		3	
Private Transportation Connection Options		3		3	
Human Services Transportation		3		2	
CONNECTED TRANSPORTATION NETWORK	**5**	**15**	**5**	**12**	**4.0**
At-Grade Railroad Crossings		3		2	
Sidewalks		3		3	
Bicycle Facilities		3		2	
Drop-off/Pick-up Areas		3		2	
Wayfinding		3		3	
Station Connectivity-Total	**10**	**30**	**10**	**24**	**8.0**

Candidate improvements

Based on the results of the connectivity analysis and field visits, Figure 3 and Table 2 identify candidate pedestrian, bicycle, multimodal and railroad crossing improvements that can be expected to enhance connectivity to the Tacoma Dome Station and promote increased safety for all travel modes.

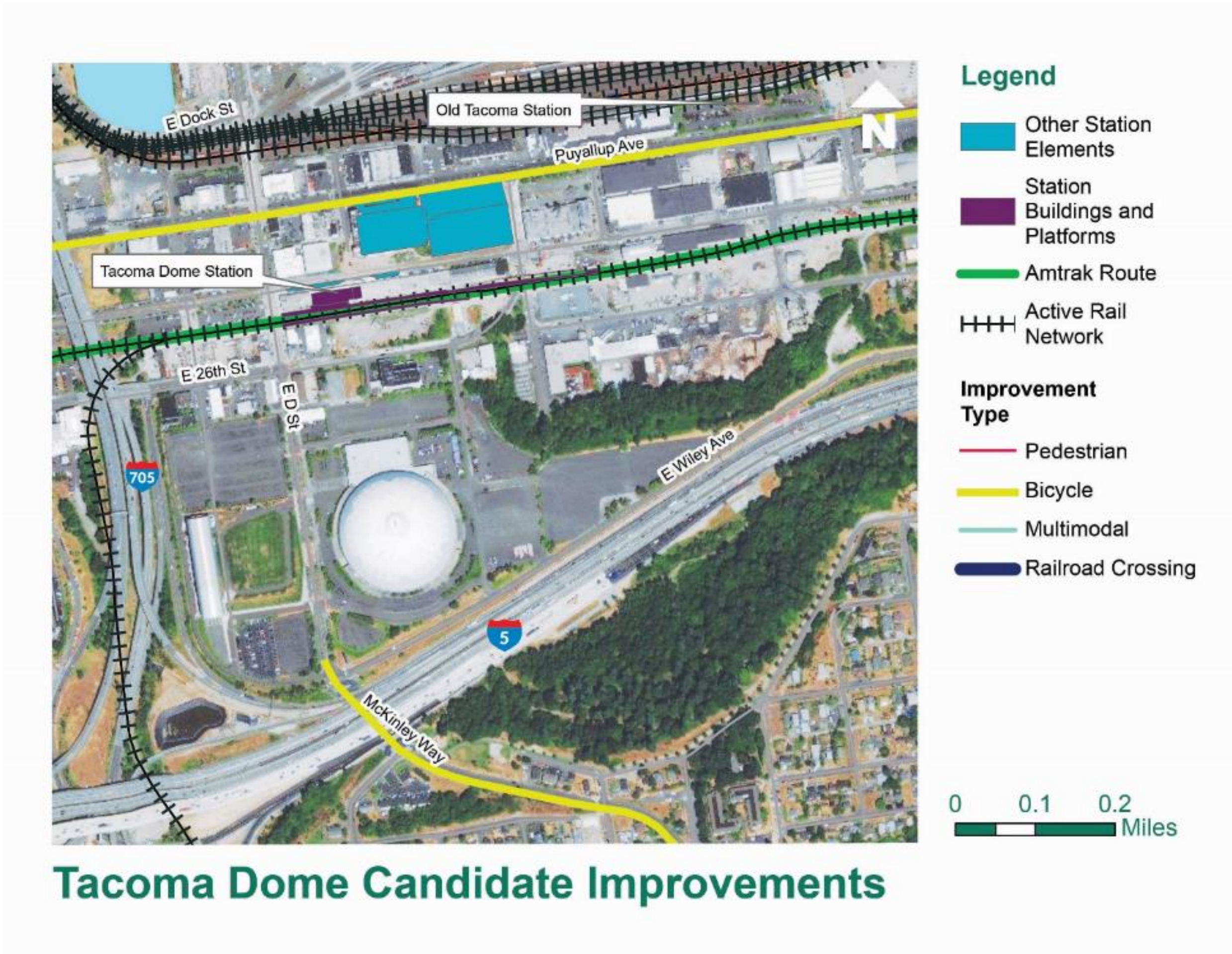


Figure 32: Candidate Improvements

Table 2. Opportunities to Enhance Connectivity at Tacoma Dome Station

Type	Gaps	Candidate Improvement*	Potential Project Examples/Locations*
Bicycle Lanes	Existing D Street bicycle lane terminates at I-5	Bicycle facility improvements within 1/2-mile radius of station	Extend D street bicycle lane with McKinley Way overpass replacement
Bicycle Lanes	Missing dedicated east-west bicycle connectivity	Bicycle facility improvements within 1/2-mile radius of station	East/west bicycle facilities on routes to be determined
Pedestrian	High volumes of pedestrian volume in area surrounding station	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	Leading pedestrian intervals at intersections with high pedestrian volumes and turning vehicle volumes
Multimodal	Wayfinding signs	Install additional wayfinding signs in station area	Locations to be determined
Pedestrian	Complete sidewalks (curb, gutter, ramps)	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	Sidewalk ramp upgrades to current accessibility guidelines
Transit	None-improvements planned	Additional transit service to station area	Sound Transit is planning, design and building improvements to Tacoma Link, Sounder, and Link Light Rail service to the Tacoma Dome Station

*WSDOT will work with stakeholders to improve access and connectivity to Amtrak Cascades stations. Local jurisdictions, transit agencies, Amtrak and railroads could consider addressing these opportunities when implementing their capital improvement and service development plans; some of the opportunities identified may also be addressed in these existing plans.

4232

Supporting information – connectivity analysis

The summary results and connectivity score for the Tacoma Dome station are supported by geospatial representations of four measured criteria (attractors, zero car households, sidewalks, and bicycle facilities) presented in the figures below and in Table C-1. Multimodal Connectivity Analysis: Observed Data & Assignment of Points.

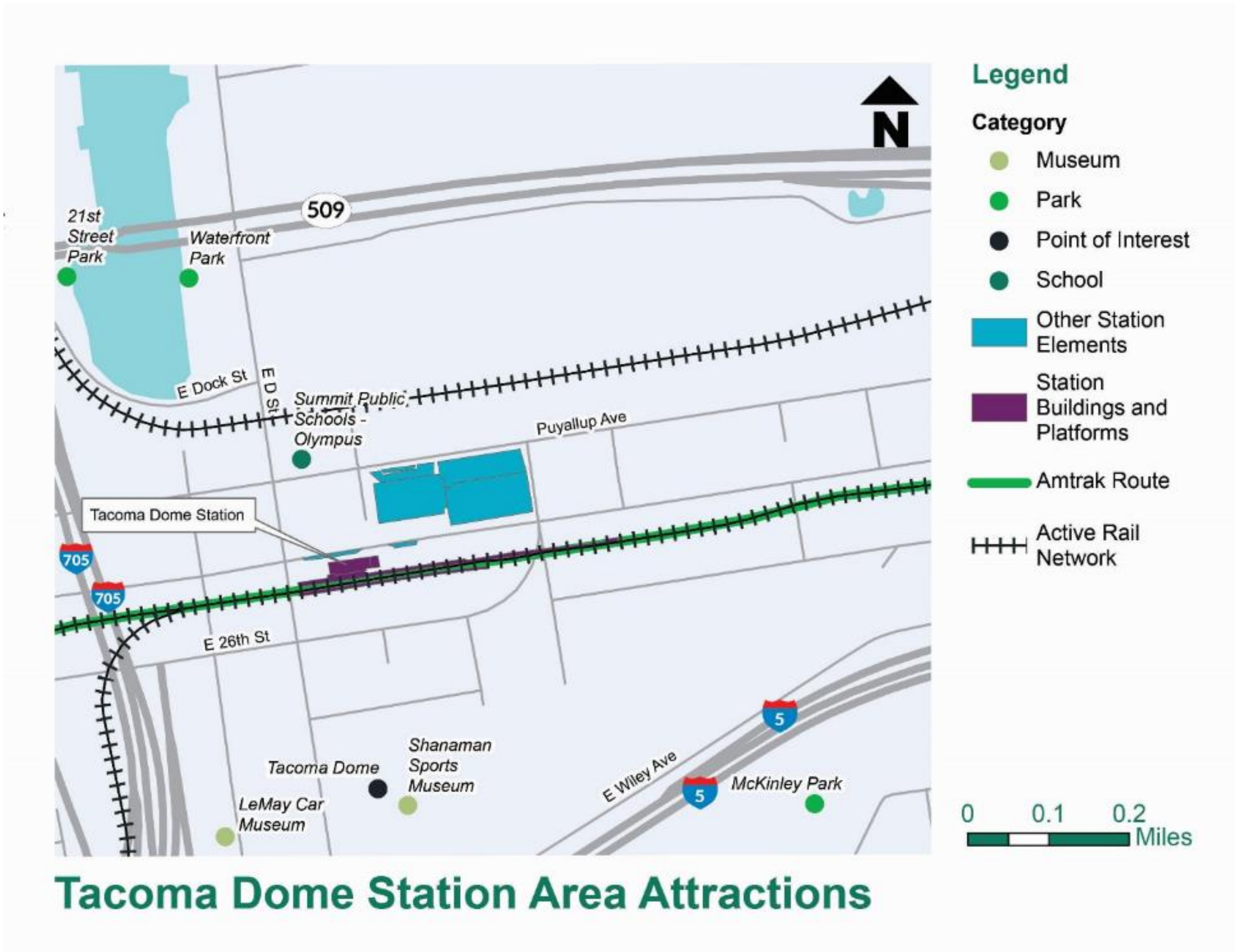


Figure 33: Station Context-Attractors

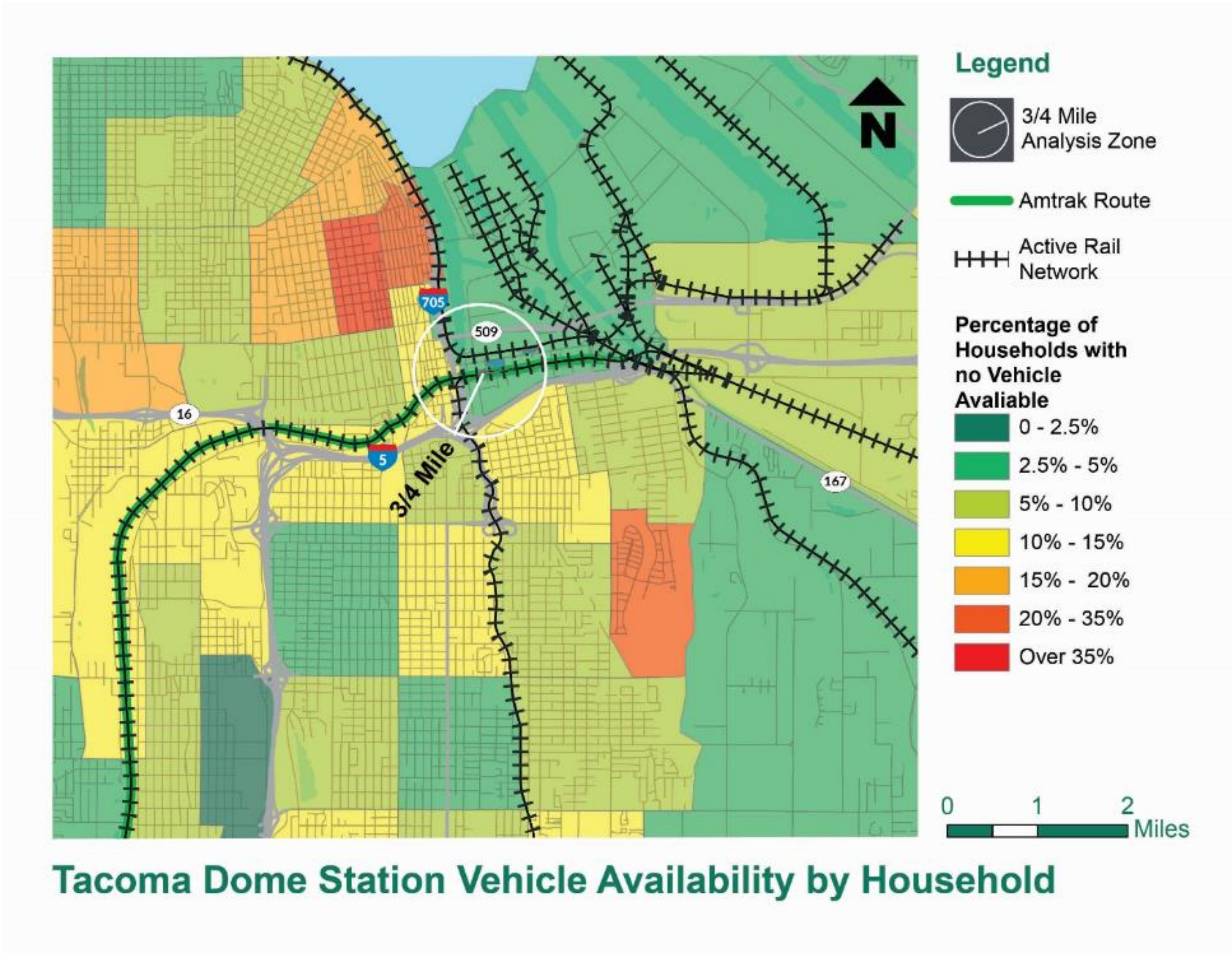


Figure 34: Zero-Car Households

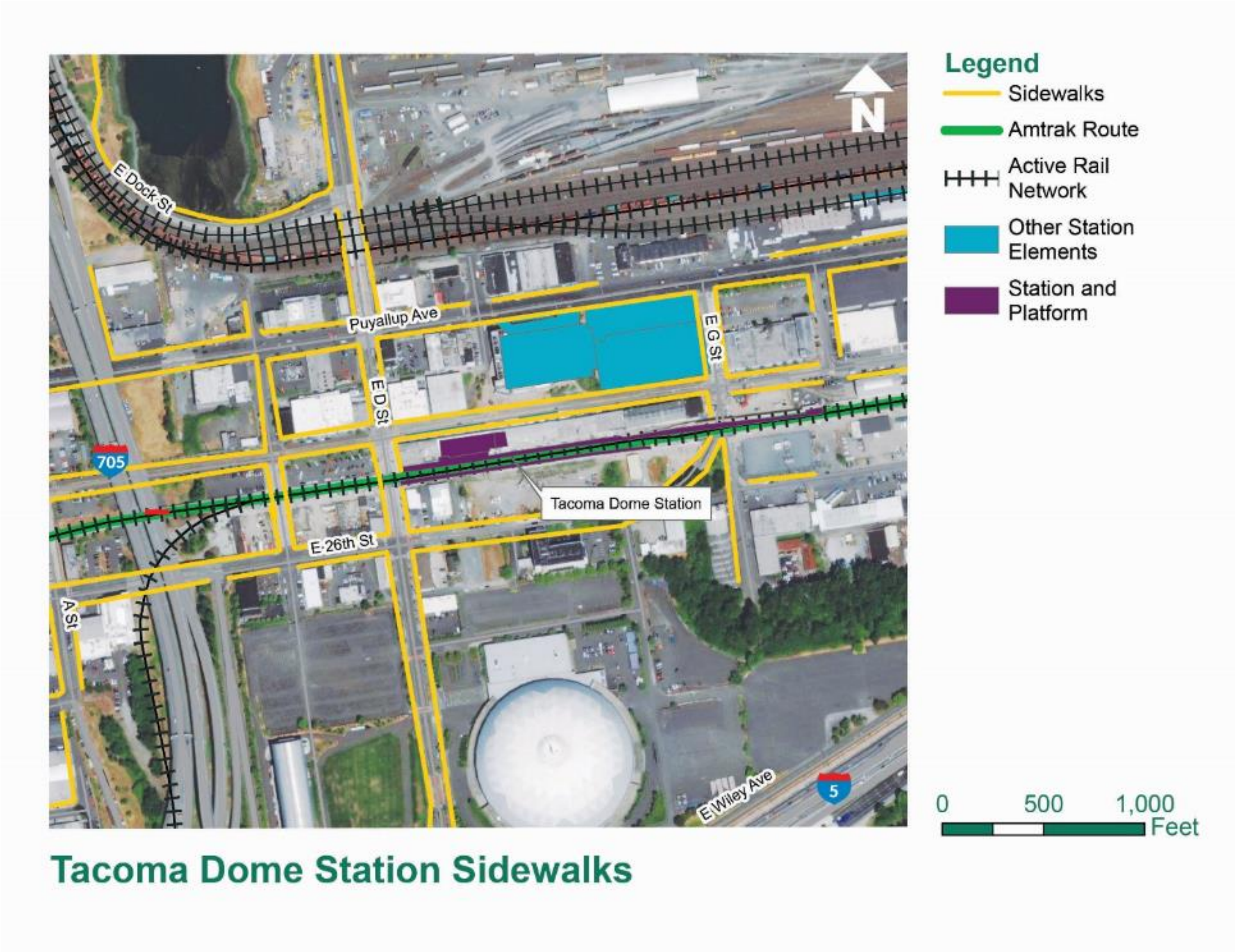
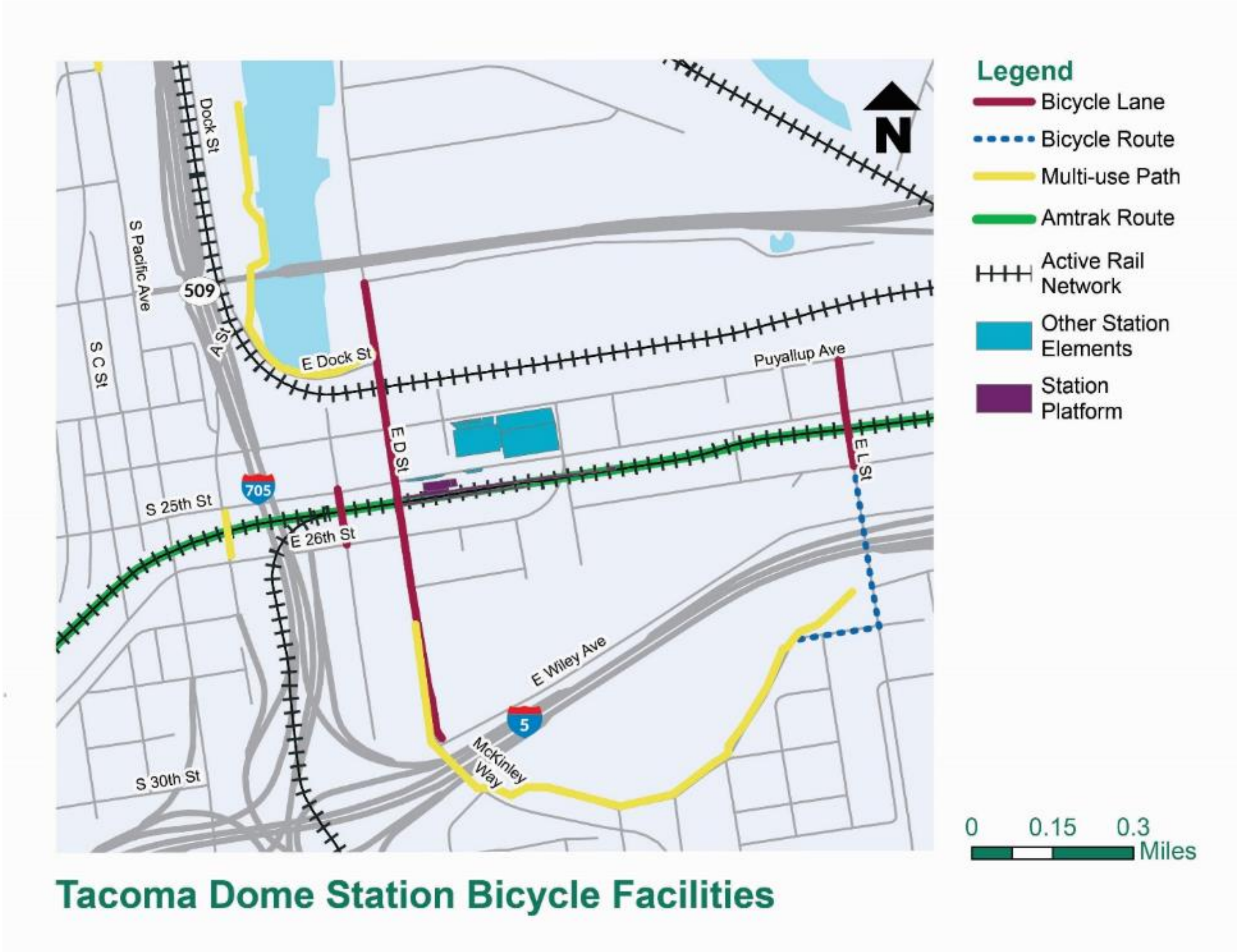


Figure 35: Sidewalks



4246

4247 **Figure 36: Bicycle Facilities**

4248

4249

Tukwila, WA

Tukwila Station

7301 Longacres Way

Tukwila, WA 98188

Tukwila, WA
Tukwila Station

Connectivity Score

6.3

Station overview

The Tukwila Station provides Amtrak Cascades, Sounder commuter rail, and local (bus) transit service. This station, owned and operated by Sound Transit, is located in an area featuring hotels and office uses in a suburban, business-park setting. The nearby Interurban Trail and Green River Trail support multimodal users with connected multi-use paths. A new pedestrian/bicycle bridge over the Green River provides access within a 1/2 mile walking distance to over 2,000 hotel rooms, over 300 new apartments, and employment and shopping opportunities around Westfield Southcenter Mall.

The station served approximately 31,000 passengers in 2017. Trip purpose and mode of access data gathered from a 2018 on-board passenger survey is summarized in Figures 1 and 2. (The on-board survey reached over 1,000 Amtrak Cascades passengers, producing statistically significant results for the corridor. However, at the station level, results may not be statistically significant, particularly at stations with lower ridership.)

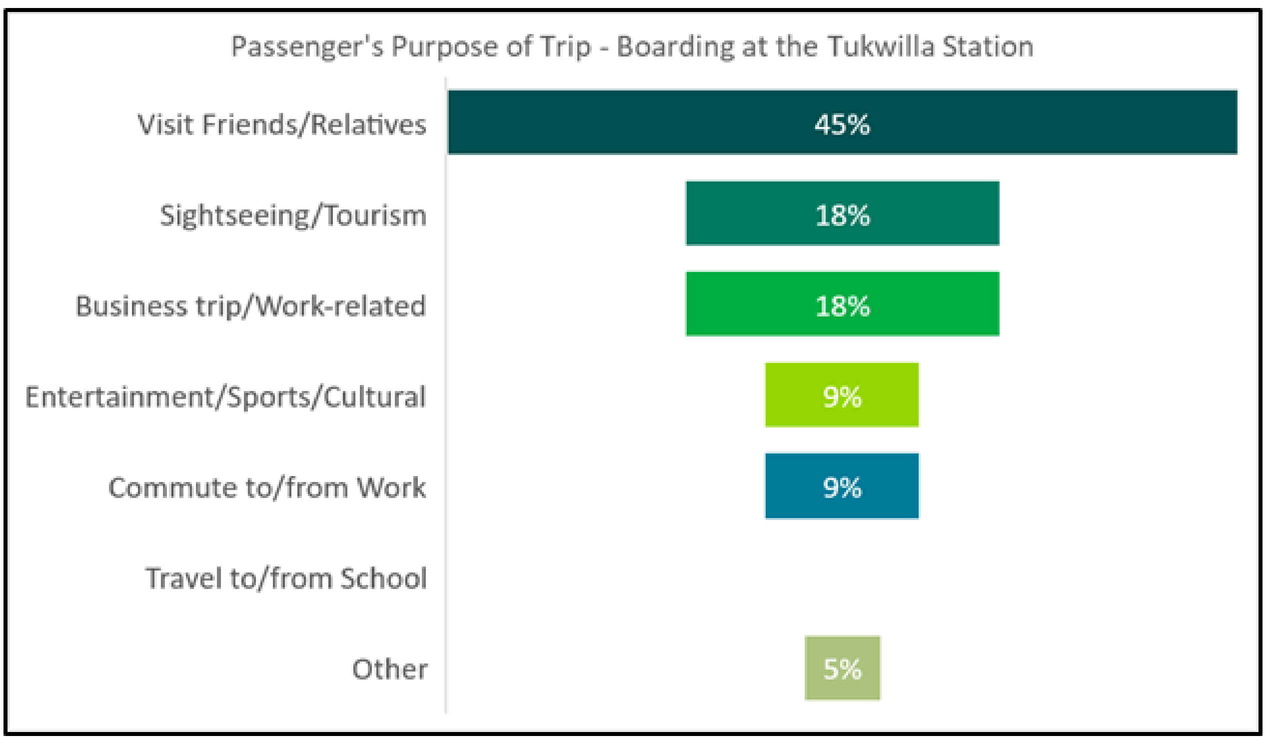


Figure 37: Survey Results-Trip Purpose

Note: Survey respondents had the option of selecting more than one response.

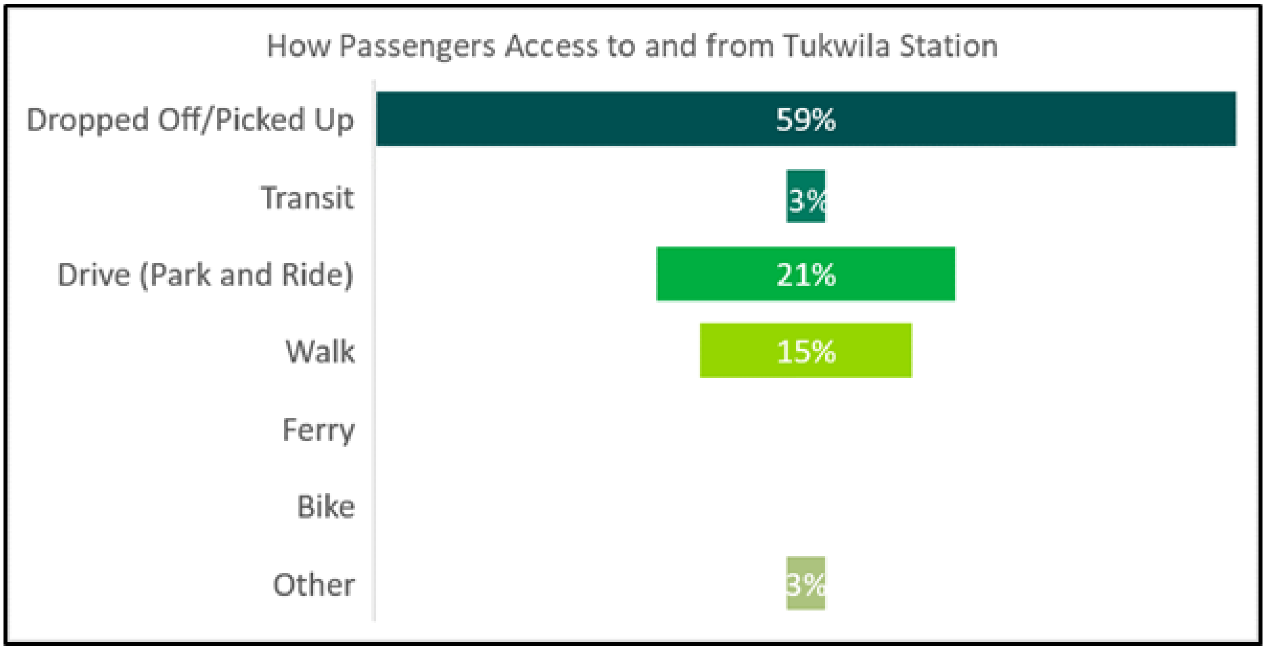


Figure 38: Survey Results-Mode of Access

Note: Survey respondents had the option of selecting more than one response.

Parking and drop-off/pick-up

A total of 350 parking spaces, including dedicated accessible parking spaces and electric vehicle charging stations, are provided for Sounder and transit patrons in a surface parking lot. There are 20 spaces designated for use by Amtrak patrons. The parking lot has clearly marked pedestrian sidewalks that lead foot traffic from the parking to a wide sidewalk for station access.

Additionally, there is a dedicated area for drop-off/pick-up (use for taxi, transportation network companies, or human services transportation) and is clearly signed. This station has a marked drop-off/pick-up area for people with disabilities placed in close proximity to the station platform and passenger amenities.

Walk and transit access

The Tukwila Station is located in an auto-oriented business park area. Recently constructed improvements that enhance pedestrian access include a pedestrian and bicycle bridge across the Green River, an enhanced multimodal trail on Christensen Road, and wayfinding to provide a shortened connection between the west side of SR 181 just south of Longacres Way and the Southcenter Urban Center area. A pedestrian can access the station via Longacres Way as it has a sidewalk on one side of the road. It also connects to SR 181 (West Valley Highway) that has sidewalks. Additionally, passengers can use either of two shared use paths to access Boeing and Kaiser Permanente business campuses that are east and southeast of the station. Pedestrian access is provided via an underpass of the railroad tracks on Longacres Way that connects to the shared used path. To access the Tukwila station from the south, the Tukwila access road does not provide sidewalks, relying on a shared-use path for non-vehicular access.

The wayfinding signs have been upgraded and provide clear direction for all different users: pedestrians, human services transportation services, bicyclists, drivers, and connecting transit services.

Sound Transit's Sounder commuter rail service is available at the shared passenger rail platform. Sound Transit plans to increase Sounder service and capacity with platform, track and signal improvement funded through the ST3 program. Connections to local/regional bus service are located within the station, providing a seamless trip transition. Benches and shelters are provided at both the train and bus platforms.

Bicycle access

People using bicycles to access the Tukwila station may use the Interurban Trail; Green River Trail; or Springbrook Trail, which are all within a 1/4-1/2 miles of the station, but have limited options within the immediate station area. There are no dedicated bicycle facilities on any of the streets in the area, though Longacres Way is marked as a bike route from the station to the intersection with the Interurban Trail. The Interurban Trail connects Tukwila with communities to the south such as Kent and Auburn. There is a shared use pathway connecting to the Boeing and Kaiser Permanente business campuses east of the station, and there are bicycle racks and bike lockers at the station.

Connectivity analysis

As shown in Table 1, analysis of land use, mobility and transportation network measures for the Tukwila station yielded a connectivity score of 6.3, of a possible 10 points, indicating significant gaps in the existing connectivity of the station.

The station achieved high sub-scores in the two categories: the number of at-grade railroad crossings (the higher the score, the lower amount of at grade railroad crossings), and the area to drop-off/pick-up passengers. The analysis also highlights access issues surrounding the Tukwila station that include: a low number of transportation connectivity options, a lower number of connecting transit routes, and wayfinding signs.

Table 1. Connectivity Evaluation: Tukwila

Categories & Measures	Measures	Maximum Points	Maximum Score	Points	Score
LAND USE	**2**	**6**	**2**	**4**	**1.3**
Station Location Context & Attractors		3		2	
Zero Car Household		3		2	
MOBILITY	**3**	**9**	**3**	**4**	**1.3**
Transit Service		3		1	
Private Transportation Connection Options		3		1	
Human Services Transportation		3		2	
CONNECTED TRANSPORTATION NETWORK	**5**	**15**	**5**	**11**	**3.7**
At-Grade Railroad Crossings		3		3	
Sidewalks		3		2	
Bicycle Facilities		3		2	
Drop-off/Pick-up Areas		3		3	
Wayfinding		3		1	
Station Connectivity-Total	**10**	**30**	**10**	**19**	**6.3**

Candidate improvements

Based on the results of the connectivity analysis and field visits, Figure 3 and Table 2 identify candidate pedestrian, bicycle, multimodal and railroad crossing improvements that can be expected to enhance connectivity to the Tukwila station and promote increased safety for all travel modes. These candidate improvements, including potential project examples and/or locations, were identified based on the system-wide candidate improvement types, analysis of existing connectivity gaps, and site visits. These representative examples may include facilities owned by the State, Amtrak, railroads or local agencies. WSDOT will further evaluate the viability of the opportunities identified here to improve state facilities for better access to Amtrak Cascades stations. Amtrak, railroads and local agencies can consider implementing improvements to their facilities and operations, similar to these representative examples, as they develop their capital improvement and service plans.

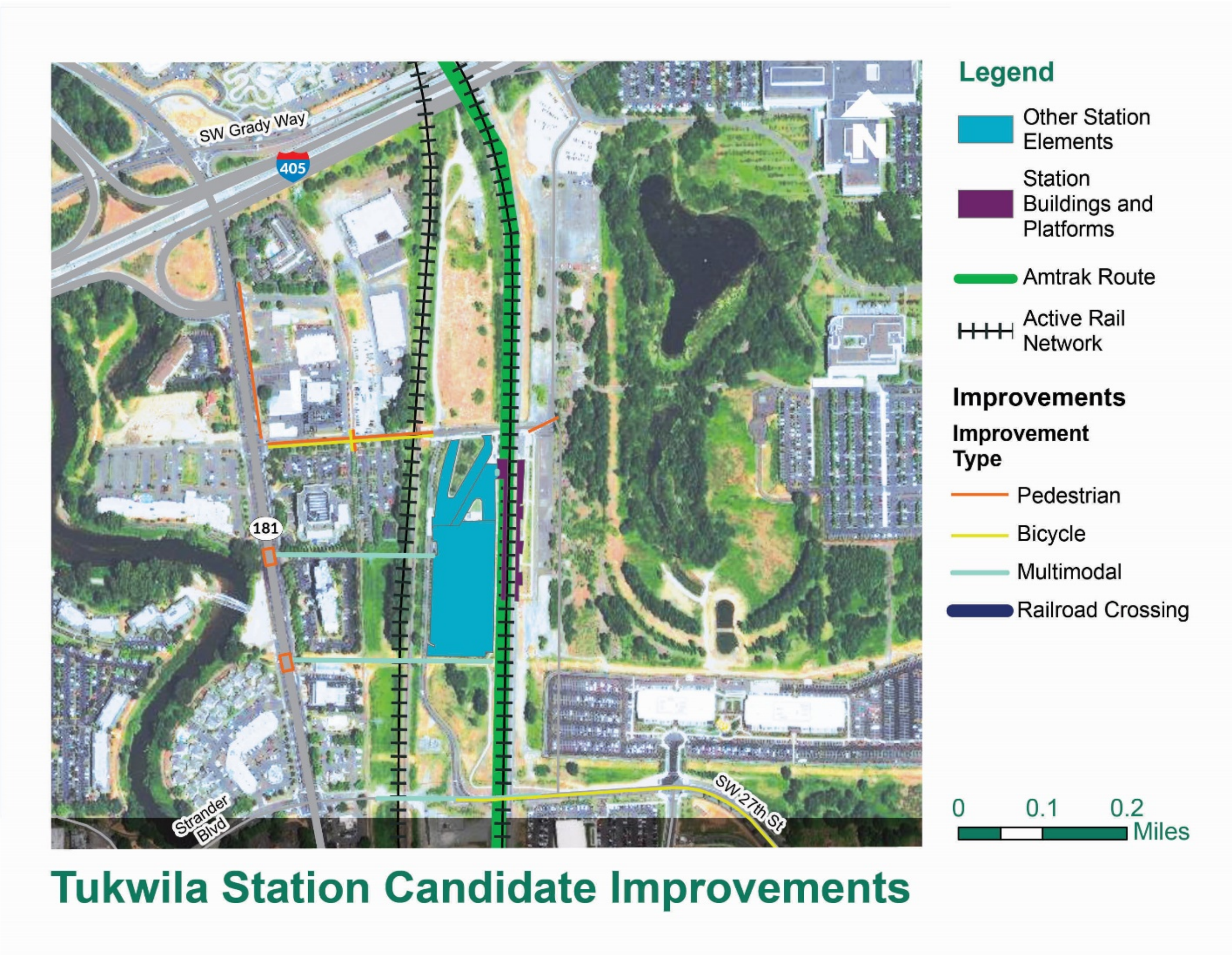


Figure 39: Candidate Improvements

Table 2. Opportunities to Enhance Connectivity at Tukwila Station

Type	Gaps	Candidate Improvement*	Potential Project Examples/Locations*
Multimodal	Strander Boulevard does not connect to 27th Street	Pedestrian and bicycle facility improvements within station area	Connect Strander Boulevard to 27th Street under UP railroad track
Pedestrian	Complete sidewalks (curb, gutter, ramps)	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	Add sidewalks and lighting to Longacres Way; complete sidewalk network on West Valley Highway
Pedestrian and Bicycle	Miscellaneous	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	Improve lighting, wayfinding, signage and markings on Interurban Trail at Longacres Way
Bicycle	Bicycle lanes	Bicycle facility improvements within 1/2-mile radius of station	Upgrade from sharrows to bike lanes on Longacres Way

*WSDOT will work with stakeholders to improve access and connectivity to Amtrak Cascades stations. Local jurisdictions, transit agencies, Amtrak and railroads could consider addressing these opportunities when implementing their capital improvement and service development plans; some of the opportunities identified may also be addressed in these existing plans.

Supporting information - connectivity analysis

The summary results and connectivity score for the Tukwila station are supported by geospatial representations of four measured criteria (attractors, zero car households, sidewalks, and bicycle facilities) presented in the figures below and in Table C-1. Multimodal Connectivity Analysis: Observed Data & Assignment of Points.

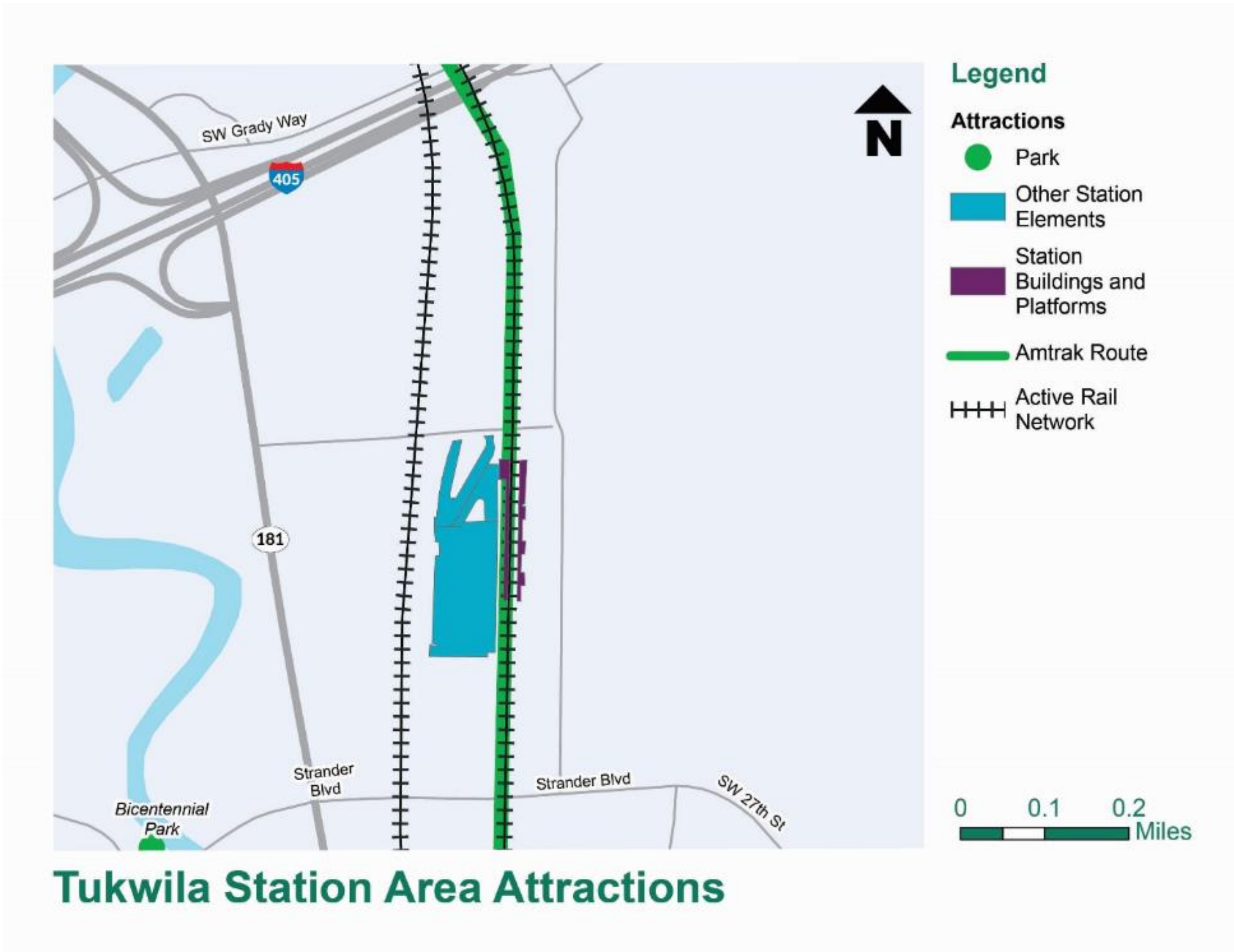


Figure 40: Station Context-Attractors

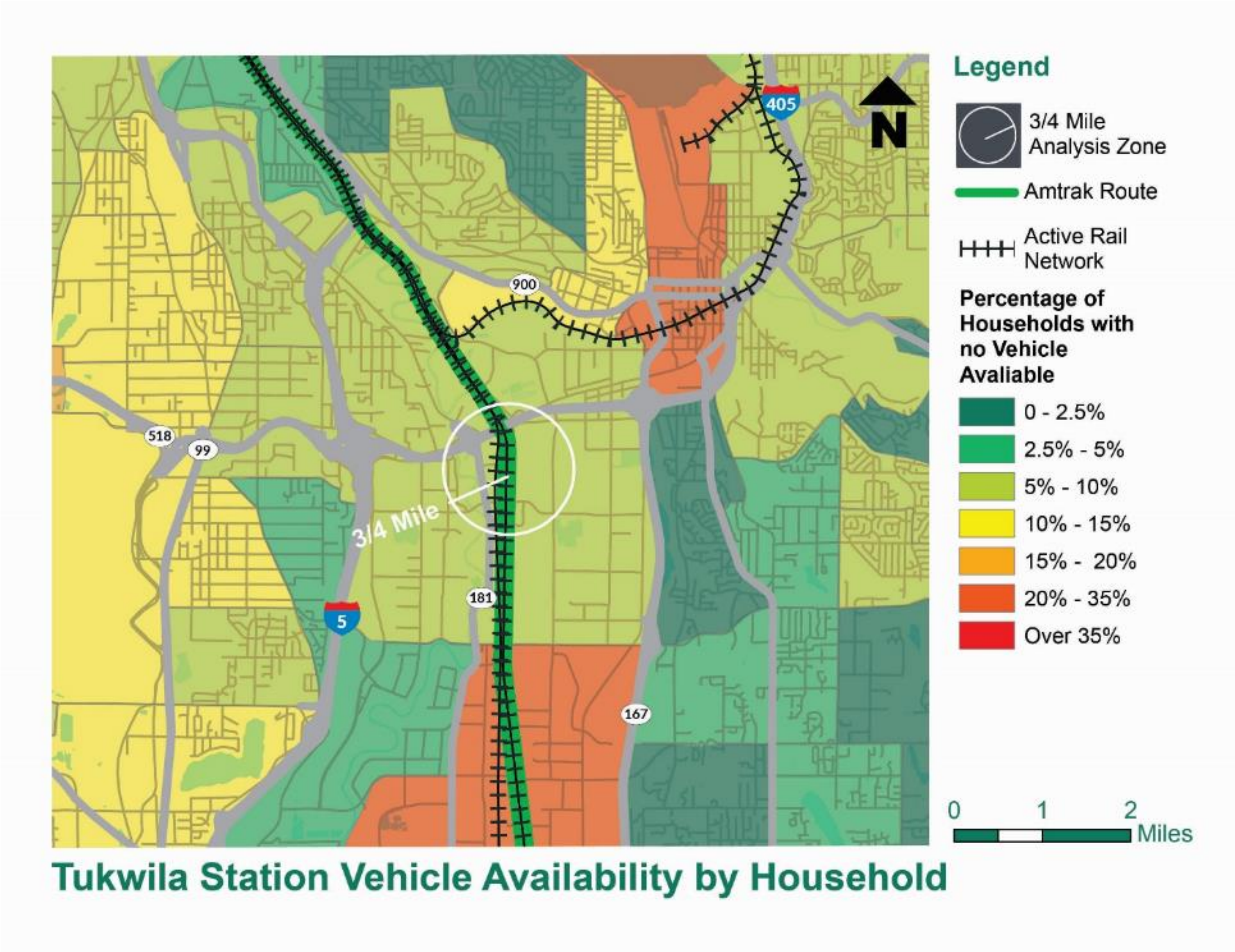
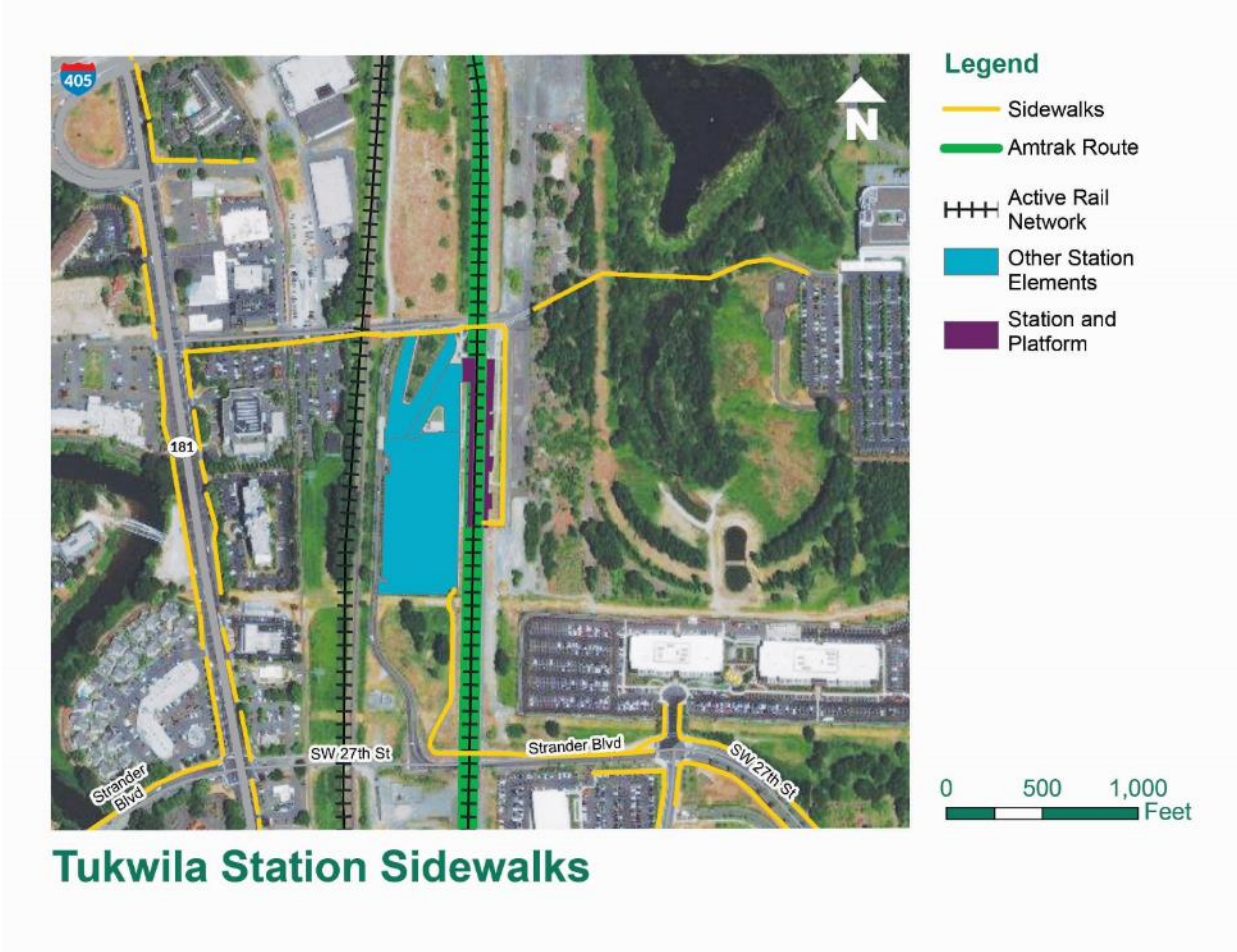


Figure 41: Zero-Car Households



4356

4357 **Figure 42: Sidewalks**

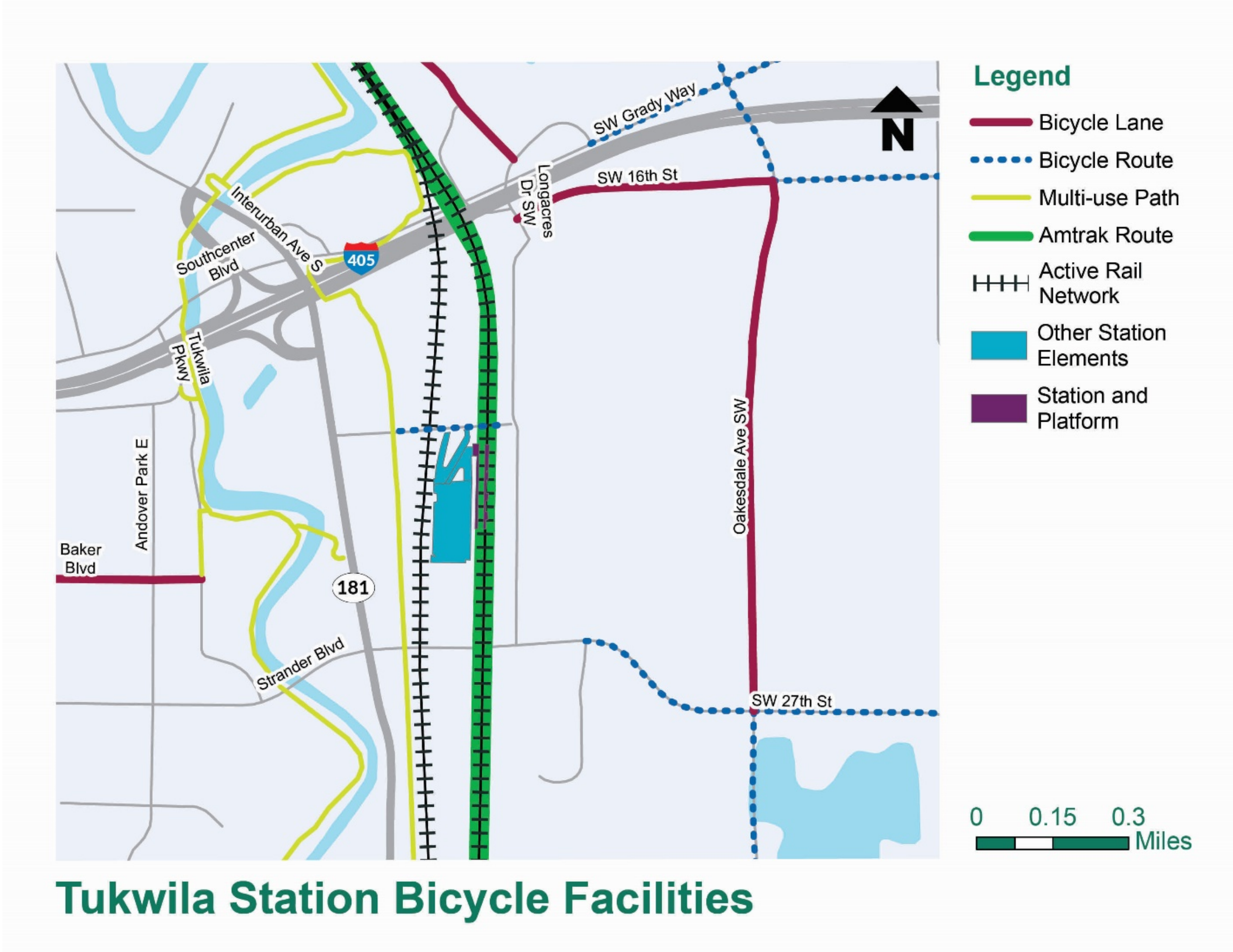


Figure 43: Bicycle Facilities

Supporting information - photo documentation

Site visits were conducted on October 10, 2018 to inventory assets at the station and assess multimodal connections.

Photo 1: Amtrak customer only parking.

Photo 2: Tukwila Station wayfinding signs.

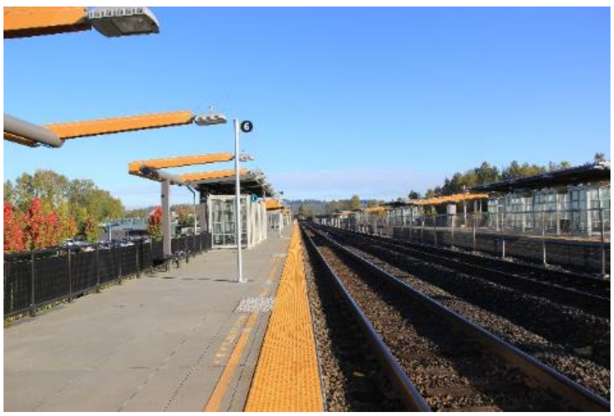


Photo 3: Tukwila Station platform and RR tracks.

Photo 4: Tukwila Station information board.

Photo 5: ADA ramp and striping.

Photo 6: RapidRide bus leaving the station.

Seattle, WA

Seattle King Street Station

303 S Jackson St

Seattle, WA 98104

Seattle, WA
King Street Station

Connectivity Score
9.0

Station overview

Amtrak service is provided at King Street Station, located in downtown Seattle in the historic Pioneer Square district. The station is a landmark on the National Register of Historic Places, and was extensively renovated in 2014 by the owner, the City of Seattle, through a funding partnership with WSDOT and the Federal Railroad Administration. The station location is adjacent to the Chinatown-International District, and within walking distance of sports and events facilities hosting the National Football League, Major League Soccer, Major League Baseball, and concerts and trade shows. The station area features transit connections to a wide variety of local and regional destinations via light rail, commuter rail, streetcar, express bus and local bus service. The area also features dense commercial and residential development and is characterized by high pedestrian and bicycle travel volumes.

The station served over 480,000 passengers in 2017. Trip purpose and mode of access data gathered from a 2018 on-board passenger survey is summarized in Figures 1 and 2

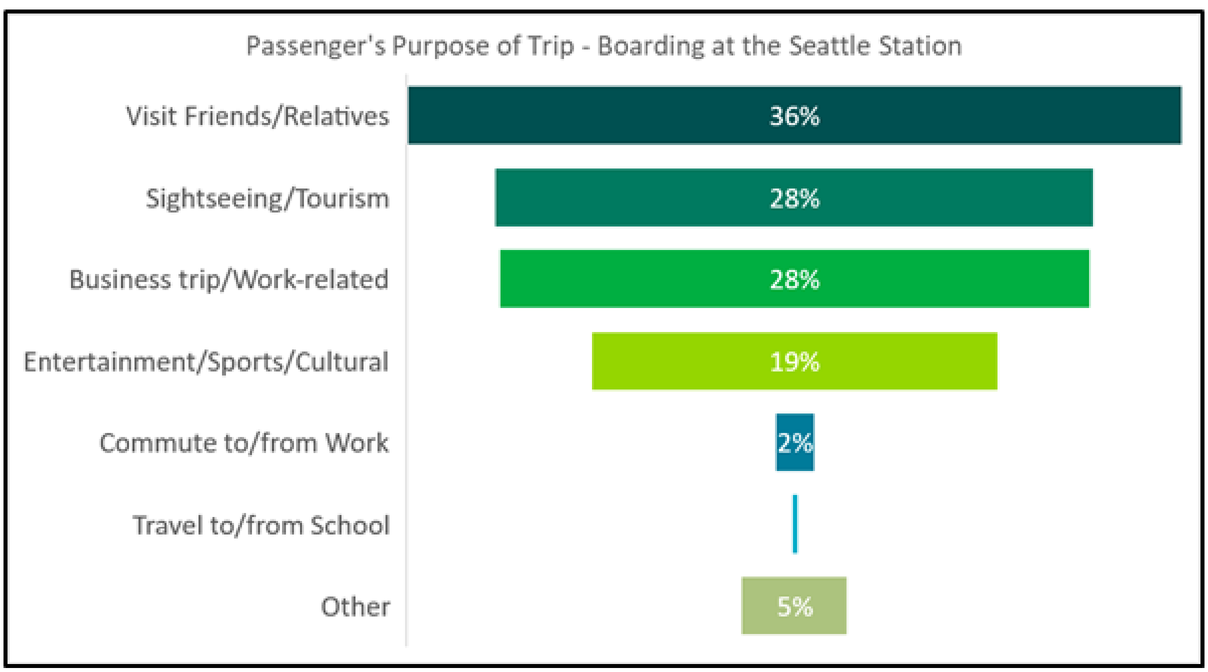


Figure 44: Survey Results-Trip Purpose

Note: Survey respondents had the option of selecting more than one response.

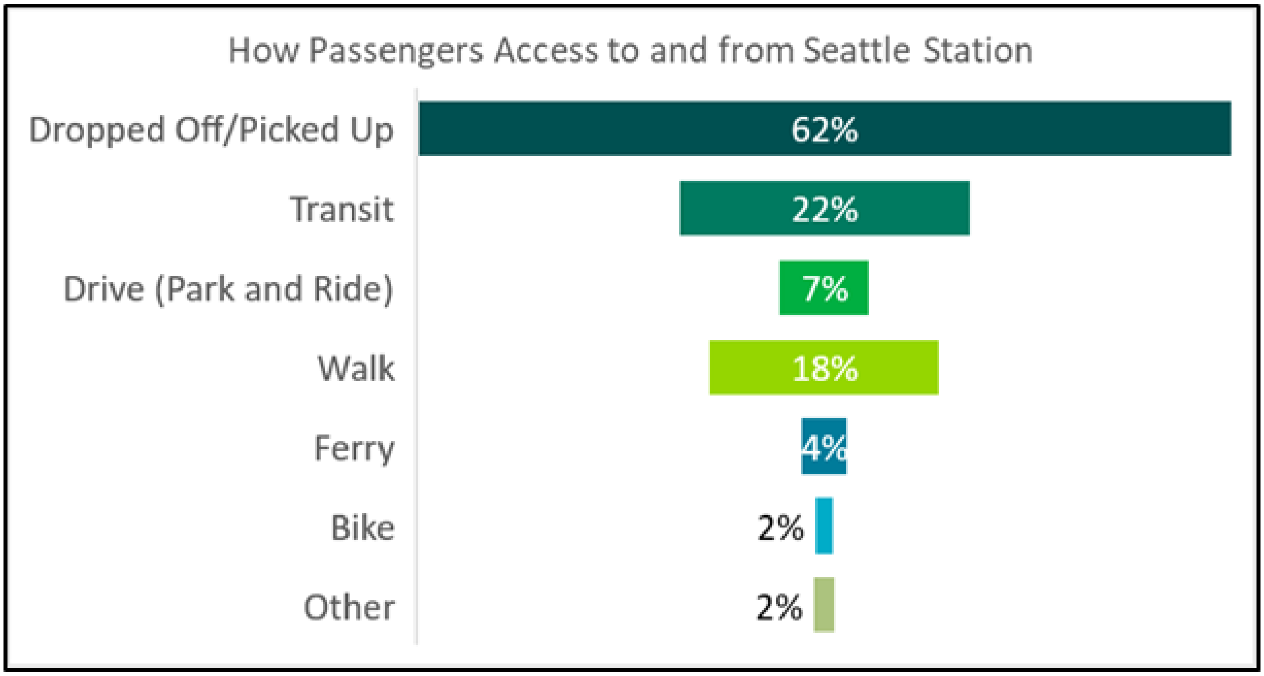


Figure 45: Survey Results-Mode of Access

Note: Survey respondents had the option of selecting more than one response.

Parking and drop-off/pick-up

King Street Station does not offer on-site parking for Amtrak passengers; there are accessible surface parking spaces at the station, and paid parking is available to the public at several garages in the immediate vicinity of the station.

There is an area for drop-off/pick-up (use for taxi, transportation network companies, or human services transportation) that has minimal signage at the front of the station. There is a small section of curb that is painted yellow and marked with signs for taxis, but other curbside areas in front of the station are not clearly marked or signed for designated uses.

Walk and transit access

From a pedestrian standpoint, King Street Station is in the midst of a walkable and transit-rich environment. Sidewalks are wide and available on all streets in the station area. Pedestrians can access the station at the Jackson Street level, where there is access to transit, or at the King Street level, where drop-off is available. While there are numerous roadway crossings, they are all marked and/or signalized. Additionally, the roadways in the area of the King Street Station are elevated over the railroad lines, so there are no at-grade pedestrian crossings. There are also grade separated pedestrian walkways between 4th Avenue and the Amtrak station.

Connections to local/regional bus service, Sounder Commuter Rail service, Greyhound bus service, and Link light rail service are located near the Amtrak station. The Sounder Commuter Rail service can be accessed at the King Street station via an elevated walkway over the railroad tracks. Sound Transit plans to increase Sounder service and capacity with platform, track and signal improvement funded through the ST3 program. The Link light rail and local transit bus station (the south end of the Seattle transit tunnel) is focused east of this heavy rail facility at the Chinatown/International District Station. The Bolt bus stops are about 3-4 blocks south of Jackson on 5th Street. The connection to Greyhound buses is south of the station and close to the Stadium station of the Link light rail. King Street Station is also located in between two of the Seattle Streetcar stops, just a few blocks away.

There are ample wayfinding signs and information kiosks in the station area with information presented to pedestrians, which helps passengers make connections easier.

Bicycle access

People using bicycles to access the King Street station have multiple route options, with a place to lock bicycles to support this connection. There is one marked bicycle lane on 3rd Avenue that is in the King Street station area, and there are bicycle “sharrow” markings to indicate share use with bicycles on Jackson Street, 1st Avenue, a section of 4th Avenue, and a section of 5th Avenue north of the station. The City of Seattle has also installed a two-way protected bicycle lane on 2nd Avenue, extends through downtown Seattle to within one block of the Jackson Street entrance to the station.

Connectivity analysis

As shown in Table 1, analysis of land use, mobility and transportation network measures for the King Street station yielded a connectivity score of 9.0, of a possible 10 points, indicating only minor gaps in the existing connectivity of the station.

The station achieved high or medium sub-scores in all of the evaluation categories.

Table 1. Connectivity Evaluation:	Seattle				
Categories & Measures	Measures	Maximum Points	Maximum Score	Points	Score
LAND USE	**2**	**6**	**2**	**6**	**2.0**
Station Location Context & Attractors		3		3	
Zero Car Household		3		3	
MOBILITY	**3**	**9**	**3**	**7**	**2.3**
Transit Service		3		3	
Private Transportation Connection Options		3		2	
Human Services Transportation		3		2	
CONNECTED TRANSPORTATION NETWORK	**5**	**15**	**5**	**14**	**4.7**
At-Grade Railroad Crossings		3		3	
Sidewalks		3		3	
Bicycle Facilities		3		3	
Drop-off/Pick-up Areas		3		2	
Wayfinding		3		3	
Station Connectivity-Total	**10**	**30**	**10**	**27**	**9.0**

Candidate improvements

Based on the results of the connectivity analysis and field visits, Figure 3 and Table 2 identify candidate pedestrian, bicycle, multimodal and railroad crossing improvements that can be expected to enhance connectivity to King Street Station and promote increased safety for all travel modes. These candidate improvements, including potential project examples and/or locations, were identified based on the system-wide candidate improvement types, analysis of existing connectivity gaps, and site visits. These representative examples may include facilities owned by the State, Amtrak, railroads or local agencies. WSDOT will further evaluate the viability of the opportunities identified here to improve state facilities for better access to Amtrak Cascades stations. Amtrak, railroads and local agencies can consider implementing improvements to their facilities and operations, similar to these representative examples, as they develop their capital improvement and service plans.

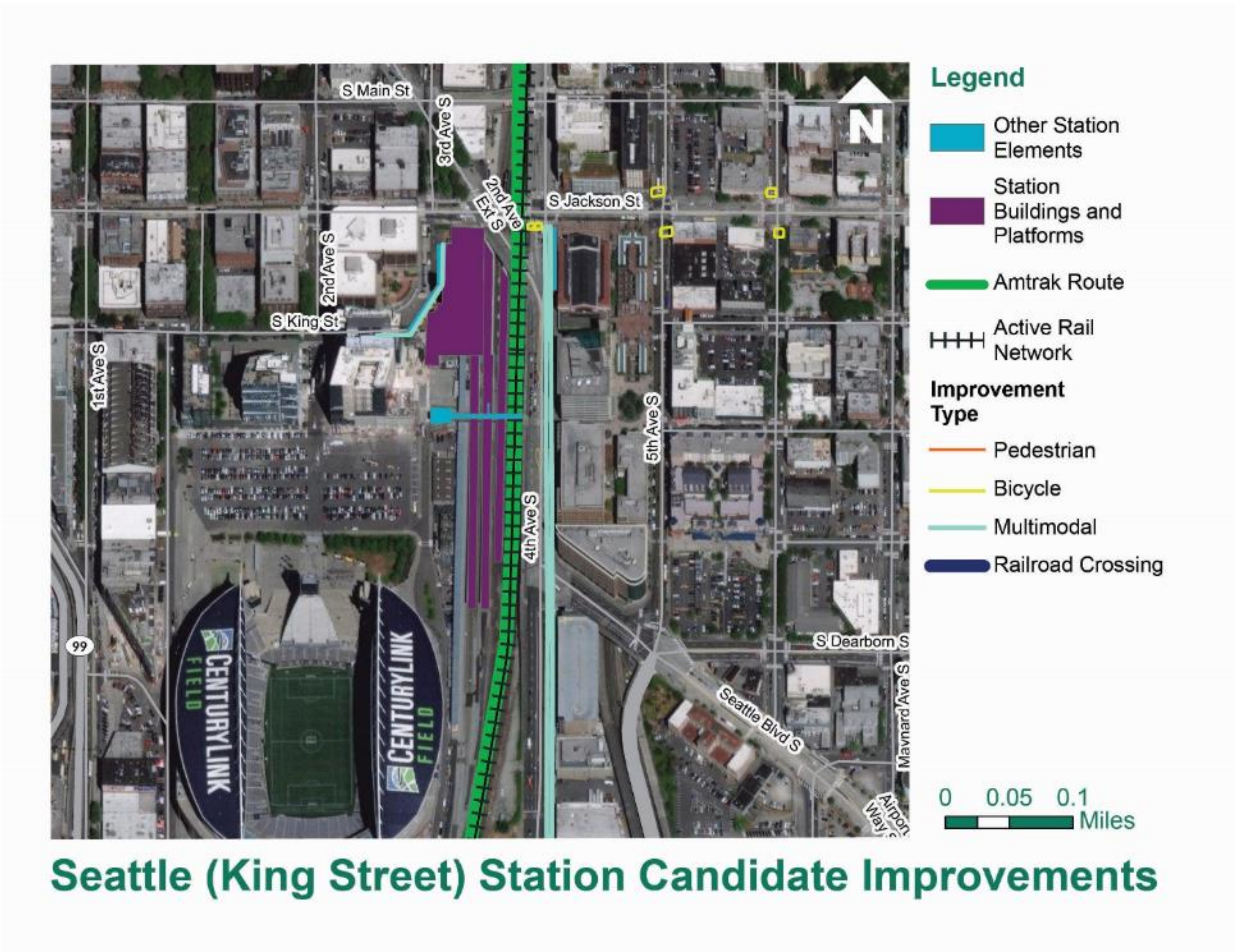


Figure 46: Candidate Improvements

Table 2. Opportunities to Enhance Connectivity at King Street Station

Type	Gaps	Candidate Improvement*	Potential Project Examples/Locations*
Multimodal	Designated drop-off/pick-up area	Signage, striping, and additional designated drop-off/pick-up area for accessible/disabled transportation, either on-site or on-street at station areas	Improve signage and markings at station frontage
Bicycle	Two-stage left turn bike box placement "outside" of crosswalk introduces additional bicycle/pedestrian conflict opportunities	Bicycle facility improvements within 1/2-mile radius of station	Upgrade bike-box treatments
Pedestrian	High volumes of pedestrian volume in area surrounding station	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	Leading pedestrian intervals at intersections with high pedestrian volumes and turning vehicle volumes
Multimodal	Wayfinding signs	Install additional wayfinding signs in station area	Identify accessible routes, including at drop-off areas
Pedestrian	Complete sidewalks (curb, gutter, ramps)	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	Sidewalk ramp upgrades to current accessibility guidelines; gradient lighting of access routes

*WSDOT will work with stakeholders to improve access and connectivity to Amtrak Cascades stations. Local jurisdictions, transit agencies, Amtrak and railroads could consider addressing these opportunities when implementing their capital improvement and service development plans; some of the opportunities identified may also be addressed in these existing plans.

Supporting information - connectivity analysis

The summary results and connectivity score for the Seattle King Street station are supported by geospatial representations of four measured criteria (attractors, zero car households, sidewalks, and bicycle facilities) presented in the figures below and in Table C-1. Multimodal Connectivity Analysis: Observed Data & Assignment of Points.

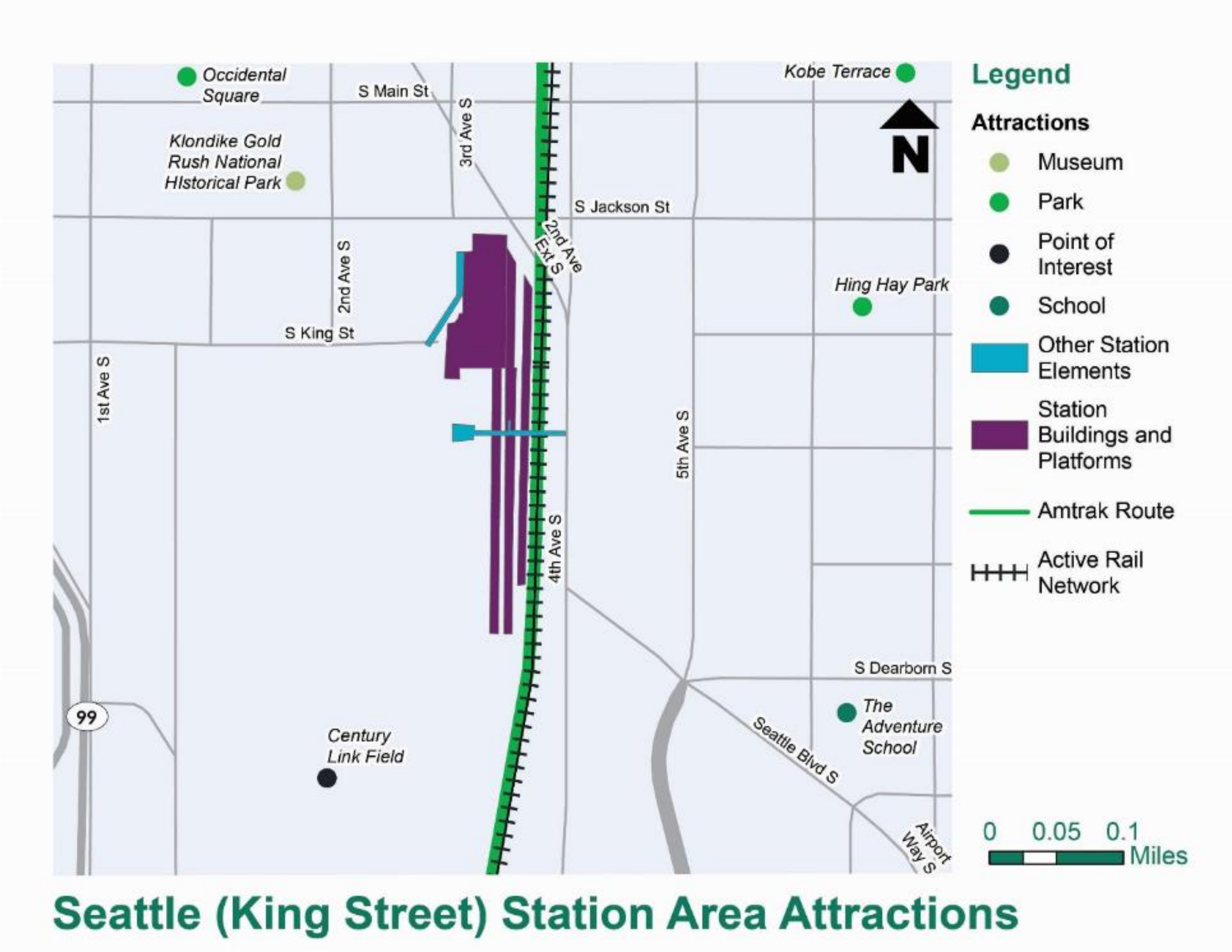
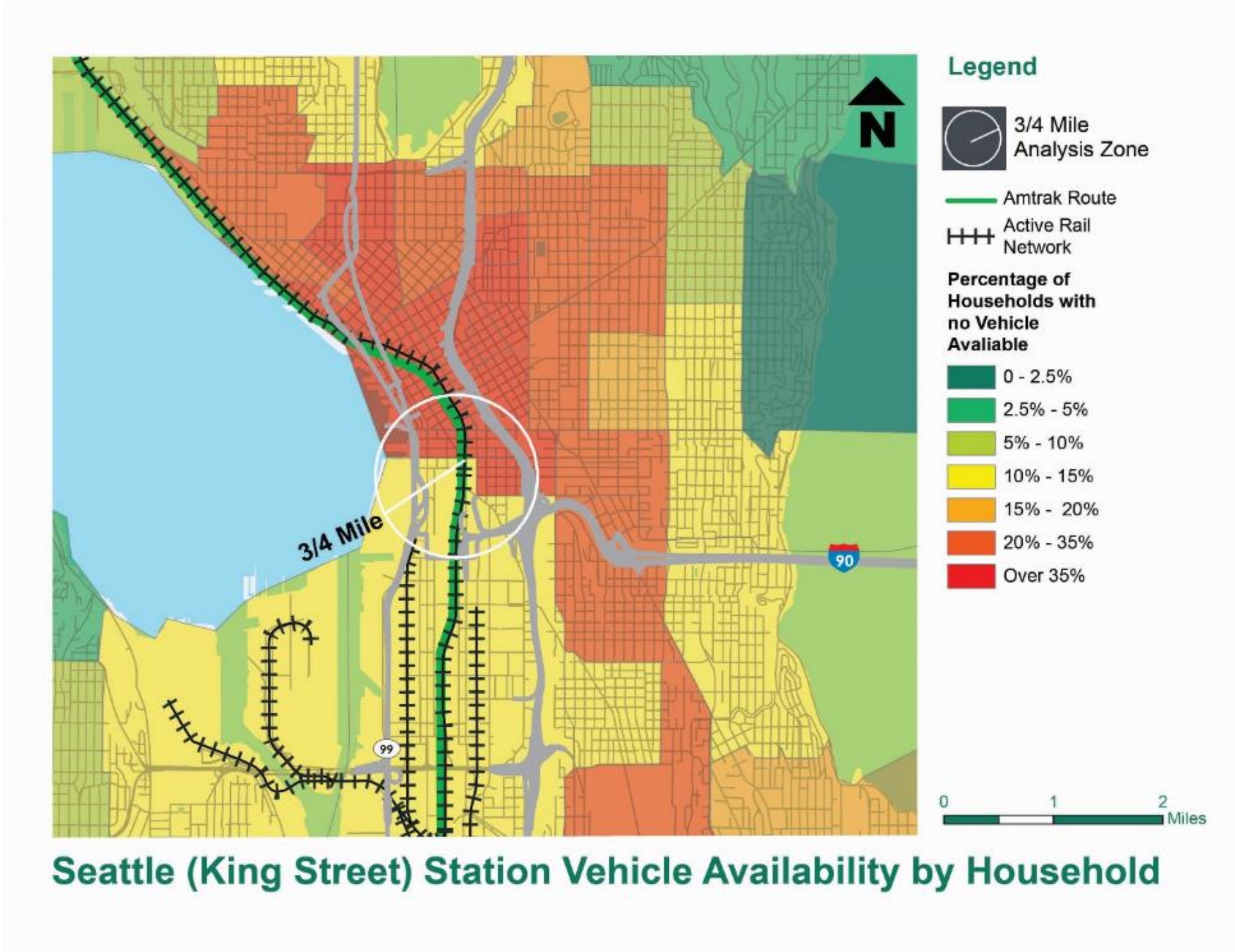


Figure 4: Station Context-Attractors



4485

4486 **Figure 5: Zero-Car Households**

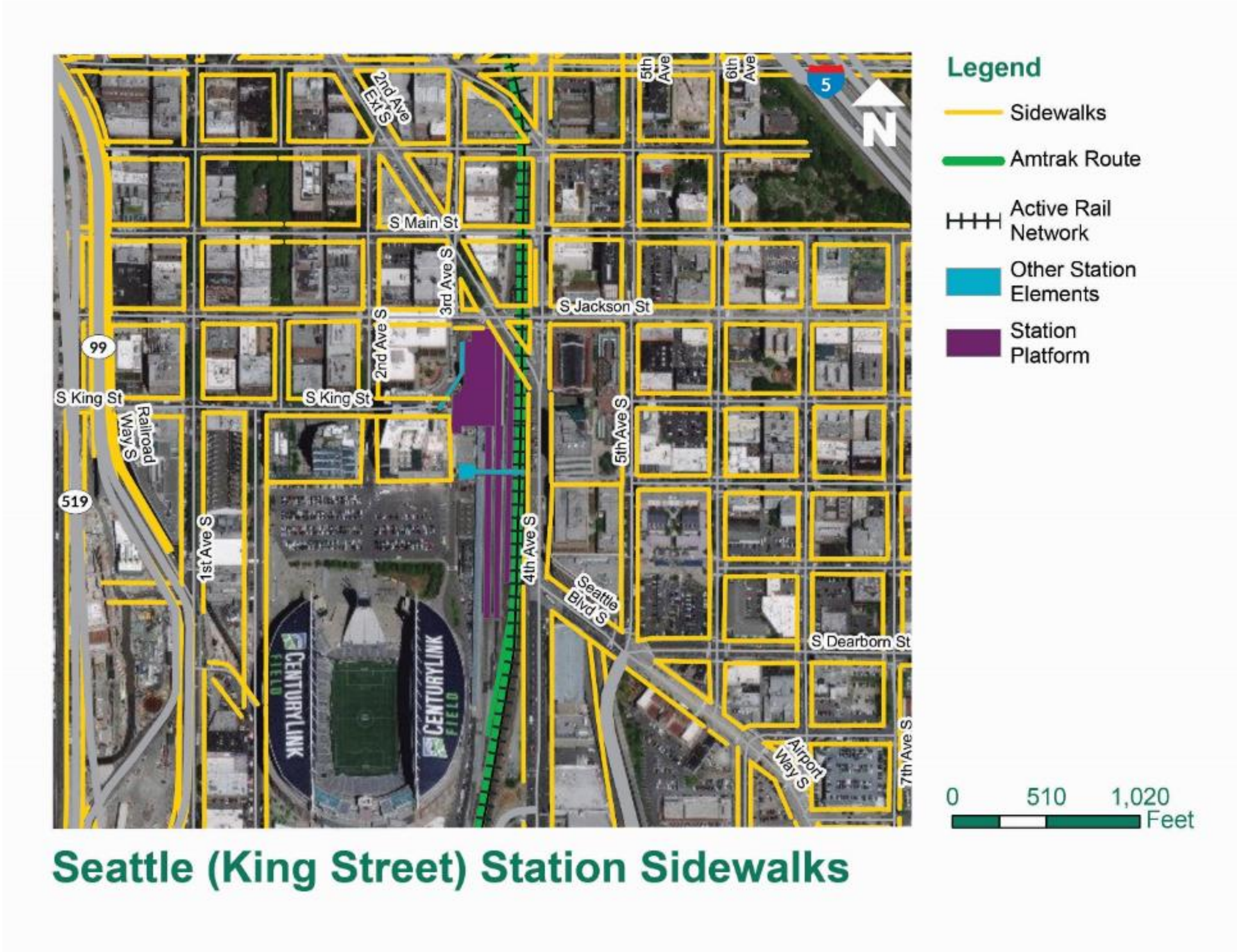


Figure 6: Sidewalks

Seattle (King Street) Station Bicycle Facilities

Figure 7: Bicycle Facilities

Supporting information - photo documentation

Site visits were conducted in Seattle on October 10, 2018 to inventory assets at the station and assess multimodal connections.

Photo 1: Unsigned, unclear markings for drop-off/pick-up area at King Street entrance.

Photo 2: Short term parking for drop-off / pick-up.

Photo 3: Looking east on Jackson at 5th Avenue.

Photo 4: Light Rail station entry way; 1-2 blocks from Amtrak station.

Photo 5: Jackson Street crossing 2nd Avenue.

Photo 6: Wayfinding and information transportation kiosk inside Amtrak station.

Edmonds, WA

Edmonds Station

211 Railroad Ave

Edmonds, WA 98020

Edmonds, WA
Edmonds Station

Connectivity Score
6.3

Station overview

The Edmonds Station, owned by BNSF Railway, features a passenger waiting room and shares a platform with Sounder commuter rail that provides other passenger amenities including bicycle lockers, wayfinding signs, and parking. The station is situated on Puget Sound, has easy connections to ferries and local buses, and is in walking distance to a small commercial area with restaurants and a museum.

The station served approximately 23,000 passengers in 2017. Trip purpose and mode of access data gathered from a 2018 on-board passenger survey is summarized in Figures 1 and 2. (The on-board survey reached over 1,000 Amtrak Cascades passengers, producing statistically significant results for the corridor. However, at the station level, results may not be statistically significant, particularly at stations with lower ridership.)

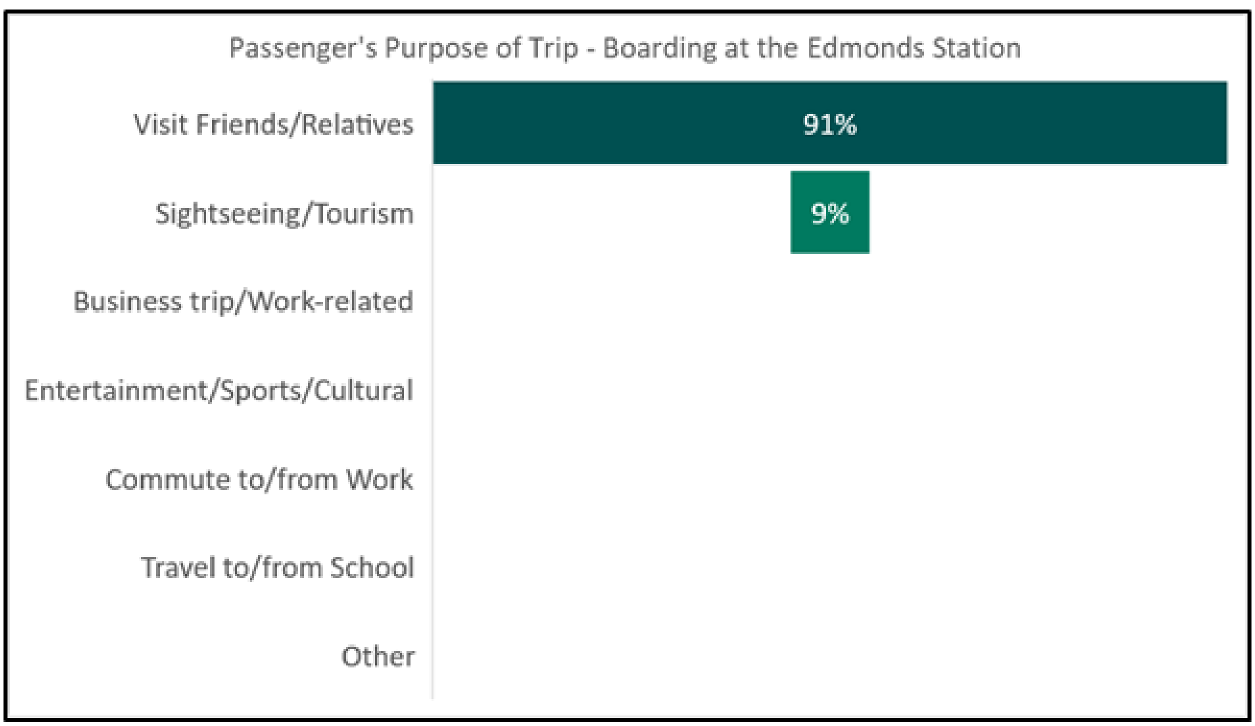


Figure 47: Survey Results-Trip Purpose

Note: Survey respondents had the option of selecting more than one response.

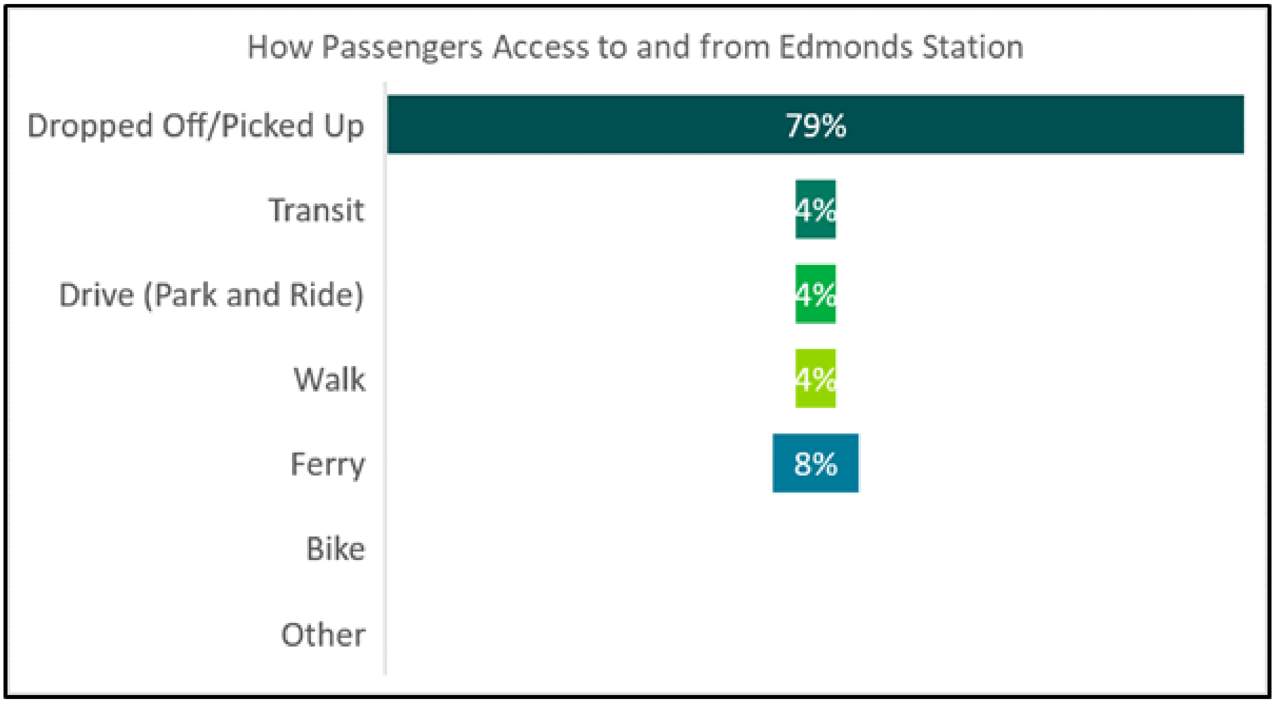


Figure 48: Survey Results-Mode of Access

Note: Survey respondents had the option of selecting more than one response.

Parking and drop-off/pick-up

A total of 259 spaces, including dedicated accessible parking, are provided in a surface parking lot at Edmonds Station.

There are painted yellow curb areas at the station with no signing, except one area indicates that there is no parking as it is a fire lane. These areas that are not designated but used for drop-off/pick-up (use for taxi, transportation network companies, or human services transportation).

Walk and transit access

From a pedestrian standpoint, the Edmonds Station is connected with roadways and sidewalks, with three different marked options that people can use to access the station. From the ferry terminal, there is a direct connection from the ferry to the north side of the station. Someone that is walking will have to cross the railroad tracks, but it's clearly marked and from a visual inspection appears ADA-compliant.

Pedestrians can also access the station from Sunset Avenue or Dayton Street. Both streets have sidewalks. A person that is going to/from the mixed-use development that is adjacent to the station, will have to navigate through the parking lot; the pedestrian paths in that parking lot are not clearly marked.

The wayfinding signs have been upgraded and provide clear direction for all users and services.

Commuter rail service is available at the shared passenger rail platform. BNSF plans to add a second track through this location, presenting an opportunity for a second platform. Connections to local/regional bus service occupy the north portion of the station, which offers a simplified multi-seat trip. The bus terminal area has multiple benches and shelters that currently support three bus bays.

Bicycle access

A person looking to bike to/from the station does have options by way of marked bike routes, but there are no marked bicycle lanes or sharrows that connect to the station. There are bike lockers offered at the station, and bicycle-focused wayfinding is provided in the station area.

Connectivity analysis

As shown in Table 1, analysis of land use, mobility and transportation network measures for the Edmonds station yielded a connectivity score of 6.3, of a possible 10 points, indicating significant gaps in the existing connectivity of the station.

The station achieved high sub-scores in the three categories: the number of attractors, the land use context of the station, connecting sidewalks, and wayfinding signs. The analysis also highlights connectivity deficiencies at the Edmonds station that include: a high number of at grade railroad crossings, a low number of connecting transit routes, a low number of private transportation service options, and the lack of a designated area for drop-off/pick-up.

Table 1. Connectivity Evaluation:	**Edmonds**				
Categories & Measures	**Measures**	**Maximum Points**	**Maximum Score**	**Points**	**Score**
LAND USE	**2**	**6**	**2**	**4**	**1.3**
Station Location Context & Attractors		3		3	
Zero Car Household		3		1	
MOBILITY	**3**	**9**	**3**	**4**	**1.3**
Transit Service		3		1	
Private Transportation Connection Options		3		1	
Human Services Transportation		3		2	
CONNECTED TRANSPORTATION NETWORK	**5**	**15**	**5**	**9**	**3.0**
At-Grade Railroad Crossings		3		0	
Sidewalks		3		3	
Bicycle Facilities		3		2	
Drop-off/Pick-up Areas		3		1	
Wayfinding		3		3	
Station Connectivity-Total	**10**	**30**	**10**	**17**	**5.7**

Candidate improvements

Based on the results of the connectivity analysis and field visits, Figure 3 and Table 2 identify candidate pedestrian, bicycle, multimodal and railroad crossing improvements that can be expected to enhance connectivity to Edmonds Station and promote increased safety for all travel modes.

Figure 49: Candidate Improvements

Table 2. Opportunities to Enhance Connectivity at Edmonds Station

Type	Gaps	Candidate Improvement*	Potential Project Examples/Locations*
Railroad Crossing	Consistent signing, striping, crossing gates, and crossing surface.	Railroad crossing improvements	Main Street, Dayton
Multimodal	Designated drop-off/pick-up area	Signage, striping, and additional designated drop-off/pick-up area for accessible/disabled transportation, either on-site or on-street at station areas	Improve signage and markings at station frontage
Multimodal	Wayfinding signs	Install additional wayfinding signs in station area	Locations to be determined
Pedestrian	Complete sidewalks (curb, gutter, ramps)	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	Sidewalk ramp upgrades to current accessibility guidelines

*WSDOT will work with stakeholders to improve access and connectivity to Amtrak Cascades stations. Local jurisdictions, transit agencies, Amtrak and railroads could consider addressing these opportunities when implementing their capital improvement and service development plans; some of the opportunities identified may also be addressed in these existing plans.

Supporting information – connectivity analysis

The summary results and connectivity score for the Edmonds are supported by geospatial representations of four measured criteria (attractors, zero car households, sidewalks, and bicycle facilities) presented in the figures below and in Table C-1. Multimodal Connectivity Analysis: Observed Data & Assignment of Points.

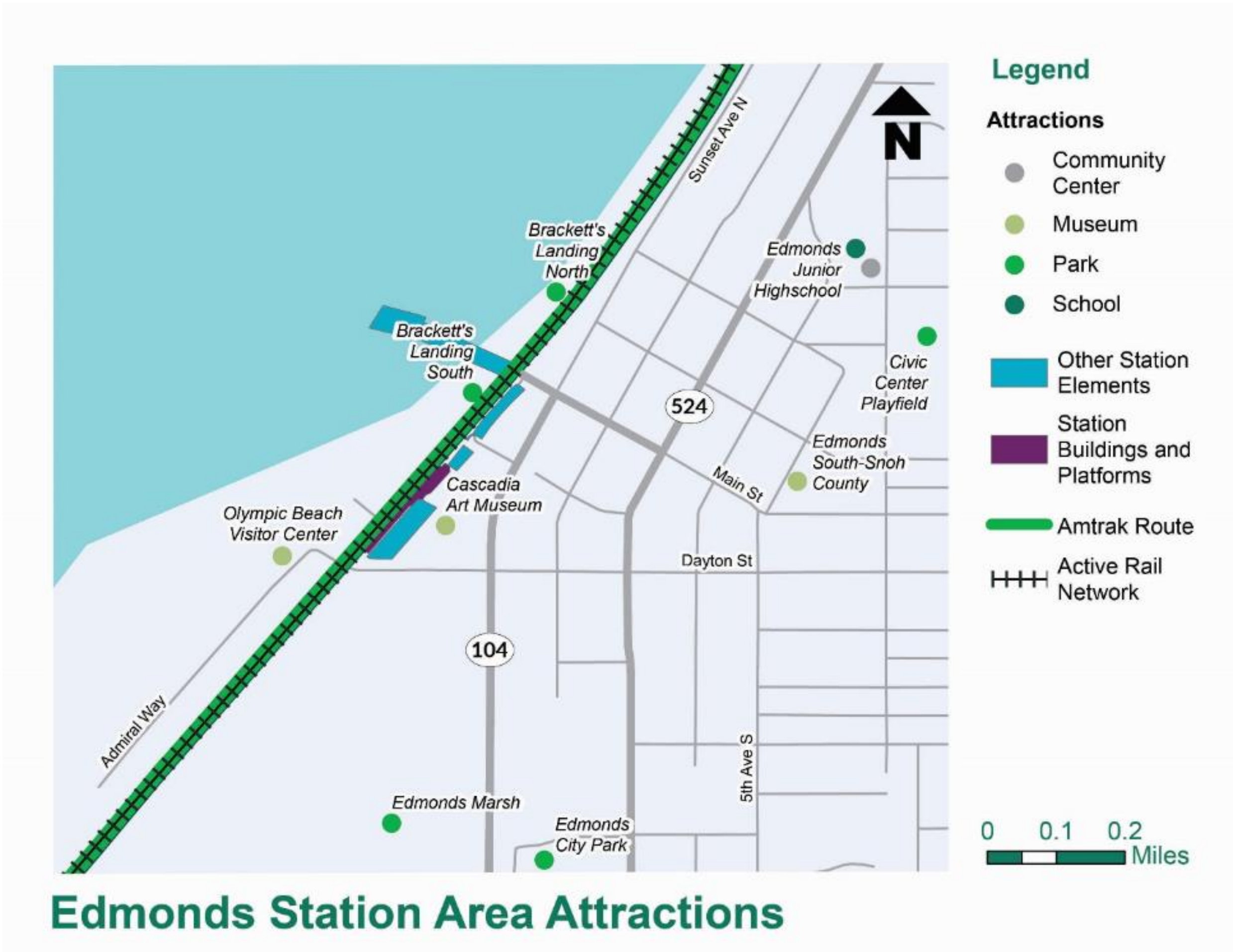
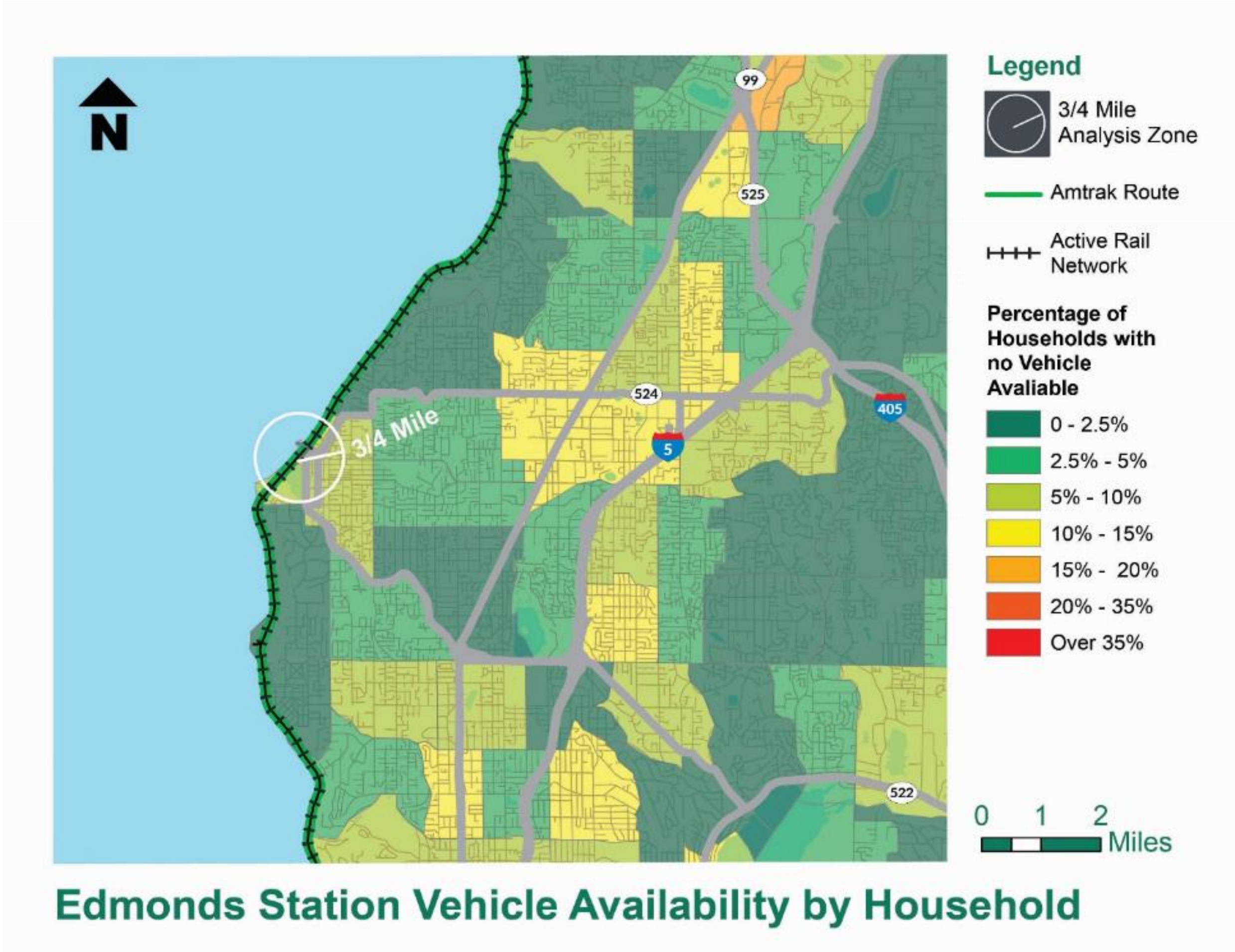


Figure 50: Station Context-Attractors



4603
4604 **Figure 51: Zero-Car Households**

Figure 52: Sidewalks

Figure 53: Bicycle Facilities

Supporting information - photo documentation

Site visits were conducted in Edmonds on October 10, 2018 to inventory assets at the station and assess multimodal connections.

Photo 1: Sidewalk and bicycle route wayfinding sign.

Photo 2: Railroad crossing.

Photo 3: Edmonds Station pick-up and drop-off area.

Photo 4: Interior of Amtrak Station.

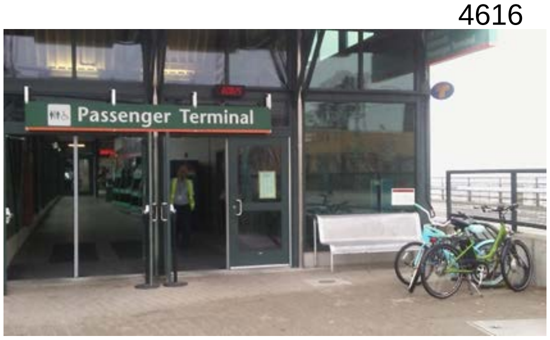


Photo 5: Entrance to the Ferry Terminal.

Photo 6: Passengers about to board train.

Everett, WA

Everett Station

3201 Smith Ave

Everett, WA 98201

Everett, WA

Everett Station

Connectivity Score

8.0

Station overview

Everett Station, owned by the City of Everett, serves Amtrak, Sounder commuter rail, local transit, and intercity bus customers. The station also serves as a community amenity that supports public meetings, job training, a youth center and veteran's services. The station is located in a commercial/industrial area within walking distance to the downtown area.

The station served approximately 23,000 passengers in 2017. Trip purpose and mode of access data gathered from a 2018 on-board passenger survey is summarized in Figures 1 and 2. (The on-board survey reached over 1,000 Amtrak Cascades passengers, producing statistically significant results for the corridor. However, at the station level, results may not be statistically significant, particularly at stations with lower ridership.)

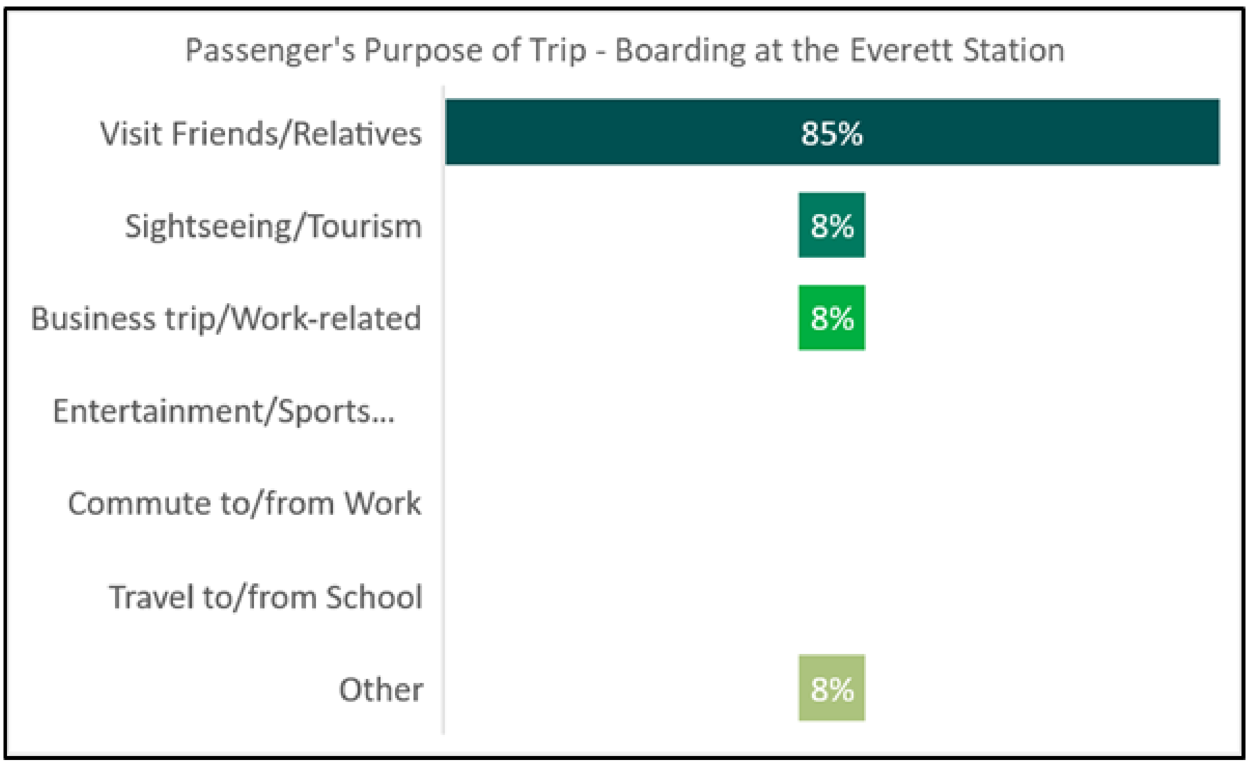


Figure 54: Survey Results-Trip Purpose

Note: Survey respondents had the option of selecting more than one response.

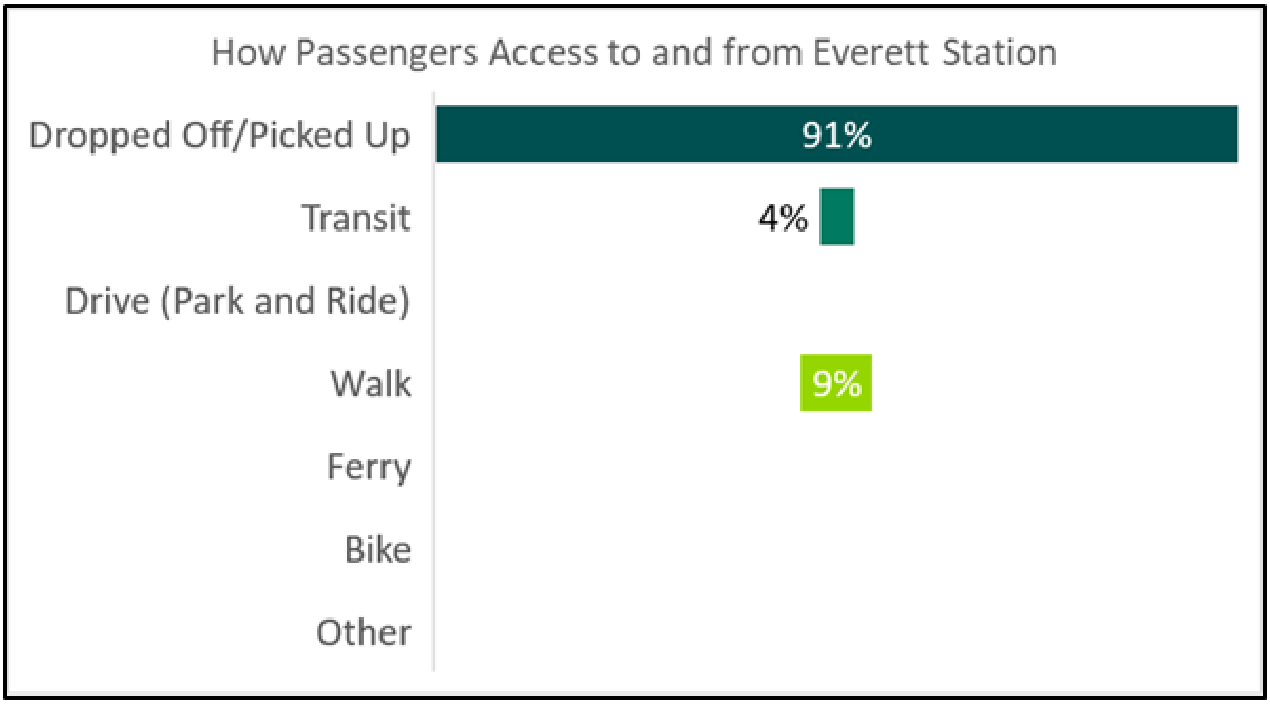


Figure 55: Survey Results-Mode of Access

Note: Survey respondents had the option of selecting more than one response.

Parking and drop-off/pick-up

Several parking lots are provided at Everett Station; most of the parking is designated for use by Sounder patrons, but 25 long-term parking spaces are available for use by Amtrak patrons.

There are painted yellow curb areas with signs at the entrance to the station, from the west side, for drop-off and pick-up (taxi, transportation network companies). Additionally, there is a dedicated, designated drop-off pick-up area for human services transportation providers.

Walk and transit access

From a pedestrian standpoint, the Everett station is connected with roadways and sidewalks that provide safe options to access the station. The only place where a person might have to cross railroad tracks at-grade is at the station platforms. Smith Avenue, the main north/south street adjacent to the station, does have sidewalks on both sides for the majority of the length of the station and connecting transit center. There is a portion of the west side of Smith Avenue that has industrial businesses without sidewalks, but sidewalks are on the station side of the street. The streets that feed east/west to the station are Pacific Avenue, 32nd Avenue, and 33rd Avenue. All have sidewalks.

The wayfinding signs have been upgraded and integrated with the local/regional transit providers to provide clear direction for all different users on how to connect to different services at the station/transit center.

Sound Transit’s Sounder commuter rail service provides train service between Everett Station and Seattle during peak periods. The transit center at the Everett station has 25 bus bays operated by five different local/regional bus service providers. The bus terminal area has multiple benches and shelters and a grade-separated pedestrian bridge connecting the park and ride lot east of the tracks to the train and bus platforms.

Bicycle access

If a passenger was planning to ride their bicycle to the Everett Station, there would not be many route options that have bicycle facilities. There is one option to connect on the south side of the transit center and Amtrak station by way of Smith Avenue that has a narrow marking for the majority of the route from 41st street, with a portion of the southbound side of the road that has a bicycle lane. At 41st Avenue, there is a direct connection to the Interurban Trail. Bicycle racks are available at this station.

Connectivity Analysis

As shown in Table 1, analysis of land use, mobility and transportation network measures for the Everett station yielded a connectivity score of 8.0, of a possible 10 points, indicating generally good connectivity with some gaps in the existing connectivity of the station.

Strengths related to the connectivity of the Everett Station include the high percentage of zero-car households in the area; the human service transportation plan provided for this area; the number of connecting transit options and sidewalks available, and the well-defined area for dropping-off/picking-up passengers. The analysis also identifies access issues at the station that include a low number of connecting bicycle facilities and the presence of unimproved at-grade railroad crossings.

Table 1. Connectivity Evaluation:	**Everett**				
Categories & Measures	**Measures**	**Maximum Points**	**Maximum Score**	**Points**	**Score**
LAND USE	**2**	**6**	**2**	**5**	**1.7**
Station Location Context & Attractors		3		2	
Zero Car Household		3		3	
MOBILITY	**3**	**9**	**3**	**7**	**2.3**
Transit Service		3		3	
Private Transportation Connection Options		3		1	
Human Services Transportation		3		3	
CONNECTED TRANSPORTATION NETWORK	**5**	**15**	**5**	**12**	**4.0**
At-Grade Railroad Crossings		3		2	
Sidewalks		3		3	
Bicycle Facilities		3		1	
Drop-off/Pick-up Areas		3		3	
Wayfinding		3		3	
Station Connectivity-Total	**10**	**30**	**10**	**24**	**8.0**

Candidate improvements

Based on the results of the connectivity analysis and field visits, Figure 3 and Table 2 identify candidate pedestrian, bicycle, multimodal and railroad crossing improvements that can be expected to enhance connectivity to Everett Station and promote increased safety for all travel modes. These candidate improvements, including potential project examples and/or locations, were identified based on the system-wide candidate improvement types, analysis of existing connectivity gaps, and site visits. These representative examples may include facilities owned by the State, Amtrak, railroads or local agencies. WSDOT will further evaluate the viability of the opportunities identified here to improve state facilities for better access to Amtrak Cascades stations. Amtrak, railroads and local agencies can consider implementing improvements to their facilities and operations, similar to these representative examples, as they develop their capital improvement and service plans.

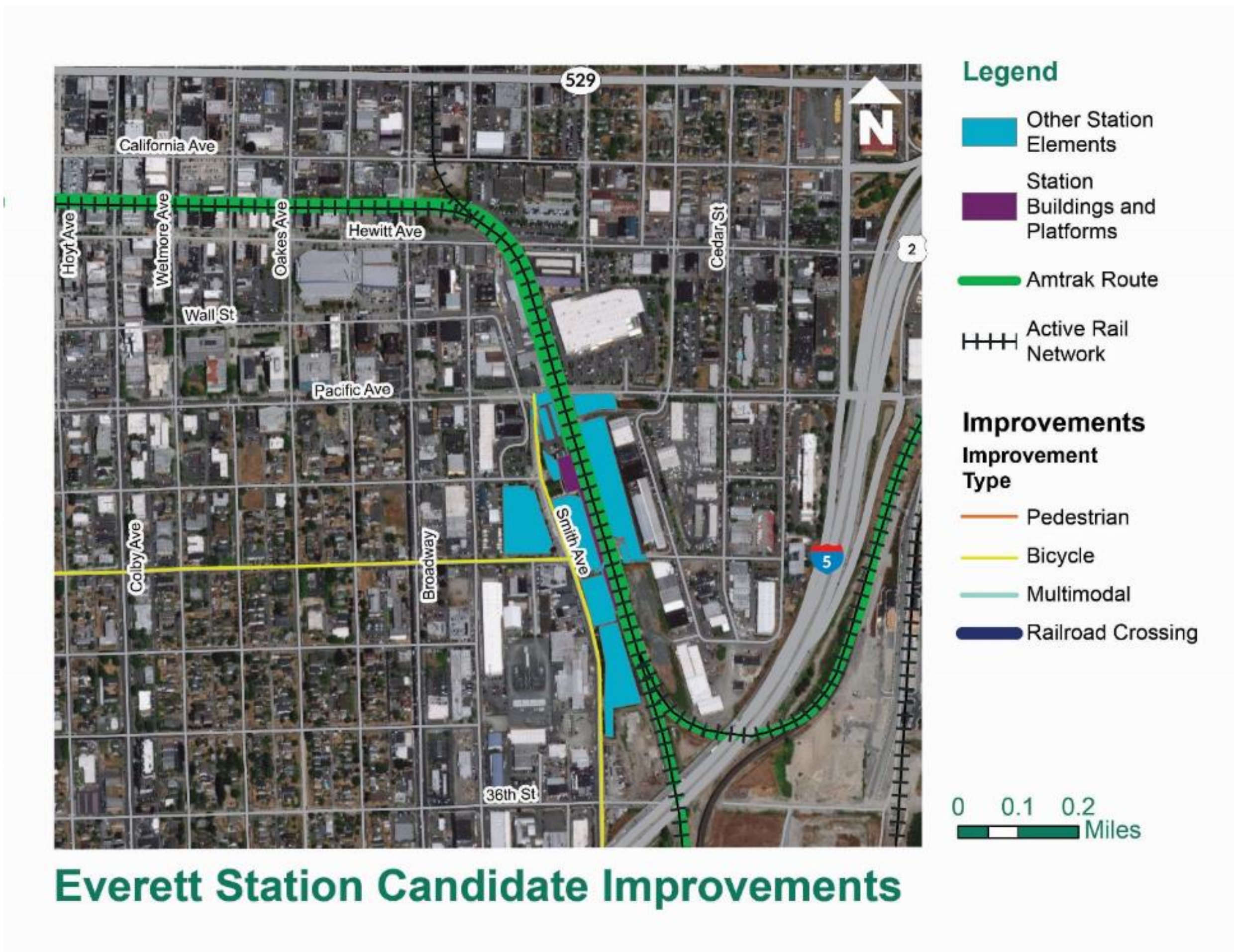


Figure 56: Candidate Improvements

Table 2. Opportunities to Enhance Connectivity at Everett Station

Type	Gaps	Candidate Improvement*	Potential Project Examples/Locations*
Bicycle	Dedicated bicycle lanes	Bicycle facility improvements within 1/2-mile radius of station	Smith Avenue from Pacific Avenue to 41st Street and the Interurban Trail; 33rd Avenue
Multimodal	Wayfinding signs	Install additional wayfinding signs in station area	Locations to be determined
Pedestrian	Complete sidewalks (curb, gutter, ramps)	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	Sidewalk ramp upgrades to current accessibility guidelines

*WSDOT will work with stakeholders to improve access and connectivity to Amtrak Cascades stations. Local jurisdictions, transit agencies, Amtrak and railroads could consider addressing these opportunities when implementing their capital improvement and service development plans; some of the opportunities identified may also be addressed in these existing plans.

Supporting information - connectivity analysis

The summary results and connectivity score for the Everett station are supported by geospatial representations of four measured criteria (attractors, zero car households, sidewalks, and bicycle facilities) presented in the figures below and in Table C-1. Multimodal Connectivity Analysis: Observed Data & Assignment of Points.

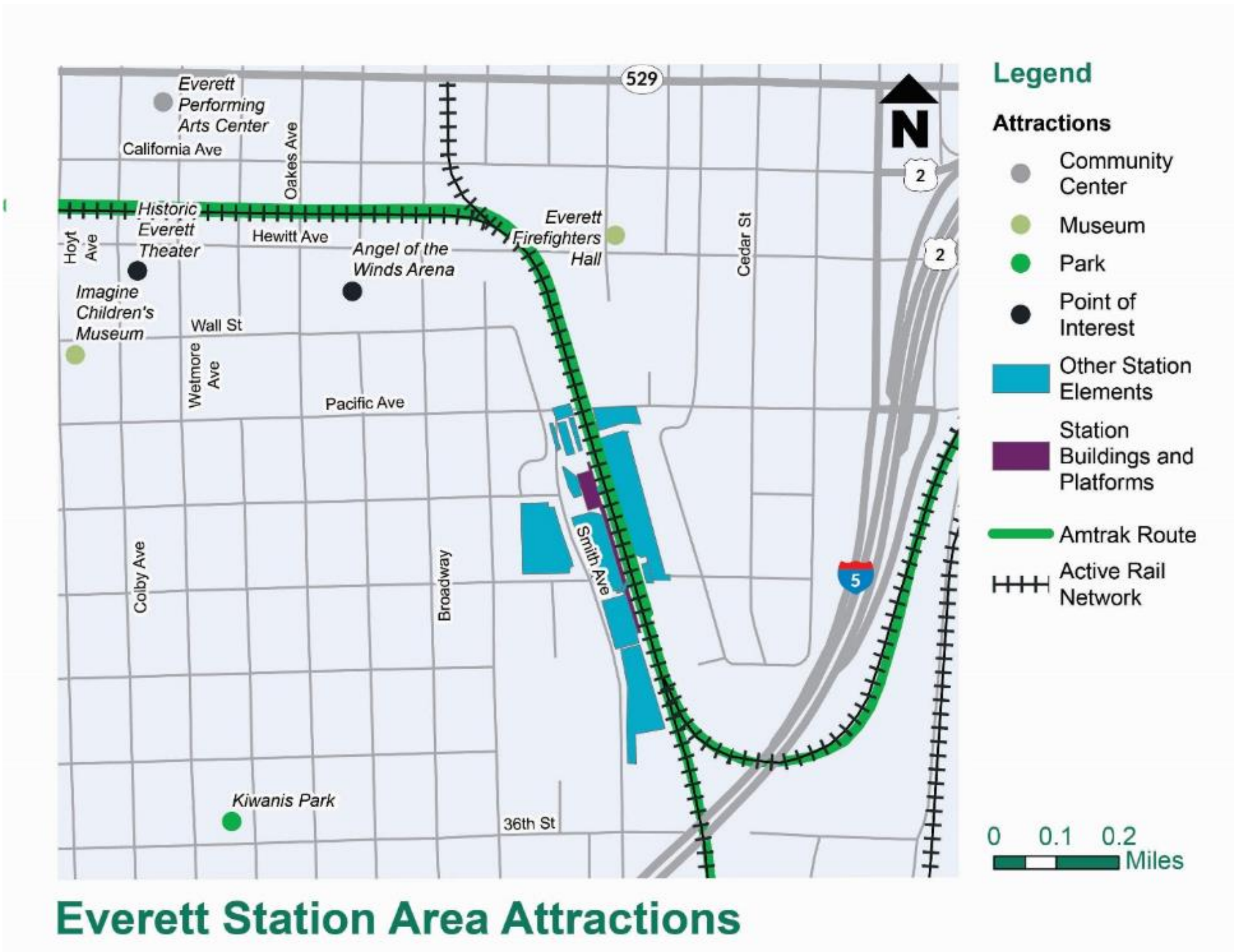


Figure 57: Station Context-Attractors

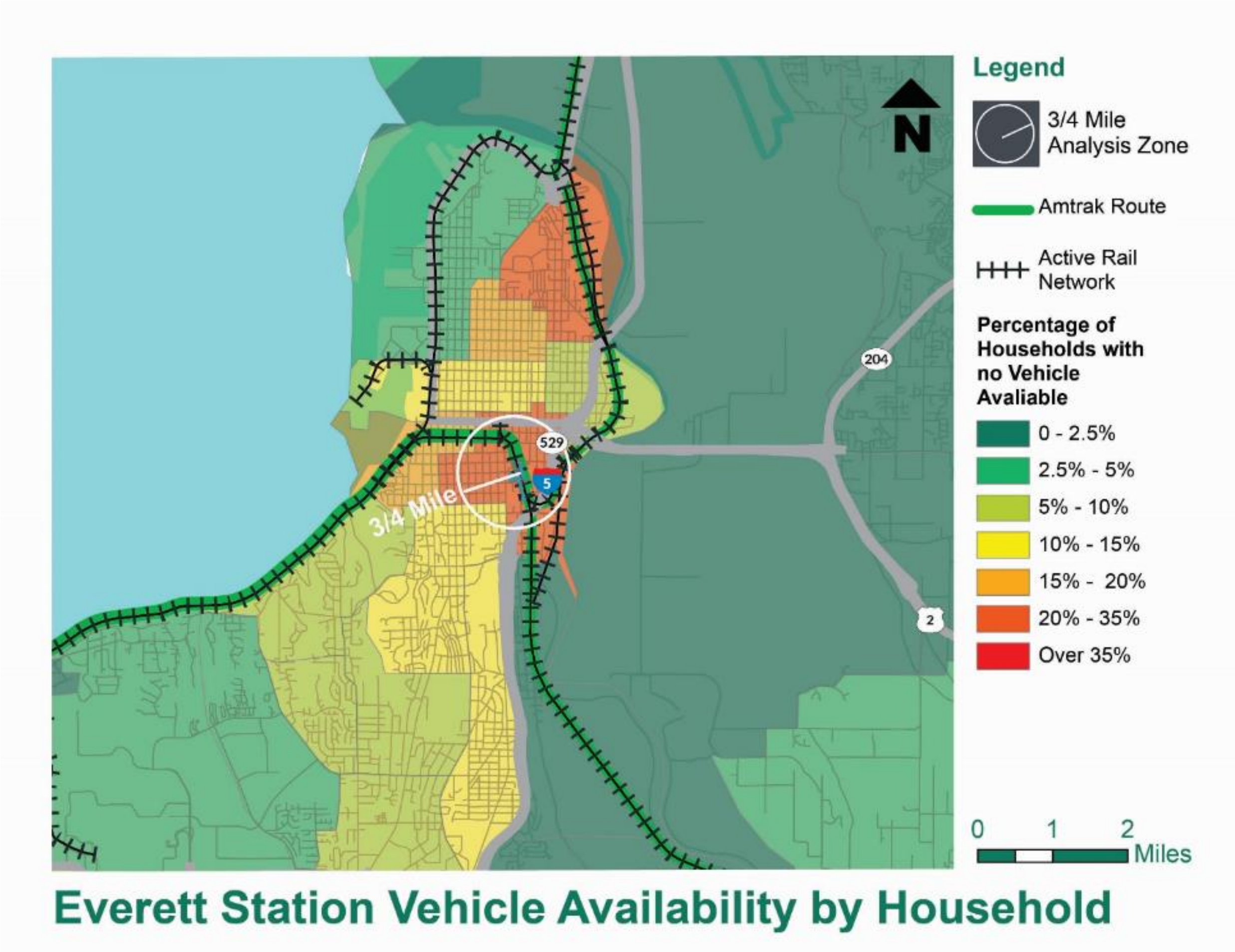
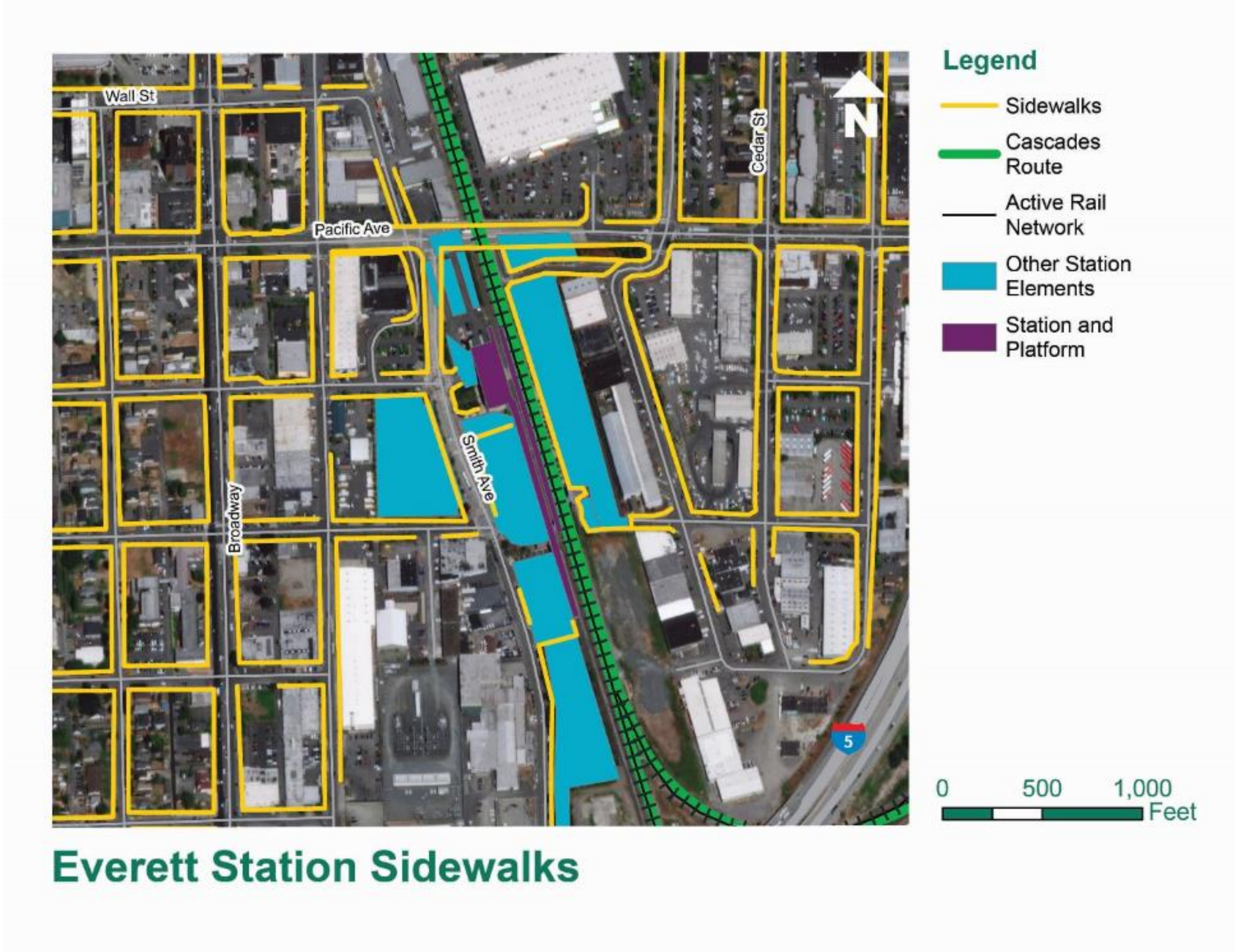


Figure 58: Zero-Car Households



4718

4719 **Figure 59: Sidewalks**

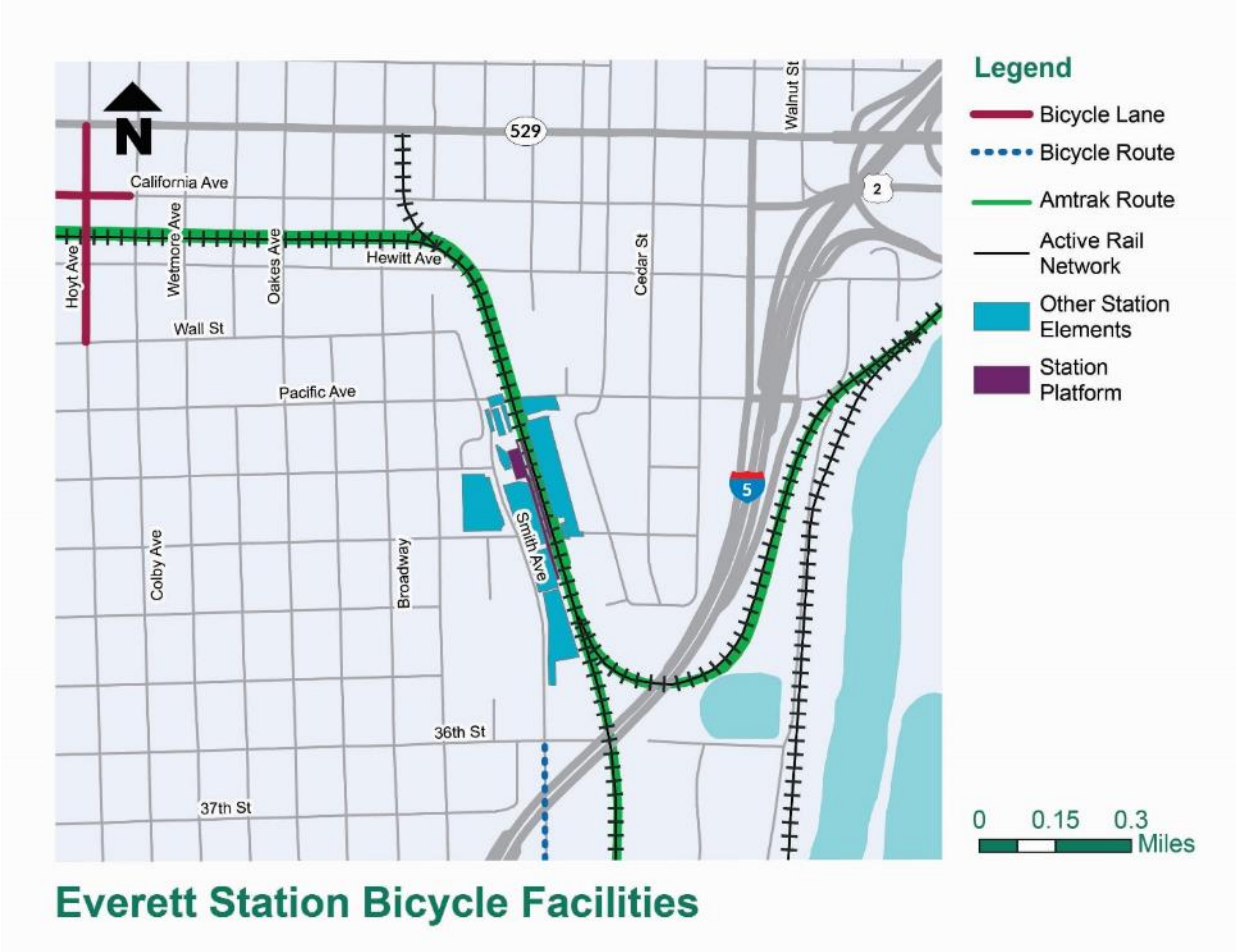


Figure 7: Bicycle Facilities

Supporting information - photo documentation

Site visits were conducted in Everett on October 10, 2018 to inventory assets at the station and assess multimodal connections.

Photo 1: Local transit connection at Everett Station.

Photo 2: Sidewalks with curb striping.

Photo 3: Bus station and shelter.

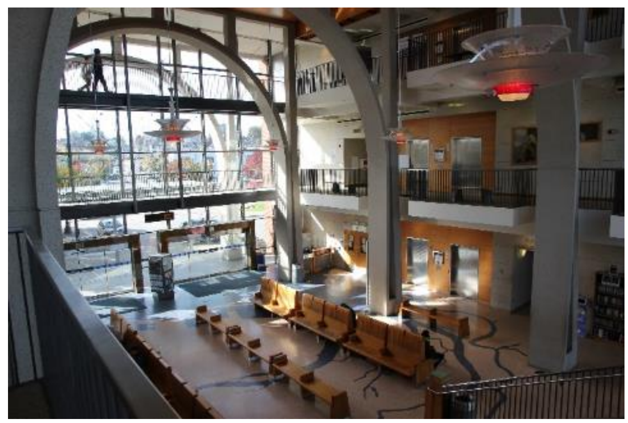


Photo 4: Interior of Everett Station

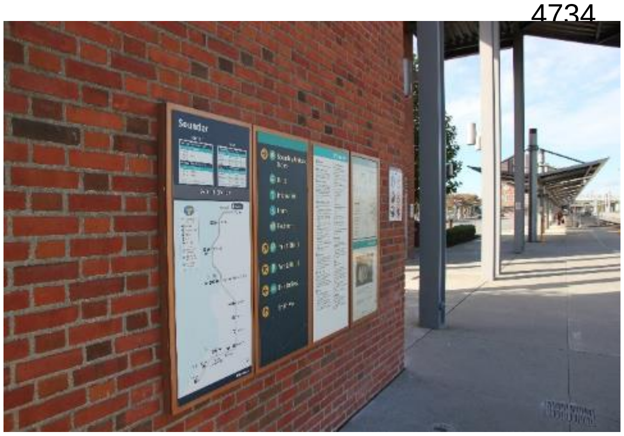


Photo 5: Informational signs.

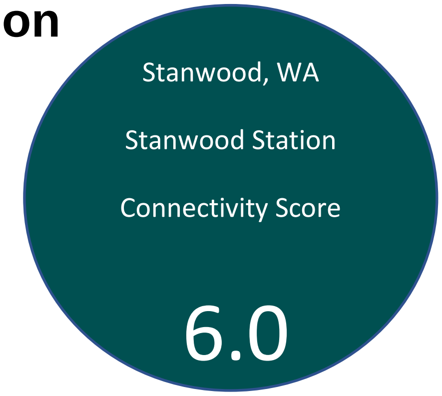
Photo 6: Information Center inside Amtrak Station.

Stanwood, WA

Stanwood Station

27111 Florence Way

Stanwood, WA 98292



Station overview

Stanwood Station offers a platform and canopy; there is no station building, waiting area or ticket office at this location. The station, owned by WSDOT, is near the main commercial street in Stanwood and close to a residential area to the east of the railroad tracks.

The station served approximately 5,000 passengers in 2017. Trip purpose and mode of access data gathered from a 2018 on-board passenger survey is summarized in Figures 1 and 2. (The on-board survey reached over 1,000 Amtrak Cascades passengers, producing statistically significant results for the corridor. However, at the station level, results may not be statistically significant, particularly at stations with lower ridership.)

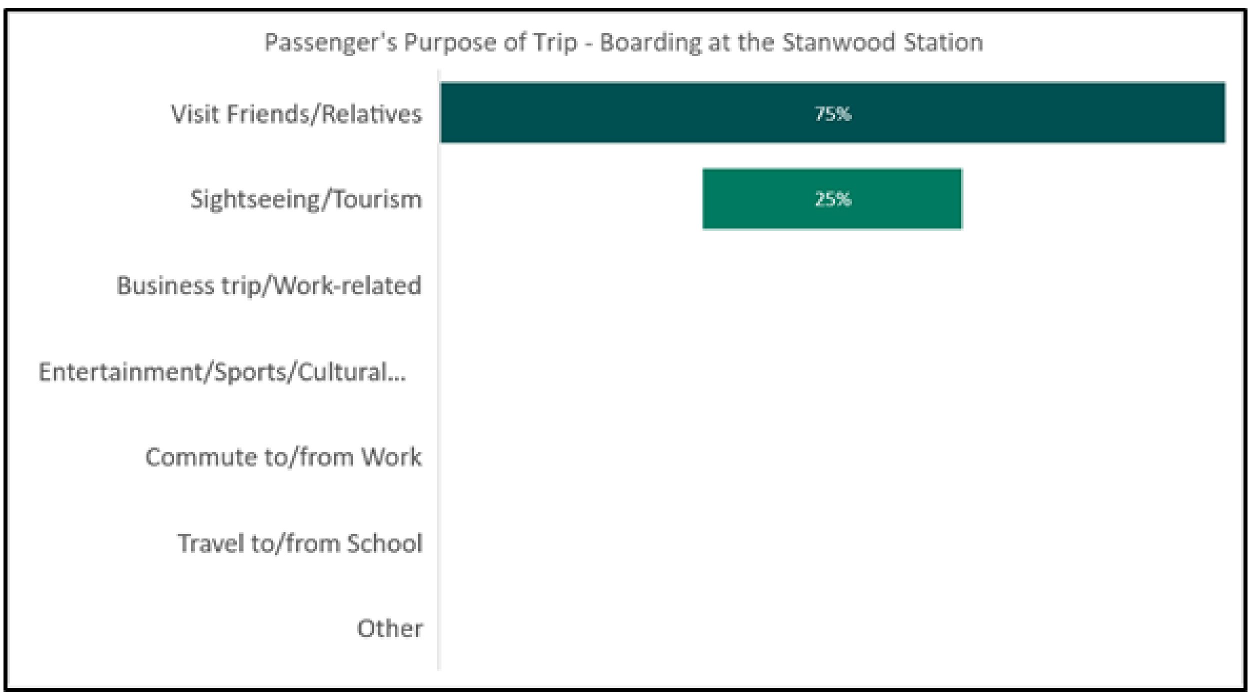


Figure 60: Survey Results-Trip Purpose

Note: Survey respondents had the option of selecting more than one response.

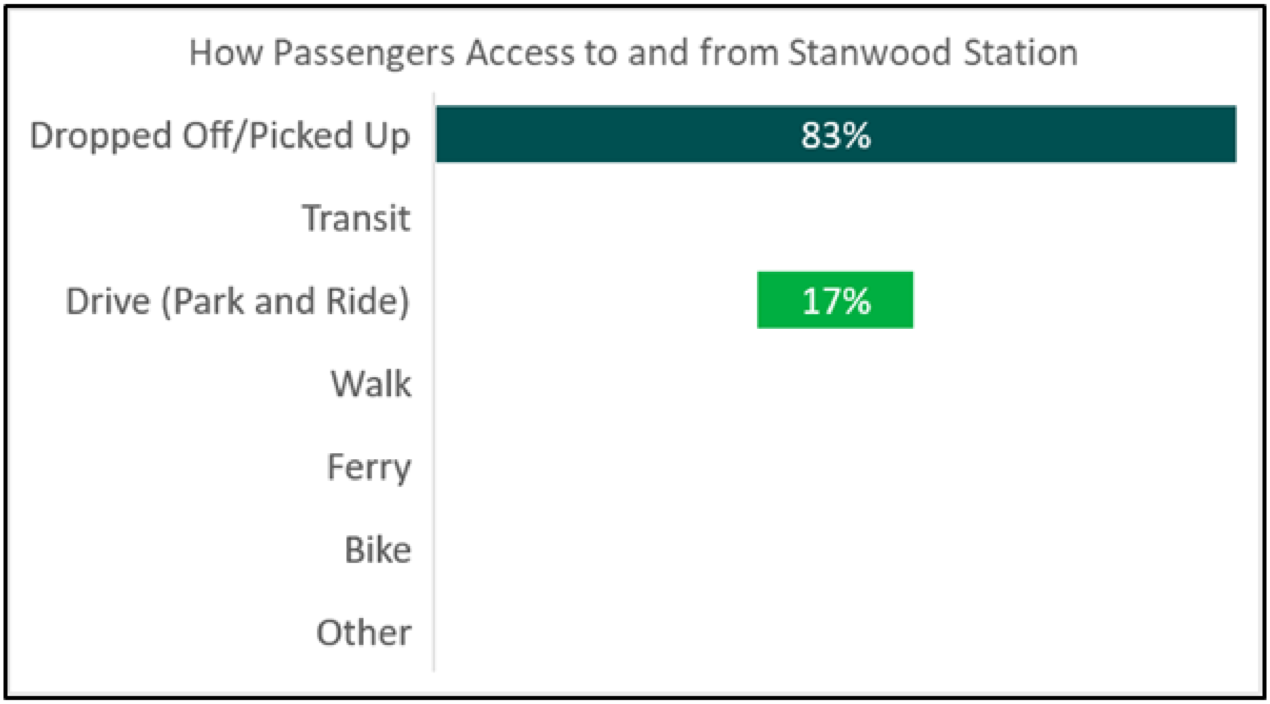


Figure 61: Survey Results-Mode of Access

Note: Survey respondents had the option of selecting more than one response.

Parking and drop-off/pick-up

The station has 10 parking spaces in a surface parking lot; the parking is also used by businesses located adjacent to the station. A designated drop-off/pick-up area is provided.

Walk and transit access

On 271st Street NW, the southern boundary of the station, there are sidewalks on both sides between SR 532 and 84th Avenue NW (adjacent to the railroad tracks). Markings clearly indicate that sidewalks end on the south side of the street and a signed crosswalk marks where people are supposed to cross to access sidewalks on the north side east of 84th Avenue NW. The presence of pedestrian safety flags at this crossing indicate safety concerns. When 271st Street NW crosses the railroad tracks at 84th Avenue NW, there is also one marked at-grade sidewalk crossing on the north side of the road. The other streets that provide access to the station, 88th Avenue NW Street and 272nd Street NW have a rural cross section with no sidewalks.

A bus stop for service provided by Island Transit is located within one-quarter mile from the station platform, near the intersection of 88th Avenue NW with SR 532.

Bicycle access

There are no marked bicycle facilities connecting to the station. The City considers SR 532, 271st Street NW, 92nd Ave NW, 276th St NW and Pioneer Highway to be bicycle routes. People that choose to access the Stanwood station must follow the bicycle laws for Washington state and ride with traffic.

Connectivity analysis

As shown in Table 1, analysis of land use, mobility and transportation network measures for the Stanwood station yielded a connectivity score of 6.0, of a possible 10 points, indicating significant gaps in the existing connectivity of the station.

The station achieved higher sub-scores in the two categories: the area to drop-off/pick-up passengers and the related Human Services Transportation Plan. The analysis also highlights access issues surrounding the Stanwood station that include: a low number of attractors, low amount of zero car households, a low number of transportation connectivity options, a lower number of connecting bicycle facilities, and wayfinding signs.

Table 1. Connectivity Evaluation:	**Stanwood**				
Categories & Measures	**Measures**	**Maximum Points**	**Maximum Score**	**Points**	**Score**
LAND USE	**2**	**6**	**2**	**3**	**1.0**
Station Location Context & Attractors		3		2	
Zero Car Household		3		1	
MOBILITY	**3**	**9**	**3**	**6**	**2.0**
Transit Service		3		2	
Private Transportation Connection Options		3		1	
Human Services Transportation		3		3	
CONNECTED TRANSPORTATION NETWORK	**5**	**15**	**5**	**9**	**3.0**
At-Grade Railroad Crossings		3		2	
Sidewalks		3		2	
Bicycle Facilities		3		1	
Drop-off/Pick-up Areas		3		3	
Wayfinding		3		1	
Station Connectivity-Total	**10**	**30**	**10**	**18**	**6.0**

Candidate improvements

Based on the results of the connectivity analysis and field visits, Figure 3 and Table 2 identify candidate pedestrian, bicycle, multimodal and railroad crossing improvements that can be expected to enhance connectivity to Stanwood Station and promote increased safety for all travel modes.

Figure 62: Candidate Improvements

Table 2. Opportunities to Enhance Connectivity at Stanwood Station

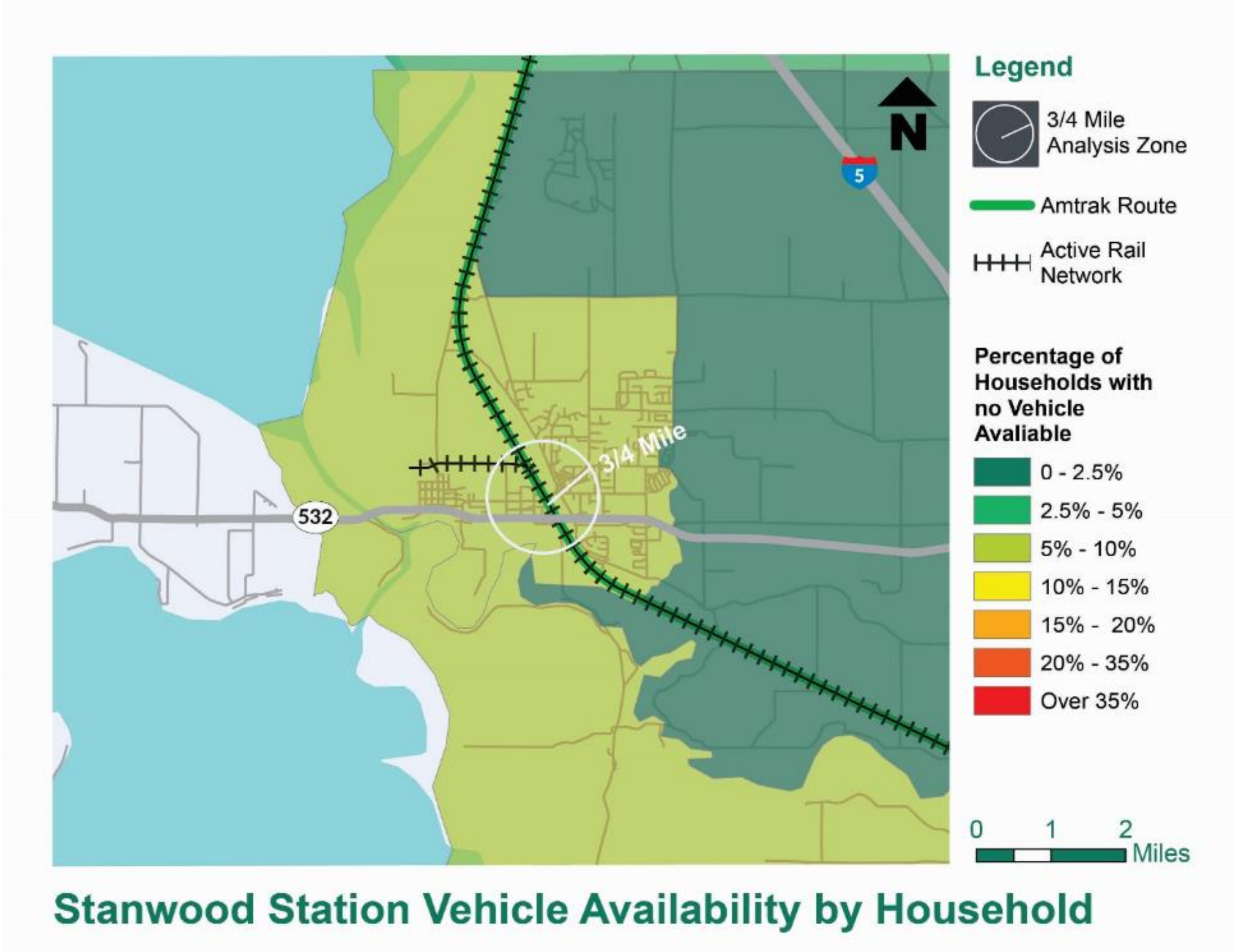
Type	Gaps	Candidate Improvement*	Potential Project Examples/Locations*
Railroad Crossing	Signage, striping, crossing gates, and crossing surface	Railroad crossing improvements	271st Street
Transit	Direct local transit service connections.	Additional transit service to station area	New or modified transit routes
Bicycle	Bicycle lanes	Bicycle facility improvements within 1/2-mile radius of station	92nd Avenue
Pedestrian	Complete sidewalks (curb, gutter, ramps)	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	Lien/88th Street sidewalk improvements; curb bulbs/flashing pedestrian beacon at 271st/84th Avenue
Multimodal	Wayfinding signs	Install additional wayfinding signs in station area	Locations to be determined

*WSDOT will work with stakeholders to improve access and connectivity to Amtrak Cascades stations. Local jurisdictions, transit agencies, Amtrak and railroads could consider addressing these opportunities when implementing their capital improvement and service development plans; some of the opportunities identified may also be addressed in these existing plans.

Supporting information - connectivity analysis

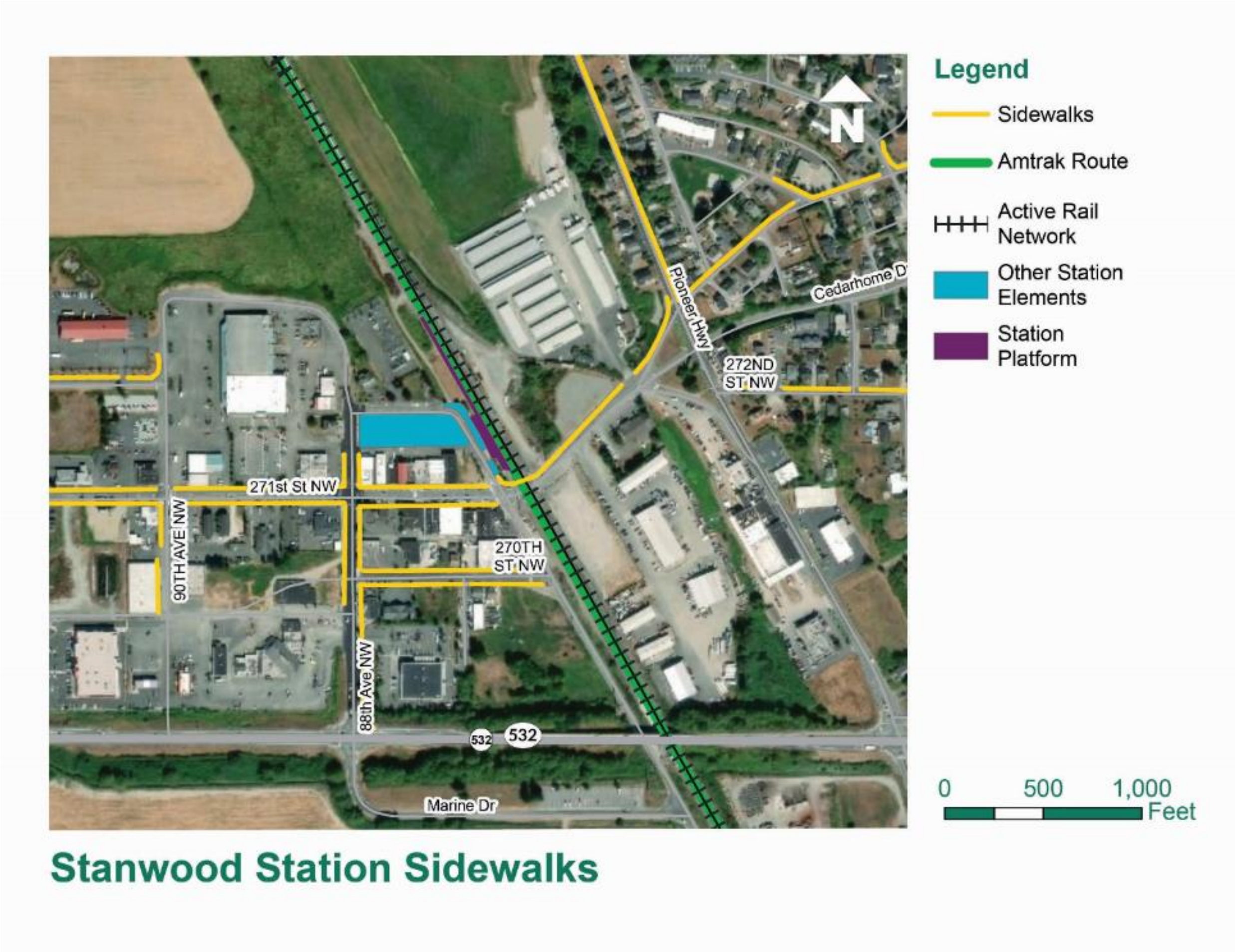
The summary results and connectivity score for the Stanwood station are supported by geospatial representations of four measured criteria (attractors, zero car households, sidewalks, and bicycle facilities) presented in the figures below and in Table C-1. Multimodal Connectivity Analysis: Observed Data & Assignment of Points.

Figure 63: Station Context-Attractors



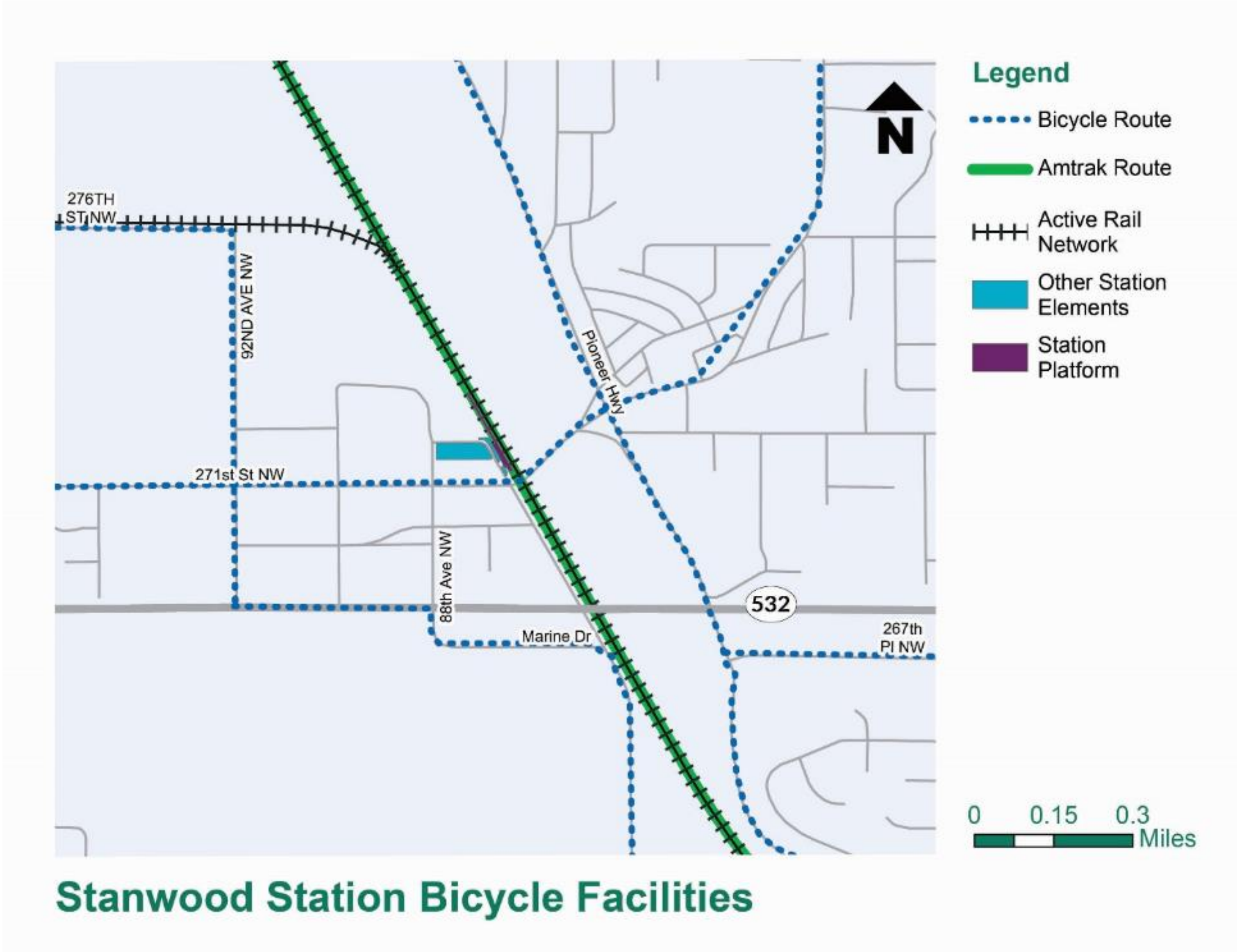
4816

4817 **Figure 64: Zero-Car Households**



4818

4819 **Figure 65: Sidewalks**



4820

4821 **Figure 66: Bicycle Facilities**

4822

Supporting information - photo documentation

Site visits were conducted in Stanwood on October 10, 2018 to inventory assets at the station and assess multimodal connections.

Photo 1: Railroad crossing.

Photo 2: ADA drop off location.

Photo 3: Station platform with shelter.

Photo 4: Local bus stop next to Amtrak

PDF

12-REVISIONS Mt

Mount Vernon, WA

Skagit Transportation Center
105 E Kincaid St
Mount Vernon, WA 98273

Mount Vernon, WA

Skagit Transportation Center

Connectivity Score

6.7

Station overview

Amtrak Cascades service to Mount Vernon, Washington is provided at the Skagit Transportation Center. Owned and operated by Skagit Transit, the Skagit Transportation Center serves twelve bus routes including local service and long-distance carriers. The station is located across the railroad tracks from the downtown commercial area of Mount Vernon and adjacent to an interchange on Interstate 5.

The station served approximately 18,000 passengers in 2017. Trip purpose and mode of access data gathered from a 2018 on-board passenger survey is summarized in Figures 1 and 2. (The on-board survey reached over 1,000 Amtrak Cascades passengers, producing statistically significant results for the corridor. However, at the station level, results may not be statistically significant, particularly at stations with lower ridership.)

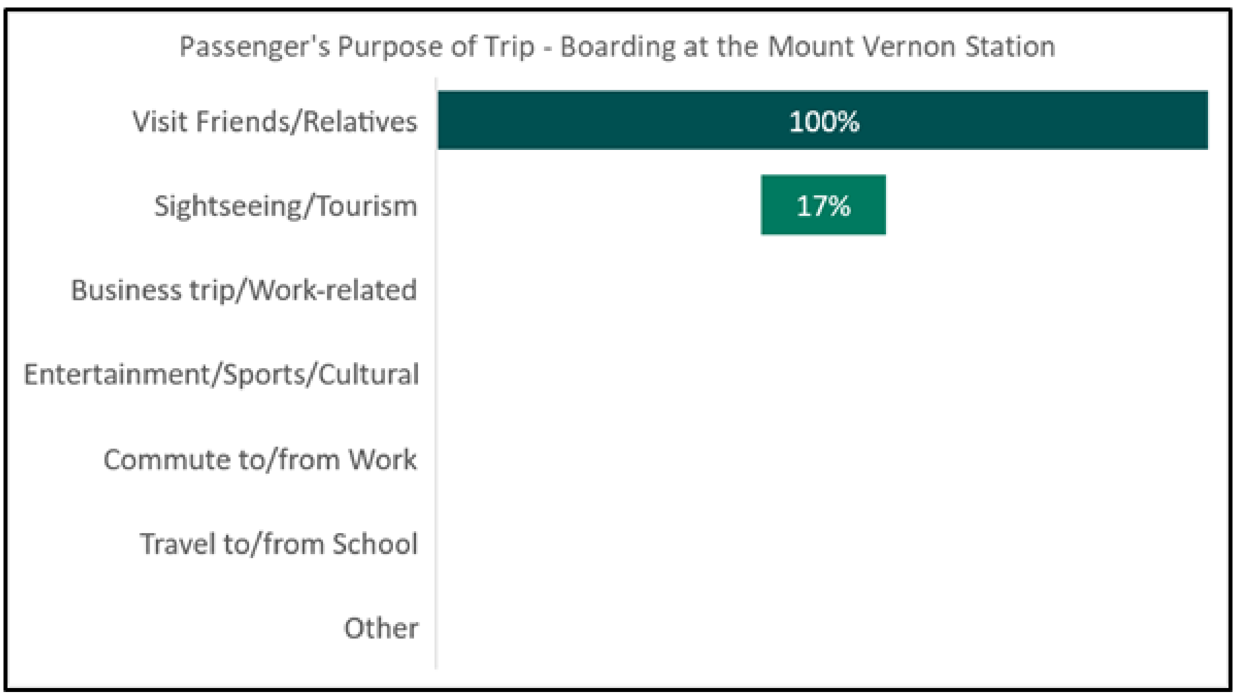


Figure 67: Survey Results-Trip Purpose

Note: Survey respondents had the option of selecting more than one response.

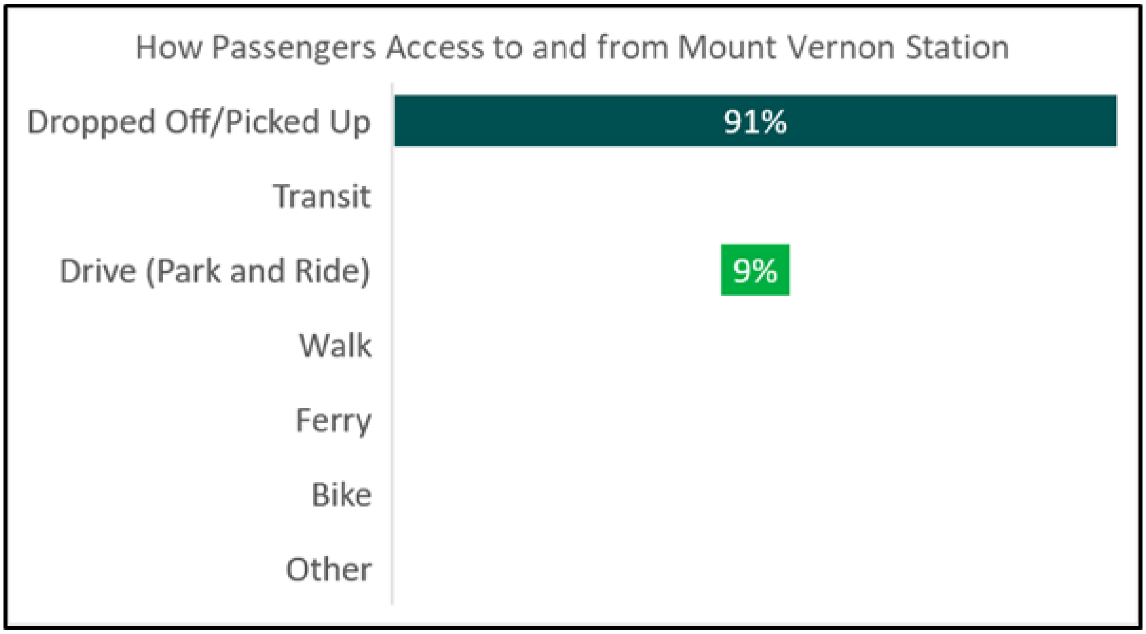


Figure 68: Survey Results-Mode of Access

Note: Survey respondents had the option of selecting more than one response.

Parking and drop-off/pick-up

The station has 50 parking spaces, including dedicated accessible parking, provided in a surface parking lot.

There are painted yellow curb areas with signs at the entrance to the station, from the west side, for drop-off and pick-up (taxi, transportation network companies). Additionally, there is a dedicated drop-off pick-up area for human service transportation and people with disabilities that is signed and striped differently than the regular drop-off/pick-up areas.

Walk and transit access

From a pedestrian standpoint, the Mount Vernon station is connected with roadways and sidewalks that users can access the station by two different entry/exit points, Montgomery Street (via South 4th Street) and Kincaid Street. These intersections have clearly marked pedestrian pathways for improved wayfinding and improved safety. On both Montgomery and Kincaid Streets, there are at-grade railroad crossings that are not marked with additional paint or striping for pedestrians.

The Skagit Transportation Center includes eight bus bays and marked pedestrian crosswalk to get to and from the station building. The bus terminal area has multiple benches and shelters. Skagit Transit provides service connecting Amtrak Cascades to regional destinations like Whidbey Island and the San Juan Islands (via Washington State Ferries terminal at Anacortes).

Bicycle access

There are no dedicated bicycle facilities providing connections to the station. However, bicycle racks are provided at the station.

Connectivity analysis

As shown in Table 1, analysis of land use, mobility and transportation network measures for Mount Vernon Station yielded a connectivity score of 6.7, of a possible 10 points, indicating generally good connectivity with some gaps.

The station achieved high or medium sub-scores in all categories except for zero-car households, at-grade railroad crossings, and private transportation connection options.

Table 1. Connectivity Evaluation:	**Mt. Vernon**				
Categories & Measures	**Measures**	**Maximum Points**	**Maximum Score**	**Points**	**Score**
LAND USE	**2**	**6**	**2**	**4**	**1.3**
Station Location Context & Attractors		3		3	
Zero Car Household		3		1	
MOBILITY	**3**	**9**	**3**	**7**	**2.3**
Transit Service		3		3	
Private Transportation Connection Options		3		1	
Human Services Transportation		3		3	
CONNECTED TRANSPORTATION NETWORK	**5**	**15**	**5**	**9**	**3.0**
At-Grade Railroad Crossings		3		1	
Sidewalks		3		2	
Bicycle Facilities		3		2	
Drop-off/Pick-up Areas		3		2	
Wayfinding		3		2	
Station Connectivity-Total	**10**	**30**	**10**	**21**	**6.7**

Candidate improvements

Based on the results of the connectivity analysis and field visits, Figure 3 and Table 2 identify candidate pedestrian, bicycle, multimodal and railroad crossing improvements that can be expected to enhance connectivity to the station and promote increased safety for all travel modes. These candidate improvements, including potential project examples and/or locations, were identified based on the system-wide candidate improvement types, analysis of existing connectivity gaps, and site visits. These representative examples may include facilities owned by the State, Amtrak, railroads or local agencies. WSDOT will further evaluate the viability of the opportunities identified here to improve state facilities for better access to Amtrak Cascades stations. Amtrak, railroads and local agencies can consider implementing improvements to their facilities and operations, similar to these representative examples, as they develop their capital improvement and service plans.

Figure 69: Candidate Improvements

Table 2. Opportunities to Enhance Connectivity at Skagit Transportation Center

Type	Gaps	Candidate Improvement*	Potential Project Examples/Locations*
Railroad Crossing	Consistent signing, striping, crossing gates, and crossing surface	Railroad crossing improvements	Kincaid Street, Montgomery Street
Bicycle	Bicycle lanes	Bicycle facility improvements within 1/2-mile radius of station	Bicycle lanes on 2nd Street; Bicycle route crossing I-5 from the station area southward
Multimodal	Wayfinding signs	Install additional wayfinding signs at station	Add signage to increase branded Amtrak presence
Pedestrian	Crosswalk markings	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	Pedestrian crossing markings at Kincaid Street

*WSDOT will work with stakeholders to improve access and connectivity to Amtrak Cascades stations. Local jurisdictions, transit agencies, Amtrak and railroads could consider addressing these opportunities when implementing their capital improvement and service development plans; some of the opportunities identified may also be addressed in these existing plans.

Supporting information - connectivity analysis

The summary results and connectivity score for the Mount Vernon station are supported by geospatial representations of four measured criteria (attractors, zero car households, sidewalks, and bicycle facilities) presented in the figures below and in Table C-1. Multimodal Connectivity Analysis: Observed Data & Assignment of Points.

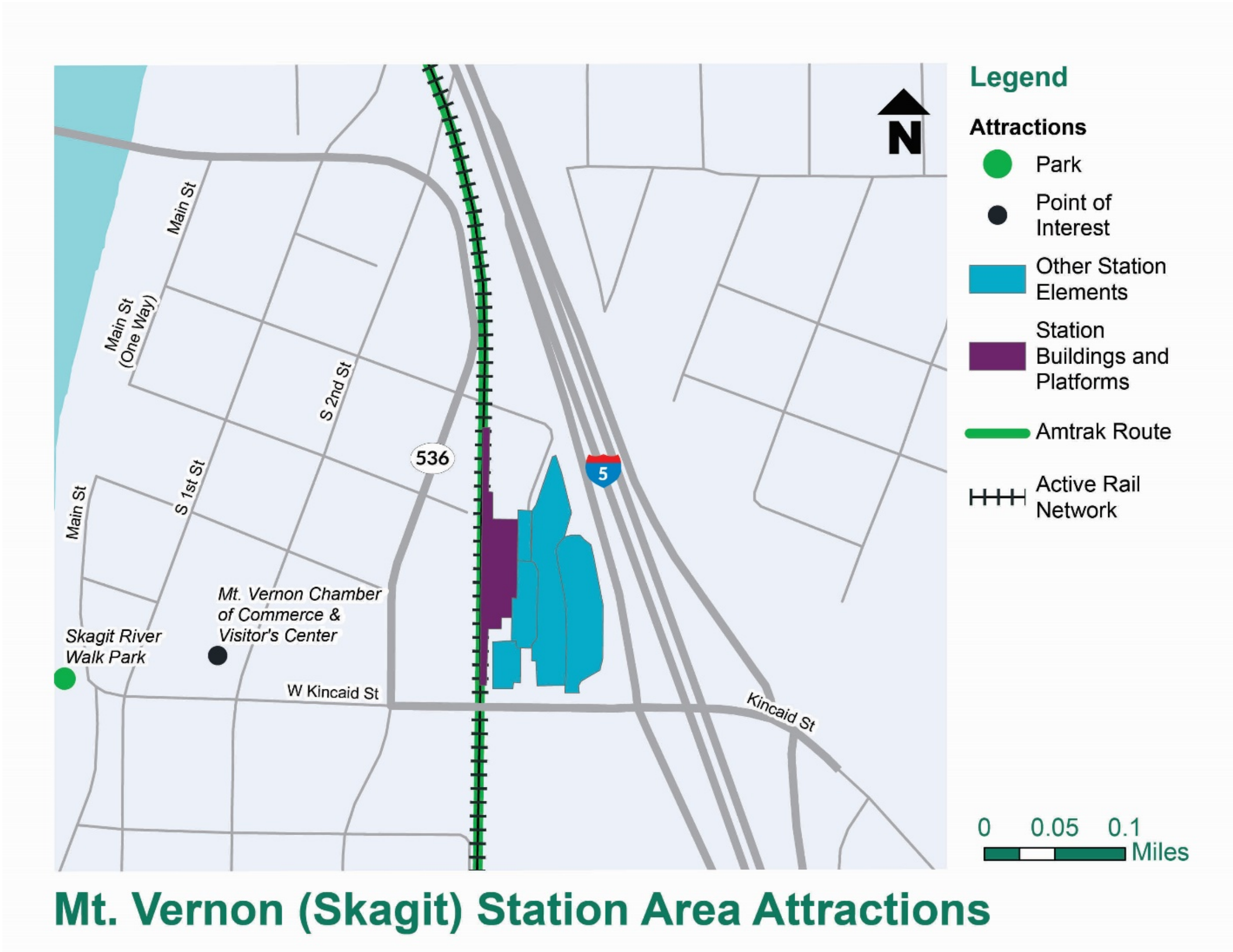


Figure 70: Station Context-Attractors

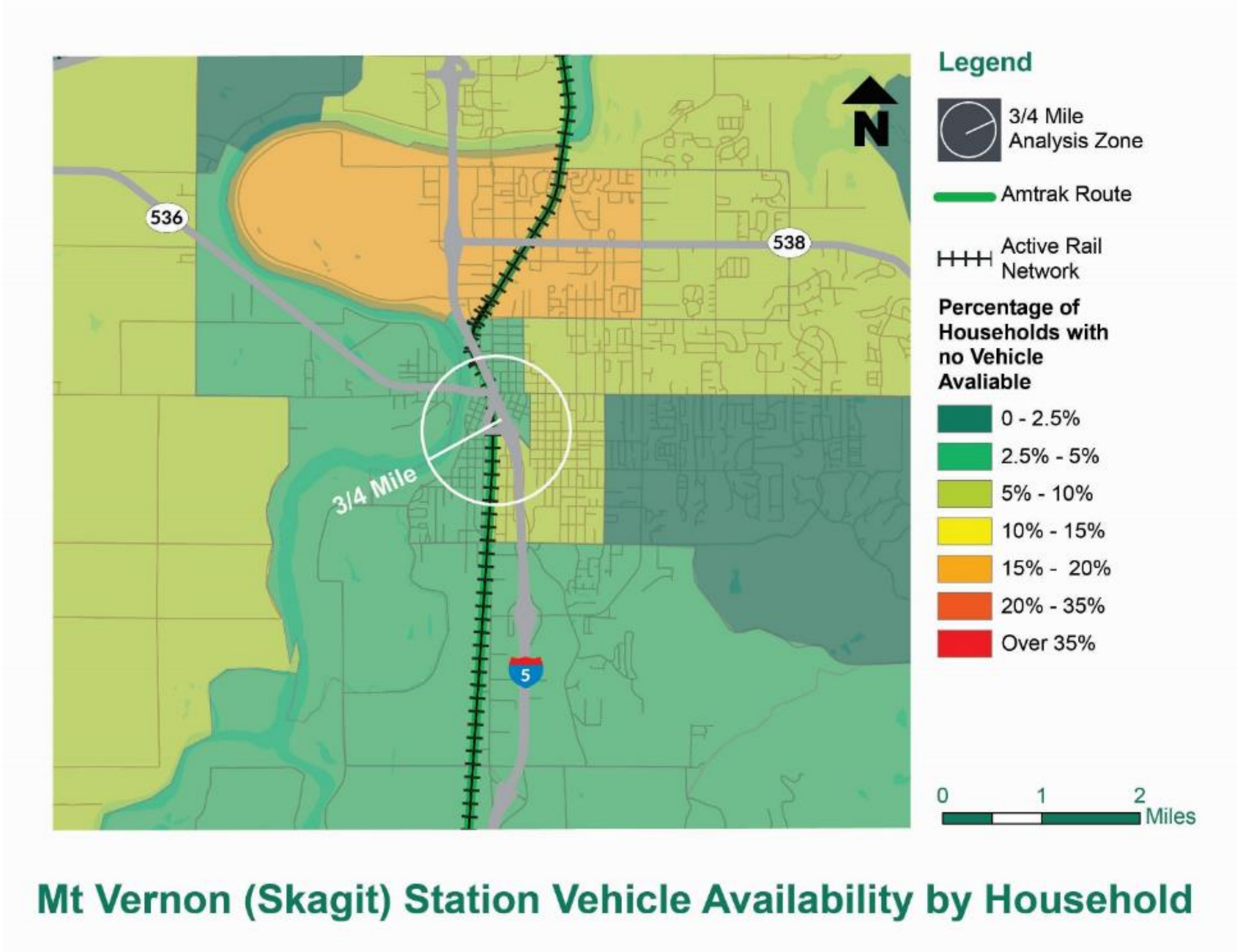
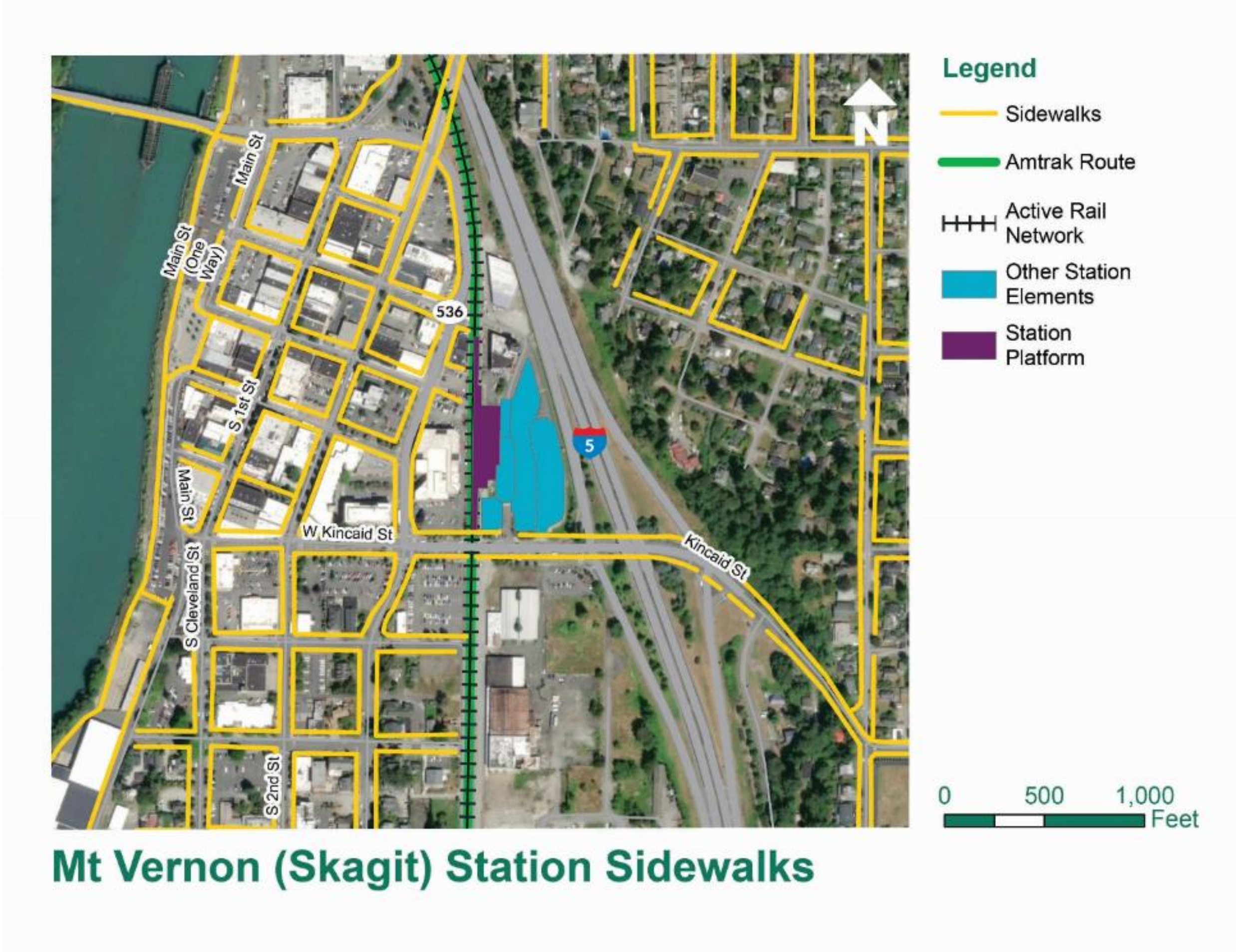


Figure 71: Zero-Car Households



4914

4915 **Figure 72: Sidewalks**

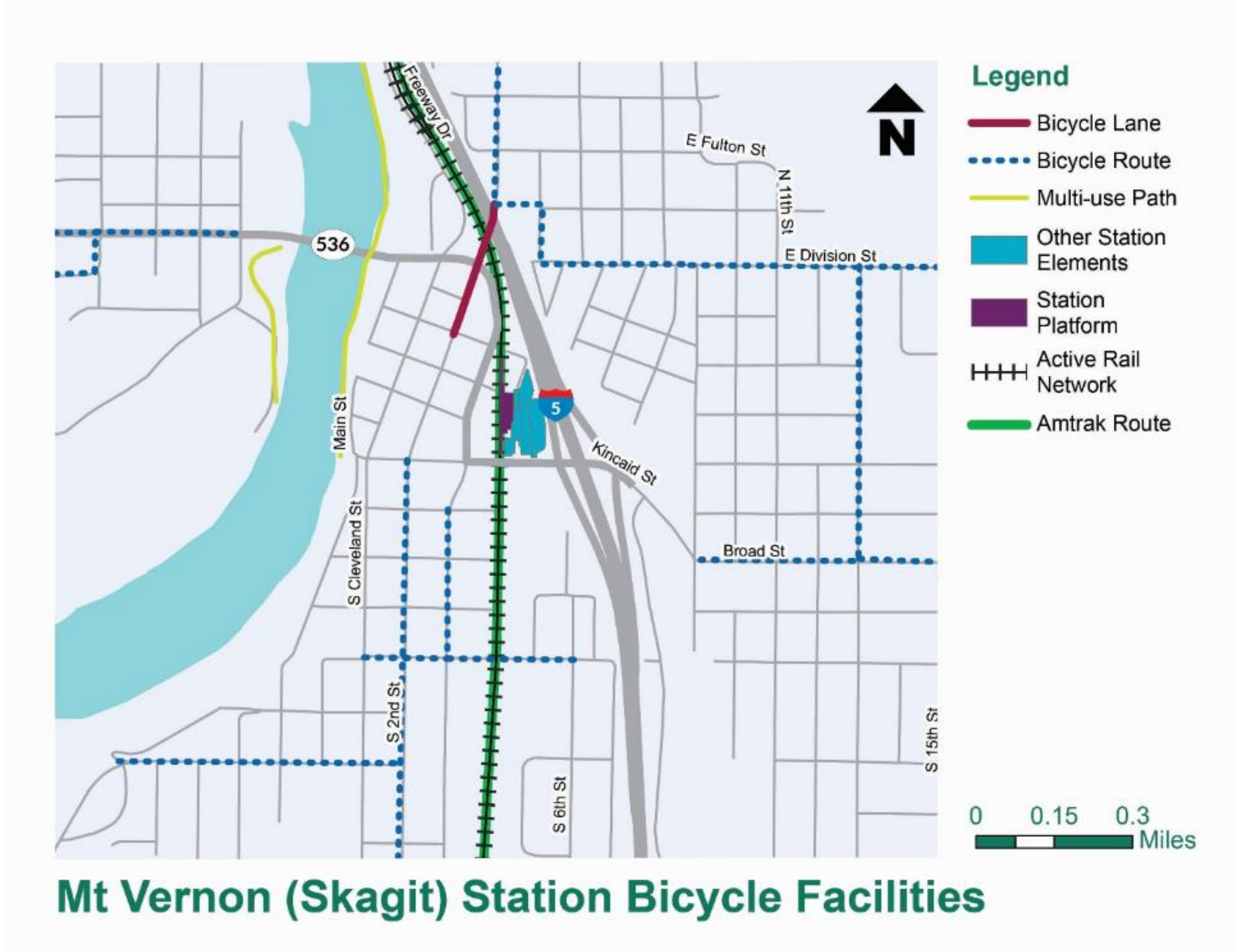


Figure 73: Bicycle Facilities

Supporting information - photo documentation

Site visits were conducted in Mt. Vernon on October 10, 2018 to inventory assets at the station and assess multimodal connections.

Photo 1: Skagit Station

Photo 2: Mt. Vernon city map at station.

Photo 3: Accessible drop-off/pick-up area.

Photo 4: Vending machines inside station.

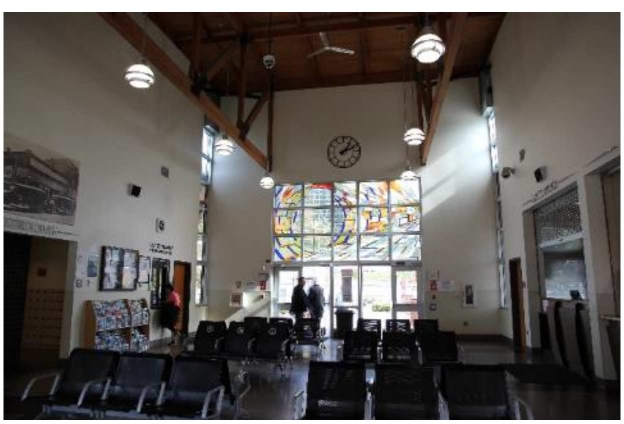


Photo 5: Skagit Station interior.

Photo 5: Outdoor pedestrian area at transit station.

Bellingham, WA

Fairhaven Station

401 Harris Ave

Bellingham, WA 98225

Station overview

Fairhaven Station in Bellingham serves Amtrak Cascades and local transit customers. The station, owned by the Port of Bellingham, is a mixed-use building with office tenants and a coffee shop. The station is located just outside of the downtown commercial area (approximately ½ mile) and is adjacent to the Bellingham Cruise Terminal, which serves as a terminal for the Alaska Marine Highway System ferry.

The station served approximately 50,000 passengers in 2017. Trip purpose and mode of access data gathered from a 2018 on-board passenger survey is summarized in Figures 1 and 2. (The on-board survey reached over 1,000 Amtrak Cascades passengers, producing statistically significant results for the corridor. However, at the station level, results may not be statistically significant, particularly at stations with lower ridership.)

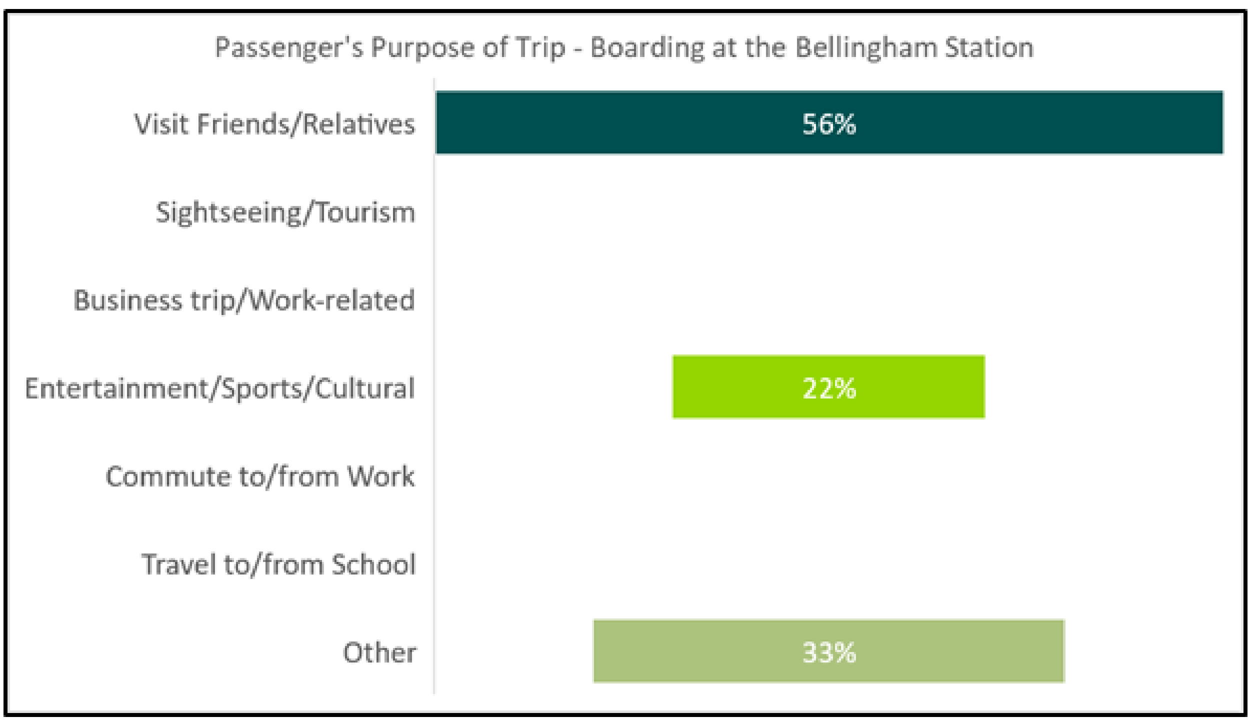


Figure 74: Survey Results-Trip Purpose

Note: Survey respondents had the option of selecting more than one response.

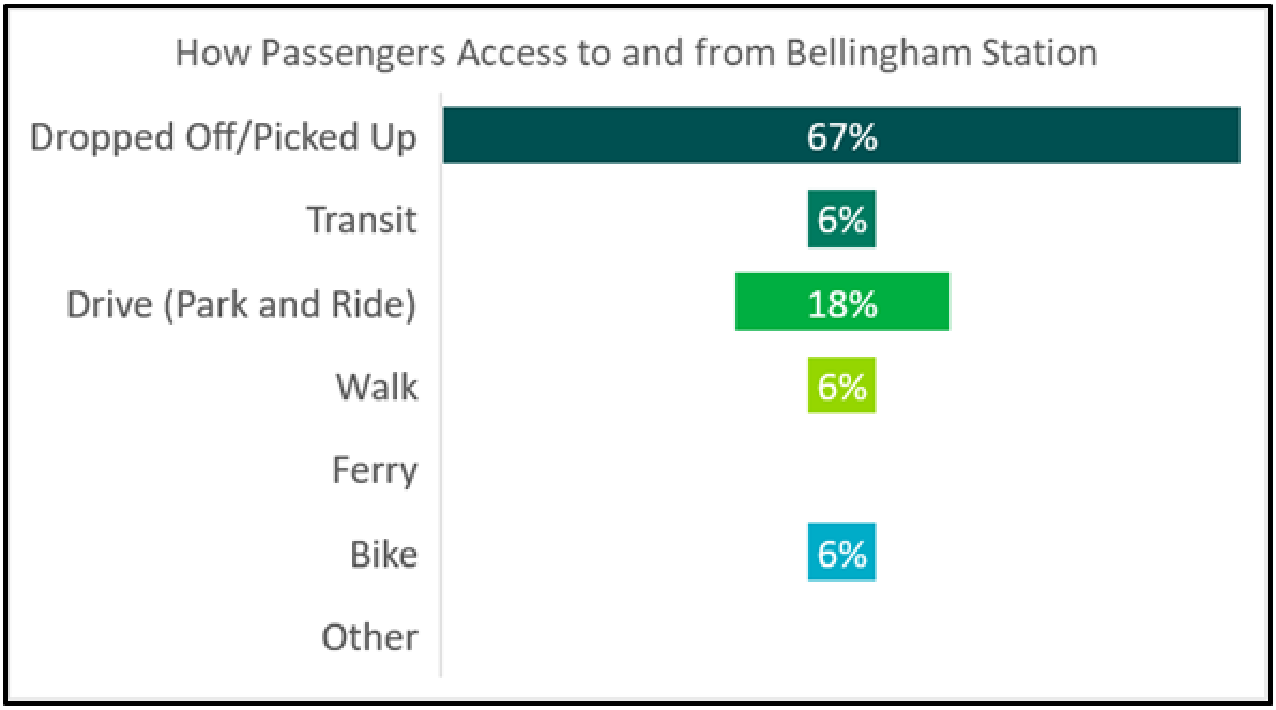


Figure 75: Survey Results-Mode of Access

Note: Survey respondents had the option of selecting more than one response.

Parking and drop-off/pick-up

There are 52 short-term and 117 long-term parking spaces provided in surface parking lots at the station. Passengers who are parking and riding, have to cross the street through an unsignalized, but marked and signed crosswalk. There is also dedicated, accessible parking that is clearly marked.
A drop-off and pick-up area is provided in front of the station (taxi, transportation network companies, and human service transportation). Bus service is located on the east side of the station as described below.

Walk and transit access

There are two main streets that connect passengers to the station, Harris Avenue and 4th Street. Fourth Street has sidewalks connecting at the station, but quickly end when a person leaves the station area. Harris Avenue has an uninterrupted sidewalk on the north side of the street that connect east and west movements to the Fairhaven Historic District. The Port of Bellingham is improving the crossing at Harris Avenue to prepare for eventual quiet zone, and pedestrian and bike facilities are being added to the south side of Harris Avenue incrementally as parcels are developed.

While the exterior wayfinding signs appear focused on vehicular traffic, they do provide guidance for all modes of travel in the complex environment around Fairhaven Station and the Bellingham Cruise Terminal (Alaska Marine Highway System ferry).

Whatcom Transit services Fairhaven Station at the east end of the station area and has both benches and shelter for bus passengers. Intercity bus service (Greyhound) is served by a single large shelter adjacent to the train platform. There are two viable connections to the ferry terminal where passengers have to cross the railroad tracks at grade.

Bicycle access

Two bike routes identified in the City of Bellingham bicycle route map serve the station via Harris Avenue and 4th Street; neither of these is facility with on-street markings, however. Bicycle racks are provided at the station.

Connectivity analysis

As shown in Table 1, analysis of land use, mobility and transportation network measures for the Bellingham station yielded a connectivity score of 6.0, of a possible 10 points, indicating significant gaps in the existing connectivity of the station.

The station achieved high sub-scores in two categories: the station location context and the lower amount of crashes), and the regional Human Services Transportation Plan for the area. The analysis also highlights access issues surrounding the Bellingham station that include: a low number of attractors, a low number of zero car households, a low number of transportation connectivity options, and a low number of connecting transit routes and sidewalks.

Table 1. Connectivity Evaluation:	**Bellingham**				
Categories & Measures	**Measures**	**Maximum Points**	**Maximum Score**	**Points**	**Score**
LAND USE	**2**	**6**	**2**	**4**	**1.3**
Station Location Context & Attractors		3		3	
Zero Car Household		3		1	
MOBILITY	**3**	**9**	**3**	**5**	**1.7**
Transit Service		3		1	
Private Transportation Connection Options		3		1	
Human Services Transportation		3		3	
CONNECTED TRANSPORTATION NETWORK	**5**	**15**	**5**	**9**	**3.0**
At-Grade Railroad Crossings		3		2	
Sidewalks		3		1	
Bicycle Facilities		3		2	
Drop-off/Pick-up Areas		3		2	
Wayfinding		3		2	
Station Connectivity-Total	**10**	**30**	**10**	**18**	**6.0**

Candidate improvements

Based on the results of the connectivity analysis and field visits, Figure 3 and Table 2 identify candidate pedestrian, bicycle, multimodal and railroad crossing improvements that can be expected to enhance connectivity to Fairhaven Station and promote increased safety for all travel modes. These candidate improvements, including potential project examples and/or locations, were identified based on the system-wide candidate improvement types, analysis of existing connectivity gaps, and site visits. These representative examples may include facilities owned by the State, Amtrak, railroads or local agencies. WSDOT will further evaluate the viability of the opportunities identified here to improve state facilities for better access to Amtrak Cascades stations. Amtrak, railroads and local agencies can consider implementing improvements to their facilities and operations, similar to these representative examples, as they develop their capital improvement and service plans.

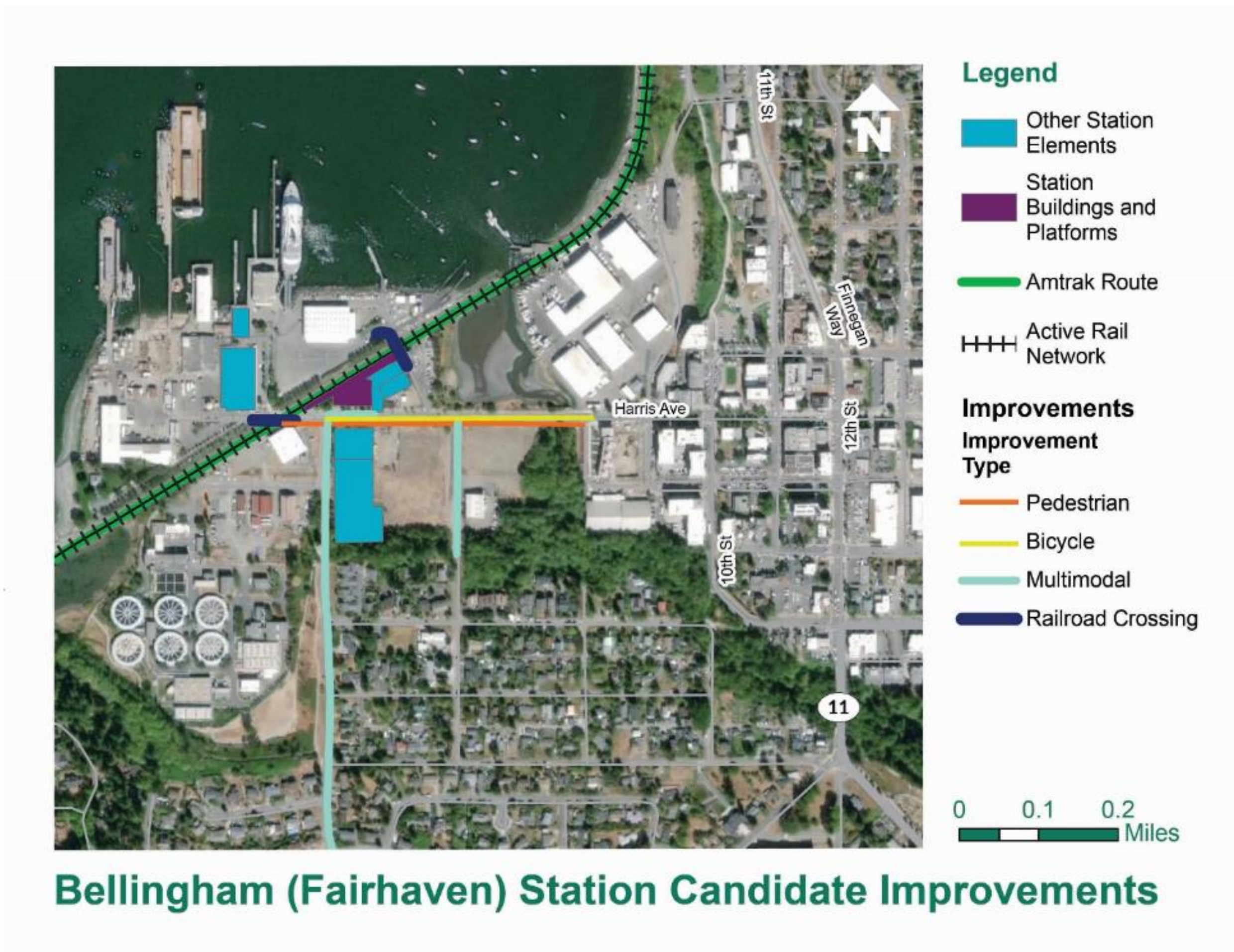


Figure 76: Candidate Improvements

Table 2. Opportunities to Enhance Connectivity at Fairhaven Station (Bellingham)

Type	Gaps	Candidate Improvement*	Potential Project Examples/Locations*
Pedestrian	Complete sidewalks (curb, gutter, ramps)	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	Harris Avenue-Sidewalks on south side
Railroad Crossing	Consistent signing, striping, crossing gates, and crossing surface	Railroad crossing improvements	Harris Avenue and Ferry Access Road/Vehicle Landing
Multimodal	Pedestrian & bicycle network	Complete streets with bicycle lanes	4th Street: Harris Avenue to Bayside Rd.
Multimodal	Designated drop-off/pick-up area	Signing, striping, and additional designated drop-off/pick-up area for accessible/disabled transportation, either on-site or on-street at station areas	Harris Avenue
Bicycle	Bicycle lanes	Bicycle facility improvements within 1/2-mile radius of station	Harris Avenue

*WSDOT will work with stakeholders to improve access and connectivity to Amtrak Cascades stations. Local jurisdictions, transit agencies, Amtrak and railroads could consider addressing these opportunities when implementing their capital improvement and service development plans; some of the opportunities identified may also be addressed in these existing plans.

Supporting information - connectivity analysis

The summary results and connectivity score for the Bellingham station are supported by geospatial representations of four measured criteria (attractors, zero car households, sidewalks, and bicycle facilities) presented in the figures below and in Table C-1. Multimodal Connectivity Analysis: Observed Data & Assignment of Points.

Figure 77: Station Context-Attractors

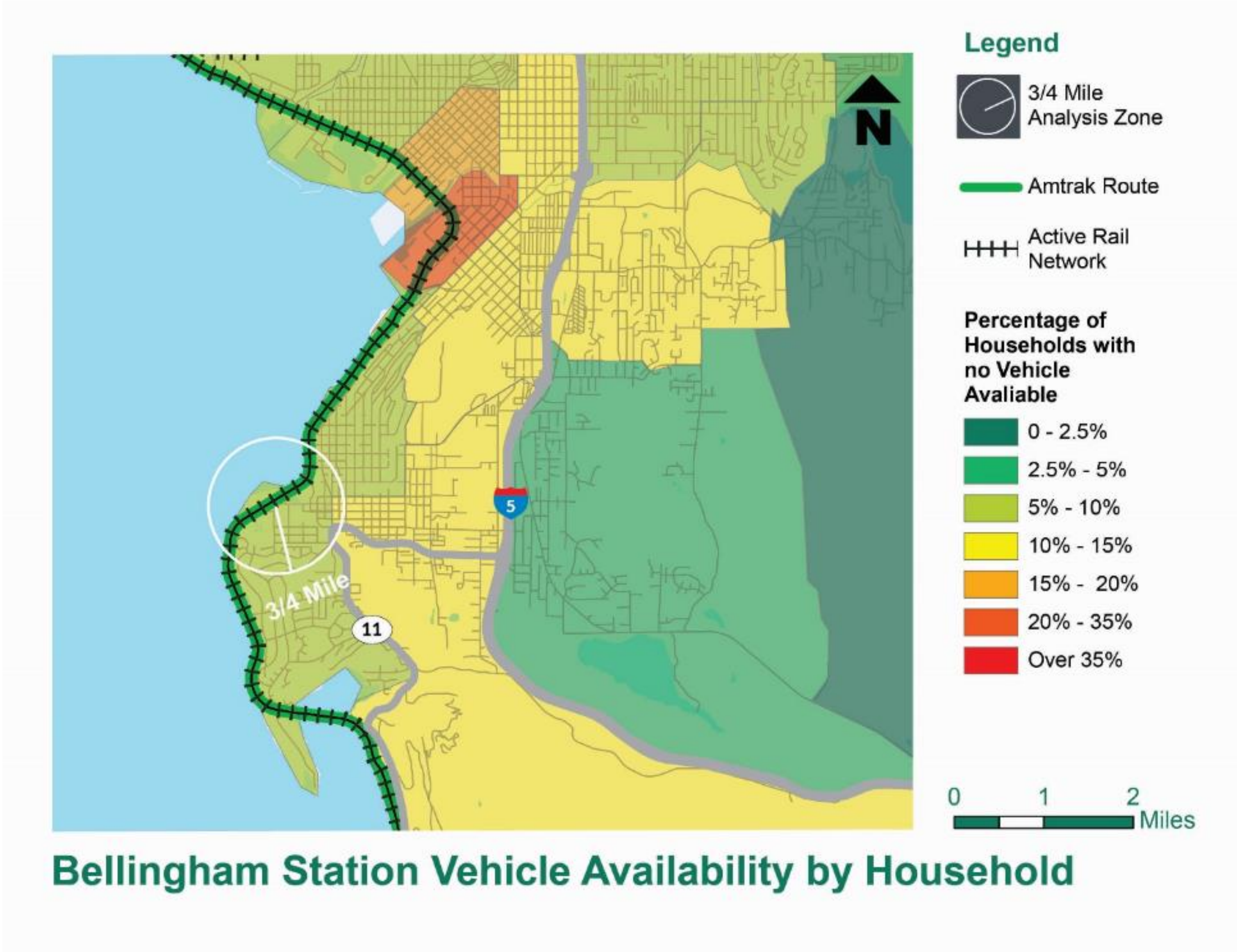


Figure 78: Zero-Car Households

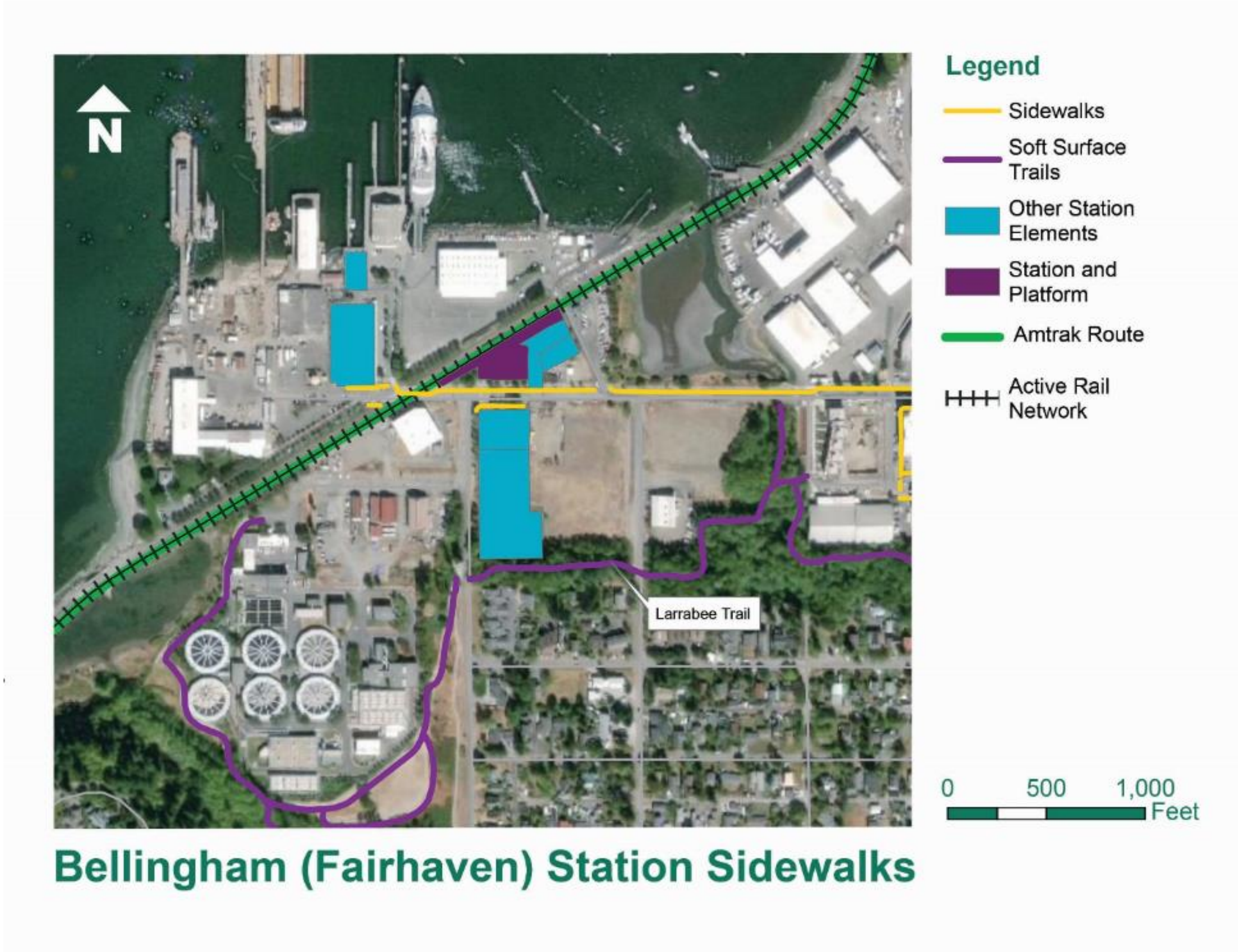


Figure 79: Sidewalks

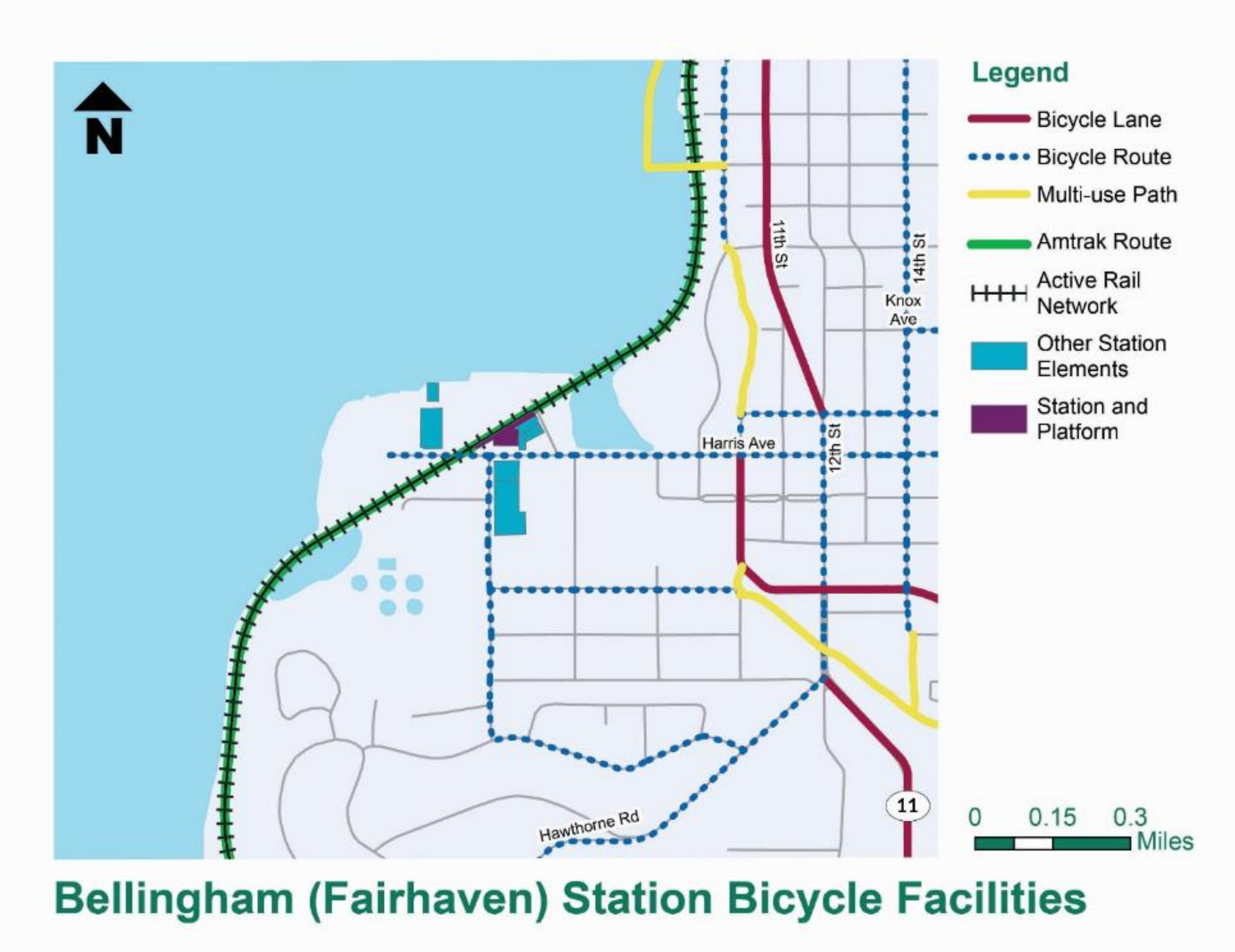


Figure 80: Bicycle Facilities

Supporting information - photo documentation

Site visits were conducted in Bellingham on October 10, 2018 to inventory assets at the station and assess multimodal connections.

Photo 1: Local transit connection and ADA parking spots.

Photo 2: Connections to Bellingham Cruise Terminal.

Photo 3: At-grade railroad crossing looking at station platform.

Photo 4: Connected sidewalks to Fairhaven District.

Photo 5: Bellingham Station platform and shelter with bicycle racks.

Vancouver, British Columbia

Pacific Central Station

1150 Station St

Vancouver, BC, Canada V6A 4C7

Vancouver, BC

Pacific Central Station

Connectivity Score

8.2

Station overview

The Pacific Central Station near downtown Vancouver, British Columbia is a multimodal hub owned and operated by VIA Rail. The station that provides customers with access to: Canadian intercity passenger rail (VIA Rail), the Vancouver SkyTrain, long-distance bus routes, and local bus connections. The station is located within the False Creek Flats neighborhood southeast of Downtown Vancouver, near high-density residential areas, and adjacent to light industrial and commercial areas.

The station served approximately 167,000 passengers in 2017. Trip purpose and mode of access data gathered from a 2018 on-board passenger survey is summarized in Figures 1 and 2. (The on-board survey reached over 1,000 Amtrak Cascades passengers, producing statistically significant results for the corridor. However, at the station level, results may not be statistically significant, particularly at stations with lower ridership.)

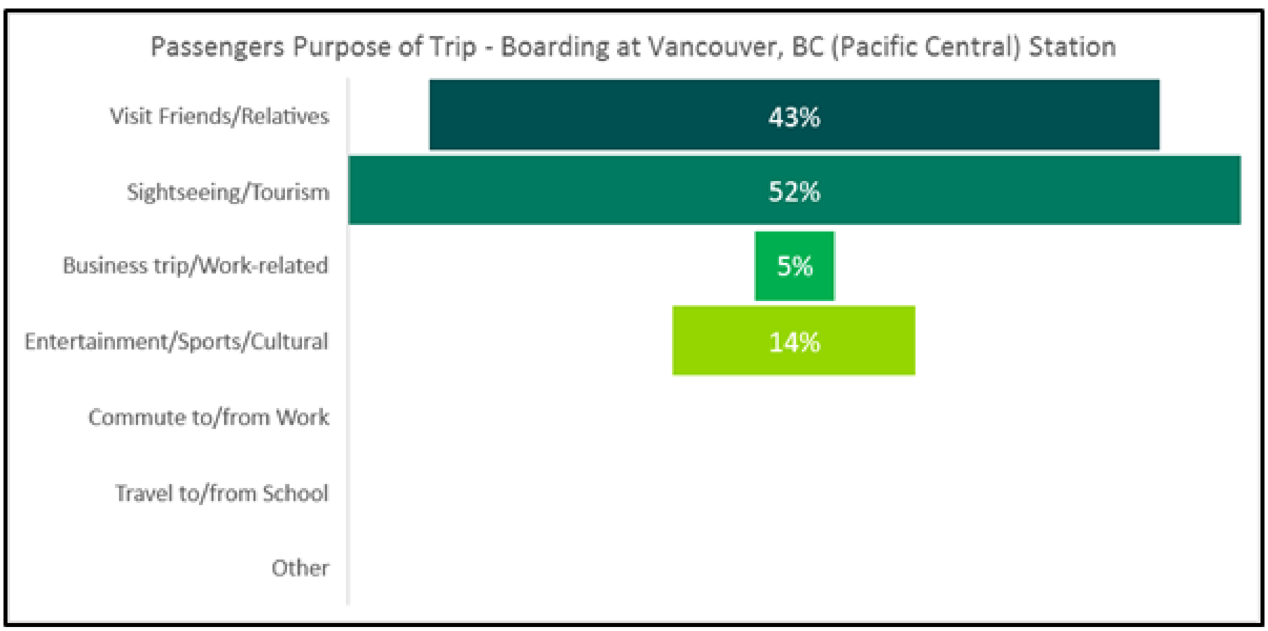


Figure 81: Survey Results-Trip Purpose

Note: Survey respondents had the option of selecting more than one response

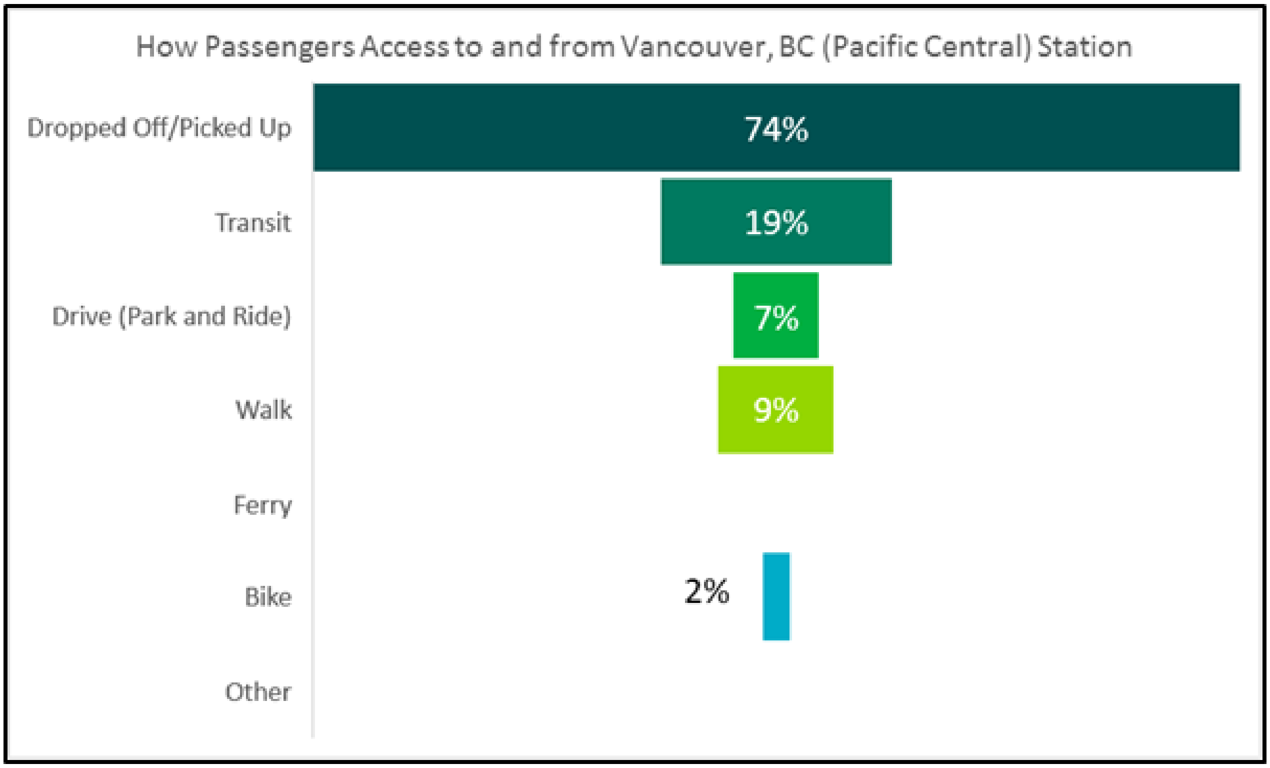


Figure 82: Survey Results-Mode of Access

Note: Survey respondents had the option of selecting more than one response

Parking and drop-off/pick-up

The station has 20 short-term parking spaces, including dedicated accessible parking spaces, provided in a surface parking lot.

The station features a clearly delineated pick-up/drop-off area with a dedicated taxi stand. Currently, local regulations prohibit services such as Uber.

Walk and transit access

From a pedestrian standpoint, Vancouver Pacific Central Station is highly integrated into the pedestrian and transit environment. From the primary station entrance to Station Street, the sidewalk network surrounding the station appears complete. One exception is the northern boundary of the station. National Avenue has only a soft shoulder separated from traffic via temporary curbing from Station Street to Trillium Park.

Within Pacific Central Station wayfinding signs are highly visible and clearly indicate station features. This is especially important given the high level of segregation between VIA Rail and Amtrak services due to customs requirements. While there are significant additional transit opportunities in the vicinity of the station, there is little pedestrian oriented wayfinding outside of the station building. This is mitigated by the visual prominence of the SkyTrain elevated rail station south of the Pacific Central Station building.

Several alternative modes of travel are available at or near Pacific Central Station. TransLink's SkyTrain Expo Line Main Street - Science World Station is within a block of the Amtrak station.

SkyTrain can be used to access Vancouver International Airport, the main passenger airport for British Columbia. Several TransLink bus routes also have stops within a block of Pacific Central Station. The main long-distance bus terminal for Vancouver is located within the station.

Bicycle access

The City of Vancouver has substantial bicycle infrastructure, but most of the streets surrounding Pacific Central Station do not have any bicycle specific improvements. While there have been few improvements made to the immediate street network surrounding the station, these roads are generally low volume and connect to improved facilities within a few blocks. There are bicycle parking (racks) at Pacific Central Station.

Connectivity analysis

As shown in Table 1, analysis of land use, mobility and transportation network measures for the Vancouver BC station yielded a connectivity score of 8.2 of a possible 10 points, indicating only minor gaps in the existing connectivity of the station.

Table 1. Connectivity Evaluation:	**Vancouver, BC**				
Categories & Measures	**Measures**	**Maximum Points**	**Maximum Score**	**Points**	**Score**
LAND USE	**1**	**3**	**2**	**3**	**2.0**
Station Location Context & Attractors		3		3	
MOBILITY	**2**	**6**	**3**	**3**	**1.5**
Transit Service		3		2	
Private Transportation Connection Options		3		1	
CONNECTED TRANSPORTATION NETWORK	**5**	**15**	**5**	**14**	**4.7**
At-Grade Railroad Crossings		3		2	
Sidewalks		3		3	
Bicycle Facilities		3		3	
Drop-off/Pick-up Areas		3		3	
Wayfinding		3		3	
Station Connectivity-Total	**8**	**24**	**10**	**20**	**8.2**

Note: Due to data limitations, fewer measures and points are applicable to the Vancouver, B.C. station. Same maximum scores used in other station's connectivity analysis are applied to Vancouver B.C. station to match the 10-point scale for consistency and comparability purpose.

Candidate improvements

Based on the results of the connectivity analysis and field visits, Figure 3 and Table 2 identify candidate pedestrian, bicycle, multimodal and railroad crossing improvements that can be expected to enhance connectivity to Pacific Central Station and promote increased safety for all travel modes. These representative examples may include facilities owned by railroads or local agencies. Railroads and local agencies can consider implementing improvements to their facilities and operations, similar to these representative examples, as they develop their capital improvement and service plans.

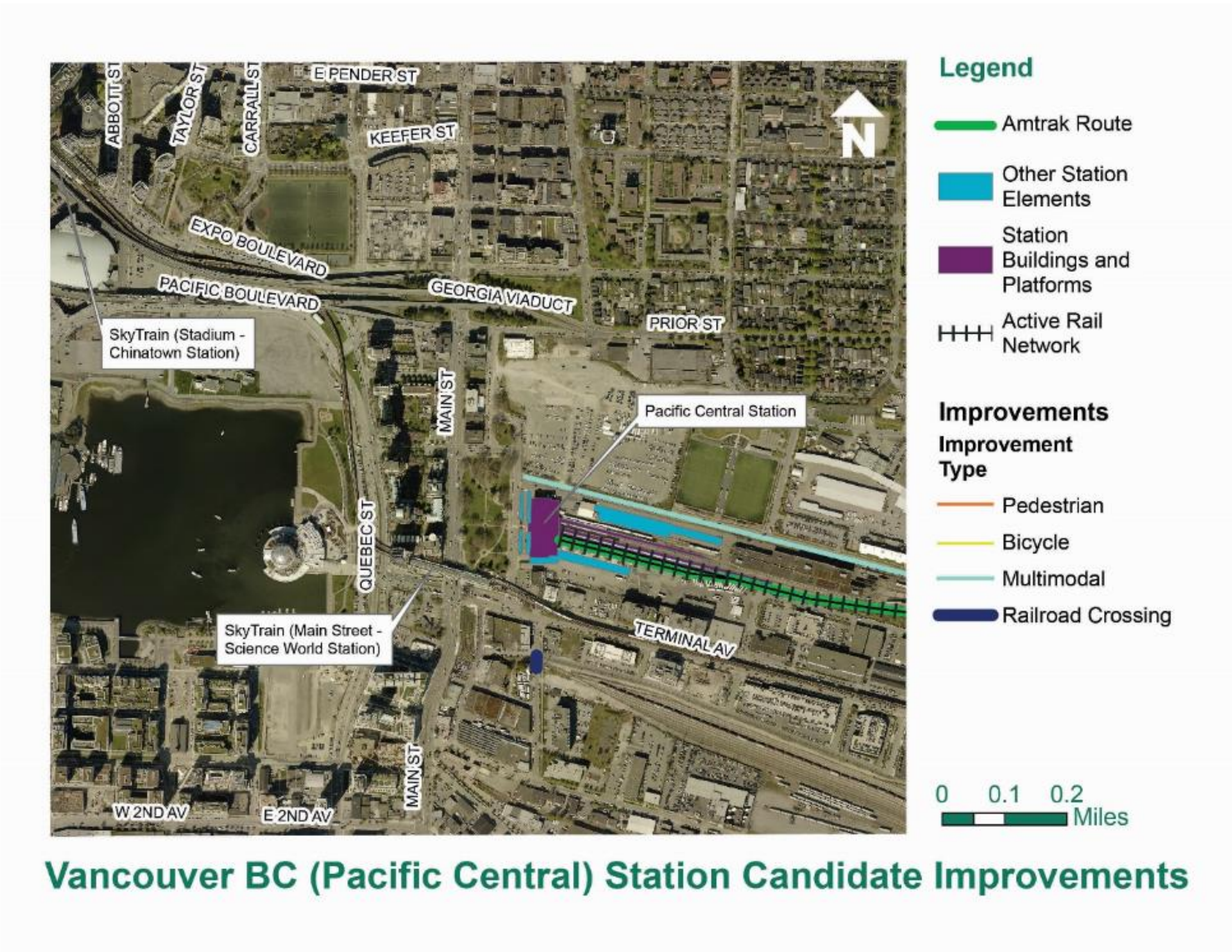


Figure 83: Candidate Improvements

Table 2. Opportunities to Enhance Connectivity at Pacific Central Station (Vancouver, B.C.)

Type	Gaps	Candidate Improvement*	Potential Project Examples/Locations*
Pedestrian	Complete sidewalks (curb, gutter, ramps)	Sidewalk improvements, lighting, and other pedestrian amenities within 1/4-mile radius of stations	National Avenue: Station Street to Chess Street
Railroad Crossing	Consistent signing, striping, crossing gates, and crossing surface.	Railroad crossing improvements	Station Street and Northern Street
Multimodal	Wayfinding signs	Install additional wayfinding signs in station area	Locations to be determined

*Local jurisdictions, transit agencies, Amtrak and railroads could consider addressing these opportunities when implementing their capital improvement and service development plans; some of the opportunities identified may also be addressed in these existing plans.

Supporting information - connectivity analysis

The summary results and connectivity score for the Vancouver, BC station are supported by geospatial representations of four measured criteria (attractors, zero car households, sidewalks, and bicycle facilities) presented in the figures below and in Table C-1. Multimodal Connectivity Analysis: Observed Data & Assignment of Points.

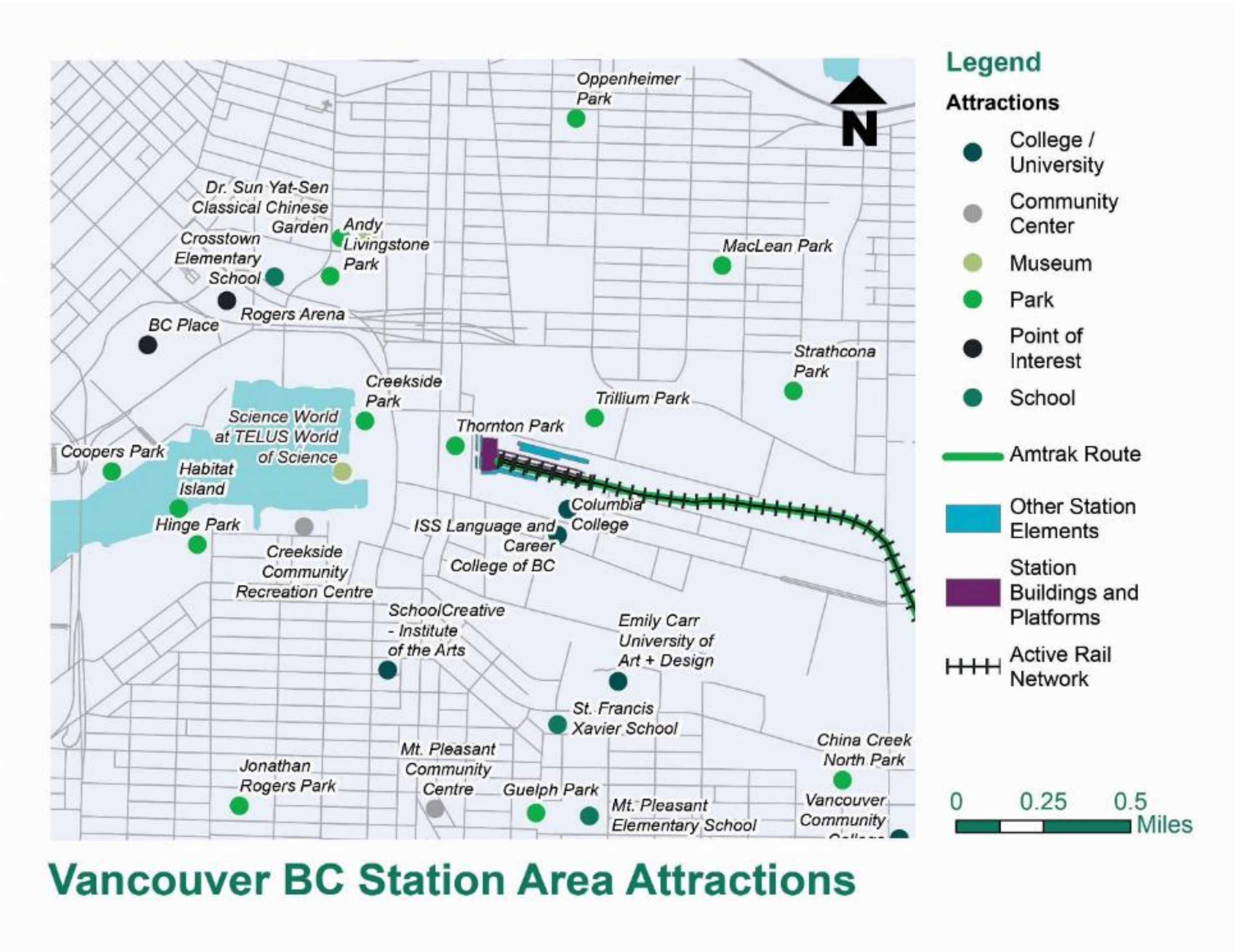
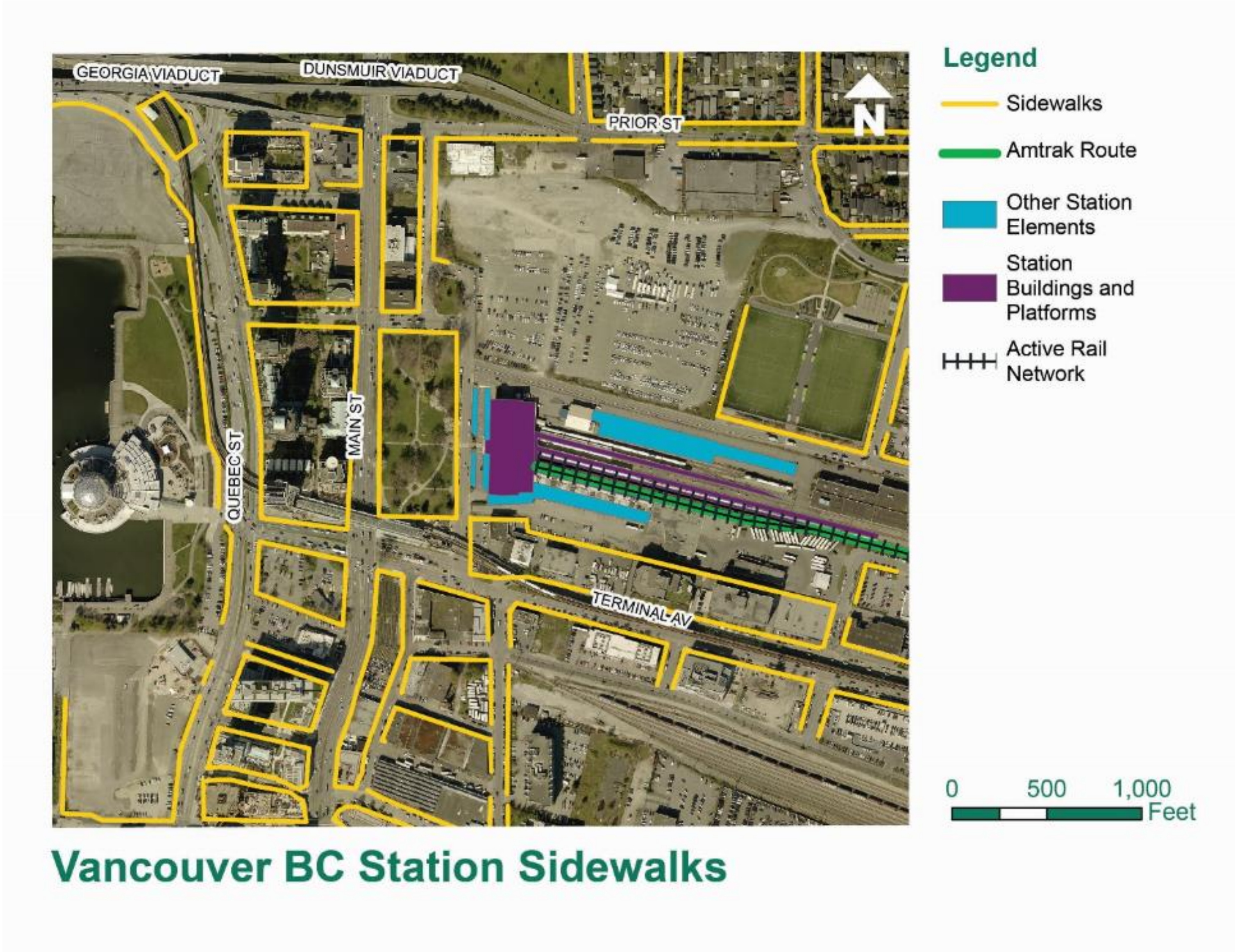


Figure 84: Station Context-Attractors



5129

5130 **Figure 85: Sidewalks**

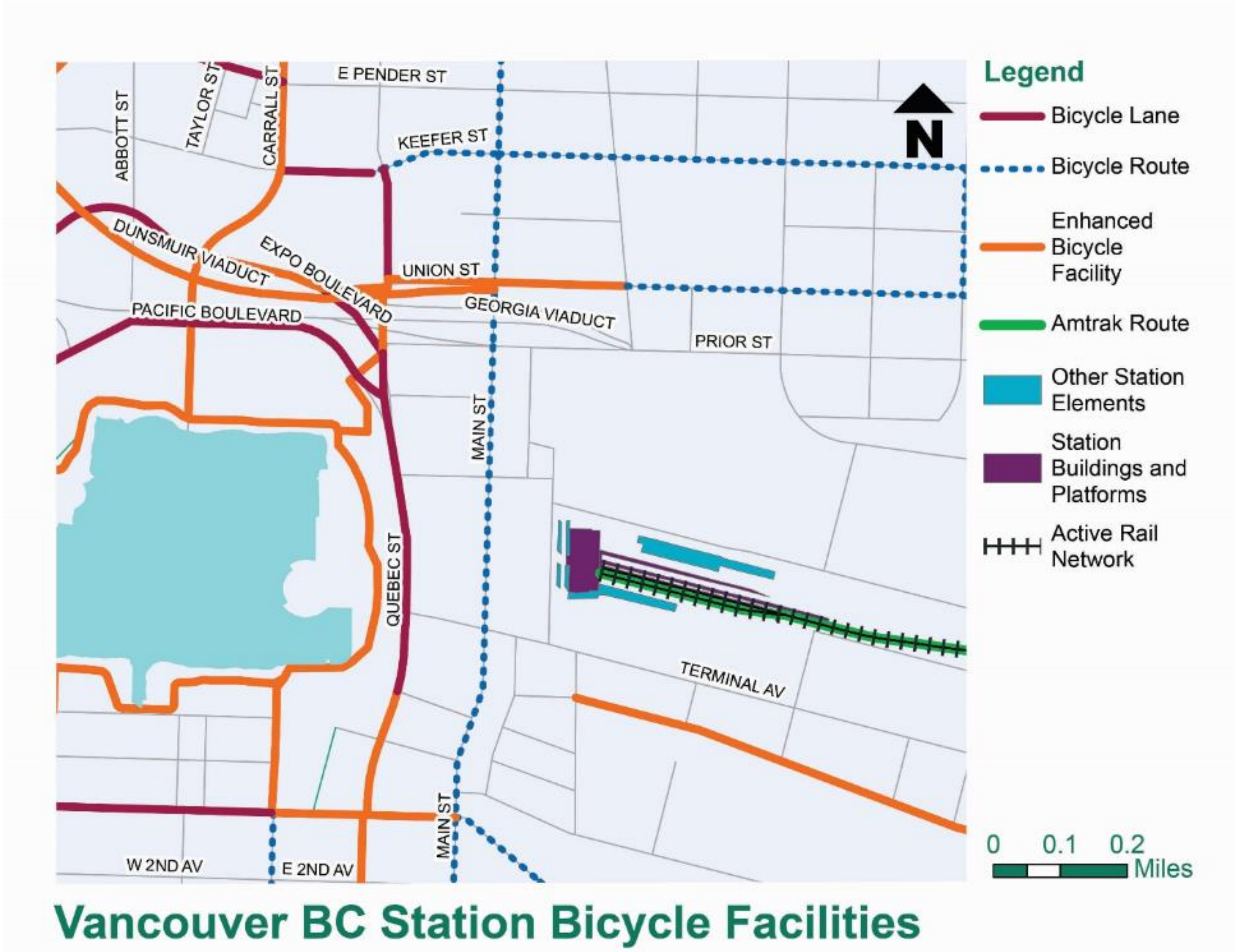


Figure 86: Bicycle Facilities

Supporting information - photo documentation

Site visits were conducted in Vancouver, BC on October 10, 2018 to inventory assets at the station and assess multimodal connections.

Photo 1: Local bus stop and elevated SkyTrain platform.

Photo 2: Fare gates restricting access to SkyTrain platform.

Photo 3: Wayfinding sign for bicycle parking.

Photo 4: Ticketing counter.

Photo 5: Striped drop off and pick up area in front of station.

Photo 6: Interior of station.

5144 **Table C-1. Multimodal Connectivity Analysis: Observed Data & Assignment of Points**

	Portland, OR	Vancouver, WA	Kelso-Longview	Centralia	Olympia-Lacey	Tacoma	Tukwila	Seattle	Edmonds	Everett	Stanwood	Mount Vernon	Bellingham	Vancouver, BC
LAND USE														
Station Location Context & Attractors														
Observed Data	Urban Center / Significant Attractors	Industrial Commercial; 1/2 Mile from Urban Center / Attractors	Main Street / Residential with Limited Attractors	Main Street / Residential with Limited Attractors	Rural / No Attractors	Industrial / Mixed Use with Attractors	Commercial with Attractors	Urban Center / Significant Attractors	Main Street / Residential with Attractors	Industrial / Commercial with Attractors	Main Street / Rural with No Attractors	Main Street with Attractors	Residential / Main Street with Attractors	Urban Center / Significant Attractors
Points	3	1	3	3	1	2	2	3	3	2	2	3	3	3
Zero Car Households														
Observed Data	3	High	High	High	Low	Medium	Medium	High	Low	High	Low	Low	Low	n/a
Points	3	3	3	3	1	2	2	3	1	3	1	1	1	n/a
MOBILITY														
Transit Service														
Observed Data	6	0	4	3	2	14	2	26	4	18	6	12	2	7
Points	2	0	1	1	1	3	1	3	1	3	2	3	1	2
Private Transportation Connection Options														
Observed Data	4	2	2	2	2	4	2	3	2	2	2	2	2	2
Points	3	1	1	1	1	3	1	2	1	1	1	1	1	1
Human Services Transportation														
Observed Data	2	2	2	3	3	2	2	2	2	3	3	3	3	n/a
Points	2	2	2	3	3	2	2	2	2	3	3	3	3	n/a
CONNECTED TRANSPORTATION NETWORK														
At-Grade Railroad Crossings														
Observed Data	0	2	0	3	0	1	0	0	3	1	1	2	1	1

	Portland, OR	Vancouver, WA	Kelso-Longview	Centralia	Olympia-Lacey	Tacoma	Tukwila	Seattle	Edmonds	Everett	Stanwood	Mount Vernon	Bellingham	Vancouver, BC
Points	3	1	3	0	3	2	3	3	0	2	2	1	2	2
Sidewalks														
Observed Data	High	Low	High	High	Low	High	Medium	High	High	High	Medium	Medium	Low	High
Points	3	1	3	3	1	3	2	3	3	3	2	2	1	3
Bicycle Facilities														
Observed Data	High	Low	Low	Low	Low	Medium	Medium	High	Medium	Low	Low	Medium	Medium	High
Points	3	1	1	1	1	2	2	3	2	1	1	2	2	3
Drop-off/Pick-up Areas														
Observed Data	2	0	1	1	1	2	3	2	1	3	3	2	2	3
Points	2	0	1	1	1	2	3	2	1	3	3	2	2	3
Wayfinding														
Observed Data	5	5	3	3	3	6	4	8	7	6	3	5	5	6
Points	2	2	1	1	1	3	1	3	3	3	1	2	2	3

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Appendix D: Federal requirements for state rail plans

Requirement	Location in Plan	Citation
Involve public and stakeholders	Chapter 1	49 CFR 266.15 (a)
Describe State Rail Service Assistance Program	Chapter 7	49 CFR 266.15 (c) (1)
Include map(s) of entire rail system designating the operating carrier or carriers; freight traffic density; location of passenger service.	Chapter 2	49 CFR 266.15 (c) (2)
Identify classes/services of rail system on maps	Chapter 2	49 CFR 266.15 (c) (3)
Describe screening criteria used in selecting eligible lines for funding assistance programs	Chapter 7	49 CFR 266.15 (c) (4)
Describe method for determining ratio of benefits to costs for projects eligible under 266.7	Appendix A	49 CFR 266.15 (c) (5)
Include, to the extent that the information is available to the State, the following data for each line the State has selected to analyze in detail: Annual freight tonnage and carloads segregated by commodity type and indicating any seasonal traffic fluctuations and the number of shippers and receivers on the line aggregated by type (e.g., grain elevator, power plant, heavy manufacturing), including identification of information which a shipper wishes the Administrator to consider confidential to the extent permitted by law	Chapter 3	49 CFR 266.15 (c) (6) (i)
Include, to the extent that the information is available to the State, the following data for each line the State has selected to analyze in detail: Revenues and costs of providing rail freight service on the line.	Chapter 6 (PCC Rail System)	49 CFR 266.15 (c) (6) (ii)
Include, to the extent that the information is available to the State, the following data for each line the State has selected to analyze in detail: Condition of the related rail facilities and equipment, and for a line eligible under §266.7(b) of this part, a description of the particular rail facilities involved in any project a State may be considering on the line	Chapter 6 (PCC rail system)	49 CFR 266.15 (c) (6) (iii)

Requirement	Location in Plan	Citation
Include, to the extent that the information is available to the State, the following data for each line the State has selected to analyze in detail: When the State is considering a line for rail service continuation assistance, projections of freight traffic needs on the line for at least the three succeeding calendar years and estimates of the amount and type of equipment, the condition of the rail facilities, and the level of service necessary to satisfy the projected traffic needs as well as estimates of the revenue and costs of providing this service;	Chapter 6 (PCC Rail System)	49 CFR 266.15 (c) (6) (i)
Include, to the extent that the information is available to the State, the following data for each line the State has selected to analyze in detail: When the State is considering a project eligible under §266.7(b) of this part, the amount of funds expended for the maintenance of the line and the kinds of work performed during the five year period preceding its eligibility.	Chapter 7 (FRAP)	49 CFR 266.15 (c) (6) (v)
Include, to the extent that the information is available to the State, the following data for each line the State has selected to analyze in detail: When the State is considering a line for rail banking, a description of the line's future economic potential, such as the existence of fossil fuel reserves or agricultural production likely to be served;	N/A - State is not considering lines for rail banking	49 CFR 266.15 (c) (6) (vi)
Describe any alternatives to cost benefit methodologies	Appendix A	49 CFR 266.15 (c) (7)
Apply methodology	Appendix A	49 CFR 266.15 (c) (8)
Explain decisions regarding alternatives	Appendix A	49 CFR 266.15 (c) (9)
Describe planning process participation by stakeholders and public	Chapter 1	49 CFR 266.15 (c)(10)
Describe overall planning process in the state	Chapter 1	49 CFR 266.15 (c) (11)
Include a program of projects	Appendix A	49 CFR 266.15 (c) (12)

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