

DRAFT



Washington State Ferries 2040 Long Range Plan

DRAFT PLAN

Reliable service



Customer experience



Manage growth



Sustainability and resilience



Washington State Ferries

September 2018

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Executive summary

Washington State Ferries (WSF), a division of the Washington State Department of Transportation (WSDOT), operates the largest ferry system in the United States. The system carried almost 25 million riders in 2017 through the operation of 10 routes and 20 terminals. The WSF system is an essential part of Washington's transportation network, linking communities on both sides of Puget Sound with the San Juan Islands and internationally to Sidney, British Columbia.

Every day, WSF ferries carry thousands of commuters, recreational users and commercial vehicles safely across Pacific Northwest waters. As part of the state highway system, WSF ferries link farmers in the Yakima Valley with markets on the Olympic Peninsula. They bring not only economic opportunities to island communities through tourism and trade, but also a critical lifeline to island residents who need medical services on the mainland or to people needing rescue as an auxiliary to the Coast Guard.

With WSF's ridership expected to grow 30 percent between 2017 and 2040, increasing demand for service presents challenges to an already overburdened fleet and aging infrastructure. The type of increased demand for ferry service is unique to this era: Traditional weekday commute patterns and demographics are changing, recreational and other discretionary trips are increasing, and more of the population is expected to need special transportation services. All of these factors compound the challenge of WSF's aging fleet and workforce, which already cause disruptions in service and decreased reliability.

At the same time, advances in technology present opportunities for WSF's customers to connect with the rest of the transportation system in new ways, as well as to access more up-to-date information about the ferry system. For example, many ferry customers are already able to plan trips and pay for tickets via smartphone apps and other tools, which enable them to make a more seamless door-to-door trip, and technology will play an increasingly important role in improving the customer experience.

Finally, the possibility of natural disasters and the effects of climate change present challenges to WSF's vessel and terminal infrastructure. WSF has begun making terminal improvements to address seismic concerns and is following executive guidance to increase sustainability and conserve fuel.

The 2040 Long Range Plan recommends short-, medium- and long-term actions for WSF to pursue and identifies opportunities and challenges to address. The Plan uses the Washington State Department of Transportation's Practical Solutions approach, which emphasizes efficient use of existing resources and strategic capital investments to improve the performance of the state's transportation system.

The Plan provides a proposal for investments and policy recommendations that support reliable, sustainable and resilient ferry service through 2040 and beyond, while managing growth and offering an exceptional customer experience. Successful implementation of this 2040 vision will depend on a coordinated set of investments in the fleet, terminal infrastructure, workforce and technology over the next 20 years.

2040 Plan development and key themes

Several pieces of legislation and policies shaped the Plan's scope and areas of emphasis, including:

- The 2017-19 Legislative budget proviso, which directed WSF to review the changing needs of ferry system users and evaluate strategies to help spread peak ridership, among other things.
- Executive orders from the Governor, including Executive Order 18-01, which directs WSF to begin transitioning to a zero-carbon emission ferry fleet.
- WSDOT plans and strategic goals, such as the Washington Transportation Plan, the Workforce Development Plan, and the Public Transportation Plan.

Development of the 2040 Plan started in 2017 by identifying issues and priorities from public and stakeholder engagement activities. WSF convened three advisory groups, whose members included:

- Ferry Advisory Committee (FAC) members
- Local, regional, state and transit agencies
- Tribal representatives
- Bicycle, transit and pedestrian advocates
- U.S. Coast Guard representatives
- Business and tourism interests
- Elected and appointed officials

WSF heard a wide range of concerns and issues from the advisory groups. During public outreach meetings in spring 2018, many similar issues came to light in ferry-served communities. From all of the community engagement activities, the following themes emerged:

- Reliability
- Customer experience
- Manage growth
- Sustainability and resilience

Within each of these themes, the Plan establishes goals for meeting customer needs while improving efficiency and advancing the state’s environmental goals. The Plan recommends capital investments, service modifications and policy changes to achieve these goals, along with specific tactics for implementation. The Plan also identifies key considerations and challenges to implementing the recommendations. For example, as WSF makes investments in constructing new vessels to stabilize the fleet, WSF must also consider maintenance needs for its vessels before expanding service.



2040 Plan recommendations

This Plan makes recommendations for WSF to implement between now and 2040, as described in more detail in the sections that follow. In summary, WSF’s recommendations are:

Reliable service

Vessels

- **Build new vessels to stabilize the system.**
 - Extend the existing open contract for the Olympic class of vessels to construct five more vessels as soon as possible—two to stabilize the fleet and three to replace vessels due to retire.
- **Examine the 60-year life expectancy for vessels in the fleet that have not had the maintenance and preservation time required to meet this high life-expectancy goal.**
 - Because Issaquah Class vessels are experiencing reliability issues and steel degradation that will shorten their attainable service life, retire the Issaquah class early, at approximately 50 years of age.
- **Allow for 12 weeks of annual out-of-service maintenance and preservation time for each vessel to achieve the 60-year life expectancy goal.**
 - Grow the fleet from 22 to 26 total vessels.
- **Invest in new vessels to replace retiring vessels.**
 - Retire and replace 13 vessels over the planning horizon.
- **Streamline the fleet composition to realize enhanced efficiencies and redundancy.**
 - Simplify the fleet to include five vessel classes by 2040.

Terminals

- **Plan for reliable terminal infrastructure.**
 - Continue to enhance the asset management model to prioritize projects that increase reliability and resiliency.
- **Monitor terminal maintenance trends through 2040.**
 - Perform ongoing evaluation of methods to reduce paint maintenance costs, such as models to help plan and estimate when to repaint assets.
- **Program terminal preservation projects to support reliable service.**
 - Continue to monitor for opportunities to enhance and support reliable service, and improve vehicle processing and operational efficiencies through preservation projects.
 - Plan for critical preservation work to upgrade the Fauntleroy terminal.
 - Work with the community to determine the best solution for operational challenges at the Edmonds terminal.
- **Invest in the Eagle Harbor Maintenance Facility to serve system needs through 2040.**
 - Convert an existing tie-up slip to a drive-on slip at Eagle Harbor.

Workforce

- **Establish a workforce development plan unique to maritime conditions.**
 - Continue investing in recruitment, training, apprentice and mentoring programs for all WSF positions.
 - Develop strategies to encourage qualified, experienced workers to stay in the workforce while attracting and retaining a younger workforce.
 - Update salary survey data regularly for wage adjustments to reflect market conditions.
- **Retain skilled labor at the Eagle Harbor Maintenance Facility.**
 - Survey regional salary information frequently to gain awareness of the latest market conditions and take measures to compete with these conditions.
 - Explore opportunities to expand the apprentice program to support a sustainable workforce at Eagle Harbor.

Customer experience

- Invest in technology that gives customers more information to support better trip planning, including terminal queue detection and wait times, website upgrades, improvements to the customer alerts and notifications system, and real-time parking information.
- Modernize fare collection to provide operational efficiencies and meet customer preferences and expectations.
 - Upgrade ticketing and reservations systems.
 - Monitor the progress and development of two available technologies: automatic vehicle length detection and automatic vehicle passenger counting.
- Increase accessibility and wayfinding in and around the vessels and terminals to improve access and multimodal connections.
 - Install Americans with Disabilities Act (ADA)-compliant electronic signage at terminals with directional information, service alerts and real-time schedule information.
- Enhance mobility by improving pedestrian, bike and transit connections to and from terminals.
 - Prioritize bike and pedestrian loading.
 - Look for opportunities to incorporate improved bike and pedestrian infrastructure in terminal preservation and improvement projects.
- Plan vessel and terminal spaces to be flexible and responsive to emerging technologies and new transportation options.
 - Assess the evolution and expansion of pick-up/drop-off areas at terminals as part of capital improvements planning.
 - Design new vessels with flexible vehicle and passenger spaces in order to accommodate changing ratios of vehicle, walk-on and bike passengers in the future.

Manage growth

- Refine existing metrics and define new metrics to offer better data for future system planning that prioritizes the movement of people and improves the customer experience.
 - Establish a passenger Level of Service standard.
 - Adjust capacity standards on routes with reservations.
 - Establish vehicle wait time as a performance metric.
- Maximize existing system utilization through the advancement of adaptive management strategies that make operations more efficient, spread out demand beyond peak travel times, and prioritize walk-on and bike-on passengers through better connectivity at the terminal.
 - Expand vehicle reservations.
 - Fare structure and pricing strategies.
 - Additional adaptive management strategy areas.
- Provide system capacity enhancements through modest increases in service hours and by leveraging new vessel construction, terminal improvements and existing infrastructure modifications.
 - Enhanced service hours.
 - Increased carrying capacity (through size of the vessels).
 - Terminal operations efficiencies.

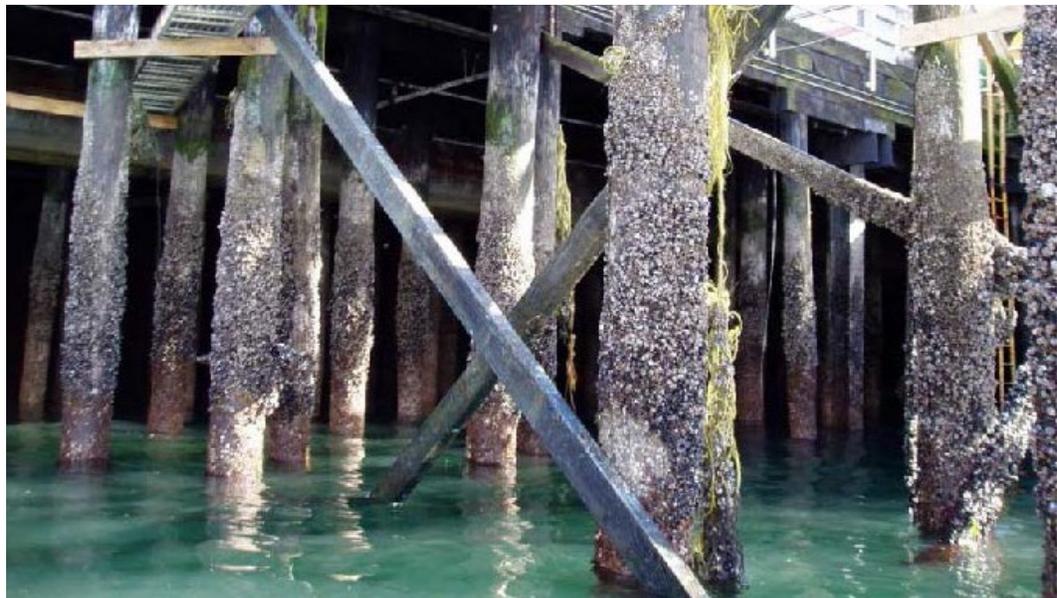
Sustainability and resilience

Sustainability

- Highlight sustainability through organizational structure, decision-making and reporting.
 - Dedicate resources to sustainability.
- Reduce vehicle emissions by optimizing terminal operational efficiencies and employing adaptive management strategies that spread out peak demand and minimize wait times.
 - Add overhead loading.
 - Improve traffic at terminals.
 - Invest in vehicle queue detection.
 - Optimize terminal operations.
 - Enhance customer information.
- Promote mode shift through investments in technology and infrastructure that promote walk-on and bike-on passengers and improve multimodal connections.
 - Improve customer information.
 - Enhance transit connections.
 - Improve terminal access.
- Design future vessels and terminals to be more environmentally friendly and flexible in design to accommodate new technology, changing transportation modes and increased passenger ridership.
 - Invest in hybrid-electric propulsion.
 - Reduce vessel noise.
 - Plan a vessel design charrette.
 - Increase energy efficiency and waste reduction.
 - Continue to assess Terminal Design Standards.
 - Increase efficiency.
 - Monitor stormwater at terminals.
 - Continue creosote removal.

Resilience

- Develop an emergency response plan to enhance preparedness and aid in response and recovery efforts, and develop a prioritization of terminal capital projects for emergency response.
 - Develop a disaster response and preparedness plan.
 - Assess the potential for emergency side-loading.
 - Identify alternative landing sites.
 - Fuel/energy access plans.
 - Plan for disruptive events.
- Prioritize terminal maintenance needs with the most seismic risk, vulnerability to sea level rise and “lifeline routes” that provide access to major population centers or critical facilities.
 - Prioritize maintenance.
 - Assess seismic risk.
 - Prepare for climate change and sea level rise.
 - Incorporate coastal design standards.
 - Identify lifeline routes.
- Increase the number of spare vessels to support regional emergency response.
 - Grow the relief fleet.



Progress since the 2009 Long Range Plan

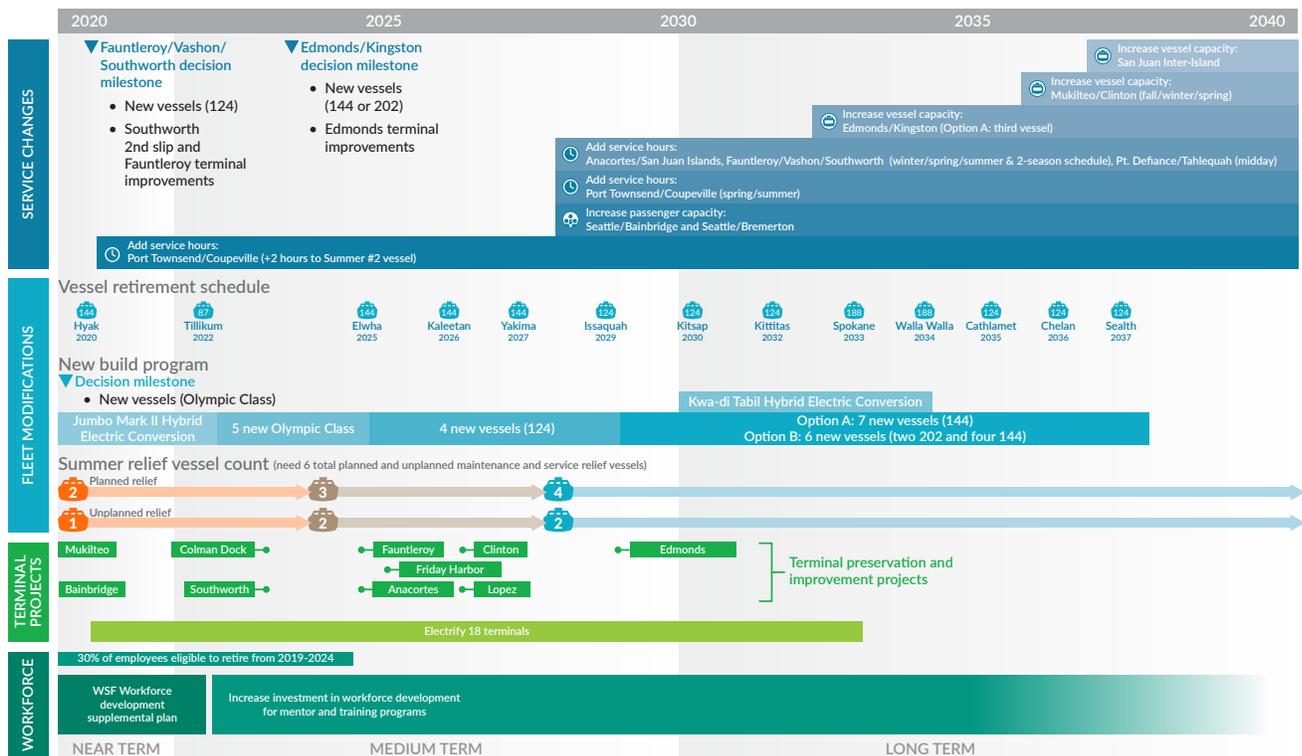
The 2009 Plan sought to balance a constrained service and capital investment strategy with long-term funding requirements. The Plan proposed capital investments in both vessels and terminals and recommended new ways to manage increased demand, such as a vehicle reservations system. These types of ridership demand management tools are referred to in this Plan as adaptive management strategies.

The 2040 Plan is consistent with the vital investments that were implemented as part of the 2009 Plan.

Investment and implementation

Beyond stabilizing the fleet, this Plan recommends improvements to service, adaptive management strategies, and capital investments. Because these issues are so interconnected, and the investment required would take place over a number of years, the Plan groups these strategies into target timeframes for implementation:

- **Near-term (0-2 years)—Stabilizing the system.**
- **Medium-term (3-7 years)—Building the infrastructure.**
- **Long-term (8-20 years)—Responding to growth.**



*To view the implementation plan in detail, please refer to section 7: Implementation, Investments, and Financial Overview.

As identified in the 2009 Plan, the primary challenge facing WSF is the anticipated lack of capital funding needed to stabilize the fleet, manage growth, improve the customer experience, and address sustainability and resiliency challenges. Addressing the funding challenge will entail consideration of new revenue sources, contracting procedures, and careful attention to all factors that drive system costs. Some of the steps needed to make this plan a reality will require action by the Legislature.

The total cost to implement this plan over the next 20 years is \$14.2 billion. However, dedicated tax revenue and fare collection are projected to cover \$7.5 billion of these costs. Historically the Legislature has appropriated additional revenues to cover the shortfall between dedicated WSF revenues and WSF operating and capital funding needs. Over the 20-year planning horizon, WSF’s total funding needs exceed dedicated revenue by a combined capital and operating amount of \$6.7 billion over the 20 years.

Funding capital investments (\$ in millions)



Funding operations (\$ in millions)



The Plan’s proposed investments will benefit the ferry system by improving reliability and constraining operating cost growth, and by reducing fuel/energy operating costs. The consequences of not investing in the system are dire, with vessels and other infrastructure continuing to deteriorate without replacement, cuts to service, and a gradual shrinkage of the ferry system. WSF’s customers and ferry-served communities would suffer as a result.

Summary

The WSF system has a vital role in the economic, recreational and transportation systems of Washington state. Ferries provide mobility and opportunity to those living and working in Puget Sound communities, and they provide unique experiences to visitors. In some ferry-served communities, WSF is the only link to medical and emergency services and provides a vital lifeline.

The Plan recommends a modest increase in service, which focuses on addressing congestion. WSF needs most of the capital investments to renew the fleet and bring the system to a state of good repair through 2040. WSF needs the investments in the Plan to ensure system reliability and resilience, with the added benefit of increased operating efficiency.

The key themes of the Plan (Reliable service, Customer experience, Manage growth, and Sustainability and resilience) and their corresponding recommendations are interrelated. For example, a decision about technology and improving the customer experience has potential effects on operational efficiency and reliable service. The Plan focuses on a coordinated set of investments and service enhancements to be implemented over 20 years, but is meant to work as a “living” document that will guide decisions and allow WSF to adapt to changing conditions.



Next Steps

With the release of this Draft Plan, WSF will begin a 45-day public comment period. During the public comment period, WSF will host in-person open houses, outreach sessions onboard ferries during peak commutes, and an online open house.

After the public comment period, WSF will review and consider all comments before finalizing the Plan. The Final Plan will be submitted to the Legislature in January 2019.

Section 1

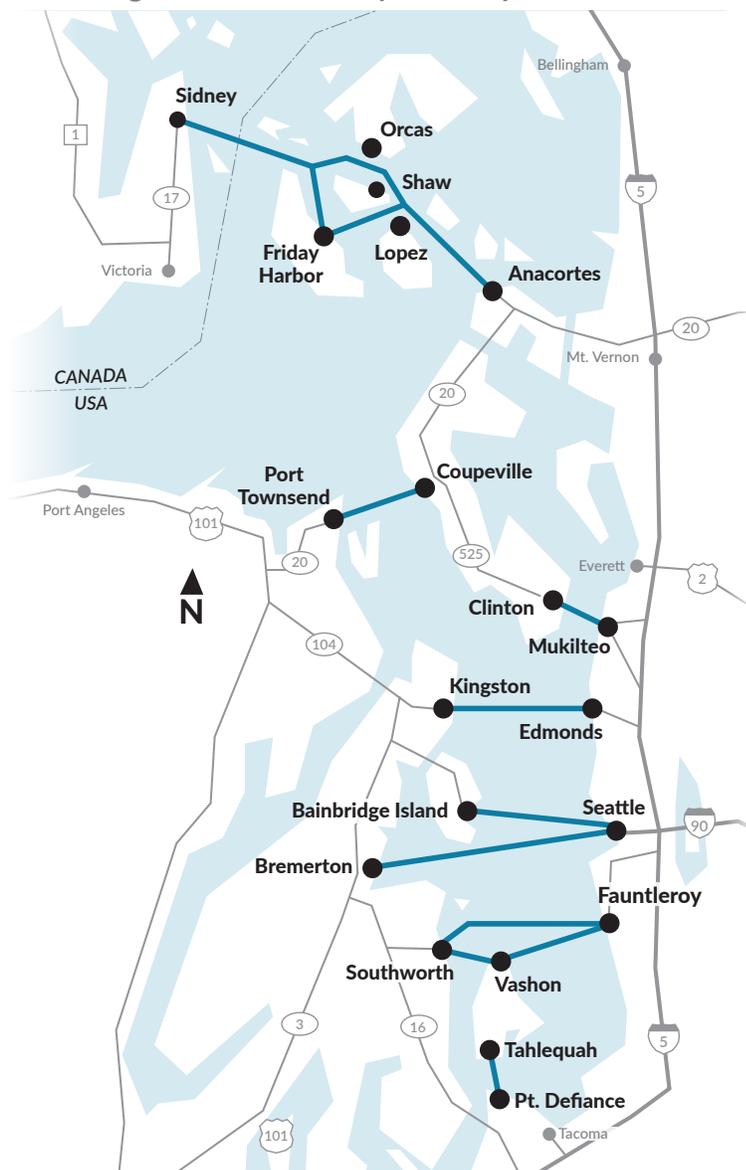
Introduction

Washington State Ferries (WSF), a division of the Washington State Department of Transportation (WSDOT), operates the largest ferry system in the United States. In 2017, the system carried more than 24 million customers through the operation of 10 routes and 20 terminals.

The WSF 2040 Long Range Plan (the Plan) provides a vision intended to guide the future service and capital investment decisions for this critical part of the State highway system. In April 2017, the Washington State Legislature directed WSF to update its 2009 Long Range Plan, and within the update, take into consideration the changing needs of ferry system users and associated funding opportunities and challenges. This Plan provides a proposal for investments and policy recommendations to support reliable, sustainable and resilient ferry service through 2040 and beyond while managing growth and offering an exceptional customer experience.

Implementation of this plan depends on investments in the fleet, terminal infrastructure, workforce, and technology. Washington's ferry system is at a crossroads, where service reliability is beginning to deteriorate despite efforts to

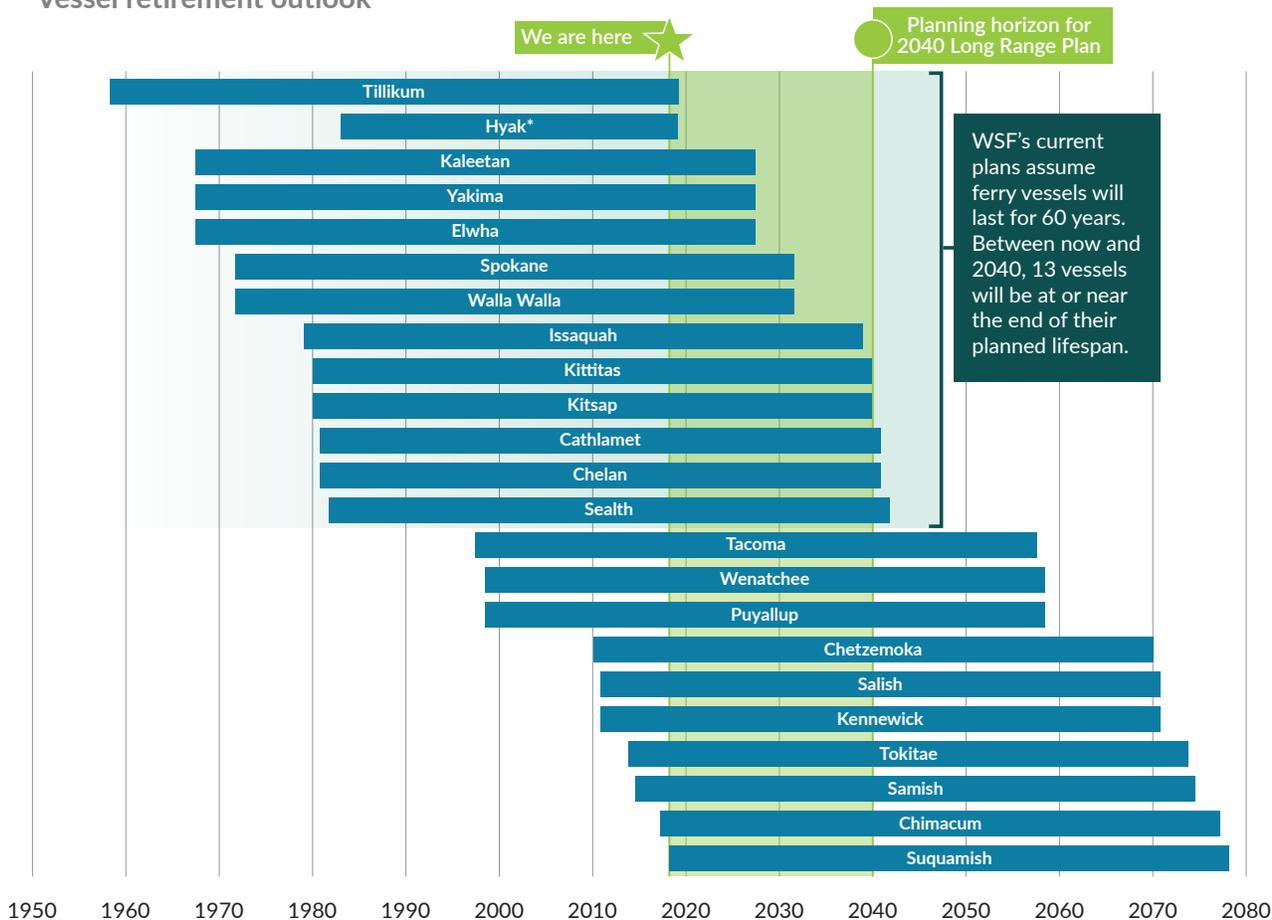
Washington State Ferries system map



prioritize service over other competing needs. Funding challenges over the last decade are becoming more evident in an increased number of missed sailings because of vessel mechanical issues, aging infrastructure and the deterioration of on-time performance.

Within the next 20 years, 13 vessels are due for retirement and replacement. At the same time, WSF needs to increase its fleet size to maintain reliable service and allow for the maintenance and repair of existing vessels. Traffic congestion continues to grow as more people move to the region. This trend is projected to continue over the next 20 years, along with evolving technologies bringing new opportunities for efficiencies and enhanced information for trip and system planning. These changes will also bring challenges, requiring infrastructure and operations to be flexible, and policies and metrics to inform effective and efficient use of resources.

Vessel retirement outlook



*Hyak did not have a midlife refurbishment. It is scheduled to be retired in 2019.

Purpose

To plan for the region's coming challenges in growth and evolving transportation needs, WSF presents this Plan, which includes recommendations for improvements to the ferry system and accounts for the changing needs of ferry system users. WSF intends for the Plan to:

- Guide internal planning, including key initiatives for service modifications and future changes to vessels, terminals and technology.
- Inform Legislative proposals, including how WSF intends to achieve adopted goals and what investments are needed to do so.
- Facilitate external coordination with other state agencies that are involved in implementation and help align WSF's plans with those of local jurisdictions.

The scope and areas of emphasis in the Plan were shaped by several pieces of legislation, and policies, including:

- The 2017-19 Legislative budget proviso, which directed WSF to review the changing needs of ferry system users and evaluate strategies to help spread peak ridership, among other things.
- Executive orders from the Governor, including Executive Order 18-01, which directs WSF to begin transitioning to a zero-carbon emission ferry fleet.
- WSDOT plans and strategic goals, such as the Washington Transportation Plan, the Workforce Development Plan, and the Public Transportation Plan.

The graphic below describes the 2040 Plan inputs.



Background and progress since the 2009 Plan

WSF completed its last Long Range Plan in 2009, based on direction from the Washington State Legislature during the 2007 session. One of the goals of the 2009 Plan was to maximize existing resources before taking steps to accommodate growth. Specifically, WSF was charged with:

- Identifying adaptive management strategies, which are methods to spread peak vehicle ridership and make better use of existing vessel and terminal capacity (one example would be WSF’s current use of the Save-A-Spot vehicle reservation system).
- Proposing an investment program for vessel replacement and terminal preservation.
- Adopting a new decision framework for managing congestion (level of service) standards.

Where we started...

In 2007, the Legislature directed Washington State Ferries (WSF) to develop a Long Range Plan. The emphasis was to maximize use of existing resources by:

- Identifying adaptive management strategies.
- Proposing a capital program for vessel replacement.
- Adopting new level of service standards.

What we have accomplished since 2009...

In 2009, WSF released the Long Range Plan. The Plan presented a vision for the future of the ferry system.

Studied and implemented vehicle reservation systems

- Feasibility study delivered to legislature in 2010.
- Phase I at Port Townsend/ Coupeville launched in 2012.
- Phase II at San Juan Islands launched in 2015.
- Phase III Central Sound (currently not funded).

Improved customer web experience to allow for easier trip planning

- Added **Best Times to Travel** feature.
- Updated terminal conditions.
- WSDOT app launched in 2010. In 2016, WSF tab had 9.7 million hits.



Designed and began to construct Colman Dock and Mukilteo ferry terminals

- Colman Dock 90% design completed spring 2017, construction began summer 2017, planned completion 2023.
- Mukilteo ferry terminal 90% design completed spring 2017, construction began summer 2017, scheduled to open in 2019.

Implemented pricing strategies to maximize use of vehicle space

- Increased passenger fares at lower rate than vehicle fares.
- Added small car discounted fare.
- Lowered the youth fare.



Build ten new vessels by 2030

- Two new Olympic class vessels built by 2014.



(Samish, Tokitae)

- Three new Kwa-di Tabil class vessels will be built by 2030.



(Chetzemoka, Kennewick, Salish)

- Five additional Olympic class vessels recommended to be built by 2030.



(Chimacum entered service 2017, Suquamish in 2018)

Funding for remaining three vessels not identified.

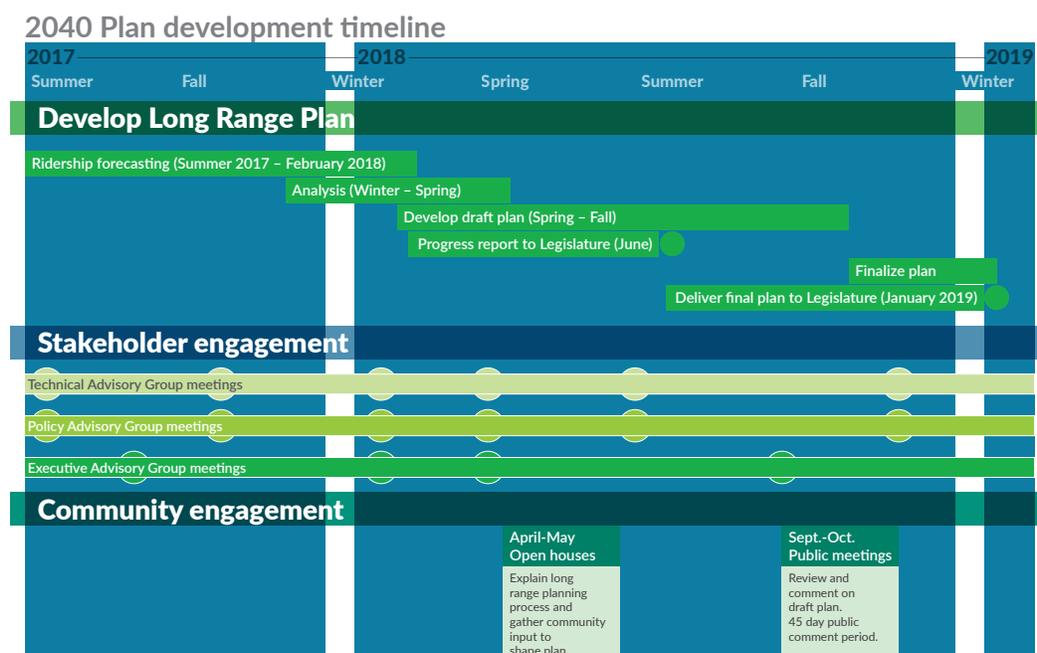
The 2009 Plan outlined ways to increase efficiency, such as encouraging more vehicles to travel during off-peak hours and recommending strategies to increase the number of walk-on passengers.

WSF has made significant progress on implementing the goals and strategies set forth in the 2009 Plan. This work includes implementation of adaptive management strategies such as launching a reservation system and improving its customers' online experience, as well as capital investments such as the new Colman Dock and Mukilteo ferry terminals and building new Olympic Class vessels. Several challenges remain for implementing the 2009 Plan. Some recommended projects encountered funding gaps and lack of time for vessel maintenance because WSF needed to prioritize keeping vessels in service and maintaining service hours, and lacked a sufficient reserve fleet.

Appendix A provides more detail on each of the three key areas of emphasis in the 2009 Plan: adaptive management strategies, vessel replacement and service standards.

Approach to the 2040 Plan

Development of the Plan included an extensive community engagement process, and in parallel, a technical analysis of the WSF system to develop recommendations for the 20-year planning horizon. WSF completed the technical analysis with consultant support as described in a scope of work composed of 22 distinct tasks (see Appendix B). The plan timeline graphic below outlines the key milestones and parallel efforts involved in Plan development. The following sections outline the public involvement process and the technical review and analysis conducted to develop the Plan.



Plan development – Phase 1: identify issues and priorities

The first phase of Plan development involved gathering input from public and stakeholder engagement activities and performing technical analyses to better understand the needs and opportunities for improvement of the ferry system.

Stakeholder advisory groups

In summer 2017, WSF convened three advisory groups to help steer the development of the Plan and review Plan elements that pertain to their membership:

Policy Advisory Group (PAG): Representing ferry customers and other community interests, PAG members include Ferry Advisory Committee members; people with disabilities; bicycle, transit and pedestrian advocates; U.S. Coast Guard representatives; business and tourism interests; tribal representatives; community service providers and government agencies.

Technical Advisory Group (TAG): Representing FAC members; local, regional, state and transit agencies; tribal representatives and WSDOT staff, the TAG reviews the Plan’s progress and ensures the Plan uses the most up-to-date local, regional and state data. Their role includes keeping agency partners informed about technical work and helping WSF to understand local, regional, state and tribal needs.

Executive Advisory Group (EAG): Composed of elected and appointed officials, including tribal representatives, the EAG provides WSF with strategic advice on how to prioritize needs in the development of the Plan, represents their constituents’ interests, reviews and provides feedback on key policy elements, and supports the successful delivery of the Plan.



The PAG and TAG have been meeting bimonthly starting in July 2017, and the EAG has been meeting approximately quarterly since September 2017. These advisory groups will continue to meet until the Final Plan is delivered to Legislature in January 2019. All advisory group meeting summaries are available on the project website: wsdot.wa.gov/ferries/planning/long-range-plan.

Community engagement

Since Plan development started in 2017, WSF has provided an open community engagement process, with the goal of including all perspectives, disciplines and backgrounds into outreach and decision-making. This community engagement process will continue through completion of the Final Plan. WSF's goals for community engagement are to:

- Promote public understanding of the purpose of and need for the Plan and the challenges facing the ferry system.
- Ensure inclusive engagement early and throughout the process, including robust FAC involvement. FACs represent local communities on ferry-related issues, serve as ambassadors for their communities, and play a key role in disseminating information and representing ferry-served communities in the plan.
- Deliver comprehensive and consistent information through a variety of communication methods.
- Encourage community engagement and provide opportunities for public input.

Community engagement during development of the Plan centered on identification of issues and priorities to consider in the Draft Plan in spring 2018, and review of the Draft Plan in fall 2018. At the beginning of the planning process, WSF developed a comprehensive community engagement plan to guide public and stakeholder engagement (see Appendix C). As part of the planning process, WSF consulted with ferry customers, planning organizations, policy makers, agency stakeholders, tribes and the general public.

Public outreach meetings

During the first round of community engagement in spring 2018, WSF hosted nine in-person open houses, six outreach sessions on ferries during the afternoon commute and a six-week online open house to introduce the Plan and gather input on community priorities. At the in-person events, WSF invited the public to meet with project staff, ask questions and provide early input about priorities and issues to be addressed in the Plan. WSF encouraged attendees to drop in at any time during the in-person open houses to learn about the Plan and provide input; there were no formal presentations.

Tribal consultation

The project team has been working with WSDOT tribal liaisons to ensure tribal leaders are included in the Plan's development and review process. WSF has a government-to-government relationship with all federally recognized tribes who may express an interest in any project. Ten tribes have treaty-adjudicated rights in the WSF service area, and three additional tribes have cultural resource concerns that require consultation. This consultation occurs independent of the community engagement process. Tribal leaders and staff are participating in the Executive, Policy and Technical Advisory Groups.

The goals of the initial round of outreach were to:

- Inform people about the Plan.
- Educate community members about future projected ridership growth.
- Explain the ferry system's current constraints and future opportunities.
- Understand the public's priorities for the future of the ferry system.

Nearly 4,000 people participated in the spring outreach sessions by attending an in-person or online open house. WSF offered multiple other ways for people to learn about and provide early input on the Plan, including a survey that participants could take online or in person at an open house.

WSF received a total of 869 survey responses and 482 comments in person, by email and postal mail, and through the online open house between April 11 and May 24, 2018.

The following key themes emerged in public comments and survey responses:

- **Service reliability:** The majority of participants said the Plan needs to focus on ensuring WSF is able to provide reliable service and maintains enough standby vessels in the fleet to minimize service disruptions. The strongest theme among all public comments across all communities was the need to build new vessels and to continue to maintain an aging fleet adequately.
- **Managing growth:** Many participants provided input on how WSF should accommodate and manage ridership growth, including expanding ferry service and vehicle reservations, adjusting ferry schedules, providing more frequent service, considering new routes and improving terminals to handle more customers and reduce wait times.
- **Multimodal connections and accessibility:** Several comments focused on ways to improve access to ferries via improved transit, walking, biking, parking and carpool amenities. Participants also encouraged WSF to ensure access for people with disabilities or financial constraints.
- **Customer experience and technology:** Participants mentioned multiple ways for WSF to improve the customer experience, including real-time travel information, advanced ticket technology, better access to Wi-Fi, parking and additional amenities, such as healthful onboard food options and more places for relaxing and leisure activities.
- **Sustainability and resilience:** Reducing carbon emissions, updating the fleet to be more environmentally friendly ("greening the fleet"), and preparing for climate change and emergencies were important to many WSF customers, particularly

WSF's advisory groups. Some expressed concern about the resiliency of the ferry system, including the ability not only to sustain core service but also to replace damaged highways or bridges during an emergency event such as an earthquake.

See Appendix D for a complete summary of the spring community engagement process.

Spring 2018 community engagement



Engaging underrepresented communities

To ensure the ferry system continues to be accessible to all, WSF conducted a demographic analysis to better understand the communities it serves and how to reach them during the planning process. This analysis aligns with WSDOT's Community Engagement Plan, Human Services Transportation Plan and Practical Solutions approach. WSF also includes the following Title XI and American with Disabilities Act information language in key project materials.

Title VI Notice to Public: It is the Washington State Department of Transportation's (WSDOT) policy to assure that no person shall, on the grounds of race, color, national origin or sex, as provided by Title VI of the Civil Rights Act of 1964, be excluded from participation in, be denied the benefits of, or be otherwise discriminated against under any of its federally funded programs and activities. Any person who believes his/her Title VI protection has been violated, may file a complaint with WSDOT's Office of Equal Opportunity (OEO). For additional information regarding Title VI complaint procedures and/or information regarding our non-discrimination obligations, please contact OEO's Title VI Coordinator at (360) 705-7082.

Americans with Disabilities Act (ADA) Information: This material can be made available in an alternate format by emailing the Office of Equal Opportunity at wsdotada@wsdot.wa.gov or by calling toll free at 855-362-4ADA (4232). Persons who are deaf or hard of hearing may make a request by calling Washington State Relay at 711.

Consultant team analysis

The consultant team worked with WSF representatives to gather and analyze data and develop a thorough understanding of each element or topic area that makes up the WSF system. Topic areas included:

- Review of the 2009 Plan and implementation progress.
- Adaptive management strategies.
- Emergency response and preparedness.
- Resiliency and sustainability.
- Related plans and projects.
- Performance measures and level of service.
- Vessel lifespan, maintenance, preservation, and reliability trends review.
- Technology assessment.
- Cost efficiencies.
- Terminal review.
- Route-by-route operational analysis.

For each topic area, the consultant team reviewed the existing conditions and history to develop a baseline understanding, researched best practices, identified opportunities for improvement and prepared recommendations for implementation.

Plan development – key themes

WSF organized the Plan’s goals, analysis and recommendations around the key themes that emerged from this public and stakeholder engagement. Multimodal connections and accessibility appear in several sections.

Within each of these themes, the Plan establishes goals designed to meet customer needs while improving efficiency and advancing the state’s environmental goals. The Plan recommends capital investments, service modifications and policy changes to achieve these goals, along with specific tactics for implementation, key considerations and challenges. The recommendations consider WSDOT’s mission and vision, which includes planning for reliability and resiliency with limited resources, focusing priorities, and identifying action areas and investment decisions.



Plan development – Phase 2: review draft plan

The release of this Draft Plan launches a 45-day public comment period. During the public comment period, WSF is hosting 11 in-person open houses, outreach sessions on board ferries during peak commute times, and an online open house to share the Draft Plan for public comment.

The goals of outreach during this phase are to:

- Share the Draft Plan with the public, highlighting key plan findings and recommendations.
- Report back to community members and stakeholders who participated in the first round of community engagement on how their ideas helped shape the Draft Plan.
- Provide multiple ways for people to engage with project staff and provide comments.
- Build support for the Draft Plan and highlight the urgency of public investment to maintain reliable ferry service through 2040.

After the public comment period, WSF will review and consider all comments before finalizing the Plan. The Final Plan will be submitted to the Legislature in January 2019.



Ridership and demand forecasts, 2017-2040

Understanding the current and future customer base serves as the foundation for this Plan. Overall, WSF system ridership is expected to grow more than 30 percent, from 24.5 million riders annually in 2017 to approximately 32.5 million in 2040. Of that growth, walk-on passenger ridership is expected to increase by 45 percent and vehicle ridership is expected to increase by 21 percent.

The routes with the largest numbers of walk-on passengers, Seattle/Bainbridge Island and Seattle/Bremerton, both expect large increases. Both vehicle and passenger ridership on the Edmonds/Kingston route is projected to grow significantly. Although ridership on the Port Townsend/Coupeville route is lower than these heavily-traveled routes, it is expected to have notable increases in vehicle and passenger ridership as well.

To arrive at these numbers, WSF undertook a ridership demand forecasting effort that involved analyzing the latest demographic forecasts from local jurisdictions, including the four counties (King, Kitsap, Pierce and Snohomish) that compose the Puget Sound Regional Council (PSRC) forecast area. The analysis involved dividing the demographic forecasts into 57 districts, 42 of which are within the PSRC forecast area.

For other areas of Washington within the WSF service area but outside the scope of the PSRC forecasting, the analysis used forecasts from local sources when available. The analysis compared available forecasts from local jurisdictions to population forecasts from the State of Washington's Office of Financial Management (OFM) and to employment forecasts from the Employment Security Department (ESD). It generally found the local forecasts to be consistent with OFM and ESD forecasts, with occasional missing data points, such as households, which were then estimated using available household size data.

Major findings of the ridership forecast analysis include:

- Within the WSF service area between 2017 and 2040, overall population is expected to grow about 1 percent, the number of households is expected to grow by about 1.2 percent, and the number of jobs is expected to grow by about 1.3 percent.
- Consistent with this population growth, annual ferry ridership is expected to grow by about 1.2 percent, or about 30 percent overall between 2017 and 2040.

Future ferry ridership analysis and estimates

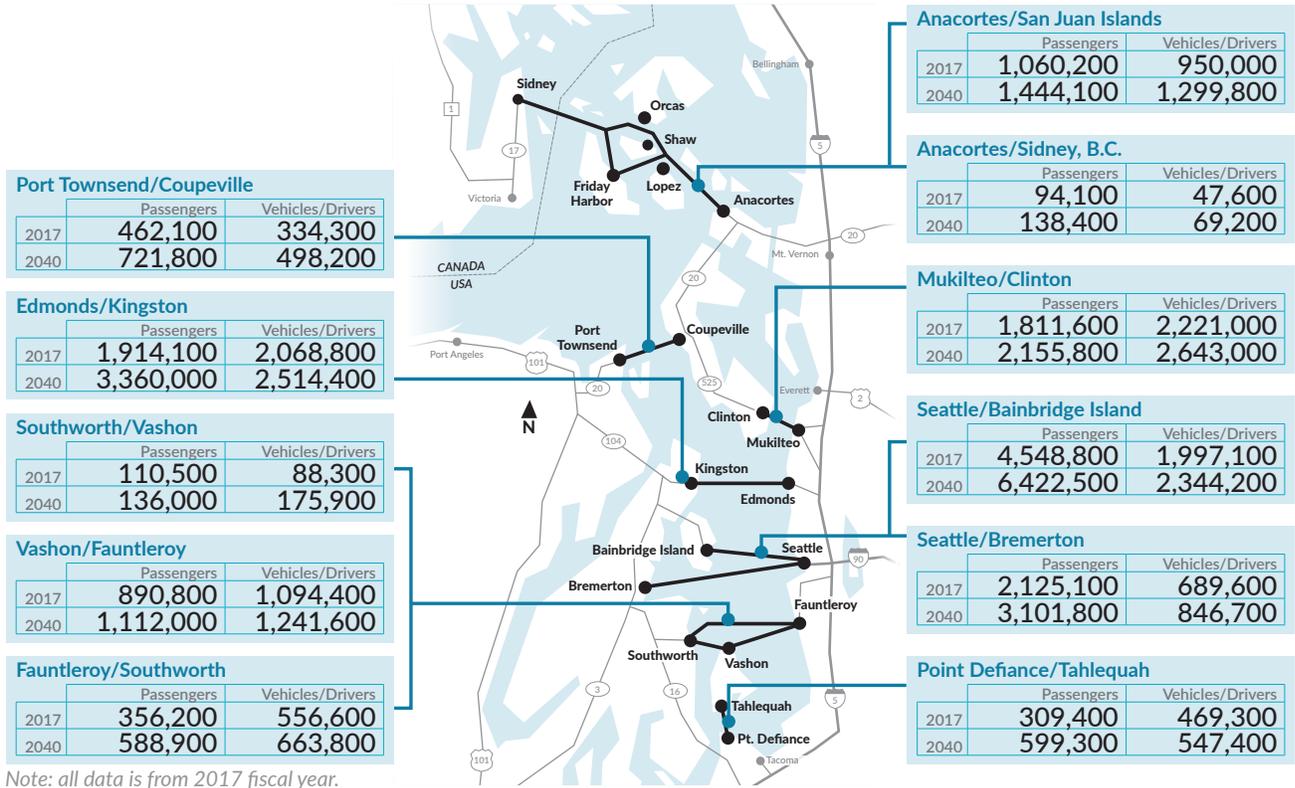
This analysis evaluated current ridership patterns through a variety of research efforts, including focus groups and customer surveys. To understand ridership patterns of future customers, the analysis used the WSF Travel Forecasting Model to develop future ridership demand forecasts. The analysis updated the model using new customer survey information expanded to reflect 2017 ferry ridership, as well as updated land-use forecasts and network assumptions from PSRC and outlying jurisdictions.

The WSF ferry ridership forecasting involved a three-stage process:

- First, the model took the base year of afternoon peak period origin-destination ferry riders (collected via survey work in 2013), and adjusted these ridership numbers to 2017 levels using the growth rate in the land use forecasts for the WSF service areas.
- Second, the WSF model assigned the number of afternoon peak ferry riders estimated in the first stage of forecasting to different ferry routes. The model used route-specific service attributes, such as changes in service levels. The model also took into account the existing and programmed transit service and traffic congestion levels on the land side.
- Third, the forecasters added future recreational and bicycle traffic to the WSF model. This final analysis resulted in complete annual ridership estimates for 2030 and 2040 for all WSF routes, including recreational ridership.

See Appendix E, *Ferry Travel Forecasting Methodology Report*, for specific methodological descriptions and additional demographic information related to the WSF planning model.

Annual ridership forecast by route



Ridership projections are intended for long-term planning only. As recommendations from this Plan are implemented, WSF will monitor ridership levels for any potential adjustments.

Relationship between ridership forecasts and regional growth

WSF has expressed a goal of accommodating the anticipated growth in ridership to ensure the ferry system is effectively meeting the public's long-term needs for service. As a public transportation provider, it is also WSF's mission to connect customers with the rest of the land-based transportation system.

Population and employment growth in ferry-served communities will influence demand for ferry service, as shown in the 2040 ridership forecast. Although communities with larger proportions of ridership growth would be expected to have more population growth than other communities, other factors affect ridership. For example, the addition of new transit connections in the form of King County Metro's Rapid Ride service and Community Transit's Swift Bus Rapid Transit service may increase ridership on the ferry routes that connect to this improved transit service.

Review of local plans and implications

This analysis included a review of local jurisdictions' comprehensive plans to identify potential effects from expected growth and to assess the extent to which the policies and projects in local plans support WSF's plans. The review focused on three specific questions:

1. Will development in the vicinity of terminals increase traffic congestion and result in operational problems for loading or unloading of ferries?
2. Are planned transit services and non-motorized facilities adequate to support a shift from single-occupant travel to other modes, which is one of WSF's available adaptive management strategies?
3. Do policies in local plans support improved ferry service and the multimodal facilities needed for that service?

The geographic locations and contexts of WSF terminals vary widely, from urban centers with high traffic volumes and good transit connections to rural settings with fewer transportation options and less potential for development. Based on this review, the following factors are likely to influence future conditions around WSF terminals:

Growth in traffic congestion near terminals

WSDOT and local transportation agencies forecast that traffic congestion in downtown Seattle and on highways connecting to terminals in Mukilteo, Edmonds and Bainbridge Island will worsen in the foreseeable future. This growth in congestion will increase the time required for drivers and buses to reach terminals and may complicate loading and unloading of ferries during peak hours. In addition, the Washington State Rail Plan forecasts that traffic on the BNSF tracks in Edmonds will increase in frequency and train length. This growth will exacerbate existing challenges with ferry loading and unloading and may create conflicts for pedestrians and motorists accessing the terminal.

Transit and non-motorized connections to terminals

Nearly all of the local plans include policy language that supports non-motorized facilities; however, many of the facilities are unfunded, and some plans are more extensive than others. Over time, the implementation of the planned facilities will create conditions that support shifting single-occupant vehicle travel to non-motorized modes. The timing and extent to which these shifts may occur is difficult to predict accurately because of funding uncertainties.

Transit agencies currently provide effective connections to most WSF terminals, especially in urban centers. Terminals at Colman Dock in Seattle, Edmonds, Mukilteo, Bremerton, Clinton and Bainbridge Island all serve as hubs for multiple transit routes serving many destinations. Many local plans also emphasize connections to ferry service. Transit plans generally call for increased service levels, which should make service more convenient for users and facilitate connections with ferries. However, traffic congestion is likely to decrease transit speed and reliability, making timed connections to ferry service more difficult to maintain.

A Practical Solutions approach to traffic problems at the Kingston terminal

The situation: Increasing traffic on the Edmonds/Kingston route is resulting in lengthy queues on State Route 104 through Kingston during peak periods (especially summer weekends). This growing line of vehicles impedes access to local businesses and can create undesirable back-ups on the eastbound lane of SR 104 more than a mile from the terminal.

A Practical Solutions approach: WSF convened a stakeholder group that includes WSDOT, Kitsap County, the Port of Kingston, Kitsap Transit, Ferry Advisory Committee (FAC) members, local businesses and others to identify short-term and longer-term improvements that address the operational problem caused by growing volumes of ferry traffic. This assessment builds on findings of the 2016 Kingston Complete Streets study led by Kitsap County. Possible improvements include realignment of the incoming ferry lanes to First Street and relocation of WSF toll booths, signage, expansion of the tally system that manages the queue by confirming vehicles place in line, and an expanded holding area on WSDOT property off SR 104 upstream from the terminal.

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More effectively managing traffic approaching the terminal can reduce negative effects on the community, eliminate conflicts with local traffic, and lessen the frustration of ferry commuters.

Funding: The Legislature provided \$500,000, which WSF is using to assess the feasibility of a remote holding facility. The working group also considered improvements such as cameras, variable message signs and automated boarding pass systems. Kitsap County secured a \$1.3 million grant for planning and design of Complete Streets improvements, including relocation of toll booths. Funding for construction of the capital improvements has not yet been identified.

Existing high-speed passenger-only ferries will continue to complement WSF service on routes to Kitsap County and Vashon Island. This service helps to give ferry customers additional travel choices and create incentives for non-single-occupant vehicle travel. However, because the Kitsap County service is so new, the net effect on future WSF ridership is not yet known.

Supportive policies in local plans

Policies in local plans are generally very supportive of improved connections between transportation modes, transit service, and non-motorized facilities. Several plans include policies specifically relating to WSF service or facilities.

Many local plans mention the effects of ferry traffic on local congestion and include recommendations for mitigating these effects and requests for improved coordination.

Even though local plans are generally supportive, constrained waterfront terminal sites tend to make expansion difficult or infeasible. Expansion options are also limited in locations where WSF does not own shoreside property. In these locations it may be difficult to accommodate future demand with existing facilities.

University of Washington study on Triangle Route improvements

In the 2018 session, the Legislature appropriated funding for the University of Washington's Evans School of Public Policy to do a study titled *Improving Loading, Ticketing, and Rider/Community Relations for the Washington State Ferries' Triangle Route*. The study, which started in June, will provide WSF with important information on its Fautleroy/Southworth/Vashon service as the agency continues to explore ways to improve this challenging dual-destination route. The study is expected to be completed in November, for delivery to the Legislature in January 2019.

Section 2

Plan elements

Based on items of importance to customers and stakeholders, WSF developed the Draft Plan was developed around four major themes: Reliable service, Customer experience, Manage growth, and Sustainability and resilience. The themes share common elements because the ferry system's assets, operations and policies are all interrelated. The Plan highlights these dependencies, and, where possible, efficiencies and opportunities.



The next pages summarize the four themes and their main goals.



Reliable service

The Plan places particular attention on renewing the ferry fleet, which is essential for providing reliable service. Over the 20-year planning horizon, many of WSF's current vessels that were brought into service in the 1960s and 1970s will reach the end of their expected life. The Plan lays out a fleet replacement schedule and identifies the functional requirements for new vessels, including responding to growing demand and meeting environmental goals. The Plan also addresses the need for sufficient reserve vessels to allow for ongoing fleet maintenance without interruptions to service.

Adequate terminal facilities are another essential system element for efficient and reliable operations. The Plan identifies terminal upgrades that match the service proposals for each route and comply with current seismic standards.

New infrastructure is only valuable if WSF has the skilled workforce to operate and maintain it. Continued workforce development is key to maintaining reliable service into the future. The Plan calls for continued and enhanced investment in attracting, retaining, and advancing a highly-skilled workforce.

Stabilize the system to maintain reliable service through 2040.

- Replace aging vessels and invest in new vessels to maintain reliable service.
- Preserve and improve terminals to enhance safety and operations.
- Invest in attracting, retaining and strengthening the workforce.



Customer experience

Rapid advances in technology since the 2009 Plan are creating opportunities to improve interactions with customers that WSF could not have imagined a decade ago. These advancements can take the form of improved real-time service information on mobile devices, online reservations, electronic fare collection, and various demand management measures.

Technology also enables new ways to monitor system performance and increase system efficiency. The Plan looks at what can be done with the technology that is currently available while remaining open to further advances that are expected by 2040, but not precisely foreseeable today.

Enhance connections for all users and harness technology for an overall easier trip.

- Provide better trip planning information.
- Reduce customer wait times.
- Enhance multimodal connections and accessibility.



Manage growth

The Puget Sound region has experienced significant population and job growth over the past 20 years, and that trend is expected to continue over the next 20 years. As a result, ferry ridership is expected to increase by 30 percent by 2040. WSF will need to move more people and manage demand during busy peak periods, but we have limited opportunities to increase capacity. This Plan reviewed opportunities to improve multimodal connections at terminals and ensure proposed service and facility improvements are compatible with local plans.

Leverage vessel, terminal and technology investments to provide strategic service enhancements for operational efficiencies while encouraging walk-on passengers.

- Increase walk-on ridership.
- Spread out demand and maximize WSF's existing assets.



Sustainability and resilience

There is a growing awareness of the need to plan for system resilience and sustainability, especially in long-range plans for systems that provide vital transportation services. To address system resiliency and sustainability, the Plan looks at ways to reduce the vulnerability to abrupt, emergent events, and takes into consideration the incremental environmental changes that occur over longer periods of time.

Invest in infrastructure to maintain reliable service in a changing climate and reduce environmental impact.

- Green the fleet and reduce our environmental footprint.
- Plan for emergencies and climate change to sustain reliable service through 2040.

The Plan by route

The Plan calls for modest enhancements to service on every route through the addition of service hours or vehicle-carrying capacity from new or modified vessels. Additionally, all terminals will benefit from planned preservation or improvements in an effort to maximize operational efficiencies, as well as electrification to support moving toward a zero-emissions fleet.

Based on projected growth patterns in ridership on the north and central Puget Sound routes, WSF is proposing service enhancements benefiting both vehicles and walk-on passengers. The Plan focuses on improvements for walk-on passengers using downtown Seattle routes, while south Sound routes would receive modest terminal operational enhancements through technology investments. The map on the next page presents a summary of improvements included in the Plan. The terminal enhancements shown in yellow include preservation or improvement projects that are already planned or proposed in the Plan. In addition to the service and terminal enhancements shown, all routes would benefit from system-wide investments in technology, expansion of the relief fleet, and investment in workforce development.

Service enhancements proposed

Replace and upgrade aging infrastructure

- New vessels to replace aging fleet.
- Terminal preservation and improvement projects are planned for the terminals highlighted on the map on the next page, with the goal of maintaining reliable service and improving terminal operational efficiencies.

Electrify the fleet

- All terminals, except for Shaw Island and Sidney, would be electrified to serve their corresponding vessel.
- This investment will bring down fuel consumption and therefore reduce costs and carbon emissions significantly over the 20-year planning horizon.

Add service hours

- Port Townsend/Coupeville
- Edmonds/Kingston*
- Fauntleroy/Vashon
- San Juan Islands
- Point Defiance/Tahlequah

Increase vessel carrying capacity

Increase passenger capacity for:

- Seattle/Bainbridge Island
- Seattle/Bremerton

Increase vehicle capacity through new vessels serving:

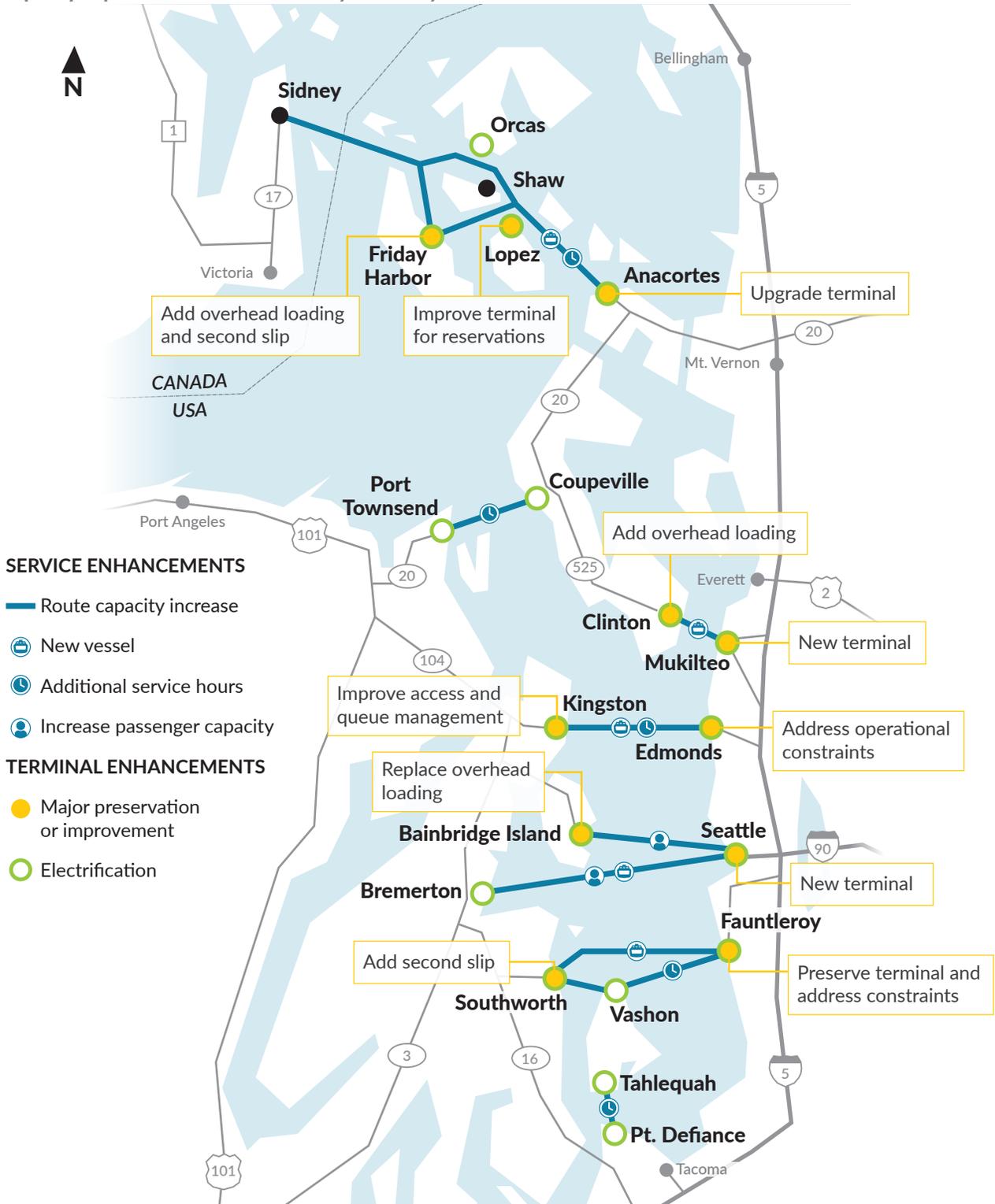
- Anacortes/San Juan Islands
- Mukilteo/Clinton
- Edmonds/Kingston
- Seattle/Bremerton
- Fauntleroy/Vashon/Southworth

Enhance customer experience

- Provide enhanced information

* WSF is proposing two service options for the Edmonds/Kingston route; see Section 5 of the Plan for a full description.

Map of proposed enhancements by route by 2040





Section 3

Reliable service

Stabilize the system to maintain reliable service through 2040.

Reliable service is by far the greatest priority for customers of the ferry system, according to comments submitted during public outreach in spring 2018. Although service reliability is an important performance measure that WSF does its best to achieve, the degrading condition of the aging fleet will lead to a continued decline in service reliability unless new investments occur in the very near term.

The vessels themselves are just one piece of the puzzle. Aging terminal infrastructure that requires increased maintenance, and challenges in recruiting new ferry workers to replace retiring staff also represent risks to service reliability.

This section of the Plan focuses on these three essential elements of service reliability: vessels, terminals and workforce. The Plan's goals are to:

- Replace aging vessels and invest in new vessels to maintain reliable service.
- Preserve and improve terminals to enhance safety and operations.
- Invest in attracting, retaining and strengthening the workforce.

Technology infrastructure, both internal to WSF and external to customers, is also a vital component of the system and is discussed in the Customer Experience section of the Plan.

Vessels

Replace aging vessels and invest in new vessels to maintain reliable service.

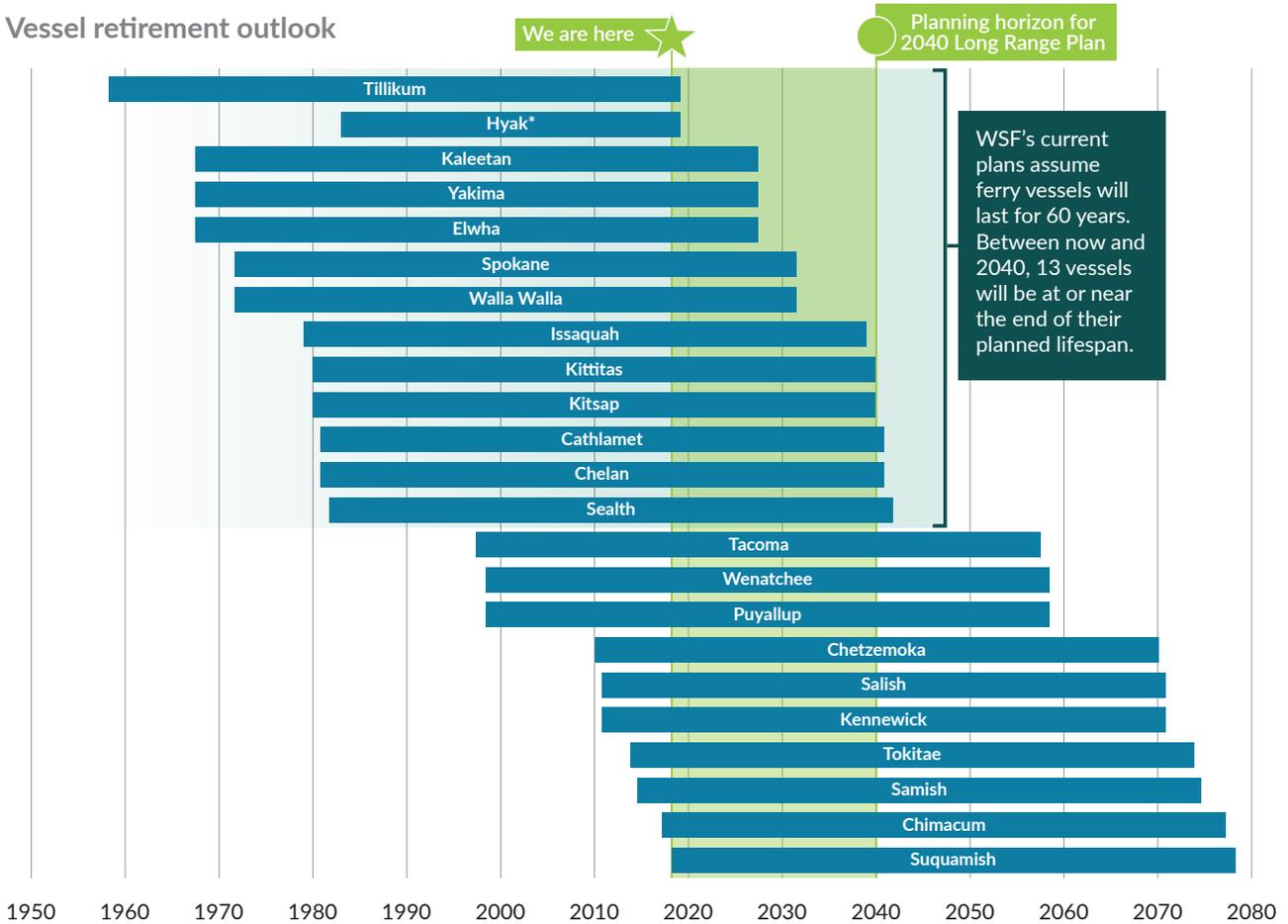
Existing WSF fleet

Many WSF vessels operate more than 20 hours each day, 365 days a year. Heavy use puts stress on the fleet, and WSF has limited spare ferries to fill in when vessels need to be taken out of service for maintenance. Within the planning horizon of approximately 20 years, 13 vessels of the existing 22-vessel fleet* will need to be retired, as shown in the vessel replacement schedule on the next page.

**22 vessels as of 2019 when the Hyak is officially decommissioned per current funding. The Hyak did not receive its customary midlife refurbishment and therefore will not meet the 60-year lifespan previously expected. The Plan recommends that vessel life expectancy be reconsidered for vessels that have not received the required planned maintenance.*

This Plan recommends that WSF invest not only in replacing aging vessels, but also in adding relief vessels beyond those currently available. These additional relief vessels will help ensure that hardworking service vessels can receive the planned out-of-service maintenance time needed for preventative maintenance, repairs, and midlife overhauls to maintain reliability and continue to serve throughout their expected lifespan of 60 years.

Vessel retirement outlook



*Hyak did not have a midlife refurbishment. It is scheduled to be retired in 2019.

Fleet limitations

During summer seasons when ridership is at its peak, 19 vessels provide passenger service. Each route has very different operating needs for navigation requirements as well as passenger and vehicle volumes. Vessels traveling to Sidney, British Columbia also have international certification requirements. Because of these differing needs, the number of vessels in the fleet is not the only consideration for meeting service needs. The types and other characteristics of vessels, as well as the overall composition of the fleet, affect which vessels can serve as back-ups while minimizing disruption to the overall system.

WSF customers experienced this disruption during the last few summers, when some vessels required immediate and unexpected maintenance. This work required several vessel reassignments throughout the system to best meet the needs of each route and maintain service. Although WSF always works to minimize disruption to customers, these reassignments produce significant costs—not only financial but also in the reduced numbers of people, vehicles and freight carried when a larger vessel is replaced by a smaller one. WSF and its customers also experience costs in the schedule delays associated with making these complicated adjustments in an already busy travel season.

In addition to unplanned maintenance needs that cause sudden service disruptions, each vessel in the WSF fleet requires routine planned maintenance and preservation. Planned maintenance can vary in scope from routine preventative maintenance to major system overhauls, all of which reduce the risk of unplanned service outages by contributing to the vessel's preservation and condition of the vessel and its systems.

With an overall fleet size of 22 vessels in 2019, and more vessels scheduled for retirement each subsequent year, it is clear that without investment in the replacement of vessels, there is growing risk to service reliability that accumulates every year. Even with one-for-one replacement as older vessels retire, the current fleet size does not include sufficient relief vessels to support a reliable system.

Maintenance and preservation needs

WSF performs most routine vessel maintenance at its Eagle Harbor Maintenance Facility. However, the facility's hours of operation are limited by surrounding land uses. The facility also needs improvements to infrastructure and workforce retention, as discussed in more detail in the Terminals and Workforce sections.

WSF has not been able to fully meet the fleet's preservation needs because of a combination of inadequate funding, lack of relief vessels and the prioritization of service over maintenance and preservation. Compounding these challenges is steep competition for shipyard availability, especially for the five Jumbo and Jumbo Mark II Class vessels that can only be accommodated in two dry docks in Puget Sound, both of which are owned by one entity. Competing demands for these dry docks from WSF's own new construction projects and the rest of the marine sector, including the U.S. Navy, result in scheduling difficulty.

Because of this limited availability of large dry docks, labor costs for shipyard work can be 10 percent higher than they would be in a competitive market. At the same time, WSF has been prioritizing ferry service over maintenance and preservation, and has not had enough time to spend all the funding authorized. For example, WSF only spent about 50 percent of the funding allocated by the Legislature in the 2013-2015 biennium. These reduced spending levels may cause reluctance to increase the preservation program funding to needed levels in the future. This cycle ultimately results in a growing backlog of work and an increased risk of vessel breakdowns, which worsens the issue by disrupting planned preservation work.

Cycle of maintenance and preservation backlog and risk



Plan recommendations

The Plan proposes to increase the fleet size over the next 20 years to provide much-needed service and relief vessels. Relief vessels include those on standby to serve a route if unplanned maintenance is required, as well as those to replace service vessels during their 12 weeks of annual planned maintenance. The Plan recommends an incremental approach to address the overall fleet size and relief vessel needs, balancing the construction of new vessels and the preservation of existing vessels in order to provide the best possible service reliability.

Specific recommendations for vessel reliability include:

- Extend the open contract for Olympic Class vessels to build five new vessels: two to stabilize the fleet and three to replace vessels due to retire.
- Examine the 60-year life expectancy for vessels in the fleet that have not had the maintenance and preservation time required to meet this high life-expectancy goal.
- Allow for 12 weeks of annual out-of-service maintenance and preservation time for each vessel to achieve the 60-year life expectancy goal.
- Invest in new vessels to replace retiring vessels.
- Streamline the fleet composition to realize enhanced efficiencies and redundancy.

The next sections discuss each of these recommendations and associated strategies in more detail.

Extend the open contract for Olympic Class vessels to build five new vessels: two to stabilize the fleet and three to replace vessels due to retire

Design, procurement and construction of new vessels can take up to seven years, given known financial and schedule constraints. At the same time, three vessels are due for retirement within the first seven years of this Plan.

Between 2019 and 2023, the total summer relief fleet for planned and unplanned maintenance includes just three vessels to cover the entire system. This level of relief vessels only supports about two-thirds of the needed 12 weeks of out-of-service planned maintenance time required by each vessel.

Beyond the expediency of using an existing open contract to build new Olympic Class vessels, there are other reasons why this type and size of vessel is the most appropriate to begin strengthening the WSF fleet. The Olympic Class vessel is an appropriate size for navigability and capacity to serve nearly any route in the system. With the exception of Keystone Harbor, the location of the Coupeville terminal on the Port Townsend/Coupeville route, Olympic Class vessels can navigate and tie up at any of WSF's facilities.



Additionally, the Olympic Class vessel brings the opportunity for standardization of the fleet under a common hull design, leading to cost efficiencies in training and spare parts, and interchangeability of labor. The top decks of the vessel can be optimized and customized to the route being served, providing flexibility in passenger cabin space and vehicle carrying capacity. With some modifications, the existing Olympic Class design can be reworked for hybrid propulsion and also certified as an international vessel with opportunities to serve the Sidney, British Columbia route as a service or relief vessel. In short, the Olympic Class vessel is a suitable platform with opportunities for optimization and customization to realize financial and operational efficiencies.

Based on the advantages discussed above, the Plan recommends the following strategy for new vessel procurement:

- **Extend the existing open contract for the Olympic Class of vessels:** Use the existing contract to construct five more vessels as soon as possible to stabilize the system. WSF could use these new vessels immediately, relieving in-service boats for planned maintenance and preservation, and replacing recent (past-due) or fast-approaching vessel retirements.

Examine the 60-year life expectancy for vessels in the fleet that have not had the maintenance and preservation time required to meet this high life expectancy goal

Within the first 10 to 15 years of the Plan, service reliability risk will be the highest, in part because of the large number of retiring vessels and because of the condition of the Issaquah Class vessels, which are among the oldest in the fleet. The Issaquah Class vessels have not had enough out-of-service time or funding to complete the preservation requirements of the Lifecycle Cost Model. As a result, at their current age of about 40 years— still a decade above industry standard for vessel lifespan of about 30 years—the Issaquah Class vessels are experiencing reliability issues and steel degradation that will shorten their attainable service life. The Plan recommends the following strategy to address this issue:

- **Retire the Issaquah Class early, at approximately 50 years of age:** The planned timing of Issaquah Class replacement vessel delivery would sync up well with planned improvements on the routes they serve, providing unique opportunities for concurrent and integrated vessel and terminal design to maximize operating efficiencies.

Allow for 12 weeks of annual out-of-service maintenance and preservation time for each vessel to achieve the 60-year life-expectancy goal

WSF currently uses a standard of eight weeks per year of needed out-of-service time for each vessel in its fleet. However, there are not enough vessels in the fleet to ensure in-service vessels receive these eight weeks of planned maintenance time. Moreover, eight weeks is not enough time to complete the maintenance and preservation needed to sustain a 60-year useful life, as evidenced by the current condition of the WSF fleet. This vessel lifespan expectation is much greater than those used by other comparable ferry operators, such as Staten Island Ferries and B.C. Ferries. Unplanned maintenance occurs for a number of reasons, mechanical or otherwise.

Whether planned or unplanned, when a vessel requires maintenance, it must be taken out of service, and a relief vessel is needed to take its place. This multifaceted issue requires a multi-step solution—increase the fleet size to have more reliability and redundancy, and also provide vessels with the planned out-of-service maintenance time needed to be in their best condition.

This Plan recommends that WSF hold two or more reserve vessels beyond the planned maintenance relief vessels, so that they can be available if unplanned maintenance needs arise. With an aging fleet, these relief vessels would help maintain reliability and lessen inconveniences to customers. These extra relief vessels would also help maintain sufficient capacity and curb operating costs resulting from unplanned vessel maintenance and an insufficient relief fleet.



WSF can monitor and reevaluate the number of vessels held for unplanned maintenance relief as the fleet becomes more stable, with newer vessels and increased maintenance levels. Costs associated with maintaining an adequate relief fleet include direct operating costs, such as engine room labor and fuel consumption, and other operating costs, such as insurance and maintenance needs.

To allow for adequate maintenance and have enough spare vessels to maintain reliable service, this Plan recommends the following strategies:

- **Grow the fleet from 22 to 26 total vessels, to include:**
 - All service vessels (18 in the fall/winter/spring season or 20 vessels in the summer season, depending on the service expansion opportunities outlined in the Manage Growth section).
 - A minimum of two vessels to provide service during unplanned maintenance relief.
 - Four vessels to provide service during planned summer maintenance, and six vessels to provide service during winter maintenance.



Invest in new vessels to replace retiring vessels

Even with the new vessel delivery outlined in the Plan, customers will not experience benefits from these investments immediately because of the time needed to build new vessels. Meanwhile, existing vessels will continue to age and are likely to have more unplanned maintenance needs because WSF cannot both provide out-of-service time for planned maintenance and prioritize trip reliability. In short, maintenance needs and service disruptions are likely to grow before an improvement in reliability is realized.

This Plan recommends the following strategy:

- **Retire and replace 13 vessels over the planning horizon:** The recommended retirement schedule will result in an overall younger and better-maintained fleet.

Streamline the fleet composition to realize enhanced efficiencies and redundancy

Simplifying the fleet by reducing the number of different vessel classes from seven to five would help realize efficiencies in training, spare parts and interchangeability in labor. Additionally, this change would help increase system redundancy and flexibility in relief vessels, as more vessels would be suitable replacements on more routes.

All vessels would be plug-in hybrid-capable, with the exception of the four initial Olympic Class vessels (delivered from 2014 to 2018). Overall, the fleet would experience a large emissions reduction, complying with Executive Order 18-01, which directs WSF to transition to a zero-emission fleet, and meeting or exceeding 2030 and 2050 emission reduction targets set in the Revised Code of Washington (RCW 70.235.050). Additionally, the fleet would comply with Executive Order 18-02, which focuses on the protection of orca whales and directs WSF to develop strategies to reduce vessel noise.

Generally, all of the new proposed vessel classes would retain the 60-year life expectancy because planned maintenance is expected to occur on schedule with the increase in fleet size and because of assumed funding throughout the vessel life.

The Plan recommends the following strategy, as well as the specific vessel design recommendations in the following section:

- **Simplify the fleet:** Design the fleet to include five vessel classes by 2040.

2040 WSF fleet

If WSF is able to implement the investments and replacements recommended by this Plan, the 2040 fleet will be younger, more versatile and more environmentally friendly.

Because of the inherently complex combination of route and demand types that WSF must meet, the agency must balance the desire to simplify operations by standardizing the fleet with the desire to serve each route at an efficient point where vessels are neither oversized nor undersized.

The Plan recommends standardization of the fleet where possible, while meeting the demands and needs of each route and its customers. To that end, in addition to recommending more Olympic Class vessels, the Plan also recommends a new middle-sized vessel class option.

The next sections describe considerations for these new vessels.

New 124-Car vessels

This Plan recommends new 124-Car Class vessels specifically for the Fauntleroy/Vashon/Southworth route. Although this Plan generally recommends minimizing the number of vessel classes through a single basic vessel design platform (hull form, length, depth, mean, propulsion systems), loading issues on the Fauntleroy/Vashon/Southworth route restrict the vessel size that can be recommended. The new 124-Car Class vessels would have similar passenger and vehicle-carrying capacity as the existing Issaquah (124-Car) Class, with the inclusion of gallery car decks on both sides of the vessel. Passenger cabins would be designed to provide flexibility in capacity so that they could be expanded in the future to hold more passengers as demand increases, but keep costs down in the interim by providing less capacity and therefore requiring less crew.

Characteristics:

- Car capacity: 124
- Passenger capacity: 750 / 1200
- Propulsion system: Plug-in hybrid capable with tier 4 diesel engines

New 144-Car Class

The new 144-Car Class vessel is intended to provide a slight capacity increase over the remaining Issaquah Class vessels and to be a versatile vessel with the ability to provide relief for most routes. The Plan recommends using the new 144-Car and Olympic Class vessels as the backbone of the 2040 fleet.

With a similar projected vehicle capacity, the new 144-Car Class would be similar to the Olympic Class. However, this new class should be designed to include industry best practices as possible, including system automation, optimized propulsion systems, weight reduction, and flexible vessel arrangements.

To accommodate the different traffic on the San Juan Islands interisland route, the Plan recommends a single-deck variant on the new 144-Car Class. This vessel would act as a slightly larger replacement for the *Sealth*, with a capacity of 114 cars.

Characteristics:

- Car capacity: 144
- Single-deck variant car capacity: 114
- Passenger capacity: 750 / 1200
- Propulsion system: Plug-in hybrid capable with Tier 4 diesel engines

2040 WSF fleet by vessel classes

		Car capacity	Passenger Capacity	Speed in Knots	Propulsion system
Jumbo Mark II		202	2,200	18	Plug-in hybrid
Olympic		144	1,500	17	Plug-in hybrid (new) diesel (existing)
New 144-Car		144	750/1,200	17	Plug-in hybrid
New 124-Car		124	750/1,200	17	Plug-in hybrid
Kwa-di Tabil		64	748	15	Plug-in hybrid

Terminals

Preserve and improve terminals to enhance safety and operations.

The state of ferry terminal infrastructure directly affects WSF's ability to maintain service and complete all scheduled trips. Maintenance and preservation of terminals is especially important because they are located in a marine environment where ocean salts, wave impacts, wind, marine vegetation growth and sunlight all accelerate deterioration of infrastructure. In addition to harsh environmental factors, WSF's terminal infrastructure has been built or repaired at different times with differing materials and to different standards. Meanwhile, engineering design and material considerations, our understanding of environmental considerations and mechanical systems, and other technology have all evolved.

A variety of factors contribute to a terminal's operational efficiency and reliability. The marine environment directly affects in-water and over-water components such as ferry landing aids and the trestles and bridges used to transfer passengers on and off the vessel. It also indirectly affects landside infrastructure, including terminal buildings, queuing space for vehicles, tollbooths, roadways, and pedestrian and bicycle facilities.

Plan recommendations

Throughout the years leading to 2040, maintenance and preservation of terminal infrastructure should remain a priority for a reliable WSF system. This section makes recommendations for maintenance of existing terminal infrastructure and preservation efforts over the next 20 years.

Other Plan sections provide recommendations regarding terminal modifications to accommodate growth, enhance the customer experience through operational efficiencies, and maintain resiliency through changing climate conditions and geologic events.

Specific recommendations for terminal maintenance and preservation include:

- Plan for reliable terminal infrastructure.
- Monitor terminal maintenance trends through 2040.
- Program terminal preservation projects to support reliable service.
- Invest in the Eagle Harbor Maintenance Facility to serve system needs through 2040.

Plan for reliable terminal infrastructure

Terminal maintenance experiences the same funding challenges as the ferry fleet, with a backlog of maintenance based on the age of the infrastructure. WSF uses modeling to support the allocation of limited funding to preserve the many pieces of infrastructure within terminals.

Aside from regular maintenance and repair, two new terminals are in various stages of construction: Colman Dock, which serves the Seattle/Bainbridge Island and Seattle/Bremerton routes, and the Mukilteo terminal, which serves the Mukilteo/Clinton route. Completion of these two projects, expected in 2023 and 2020 respectively, should significantly reduce maintenance and preservation costs for those terminals. Although these costs cannot be eliminated altogether, this cost reduction will free up some maintenance budget for other terminals with aging infrastructure.

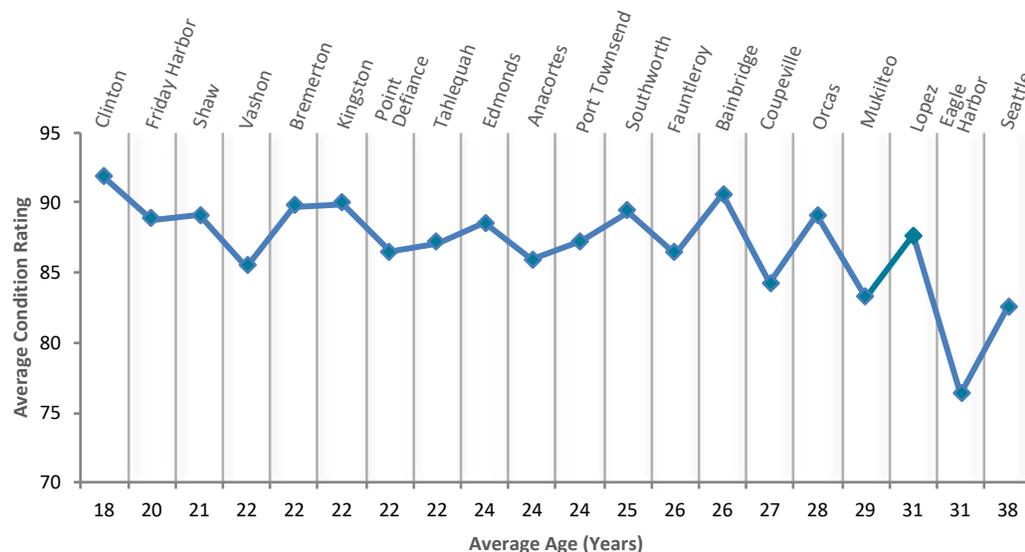
WSF has already begun implementing many of the Plan's policy recommendations related to managing and prioritizing infrastructure maintenance and allocation of resources through improvements to their asset management system. These recommendations are discussed in the Sustainability and resilience section of this Plan, and include the prioritization of "lifeline" routes that WSDOT identified as critical to response and recovery. Additional recommendations include the integration of seismic upgrades into the maintenance management tool, which WSF uses to guide capital investment decisions. Aside from these upgrades, WSF has already outlined and estimated many terminal maintenance projects through the 20-year planning horizon.

The Plan recommends the following strategy for reliable terminal infrastructure:

- **Continue to enhance the asset management model:** Prioritize projects that increase reliability and resiliency.

Monitor terminal maintenance trends through 2040

Most WSF assets are located in a harsh marine environment where ocean salts, wave impacts, wind, marine growth, and solar ultraviolet light accelerate deterioration when compared to structures on land. The general trend is that the older terminals have lower condition ratings. The two oldest facilities have the lowest average condition ratings (Colman Dock in Seattle and the Eagle Harbor maintenance facility). The average age and condition rating for each terminal is represented in the following figure.



Over the past 20 to 25 years, WSF has been replacing a large number of existing timber structures with more durable concrete and steel structures. This approach improves decaying structures and promotes environmental stewardship, as the previous timber structures were treated with water-contaminating creosote. Although the concrete and steel structures will presumably last longer than the timber structures they replace, deterioration of these relatively new assets will accelerate as they age. These structures will likely experience increased maintenance costs over the long term because concrete and steel structures are more expensive to purchase and install, and therefore more expensive to replace.

In addition, to avoid corrosion by saltwater, steel structures require painting, which tends to require a more significant percentage of the maintenance budget. The maintenance costs for new projects that replace timber will likely increase over the lifetime of the infrastructure, as they will likely introduce additional steel that would need to be repainted on a regular basis.

The Plan recommends the following strategy related to terminal maintenance trends:

- **Perform ongoing evaluation of methods to reduce paint maintenance costs:**
Ongoing evaluation of methods to reduce paint maintenance costs, such as models to help plan and estimate when to repaint assets.



Program terminal preservation projects to support reliable service

Conducting terminal maintenance while maintaining operations is difficult because of limited space and is especially challenging at terminals with only one operating slip for vessels. Having two slips allows for vessels to maintain operations during maintenance. It also provides redundancy and enhances service reliability during emergency situations. To increase reliability, WSF has identified and planned for projects to increase slip availability at the Friday Harbor and Southworth terminals over the 2040 planning horizon.

Over the next 20 years, a number of elements at each terminal will reach the end of their service life and must be replaced to maintain reliable service. Examples of these preservation projects include replacing landing aids, improving trestles, modifying bridge structures, and upgrading terminal facilities.

The two largest preservation projects over the next 20 years are expected to be upgrades to the terminal facility at Fauntleroy and the terminal building at Anacortes. Other preservation projects over this planning horizon include preserving trestle and bridge structures at nine terminals, landing aids at six terminals, terminal buildings at Vashon Island and Point Defiance, and overhead loading structures at Bainbridge Island.

The Plan recommends the following strategies for terminal preservation projects:

- **Continue to monitor for opportunities to enhance and support reliable service through preservation projects:**
 - Plan for critical preservation work to upgrade the Fauntleroy terminal.
 - Work with the community to determine the best solution for operational challenges at the Edmonds terminal

Invest in the Eagle Harbor Maintenance Facility to serve system needs through 2040

The Eagle Harbor Maintenance Facility is one of WSF's oldest system facilities, resulting in increasing maintenance requirements. The facility comprises assets that represent one of the oldest average ages for terminals in the system, with one of the lowest condition ratings. Aging infrastructure and limited slip availability restricts the ability to conduct the full range of needed vessel maintenance. The Plan recommends the following strategy at Eagle Harbor:

- **Convert an existing tie-up slip to a drive-up slip:** WSF has recognized this need by programming preservation funds for this purpose.

WSF also has a specialized team of maintenance staff both at their headquarters in Seattle and at Eagle Harbor. Challenges with maintaining an adequate skilled labor force at Eagle Harbor facility affect WSF's ability to accommodate the simultaneous maintenance of more than two vessels. Investments in workforce, as detailed in the next section, are necessary to sustain the facility operations that support overall system reliability.



Workforce

Invest in attracting, retaining and strengthening the workforce

WSF has more than 1,900 employees throughout the Puget Sound region on vessels, in terminals, at the Eagle Harbor Maintenance Facility and at the headquarters facility in Seattle. The management, maintenance, and operations of the ferry system relies on specialized positions responsible for transporting people and goods in a marine environment nearly 24 hours a day, 365 days a year. These specialized employees, such as deck officers and engineers, undergo years of training, certifications and sailing time before they are qualified to serve in these positions.

The WSF workforce is experiencing the same pressures felt by other employers nationwide, as a wave of people born during the post-World War II population boom start to retire. Just over 30 percent of the vessel workforce, 37 percent of the terminal workforce, and 24 percent of the Eagle Harbor Maintenance Facility staff are eligible for retirement within the next five years.

Ensuring enough qualified deck officers presents a challenge because of the many years of training involved. Approximately 75 percent of masters and staff masters will be retirement-eligible in the next five years. Earning a master’s license requires many years of training, testing and preparation, including piloting 16 round trips on each of WSF’s 10 routes and successfully drawing pilotage maps during testing. Most of the required work must be accomplished on an employee’s own time.

To achieve a master’s position within WSF, an individual must enter as an ordinary seaman. Some employees have joined WSF with a third mate’s license through one of the maritime academies or from previous employment and can advance more quickly to a mate’s position within WSF, in as little as 18 months. Others who have not completed schooling or received a license through other employment before joining WSF must invest many years to complete all requirements.

Definitions

WHEELHOUSE:

Master/Captain:

Responsible for full command of vessel and passenger safety.

Mate: Shares navigation responsibilities with captain

AB-QM (Quartermaster):

Assists mate at the helm and keeps watch.

PASSENGER CABIN AND DECKS:

Ordinary seaman (OS):

Responsible for the cleanliness of the vessel.

CAR DECK:

Able seaman bosun:

Serves as AB foreman and is responsible for loading/unloading vehicles.

Able seaman: Responsible for loading/unloading vehicles

continues on next page >



ENGINE ROOM:
Chief engineer/ Assistant chief engineer: Responsible for vessel's engines and mechanical systems.
Oiler: Responsible for lubricating engines and mechanical systems.
Wiper: Cleans engine spaces and machinery

Licensed engineering positions face similar challenges with over 53 percent of chief engineers eligible for retirement in the next five years. Similar to deck officers, becoming a licensed engineer requires training and experience that are both generalized and specific to WSF vessels. The advancement path requires training, testing and sea time requirements, which can take approximately five years to become an assistant engineer and 10 additional years to earn a chief engineer license.

Compounding the effects of these retirements is the economic boom of the greater Puget Sound region, which contributes to wage pressures and high turnover. In addition, current financial constraints and cuts over the last 10 years have contributed to the lack of qualified positions and current challenges

in filling licensed positions. For example, before WSF eliminated their mate training program nearly 10 years ago, an average of seven employees per year received mate's licenses. Since then, less than three employees have received those licenses each year. The International Organization of Master, Mates and Pilots estimates that to meet WSF's current and future needs, certification of 12 new mates per year is needed.

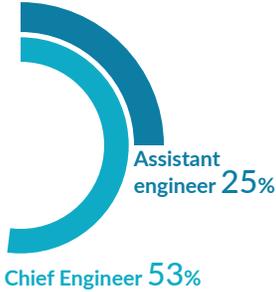
WSF will continue to feel this shortage in licensed and engine room positions this year and beyond, as open positions remain unfilled with new talent and the pool of retirement-eligible employees continues to grow. WSF will need to fill shifts that require licenses with fewer employees, leading to overtime hours and higher costs.

WSF also faces a unique workforce challenge in the discrepancy between where vessels start their service days and where the majority of the workforce lives. Notably, 70 percent of vessels start their service days in Kitsap County, but an increasing number of WSF employees live in King County. This gap leads to long commutes for workers on the east side of Puget Sound, and may be a challenge for recruiting. On-call and relief workers may be required to commute especially long distances.

Deck officers eligible to retire in five years



Licensed engineers eligible to retire in five years



Plan recommendations

The Plan recommends strategies to support the existing workforce and to retain skilled workers to maintain service reliability, with a focus on the following:

- Establish a workforce development plan unique to maritime conditions.
- Retain skilled labor at the Eagle Harbor Maintenance Facility.

Establish a workforce development plan unique to maritime conditions

WSDOT recognizes the importance of workforce development through the identification of a specific agency goal, as noted in the sidebar and identified in employee toolkits and updated plans and surveys:

The Plan recommends developing a supplemental section to the WSDOT workforce development plan that is focused on the unique maritime conditions and requirements of WSF. The Plan also recommends the following strategies to strengthen the workforce:

- **Establish and invest in:** on-going recruitment, training, apprentice and mentoring programs for all WSF positions.
- **Develop strategies:** to encourage qualified, experienced workers to stay in the workforce while attracting and retaining a younger workforce.
- **Update salary survey data regularly:** for wage adjustments to reflect market conditions.

“WSDOT wants to be an employer of choice and is creating a modern work environment. We’re proactively working to find the best possible talent for the agency, while taking steps to retain our quality workforce. As part of our Workforce Development goal, we listen and act on employee feedback and we provide training and other opportunities for development. At the same time, we evaluate systems to achieve and maintain competitive compensation.”

Source: wsdot.wa.gov/about/secretary/results-wsdot

Retain skilled labor at the Eagle Harbor Maintenance Facility

The Eagle Harbor Maintenance Facility depends on skilled staff to perform specific functions. However, skilled laborers can currently earn more as private-sector contractors than as public-sector WSF employees, posing challenges for WSF’s recruitment and retention efforts.

The Plan recommends the following strategies for strengthening the Eagle Harbor Maintenance Facility workforce:

- **Survey regional salary information frequently:** to gain awareness of the latest market conditions and take measures to compete with these conditions.
- **Explore opportunities to expand the apprentice program:** to support a sustainable workforce at Eagle Harbor.

The next section of the Plan outlines the goals and strategies for improving the customer experience outside of the concept of service reliability. The section will focus on how a customer finds and uses information in their day-to-day interactions with WSF and how a customer accessibly moves through the system.



Section 4

Customer experience

Enhance connections for all users and harness technology for an overall easier trip

The customer experience factors into every aspect of a passenger's interaction with WSF, from looking up a schedule online, to purchasing a ticket, to knowing what to expect at the terminal, to staying informed during their trip for a safe and timely completion of their journey. Customers increasingly expect multimodal travel to be seamless, with an experience that extends beyond the terminal and to their front door. Therefore, the Plan recommends strategies for partnerships and enhancements that consider all legs of a journey to and from a WSF terminal.

In many cases, customers' first interaction with WSF occurs through technologies such as the WSF website, the Save A Spot vehicle reservations system, or the Wave2Go ticketing system. Those interactions can set the tone and expectations for the rest of their trip, as well as their overall impression of ferry service. Reliable, accurate information can help customers better navigate travel challenges that occur if a vessel or terminal is not operational.

Since the 2009 Plan, WSF has made a major technology investment in the launch of the Save A Spot system, as well as enhancements to Wave2Go ticketing and the customer website. Before customers begin their journey, they may consult WSF's website for sailing schedules, alerts and space availability. They can find scheduled ferry departure and predicted arrival times through VesselWatch, vehicle reservation availability, and even view live video images of the terminal holding areas, giving them an idea of what kind of traffic congestion to expect. Although this information is helpful, it can be difficult to derive the amount of time a customer will wait in line based upon a video image of cars in line, particularly for infrequent travelers. Anecdotally, customers approaching the tollbooth still frequently ask the question, "What sailing will I be on?"

Currently WSF relies on manual processes to collect data, which is segmented and limits the amount of information that is communicated regarding travel and wait times. The manual data input limits the amount of service alerts and notifications that can be sent

WSF's technology needs and opportunities

- Increased system integration.
- Enhanced data management and analytics.
- Reliable customer information.
- Automation of current manual processes.
- Accurate and reliable passenger counting.
- Enhanced electronic fare system.
- Improved communications infrastructure.
- Integration with landside infrastructure and coordination with other agencies.



to customers. Automating certain manual processes can free up staff time to provide additional services and support. Technology investments focused on system integration and automation would enable WSF to respond more quickly and enhance ferry customers' experience door to door.

In addition to technologies, accessibility within the terminal (terminal design) and adjacent to the terminal (transit connections and infrastructure) can affect the customer experience. Knowing how to navigate the terminal and the ease of traveling through the terminal can affect how customers make their connections to continue their trip. Currently, the WSF Terminal Design Manual calls for standards for accessibility and improving multimodal connections for preservation and improvement projects.

The Plan's main goals for improving customer experience include:

- Provide better trip planning information.
- Reduce customer wait times.
- Enhance multimodal connections and accessibility.

Plan Recommendations

This Plan provides the following recommendations and strategies for enhancing the customer experience with the ferry system from the online search bar to the journey home:

- Invest in technology that gives customers more information to support better trip planning.
- Modernize fare collection to provide operational efficiencies and meet customer preferences and expectations.
- Increase accessibility and wayfinding in and around the vessels and terminals to improve access and multimodal connections.
- Enhance mobility by improving pedestrian, bike and transit connections to and from terminals.
- Plan vessel and terminal spaces to be flexible and responsive to emerging technologies and new transportation options.

The sections below describe specific strategies to help implement these recommendations.

Invest in technology that gives customers more information to support better trip planning

The first interaction between the customer and WSF often occurs long before arrival at the terminal. It may be on the website looking up sailing schedules, making a reservation or looking for somewhere to park. The Plan provides strategies to improve the customer experience through technologically updated and coordinated systems that provide easily accessible, real-time information—all with the purpose of utilizing resources most efficiently and allowing customers to make informed decisions about how and when they travel.

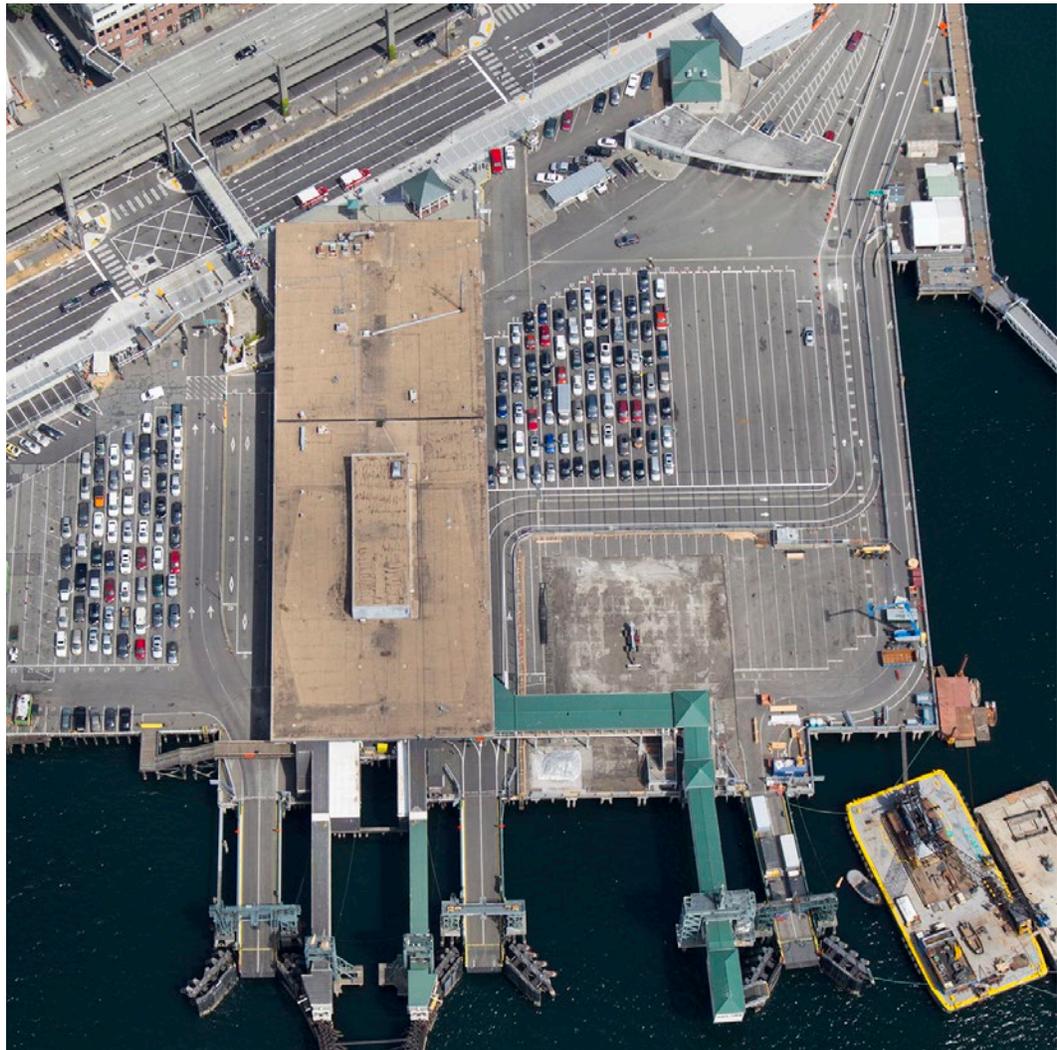
WSF already manages several information databases, and many are accessible through their existing website. However, the right information is sometimes hard to find and not always as up-to-date as customers would like to help them make traveling decisions. Currently, Wave2Go, Save A Spot and customer alerts subscriptions require multiple passwords and usernames. Similarly, wait time and traffic congestion information is not always easily understood or updated in a timely manner because of reliance on manual processes. Information related to parking availability around terminals is also not available, providing uncertainty about which sailing time a customer may take and whether they would prefer to take the journey, by walking on or driving. A unified, multi-platform system would allow travelers to be able to access ticketing and up-to-date travel information using one login.

Additionally, with the replacement of vessel communication systems and the internal schedule database, service changes would be automatically updated and pushed out to customers through a unified notification. This upgrade would also offer the opportunity to provide customers with public Wi-Fi, allowing for the potential to work onboard and provide flexibility in commuting hours.

The following strategies could be implemented in the near term to help improve data collection and communication of information to customers:

- **Upgrade the website:** Create a more user-friendly interface and minimize the number of pages that customers need to view to obtain key information.
- **Move toward a unified, multi-platform alerts system:** Automate the dissemination of service alerts (including queues and wait times) across multiple channels.
- **Automate queue detection and wait time information:** Explore opportunities to electronically detect the length of vehicle queues approaching terminals in real time, which would be reported to customers via a variety of communications channels, including electronic signage at the terminals and at decision points on roadways, and via web and mobile applications.

- **Provide real-time parking information:** Invest in technology that detects and communicates where parking is available and what it costs at high demand terminal parking locations.
- **Replace the vessel communications system:** Replacement of the ship-to-shore communications system and onboard wireless network would facilitate real-time data transfer between vessels and shoreside locations, more quickly update customers about service changes and offer the ability to provide public Wi-Fi.
- **Upgrade the common schedule database:** Upgrade and integrate core schedule data with other systems to provide automated updates and coordination to the other systems that rely on this information.



Modernize fare collection to provide operational efficiencies and meet customer preferences and expectations

WSF's existing fare collection system is efficient at collecting fares and validating tickets; however, it does not offer certain fare collection alternatives that customers are beginning to expect, such as mobile ticketing. WSF plans to continue allowing customers to pay for their travel using the regional ORCA transit smart card as the next generation ORCA system is planned for release in 2021. WSF is exploring the possibility of collecting fares with *Good To Go!* toll transponders that some customers with vehicles already use when driving on tolled facilities.

WSF is also monitoring the development of advanced automated technologies for vehicle length measurement and in-vehicle passenger counting, which could further increase the efficiency of fare collection and provide more efficient vessel load management.

Implementation of the following short-term strategies would help to make travel more convenient for customers and also encourage pre-payment of ferry fares, reducing congestion at tollbooths.

- **Upgrade ticketing and reservations systems:** Update the existing electronic fare system with features such as integration with a customer relationship management system; new payment and ticketing capabilities to support payment with mobile devices, *Good To Go!* and next generation ORCA passes; and improved customer information and account functions.

To meet the long-term goal of automating portions of the loading process and data collection, WSF should monitor the progress and development of two available technologies:

- **Automatic vehicle length detection:** Installation of equipment to automatically detect the physical dimensions of vehicles would result in the most accurate fare pricing and the most efficient vessel loading. However, this technology is considered to be emerging.
- **Automatic vehicle passenger counting:** Implementation of a solution that would automatically detect the number of passengers in a vehicle could allow prepaid vehicles to drive directly onto the ferry without stopping for inspection. If proven successful, this emerging technology could ultimately speed up the boarding process and be more convenient for customers.

As fare collection technology is explored, a simplified fare structure could be used to facilitate the implementation of automated systems. Fare structure and pricing strategies are discussed in more detail in the Manage growth section.



Increase accessibility and wayfinding in and around the vessels and terminals to improve access and multimodal connections

Accessible wayfinding that is compliant with the Americans with Disabilities Act (ADA) in and around the terminal is crucial for customers to understand how to travel between the ferry and their transit connection or destination. ADA-compliant signage allows all persons—including those with disabilities or impairments—to visualize the information provided. Appropriately designed signage and wayfinding help to provide the information customers need. Additionally, electronic signage can provide customers with real-time arrival and departure information for these connections. As funding becomes available or other terminal projects are undertaken, the Plan recommends the following strategy:

- **Implement ADA-compliant electronic signage at terminals:** Provide directional information, service alerts and real-time schedule information, such as the time until the next sailing.

Enhance mobility by improving pedestrian, bike and transit connections to and from the terminal

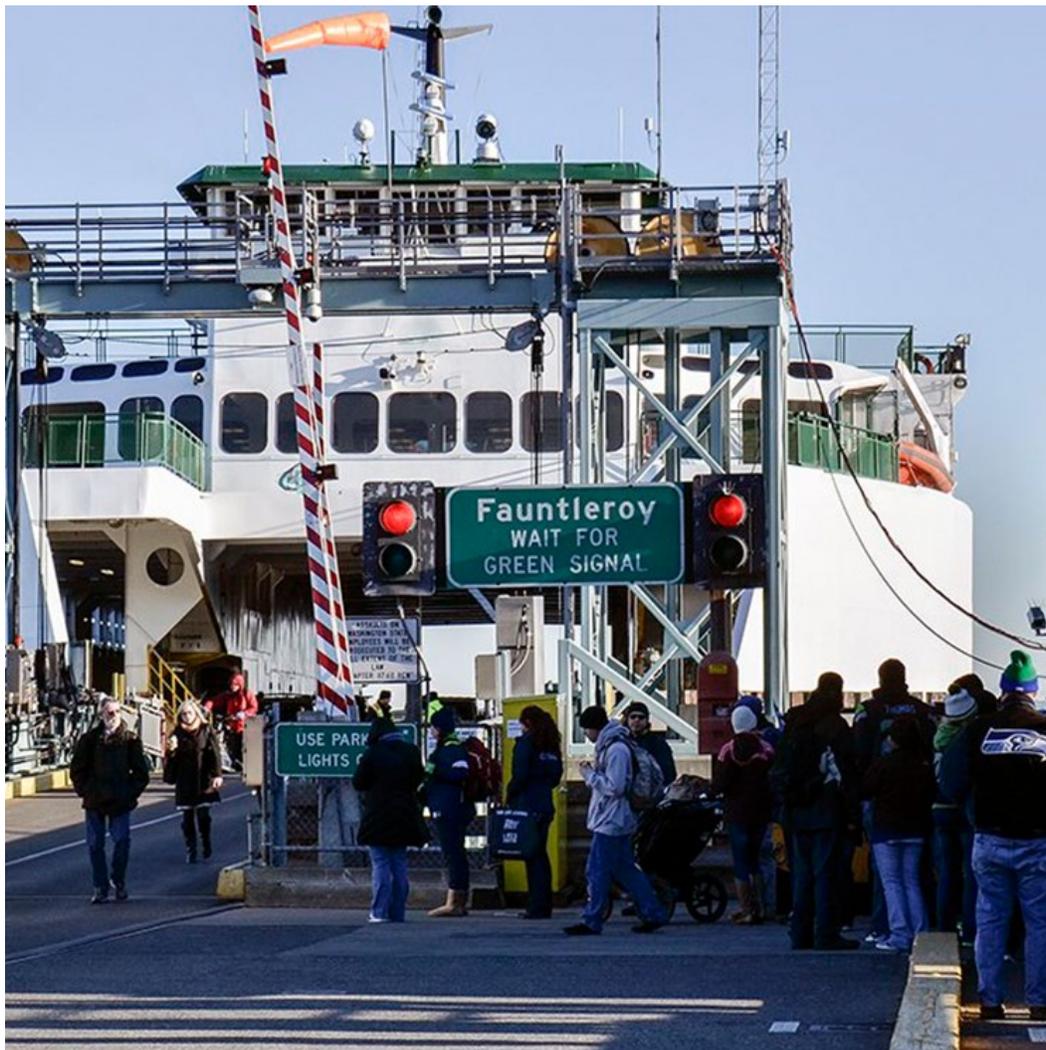
Traffic congestion approaching WSF's terminals is an issue that not only affects ferry customers but also affects some of the surrounding communities. WSF has already begun partnering with transit agencies to improve transit connections by more closely synchronizing schedules to minimize transfer times. As mentioned earlier in this section, approaches such as accepting the same fare payment methods, providing automatic fare transfers between transit modes, and improving signage and wayfinding could streamline connections from ferries to other modes of transportation.

In addition to transit connections, improving bike and pedestrian connections to and from terminals and providing alternatives to driving alone can help to reduce traffic congestion. Improving traffic control at terminal access points would also improve vehicular traffic flow and safety for bikes and pedestrians.

Although increasing bike and pedestrian connections can reduce traffic congestion, pedestrian traffic is forecast to grow more than vehicle traffic on most WSF routes, and bike ridership is also expected to grow significantly. According to 2040 forecasts, bike ridership is expected to increase by 67 percent on the Seattle/Bremerton route and by 76 percent on the Seattle/Bainbridge island route during peak evening sailings.

To support and encourage bike and pedestrian traffic, the Plan recommends implementing the following strategies throughout the planning horizon as opportunities arise or need grows:

- **Prioritize bike and pedestrian loading:** Continue to prioritize loading bicycles before and after vehicles to accommodate all bikes on each sailing.
- **Look for opportunities to incorporate improved bike and pedestrian infrastructure in terminal preservation and improvement projects:** One example is through overhead loading walkways that allow walk-on passengers to load and unload the vessel completely separated from vehicles, which increases pedestrian safety and efficiency of terminal operations.






Plan vessel and terminal spaces to be flexible and responsive to emerging technologies and new transportation options

WSF is beginning to see the effects of congestion from transportation network companies such as Uber and Lyft at terminal curbside pick-up and drop-off zones. Additionally, as autonomous vehicles become available, demand for curb space is likely to continue increasing, as it is expected that driverless taxis and shared vehicles will further reduce the cost of ride-hailing.

As these services grow and parking becomes scarcer, more customers may opt to ride-hail or rideshare to the terminal—or in the future be dropped off by an autonomous vehicle, resulting in increased traffic in pick-up and drop-off zones. This congestion can spill over to neighborhoods and cause confusion with ferry queues. To address these challenges, the Plan recommends the following strategy:

- **Assess the evolution and expansion of pick-up/drop-off areas at terminals:** as part of capital improvements planning.

Operationally, autonomous vehicles brought on board ferries are likely to be able to optimally position themselves, or “platoon,” so that they take up the least amount of space. This advancement would allow more vehicles to board per sailing. Currently, customers space themselves at the direction of terminal staff who try to minimize gaps between vehicles, but the amount of space between vehicles can still add up significantly during busy times when it is important to get as many vehicles on board as possible.

Flexible design of new vessels would maximize WSF’s ability to manage passenger and vehicle space as demand potentially shifts. Lost revenue from vehicle fares could be offset by electronically charging a fee to vehicles providing pick-ups and drop-offs (Although with the heavy demand forecasted, it is more likely that the space will simply be filled by the greater demand.) Because of the difficulty of predicting the effect on ridership of emerging technologies such as autonomous vehicles, the Plan recommends the following strategy:

- **Design new vessels with flexible vehicle and passenger spaces:** in order to accommodate changing ratios of vehicle, walk-on and bike passengers in the future.

The next section of the Plan outlines the goals and strategies for how to approach, plan for and ultimately manage the growth in demand for the system. The section will outline opportunities for greater system utilization and infrastructure investments to enhance capacity.

Section 5

Manage growth

Leverage vessel, terminal and technology investments to provide strategic service enhancements for operational efficiencies while encouraging walk-on passengers.

The Puget Sound region has experienced significant population and job growth over the past 20 years. This growth is expected to continue over the 20-year planning horizon, as is ridership on WSF routes. In addition to ridership growth, people are increasingly choosing different ways to travel to and from their destinations, such as using transit or rideshare options, bicycling, or walking as opposed to driving their own vehicles. WSF's goals are to move more people and manage demand during typical peak periods.

Each WSF route has unique landside terminal infrastructure, which creates differences in operations, route demand, schedule flexibility, and community needs and desires. For example, downtown Seattle faces much different constraints than a rural island community such as Lopez Island.

WSF and local communities adjacent to ferry terminals are interested in encouraging more customers to choose transit, walking and biking rather than personal vehicles to access ferry terminals and vessels. Strategies for encouraging this mode shift include improving infrastructure for transit, bikes and pedestrians; adjusting fare pricing to spread out trips; and providing expanded options for parking and walking onto the ferry. Many communities are working to prioritize and improve bicycle infrastructure and transit connections to the ferry through local plans and policies. Additionally, the expansion of passenger-only ferry service in King and Kitsap counties and potential introduction of this option in other areas will increase opportunities for promoting alternatives to personal vehicles.

The Plan reviewed the WSF system holistically, including how WSF manages growth through terminal and vessel infrastructure, communication to customers, information technology and other adaptive growth management strategies. Because of limited available resources, WSF takes a conservative approach to increasing how many people they can carry through the ferry system. They consider opportunities for improving existing operations through adaptive growth management strategies before turning to more expensive capital investments.

Service Schedules and Loading/Offloading Times

Vessel crossing times and the amount of time it takes to offload and load a vessel shape service frequency and the amount of ridership that can be accommodated. As ridership builds and congestion around terminals increases, it takes longer to load and offload vessels. Continuous improvements to vessel offloading and loading will be necessary to keep current service frequencies and overall route capacity.

Although implementation of some adaptive management strategies can have an associated cost, that cost is far lower than building larger vessels or increasing the service fleet size. These management strategies have two main goals:

1. **Increase walk-on ridership** by providing opportunities and incentives for customers to leave their cars at home and use transit, rideshare, walking or biking to access the ferry.
2. **Spread out demand** and maximize WSF's existing assets by using pricing and operational strategies to encourage customers traveling in vehicles to sail outside of peak travel times.

To date WSF has implemented the following adaptive management strategies:

Vehicle reservation system: A vehicle reservation system was the primary demand management strategy recommended by the 2009 Plan. WSF implemented the Save A Spot reservation system on the Port Townsend/Coupeville route in 2012. WSF also currently offers reservations on the westbound Anacortes/San Juan Islands and Anacortes/Sidney, B.C. routes, along with some legs of eastbound Anacortes/San Juan Islands routes. WSF's analysis has shown that traffic caused by vehicles waiting for ferries has decreased since implementation of the reservation system, but there is no way of knowing how many people are not sailing because they cannot get a reservation or perceive they cannot get a reservation. Additionally, WSF faces constraints in adding reservations for every route because of physical space limitations at terminals, operational challenges with handling vehicles arriving early to their ferries, and the need for additional staff. The map on the next page shows which routes already accept reservations and identifies candidates for reservations.

Transit enhancements: By working with transit agencies to coordinate and improve connections for commuters who rely on the ferry, WSF has helped provide more options for taking transit, rather than relying on personal vehicles, to access ferry terminals.

Pricing strategies: Two pricing strategies that resulted from the 2009 Plan are widening the gap between vehicle and passenger fares, which incentivizes walk-on passengers, and offering a discounted rate for vehicles under 14 feet in length, which allows WSF to transport a greater total number of vehicles.

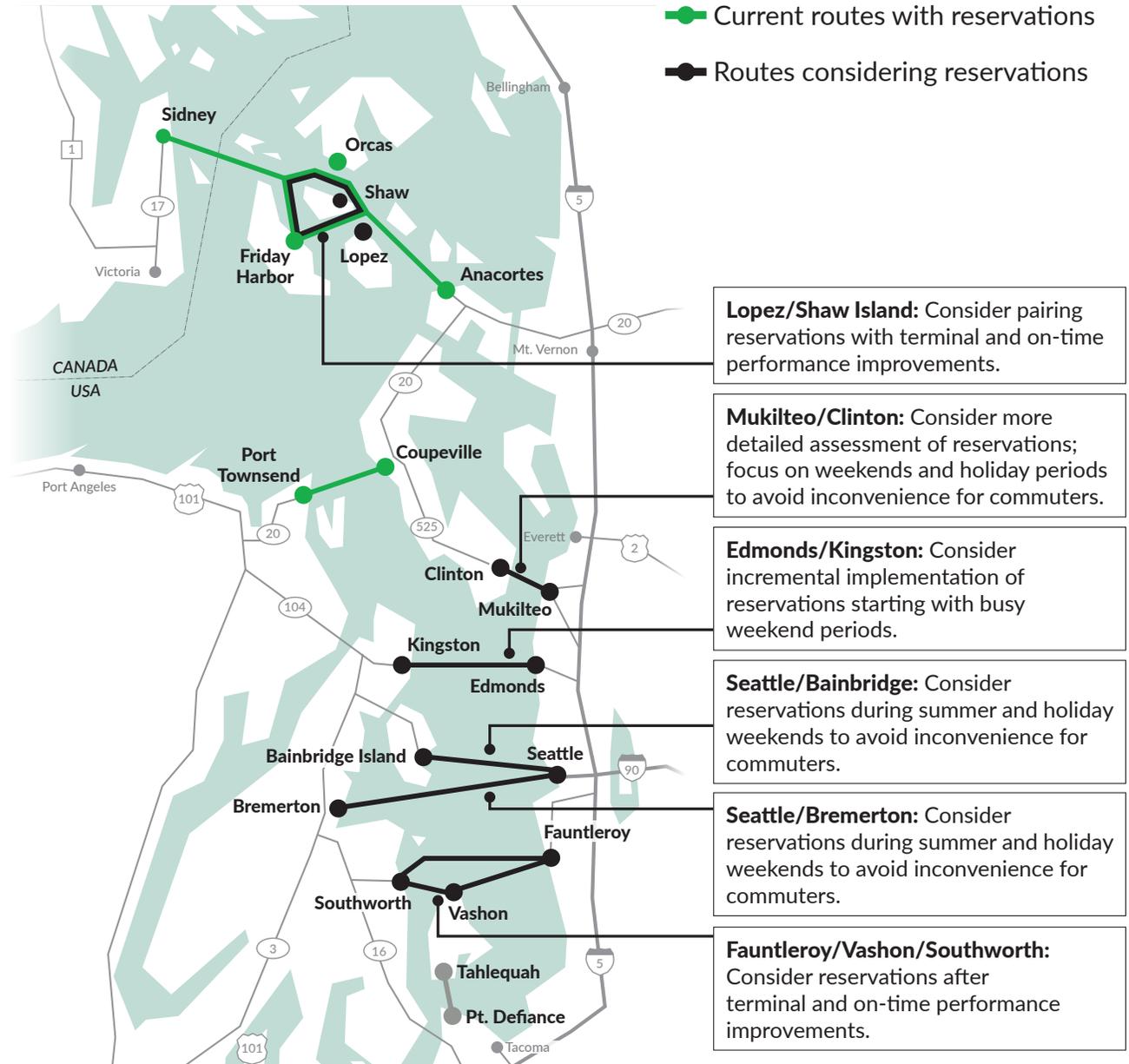
Enhanced user information: WSF has provided more information about vessel space availability and terminal line lengths on its website to help customers make informed travel decisions.

Regional passenger-only ferries

Since the 2009 Plan, passenger-only ferry operations have expanded in the Puget Sound region. King County operates two passenger-only ferry routes from Vashon Island to downtown Seattle and from West Seattle to downtown Seattle. Kitsap Transit launched service from Bremerton to Seattle in 2017 and plans to launch service from Kingston to Seattle and later Southworth to Seattle.

As traffic congestion in the Puget Sound region continues to grow, other communities may continue to explore passenger-only ferries as another option for travelers. Partnering with regional passenger ferry operators supports the regional transportation system by moving more people.

Map of reservations by route



Plan recommendations

To manage growth, this Plan focuses on the following recommendations:

- Refine existing metrics and define new metrics to offer better data for future system planning that prioritizes the movement of people and improves the customer experience.
- Maximize existing system utilization through the advancement of adaptive management strategies that make operations more efficient, spread out demand beyond peak travel times, and prioritize walk-on and bike-on passengers through better connectivity at the terminal.
- Provide system capacity enhancements through modest increases in service hours and by leveraging new vessel construction, terminal improvements and existing infrastructure modifications.

The next sections outline specific strategies for each recommendation.

Refine existing metrics and define new metrics to offer better data for future system planning that prioritizes the movement of people and improves the customer experience

As a division of WSDOT, WSF has a long history of measuring and monitoring the performance of its system. WSF tracks Legislatively-required performance measures over time and against set goals.

Internally, WSF tracks systemwide average congestion through a congestion management decision framework. This framework, also referred to as Level of Service standards, is a common metric among transit and roadway systems. For the ferry system, this decision framework measures service congestion on a route-by-route basis during low-, middle-, and high-ridership seasons. WSF uses a two-tiered approach that monitors only vehicle congestion levels. The congestion levels for Tier 1 and Tier 2 are based on a notable percentage of total vehicle capacity over the entire month. Once a route reaches the Tier 1 Level of Service standard, WSF explores adaptive management strategies to address congestion. If a route reaches the Tier 2 Level of Service standard, WSF looks to capital investments to increase capacity.

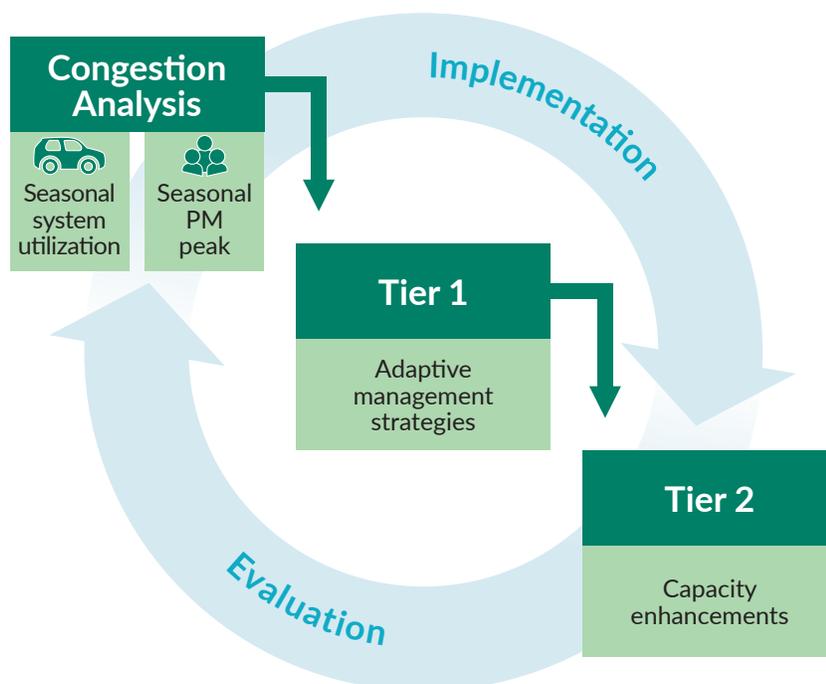
Level of Service and performance metrics can be useful tools for identifying trends, adjusting operations, identifying needed investments, and communicating ferry system performance to stakeholders. Although high performance is the goal, performance measures should also be defined as a way to communicate to decision-makers the need for investments and adjustments within the system to ensure optimal performance and efficiencies.

The ridership growth projections through 2040 include a significant increase in walk-on and bike-on passengers. These forecasts indicate that some of the Central Puget Sound routes would exceed their existing passenger carrying capacity during the evening peak period. To strengthen the priority of moving more people, the Plan recommends creating Level of Service standards for passengers that mirror the existing vehicle standards, as described in more detail below.

The Plan recommends the following strategies to track and monitor system use and capacity during the growth expected through 2040:

- Establish a passenger Level of Service standard:** Much like the existing vehicle congestion management framework (Level of Service standards), passenger standards would also take a tiered approach. They would vary by route, based on the passenger carrying capacity of the vessel serving that route. The first tier would cover the seated capacity of the vessel. Reaching capacity on this tier would indicate that the customer experience is becoming more challenging, especially on longer routes where customers would be more likely to desire seats. Reaching capacity on the first tier would also signal to WSF that capacity improvements will be needed in the future. The second tier would cover the maximum passenger occupancy of the vessel as allowed by the U.S. Coast Guard certificate of inspection. Reaching the certified capacity would require capacity improvements, which could mean the alteration of a vessel to expand the passenger cabin, adding additional staff and life boats, or increasing service hours. The Level of Service graphic below illustrates this tiered passenger capacity Level of Service and its relationship to vehicle capacity.

Level of Service (LOS) process



- **Adjust capacity standards on routes with reservations:** On routes with reservations, WSF should align the capacity calculation in the congestion management decision framework with the actual vehicle capacity available for reservations. This available capacity is typically smaller than 100 percent of the vessel's available vehicle space. Making this small adjustment in calculating capacity would provide more accurate information that WSF could use when considering service enhancements and vessel needs.
- **Establish vehicle wait time as a performance metric:** Making peak period wait times a reported performance measure would add a layer of accountability and transparency. Performance measures are tracked quarterly, along with 17 other WSF-specific metrics, and reported to the Legislature. WSF could implement wait-time tracking in the short term through the use of cameras or other automated detection devices. In the future, WSF could expand this approach to include user-sourced data, after they launch online ticketing and other technology upgrades. Better understanding customer wait times would help to inform new infrastructure investments and operational efficiencies.

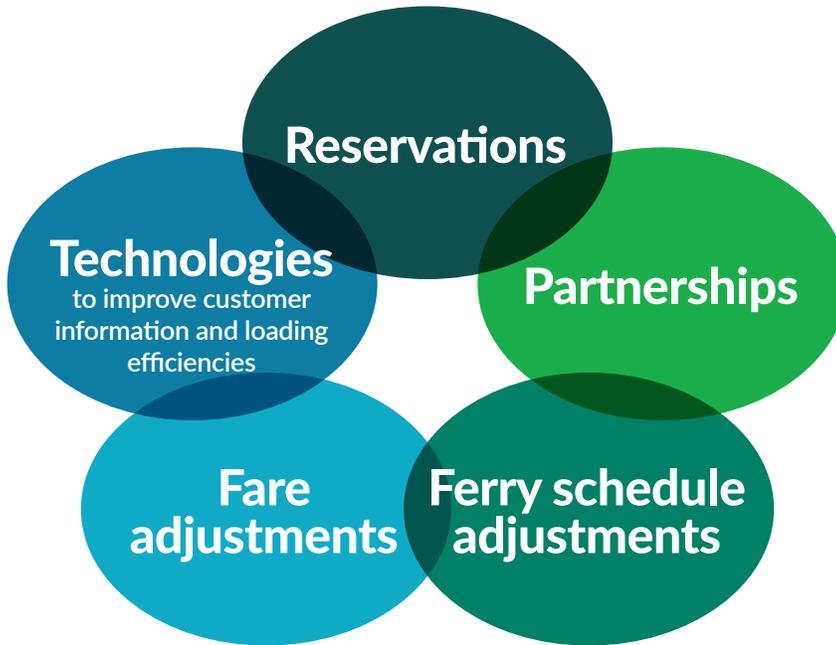
As WSF invests in technology for fare collection, enhanced customer information and operational efficiencies, data gathered from this technology can serve as another valuable tool to track and monitor system capacity and utilization. For example, queue detection technologies outlined in the Customer experience section can assist WSF in monitoring wait times. Additionally, technology upgrades to the reservations system would enhance the customer experience and aid future service planning by allowing WSF to monitor the available capacity of reservations.

Maximize existing system utilization through the advancement of adaptive management strategies that make operations more efficient, spread out demand beyond peak travel times, and prioritize walk-on and bike-on passengers through better connectivity at the terminal

Before modifying existing assets to manage growth, WSF first looks to improving existing operations through adaptive management strategies to improve operational efficiencies. Adaptive management strategies include reservations, fare collection and pricing strategies, improving customer information, and promoting mode shift.

WSF has implemented adaptive management strategies based on the tiered Level of Service standards. Once congestion levels have reached the first tier, adaptive growth management strategies should be applied. WSF's best practice is to implement growth management strategies that require very little investment on an ongoing basis. When the second tier is reached, WSF considers modifications to assets to add capacity, as discussed later in the Plan.

The toolbox of adaptive growth management strategies includes:



This Plan recommends adaptive management strategies focused on the same general categories outlined in the 2009 Plan, while using advancements in technology to improve on and expand what WSF has already achieved. Specific strategies to improve system utilization and operational efficiencies to manage growth through 2040 include:



Expand vehicle reservations

Many factors affect the success of reservations on a given route. WSF uses criteria to assess whether reservations on a given route may successfully address demand management concerns. The initial screening criterion is whether the congestion decision framework (Tier 1 or Tier 2 Level of Service) has been reached, which signals significant congestion on a route. The second and third criterion include the route's ability to meet the on-time performance metric goal of 95 percent and whether there is enough holding space at the terminal to accommodate the staging of vehicles with reservations. The Plan recommends that the following routes be further analyzed as candidates for reservations and notes needed actions before implementation could occur. All of these routes discussed below have met or will in the future meet the Tier 1 Level of Service, which means that WSF must examine adaptive management strategies such as reservations.

- **Edmonds/Kingston:** This route meets the on-time performance goal for much of the year except for the summer months. Although overall demand has not yet reached Tier 1 Level of Service, the forecasted demand could reach that level in 2030, making the route a candidate for incremental implementation of reservations. As a start, reservations could begin during high-demand weekend periods only and expand further after WSF has addressed capacity constraints at the terminals.

Implementation needs: Increased vehicle holding capacity.

- **Mukilteo/Clinton:** Because this route is expected to meet all three criteria once the new Mukilteo terminal begins operations in 2020, it would be a candidate for a more detailed reservations assessment. The vehicle holding lane capacity and configuration could make reservations difficult to implement. If WSF considers reservations, focusing on weekends could reduce the inconvenience reservations may cause commuters.

Implementation needs: Increased vehicle holding capacity at Clinton terminal and potential reconfiguration of long, linear queuing lanes at the Mukilteo terminal.

Criteria for reservations

- **Criterion 1:** Has this route reached the Tier 1 Level of Service regularly, indicating that there are frequently more vehicles needing space than what is available?
- **Criterion 2:** Does the ferry on this route leave on schedule at least 95 percent of the time? The reason for this criterion is that a reservation should offer a reasonable assurance of travel reliability, which a frequently-delayed sailing cannot do.
- **Criterion 3:** Does this terminal have enough holding space to accommodate at least one full vessel of vehicles? Again, with reservations, the reasonable assumption for customers is that they will be able to board the sailing for which they have a reservation. However, if there is not sufficient holding space, there is a risk that customers can lose their spot on the vessel by getting caught in line before reaching the tollbooth.

- **Lopez Island and Shaw Island:** These terminals are the only locations within the San Juan Islands route that do not currently offer eastbound reservations. Reservations in these locations could be successful and offer consistency and continuity among the other stops on the Anacortes/San Juan Islands routes, if paired with operational and terminal infrastructure enhancements.

Implementation Needs: Increased vehicle holding space.

- **Seattle/Bainbridge Island:** This route has not reached Tier 1 Level of Service standards overall but experiences periods of high demand on summer and holiday weekends. WSF could consider offering reservations only for these high-demand periods. Focusing on weekends would also alleviate any inconvenience reservations could cause for the large number of weekday commuter customers on this route. Additionally, the number of vehicle holding lanes and the configuration of vehicle queuing at each terminal is not currently conducive to managing reservations.

Implementation needs: Improved on-time performance and increased vehicle holding at the Bainbridge Island terminal.

- **Seattle/Bremerton:** Similar to Seattle/Bainbridge Island, this route has not reached Tier 1 Level of Service overall but experiences periods of high demand on summer and holiday weekends. WSF could consider offering reservations only for these high-demand periods. Focusing on weekends would also alleviate any inconvenience reservations could cause for the large number of weekday commuter customers on this route.

Implementation needs: Improved on-time performance.

- **Fauntleroy/Vashon/Southworth:** The Fauntleroy/Vashon/Southworth route has insufficient terminal space to hold a full sailing of vehicles and does not meet the on-time performance goal. However, reservations could be successful if evaluated in tandem with other demand management strategies, plus operational and terminal infrastructure enhancements.

Implementation needs: Improved on-time performance and increased vehicle holding capacity at each terminal.

Fare structure and pricing strategies

The Plan recommends pricing strategies to accomplish two goals: promoting mode shift and minimizing dwell times for vessels. The Plan also recommends further analysis of demand-based pricing, such as higher fares for weekend sailings on popular recreational routes, and fare structure simplification. For this approach to be successful, WSF would need to educate customers in advance of any fare changes.

Demand-based pricing could incentivize travelers to change their travel patterns by decreasing fares during less popular times. Implementing this strategy would require WSF to determine what would be considered “peak hours” for a given route, then adjust the prices accordingly.

Simplifying the fare structure could include eliminating non-driver fares for customers traveling on the ferry with a vehicle. Customers purchasing fares in advance would be able to simply purchase a vehicle fare without concern for how many passengers will be traveling with them that day. This approach could allow for more rapid processing at the tollbooth, although passenger counts would still be needed for U.S. Coast Guard regulations. This approach may also help to encourage carpooling, provide equity for traveling families and offset potentially higher peak fares.

The dilemma that WSF faces when considering making changes to the current fare structure and pricing is that it is already very complex. Adding new types of fares would increase this complexity, and removing fares may affect other types of fares or the populations that these fare types originally intended to serve. As with the other categories of adaptive management strategies, WSF would need to conduct a more thorough analysis of the potential effects of any fare structure and pricing strategies. Proposed changes would also need to receive approval from the Washington State Transportation Commission, which oversees WSF ferry fares and policies.

Additional adaptive management strategy areas

With investments in technology there are a variety of other adaptive management strategies to manage growth using existing terminals and vessels, such as enhancement of user information and multimodal connections through schedule synchronization and infrastructure improvements.

Provide system capacity enhancements through modest increases in service hours and by leveraging new vessel construction, terminal improvements and existing infrastructure modifications

WSF considers making capacity enhancements if a route reaches the Tier 2 Level of Service criterion. Adding capacity can occur through expanding service hours, increasing service frequency, and altering vessels to increase their carrying capacity. To date, no routes have reached the current Tier 2 Level of Service standards that would necessitate reviewing capital improvements to manage demand.

This Plan looked for opportunities to enhance service with the most efficient addition of service hours. The analysis involved adding hours in a way that work within existing crew work windows and existing schedule structure to move more vehicles and passengers. In many cases, enhancements recommended in the Plan are the reinstatement of service hours that were cut because of loss of funding enacted by Initiative 695 in 1999. This Plan also recommends many vessel replacements to replace the aging fleet. WSF has the opportunity to leverage these capital investments in vessels to provide enhanced capacity to customers, based on the route's current needs and future projected demand.

For ferry systems, the ability to provide on-time service relates to the system capacity—how many vehicles and passengers can be carried. Many factors can contribute to increasing the system capacity including:

- **Enhanced service hours:** Service hours indicate the number of sailings provided on a route. The number of sailings on a route depends on the transit time as well as the number and size of vessels assigned to a route. Service hours on each route are consistent throughout the year with additional hours provided in the summer months, except for the Anacortes/San Juan Islands route that varies by season. If WSF increases service hours, there is generally an increase in overall passenger and vehicle capacity.

Service capacity enhancements are in part limited by the overall fleet size. As outlined in the Reliable service section of the Plan, the existing fleet with current service levels does not have enough out-of-service time for needed maintenance to be performed. Therefore, until the fleet grows in size to provide adequate relief vessels, WSF does not have the resources to add service hours and also maintain service reliability.

- **Increased carrying capacity (through size of the vessels):** Vessel capacity, which refers to the number of vehicles and passengers carried per sailing, is based on the vessels assigned to each route

Generally, all new vessels constructed during the next 20 years will be designed with flexibility in mind, with passenger cabin spaces that can grow and shrink with passenger demand, allowing cost efficiencies through incremental crewing requirements.

and the entire fleet configuration. The Plan recommends a vessel program that provides sufficient vessels for required service and maintenance relief as well as the flexibility to accommodate more passengers in the future. As discussed in the Reliable service section, vessels constructed over the next 20 years will be designed to have expandable passenger cabin space to meet future needs.

- **Terminal operational efficiencies:** Operational efficiencies determine how quickly vehicles and pedestrians can be loaded and unloaded at the terminal. These factors include vessel slip availability, vehicle holding capacity and configuration, pedestrian and vehicle loading, and activities adjacent to the terminal.
 - When multiple vessels operate on one route, a second operational slip provides flexibility and redundancy to maintain operations when the other slip is unavailable because of schedule delays or maintenance. If a terminal only has one slip, there are periods of time when loading or unloading takes longer, and the other vessel must wait for the delayed vessel to depart that terminal.
 - Vehicle holding capacity and configuration can affect how long it takes to load and unload. A single long line of vehicles takes longer to load than multiple lanes located closer to the vessel. The configuration of queuing and holding can also affect the effectiveness of reservations.
 - Loading and unloading passengers and vehicles separately takes longer. Overhead passenger loading walkways allow for vehicle and passenger loading to occur simultaneously, reducing the time needed to load both customers.
 - Other factors, such as pedestrian activity, exit lane configuration and traffic signals, can affect the flow of vehicles exiting the ferry. Partnerships between WSF and local agencies can help identify and implement solutions.

The Plan recommends some level of capacity enhancement opportunities to each route in the system. The Implementation, investment and financial outlook section outlines more details on service capacity enhancement timeframes for implementation.

The Plan's recommendations include the following strategies for capacity enhancements on specific routes, including two scenarios for managing growth on the Edmonds-Kingston route.

Seattle/Bremerton

Ridership on this high commuter route is expected to increase significantly by 2040, with the most growth occurring in walk-on and bicycle traffic. The Colman Dock terminal is currently undergoing a major preservation project, and Alaskan Way in Seattle will be reconfigured in the near term to encourage pedestrian and bicycle activity. The Plan's recommended capacity improvements for the Seattle/Bremerton route include:

- **Vessel capacity modifications:** Increase passenger capacity from 1,500 passengers to 1,800 passengers per vessel through the addition of life rafts and enclosure of

deck space. The figure below compares forecast peak sailing ridership with the capacity increase.

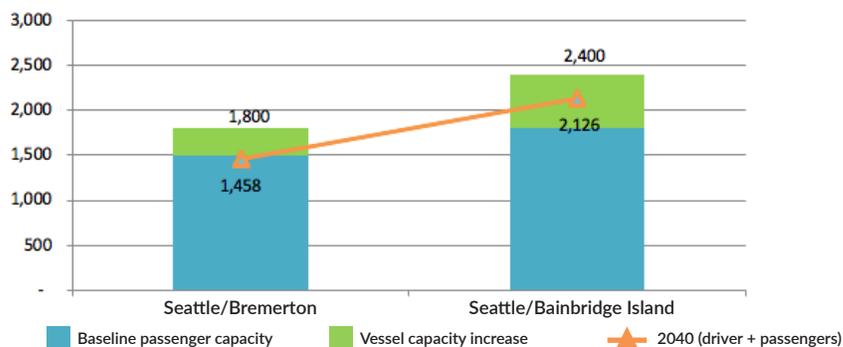
- **Terminal operational efficiency enhancements:** The new Colman Dock Multimodal Terminal will include more bike and pedestrian connections. When preservation projects are completed, WSF should explore ways to incorporate operational efficiencies and opportunities to encourage mode shift to transit, walking and biking at the Bremerton terminal.

Seattle/Bainbridge Island

Similar to the Seattle/Bremerton route, walk-on and bicycle traffic is expected to grow at a high rate by 2040. Traffic exiting the Bainbridge Island terminal adds to congestion along State Route 305, and encouraging greater use of transit, walking and biking could help relieve this congestion. The Plan’s recommended capacity improvements for the Seattle-Bainbridge Island route include:

- **Vessel capacity modifications:** Increase passenger capacity from 1,800 passengers to 2,400 passengers through addition of life rafts and enclosure of deck space. A comparison of forecast peak sailing ridership with the capacity increase is provided in the figure below.
- **Terminal operational efficiency enhancements:** Replace the existing overhead loading walkway to increase passenger throughput and improve safety.

Seattle/Bremerton and Seattle/Bainbridge Island passenger capacity increases on 2040 projected afternoon peak sailings



The Seattle/Bainbridge Island and Seattle/Bremerton routes are the only routes in the system projected to approach or exceed current certified passenger capacities on WSF vessels. To help meet WSF’s goal of shifting more customers to non-vehicle modes, this Plan recommends that WSF establish a passenger Level of Service planning metric to meet peak period walk-on passenger demand.

Fauntleroy/Vashon/Southworth

The Fauntleroy/Vashon/Southworth route currently experiences lower on-time performance compared to other WSF routes. The Fauntleroy terminal currently has less than one vessel's worth of vehicle holding space, a single vessel slip, and no overhead loading for pedestrians, which causes challenges for queuing and loading the vessel for multiple destinations. Additionally the Southworth terminal only has a single slip, which limits operational flexibility. The Plan's recommended capacity improvements for the Triangle Route include:

- **Service enhancements:** Extend the summer service schedule by adding more weekend hours in May and October with a 124-car capacity Issaquah Class vessel. Enhance winter service by adding a third 124-car capacity Issaquah Class vessel on weekends.
- **Vessel capacity modifications:** Add capacity by replacing the 90-car capacity *Sealth* with a 124-car capacity Issaquah Class vessel.
- **Terminal operational efficiency enhancements:** The preservation project at the Fauntleroy terminal facility is anticipated to improve operational efficiencies. Add another vessel slip to the Southworth terminal, potentially in partnership with Kitsap Transit for passenger-only ferry use. Look for ways to increase operational efficiencies and improve bicycle and pedestrian infrastructure when the Vashon terminal building undergoes a preservation project.

Point Defiance/Tahlequah

This route regularly meets on-time performance goals, but additional service hours and increased vehicle capacity could improve the customer experience. The Plan's recommended capacity improvements for the Point Defiance/Tahlequah route include:

- **Service enhancements:** Add two additional trips per day.
- **Terminal operational efficiency enhancements:** Improvements are planned at Point Defiance to reduce the amount of vehicles queuing along SR 163 (Pearl Street). As part of future trestle preservation projects, look for ways to increase operational efficiencies, such as vehicle holding and passenger queuing configurations.

Edmonds/Kingston

The vehicle demand on the Edmonds/Kingston route is expected to reach Tier 1 for the Level of Service standards in 2030. This route typically experiences high volumes of freight and commercial truck traffic, which are expected to increase. Each of these terminals experiences operational constraints. Because of the Edmonds terminal's downtown

location, where the vehicle holding area is separated from the vessel slip by railroad tracks and crossing, delays can occur during loading and unloading. When vehicle holding at the Kingston terminal is full, vehicles often line up along SR 104.

Because the Kingston terminal is also located on the Kitsap Peninsula, capacity enhancements on the Edmonds/Kingston route could create congestion relief for other Kitsap routes, particularly the terminals of Bainbridge Island and Bremerton, and minimally at Southworth. Because of this unique opportunity, the Plan recommends two potential options for capacity enhancements on the Edmonds/Kingston route. Each option presents a different path as it relates to the type of vessel constructed for future use on the route and would affect the make-up of the WSF fleet in 2040.

Scenario A capacity improvements for the Edmonds/Kingston route include:

- **Service enhancements:** Increase service frequency to 30-minute headways from 45- to 50-minute headways.
- **Vessel capacity modifications:** Replace the 188-car and 202-car vessel operation to operate three smaller 144-car vessels with 30-minute peak headways. This approach would increase the frequency of service and allow more traffic flow. With increased frequency, some ridership demand on other Kitsap County routes could shift to this route, relieving vehicle congestion on other high-volume ferry routes.
- **Terminal operational efficiency enhancements:** Review options for increasing terminal capacity at Edmonds to reduce operational constraints. Continue to work with stakeholders to address congestion in the town of Kingston.

Scenario B capacity improvements for the Edmonds/Kingston route include:

- **Service enhancements:** Maintain existing service hours.
- **Vessel capacity modifications:** Replace the 188-car and 202-car vessels with two 202-car vessels on Edmonds/Kingston route, with 45- to 50-minute headways.
- **Terminal operational efficiency enhancements:** Review options for increasing terminal capacity at Edmonds to reduce operational constraints.

The decision point between Scenario A and Scenario B arises when WSF must replace the two existing large vessels serving this route. WSF could replace the vessel size in-kind and maintain the same service frequency or replace the two large-sized vessels with three medium-sized vessels and increase the service frequency to 30-minute headways. While Scenario A requires more initial investment than Scenario B, Scenario A provides more opportunity for increased revenue and decreased congestion on other Kitsap routes. With a minimum of seven years for design and construction time, this decision would need to be made by 2025.

Mukilteo/Clinton

The Mukilteo/Clinton route is expected to experience modest growth by 2040. The Mukilteo terminal will be relocated and will include increased vehicle holding, overhead loading and improved transit connections. The Clinton terminal has limited vehicle holding and no overhead loading for pedestrians. The Plan's recommended capacity improvements for the Mukilteo/Clinton route include:

- **Vessel capacity modifications:** Increase vessel capacity by adding a 144-car Olympic Class vessel to replace the 124-car Issaquah Class vessel by 2019 during the peak season and by 2035 in the fall, winter and spring months.
- **Terminal operational efficiency enhancements:** Construct overhead loading at the Clinton terminal and consider options for increasing vehicle holding. Reservations would be challenging to implement on this route because of the configuration of vehicle holding at both terminals (long and linear lines at Mukilteo and capacity for holding just over one vessel's worth of vehicles at Clinton).

Port Townsend/Coupeville

The Port Townsend/Coupeville route currently accepts reservations but has already exceeded the congestion decision framework for Tier 1 Level of Service. With ridership growth, this route is projected to reach Tier 2 capacity enhancements in 2040. The Port Townsend terminal's downtown location experiences high pedestrian traffic and has limited vehicle holding space. The Coupeville terminal also has limited vehicle holding space, which makes it difficult to queue vehicles with reservations. The Plan's recommended capacity improvements for the Port Townsend/Coupeville route include:

- **Service enhancements:** Initially, add one daily round trip to the summer season. Then, once the relief vessels have come online, add four additional round trips per day in the summer and enhance spring service by extending the two-boat service in the early spring season.
- **Terminal operational efficiency enhancements:** When trestle preservation projects occur, seek opportunities for including operational efficiencies, such as increased vehicle holding space, at Port Townsend. Additionally, look for opportunities to increase vehicle holding capacity at Coupeville to better manage reservations.

Anacortes/San Juan Islands

The Anacortes/San Juan Islands route has long sailings that vary between 50 and 75 minutes in each direction. This route has low on-time performance, especially during the high-demand summer season, because of challenges with queuing and holding capacity and delays associated with high pedestrian traffic at the Friday Harbor terminal. Because sailings on this route have multiple stops, delays are compounded. All terminals on this route currently accept reservations except for eastbound sailings from Shaw Island and Lopez Island. For Lopez Island to accommodate reservations, WSF would need to expand vehicle holding. The Plan's recommended capacity improvements on the Anacortes/San Juan Islands route include:

- **Service enhancements:** Extend the summer sailing schedule into May and October. Restore the interisland service in the winter season. A two-season schedule (as opposed to the current four seasons) would simplify trip planning for customers and make it easier for WSF's transit partners to coordinate schedules. It would also align with peak period pricing that runs from May to October.
- **Vessel capacity modifications:** Increase vessel capacity by replacing the 90-car *Sealth* with a 114-car vessel for the interisland route.
- **Terminal operational efficiency enhancements:** Construct a new terminal building at Anacortes. Expand vehicle holding at Lopez Island to accommodate reservations. Construct overhead loading and convert the tie-up only slip to an operational slip that allows vehicles to drive-on the ferry at Friday Harbor.





Anacortes/Sidney, B.C.

The Anacortes/Sidney, B.C. route does not operate in the winter months and has high tourist ridership. Relocating customs to Sidney could improve vehicle and passenger movement at Anacortes and Friday Harbor. The Plan's recommended capacity improvements on the Anacortes/Sidney, B.C. route include:

- **Service enhancements:** Expand summer service into May and October.
- **Terminal operational efficiency enhancements:** Relocate all customs processing to Sidney to reduce processing time at Anacortes.

The next section of the Plan outlines the goals and strategies for greater system sustainability and resiliency. The section will focus on how each element of the Plan supports overall WSDOT agency sustainability goals and how with strategic, prioritized investments, the system will be more resilient and environmentally friendly in 2040.



Section 6

Sustainability and resilience

Invest in infrastructure to maintain reliable service in a changing climate and reduce environmental impact.

Sustainability and resilience are integral to WSDOT and WSF operations. WSDOT's vision statement is that "Washington travelers have a safe, sustainable and integrated multimodal transportation system." Furthermore, safety and sustainability are two of the agency's key values, along with engagement, innovation, integrity and leadership.

Sustainability is a broad term that can be applied to nearly every aspect of WSF's service operations. As a division of WSDOT, WSF operates within the agency's guiding framework of providing a sustainable transportation system that "supports the economy, preserves the environment and enhances equity and quality of life in our communities."* In this Plan, sustainability strategies are focused on environmental stewardship.

Resilience is also a component of a sustainable system. Resilience requires strategic investments to ensure that Washington travelers continue to have a safe transportation system into the future. This Plan focuses on resilience related to climate change and other abrupt disruptive events.

Sustainability and resilience is identified as an underlying theme of the Plan and is therefore an interwoven concept throughout each of the other Plan elements, and the recommended strategies within them. This section of the Plan focuses on two corresponding topics: environmental sustainability and system infrastructure and operational resiliency.

The Plan's goals are to:

- Green the fleet and reduce WSF's environmental footprint through sustainable practices and environmental stewardship.
- Plan for emergencies and climate change to sustain reliable service through 2040.

These overarching goals are outlined in more detail in the sections below with specific strategies identified to meet these goals.

*<http://www.wsdot.wa.gov/sustainabletransportation>, <http://www.wsdot.wa.gov/about/secretary/results-wsdot>

Sustainability and environmental stewardship

This Plan views sustainability through a holistic lens as it relates to decision-making and focuses on ways to reduce WSF’s environmental impacts. Sustainability practices have continued to evolve throughout this Plan’s development. For example, in January 2018, Governor Jay Inslee signed Executive Order 18-01, which directed WSF to move toward a zero-emissions fleet. As of July 2018, WSF became the first ferry operator in the United States to join Green Marine, an environmental certification program for the North American marine industry that establishes benchmarks and a monitoring accountability program.

Internally WSF continues to integrate decision making to ensure the consideration of the “three Es” of sustainability (economy, environment and equity). WSF has formed strategic working groups to analyze operational improvements that would reduce fuel consumption. Although WSF has made strides, its organizational structure is not set up in a way that elevates this oversight. Rather it is another responsibility added to full job descriptions, perhaps not allowing for the attention and oversight needed to keep up with requirements.

WSF designs its terminals within the framework of Washington state environmental regulations, which are some of the most stringent in the country. Beyond those requirements, WSF continues to explore ways to reduce energy consumption, with goals of reducing environmental effects and also reducing costs. In 2017, WSF completed an audit that outlined strategies for energy and water use optimization at each terminal and is working to implement these strategies.





Plan recommendations

Many of the recommendations included in this section are described previously in the report, as they focus on the goals of providing reliable service, enhancing customer experience, and managing growth, with sustainability in mind. Sustainability recommendations apply to WSF vessels and terminals, as well as to the management framework in which they are operated. These recommendations can be summarized to include:

- Highlight sustainability through organizational structure, decision making and reporting.
- Reduce vehicle emissions by optimizing terminal operational efficiencies and employing adaptive management strategies that spread out peak demand and minimize wait times.
- Promote mode shift through investments in technology and infrastructure that promote walk-on and bike-on passengers and improve multimodal connections.
- Design future vessels and terminals to be more environmentally friendly and flexible in design to accommodate new technology, changing transportation modes and increased passenger ridership.

Highlight sustainability through organizational structure, decision making and reporting

Because regulations in the realm of sustainability change frequently, WSF faces challenges with maintaining its service and complying with reporting requirements in a constrained financial environment. Other maritime organizations typically manage their sustainability operations at the departmental level.

Elevating a WSF role or department focused on sustainability initiatives would allow for better cross-departmental integration of strategies. It would also focus the responsibility for various required tracking and reporting, which is helpful for continuous improvement toward WSF's goals. Technology investments could streamline tracking and reporting processes, and investing in dedicated personnel could support cross-departmental reporting. WSF could assign dedicated personnel to stay up to date on international sustainability programs in the maritime industry, such as the World Ports Climate Initiative or the Global Reporting Initiative, and provide expertise on best practices and advancements in vessels, terminal design, operational efficiencies and technologies. The Plan recommends the following strategy:

- **Dedicate resources to sustainability:** Create a dedicated role or department within WSF that focuses on sustainability through cross-departmental strategies and development of data tracking and reporting.



Reduce vehicle emissions by optimizing terminal operational efficiencies and employing adaptive management strategies that spread out peak demand and minimize wait times

WSF can promote sustainability and reduce environmental impact at terminals by employing strategies that reduce the time cars spend in traffic and waiting in line at terminals. In addition to reduced idling and fuel use, easing terminal congestion will benefit the community in a multitude of ways that range from higher productivity to improved air quality and lower greenhouse gas emissions.

Terminal operational efficiencies like overhead loading, reducing traffic congestion impacts, and queue detection can all contribute to minimizing wait and dwell times. Overhead loading allows walk-on passengers to load simultaneously with vehicles, thus reducing the time vehicles must wait or idle while passengers are loaded or unloaded. Traffic congestion impacts caused by poorly-timed traffic signals or pedestrian crossings can cause backups that result in cars idling for longer periods of time. For example, at the Edmonds terminal, an at-grade railroad crossing frequently conflicts with loading and unloading of ferries, causing vehicles to wait while a train crosses. Improving queue detection capabilities at terminals could communicate the expected wait time to customers, which could reduce instances of customers idling their vehicles if they think the queue line will be moving shortly.

Adaptive management strategies that focus on sustainability aim to reduce the effects of customer vehicles traveling to and from, and waiting, at WSF terminals. Expanding the reservations system and implementing demand-based pricing are adaptive management strategies currently being explored to reduce congestion and spread peak demand. Technology can play an important role in reducing terminal congestion by the use of enhanced user information to spread peak loads and limit the time vehicles dwell in congestion around terminals. Technology improvements such as fare collection upgrades or automatic passenger counting systems that will process customers more quickly through the terminal are also being proposed in this Plan in the Customer experience section.

The Plan proposes some schedule adjustments to spread peak ridership through an expanded or elongated summer season, to be implemented when there are enough vessels in the fleet to allow for enhanced service hours with sufficient time for required vessel maintenance. This will reduce congestion during peak hours and the associated greenhouse gas emissions from idling vehicles.

This Plan recommends the following strategies to optimize terminal operations, which also appear and are explained in more detail in the ManageGrowth section, and to promote sustainability at terminals through adaptive management strategies, also included in the Customer experience section.



- **Add overhead loading:** Construct overhead loading at terminals, which allows passengers to load simultaneously with vehicles and reduces the time vehicles must wait or idle while passengers are loaded or unloaded. Improvement projects that will add overhead loading are currently programmed for Friday Harbor and Clinton terminals, and an existing overhead loading walkway at the Bainbridge Island terminal will be replaced to increase passenger throughput and improve safety.
- **Improve traffic at terminals:** Assess traffic around terminals, and partner with local transportation agencies to reduce causes of conflict with loading and unloading ferries such as timing of traffic signalization or pedestrian crossings. Explore options for operational improvements at the Edmonds terminal.
- **Invest in vehicle queue detection:** Improve vehicle queue detection capabilities at terminals to communicate wait times to passengers.
- **Optimize terminal operations:** Employ adaptive management strategies, such as expanded vehicle reservations and demand-based pricing, that will spread demand to reduce vehicle idling and associated emissions at terminals.
- **Enhanced customer information:** Provide customers with more real-time information in an easily accessible way to help customers make informed travel decisions, encouraging off-peak travel and opportunities to process more quickly through the terminal.

Promote mode shift through investments in technology and infrastructure that promote walk-on and bike-on passengers, and improve multimodal connections

Enhancing user information can also promote mode shift, which gets customers out of their cars to become a walk-on or bike-on customer. Strategies to increase mode shift include better aligning schedules with partner transit organizations and prioritizing the loading and movement of people and bicycles.

Terminal improvements can also encourage more walk-on and bike-on passengers. Improvements include overhead passenger loading walkways, which allow walk-on passengers and vehicles to load simultaneously, and improving accessibility and connections to the terminal for walk-on and bike passengers. As detailed in the Customer experience section, the following strategies also support sustainability:

- **Improve customer information:** Improvements to real-time user information, customer alerts, and wayfinding can be used to encourage customers to walk or bike onto the vessel rather than drive.
- **Enhance transit connections:** Partner with other transit agencies to synchronize schedules and make transit connections easier.
- **Improve terminal access:** Look for opportunities to incorporate improved bike and pedestrian infrastructure in terminal preservation and improvement projects through connecting to local trail and path systems.

Design future vessels and terminals to be more environmentally friendly and flexible in design to accommodate new technology, changing transportation modes and increased passenger ridership

WSF is the largest consumer of diesel fuel in Washington state at over 18 million gallons each year. Because of this, WSF operations are the largest generator of carbon and other greenhouse gas emissions within the state transportation system. This Plan recommends that WSF leverage the need for new vessels to meet and exceed carbon dioxide emissions reduction requirements under state law. To cut fuel consumption, the Plan recommends building new vessels to use hybrid propulsion technology instead of full diesel engines. The use of this propulsion technology has benefits of reduced engine noise and vibration, lessening effects on orcas and other marine life.

In April 2018, Governor Inslee approved \$600,000 in funding to study conversion of WSF’s three Jumbo Mark II Class vessels to hybrid-electric propulsion. These three vessels account for the highest fuel consumption and emissions in the fleet. Completing these conversions will reduce the carbon emissions from the current fleet by 25 percent.

Once WSF implements the capital investments in vessel and terminal infrastructure identified in this Plan, by 2040 the agency will have replaced 13 existing diesel vessels with hybrid-electric vessels—some capable of full electric operation—and will have converted 6 vessels to plug-in hybrids. The table below shows the planned fleet composition over time. During the development of new vessel contracting requirements, the Plan recommends that a design charrette be held with technical design experts and departments within WSF to outline design elements of a future vessel to be most efficient and environmentally friendly.

Recommended fleet composition by 2040

	2019	2023	2030	2040
Plug-in hybrid	0	5	12	22
Diesel	23	18	13	4
Total fleet size	23	23	25	26

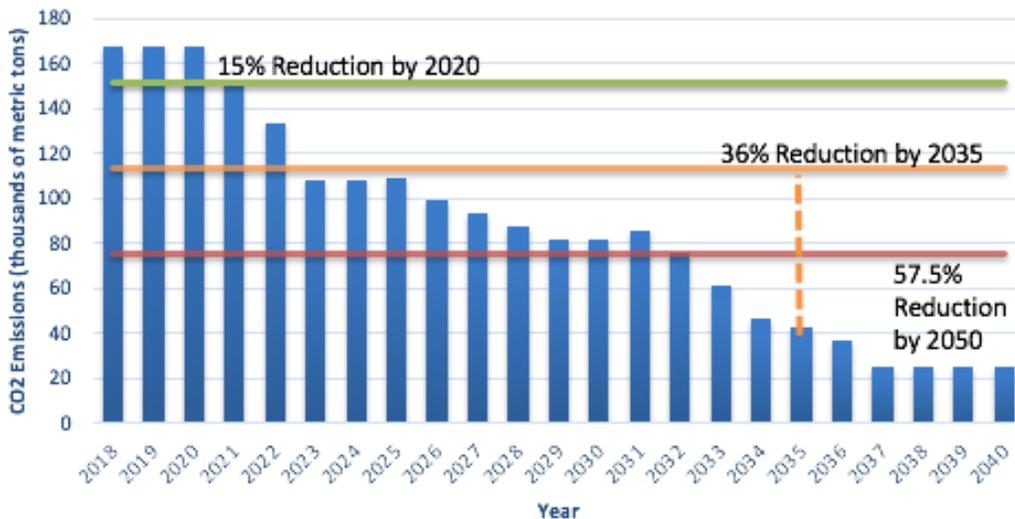
2018 fuel consumption
17 million gallons
2040 fuel consumption
4 million gallons

With this new make-up, the WSF fleet would achieve a 75 percent reduction in emissions and annual fuel consumption as compared to today, from about 17 million gallons in 2018 to about 4 million gallons in 2040. Not only does this have positive environmental effects, but also cost savings, as discussed in more detail in the Implementation, investments and financial outlook section of the Plan.



The figure below shows the corresponding change in carbon emissions, which include meeting and exceeding state law requirements of a 36 percent reduction by 2035 and a 57.5 percent reduction by 2050. The Jumbo Mark II Class vessel conversions represent the initial 25 percent reduction in emissions.

Projected carbon emissions in the WSF system, 2018-2040



While vessel fuel consumption, emissions and noise are a large focus of the strategies and investments related to vessels in this Plan, other smaller endeavors will make a difference. WSF should also consider waste management and waste diversion, the practice of trying to divert as much waste as possible out of the landfill by recycling and composting. Although there are currently no set targets for this practice, WSF could develop goals, implement programs and track progress. The ongoing effort involved in managing a sustainability program, including setting baselines, measuring data and reporting may require additional dedicated staff, which is outlined in the first strategy of this section.

To promote vessel sustainability, this Plan recommends the following strategies, which are explained in more detail in the Reliable service section, which outlines future vessel programming:

- **Invest in hybrid-electric propulsion:** Invest in converting six existing diesel propulsion vessels to hybrid-electric, and design new vessels to use hybrid-electric propulsion in order to achieve a significant reduction in fleet emissions. In the years leading up to full vessel replacement, WSF could increase from biodiesel B5 to B10 or higher, or other renewable diesel to reduce carbon emissions.
- **Reduce vessel noise:** Pursue materials and methods to maximize energy efficiency and provide opportunities for quieter operations to protect marine life.

- **Plan a vessel design charrette:** Convene different disciplines and technical experts for a vessel design charrette prior to design and construction to ensure they have evaluated all components of future vessels and their systems for minimizing environmental effects.
- **Increase energy efficiency and waste reduction:** Continue to look for ways to encourage waste management and waste diversion, and reduce energy consumption on vessels.

Terminal design standards should continue to assess WSF's environmental impact and look for opportunities to increase sustainability. Potential improvements include developing an inventory and testing program for terminal stormwater systems, integration of pervious pavement to improve the watershed ecosystems in which WSF terminals are located, and investment in high-efficiency water fixtures in terminals to reduce water use.

WSF has been working over the past 20 to 25 years to replace timber structures treated with creosote, a water-contaminating material, with steel and concrete structures to make the waters cleaner. The Plan recommends that Terminal Design Standards be continually assessed to make sure they are compatible with rapidly advancing technologies to be more efficient and environmentally conscious. For example, in the near term, drop-offs by autonomous vehicles could allow customers to walk on to the ferry instead of using their own vehicles. To reduce WSF's environmental footprint related to terminals, this Plan recommends the following strategies:

- **Continue to assess Terminal Design Standards:** Allow for flexibility within the Terminal Design Standards to accommodate new technologies.
- **Increase efficiency:** Continue to look for ways to reduce environmental impact and energy consumption at the terminals.
- **Monitor stormwater at terminals:** Create an inventory of stormwater systems and develop a stormwater testing program.
- **Continue creosote removal:** Continue to prioritize the replacement of creosote-treated timber with more environmentally-friendly materials to reduce water contamination.

Performance measures

The Plan recommendations include the addition of performance measures that will lead to the tracking of wait times, capital conditions assessment, mode shift, and energy consumption.



Resilience

WSF terminal assets are located in areas that are vulnerable to abrupt seismic events and emerging risks, such as sea-level rise and increasing intensity of storms. All of these conditions affect terminals and service. Existing terminals and the Eagle Harbor Maintenance Facility will require enhancements to withstand both abrupt and emerging infrastructure vulnerabilities.

When resiliency planning for infrastructure, the Plan recommends incorporating flexibility into terminal and vessel designs to accommodate future uses and rapidly-evolving technologies. WSF may choose to design more flexible spaces or reconsider the useful life design standards of infrastructure, which refers to the timeframe for designing infrastructure and planning for maintenance and replacement projects.

The WSF system consists of vessels and terminals that provide essential functions in the event of an emergency. In planning for emergency preparedness, it is essential that WSF has enough assets, including vessels and terminals, maintained to standards that can support emergency response.

Plan recommendations

The Plan recommends the following strategies that focus on the identification and prioritization of capital investments to support the resilience of the ferry system.

- Develop an emergency response plan to enhance preparedness and aid in response and recovery efforts, and develop a prioritization of terminal capital projects for emergency response.
- Prioritize terminal maintenance needs with the most seismic risk, vulnerability to sea level rise and “lifeline routes*” that provide access to major population centers or critical facilities.
- Increase the number of relief vessels to support regional emergency response.

*<http://geo.wa.gov/datasets/WSDOT::wsdot-climate-impact-vulnerability-assessment-state-routes>



Develop an emergency response plan to enhance preparedness and aid in response and recovery efforts and develop a prioritization of terminal capital projects for emergency response

The Plan recommends that WSF develop a comprehensive disaster response and preparedness plan that aligns with and supplements other regional plans at the state and local agency level. The disaster response and preparedness plan should clearly define WSF's role as a maritime entity in disaster recovery. The plan should also include an evaluation of response time assumptions, fuel supply access, damage assessment, and staffing and communication protocols.

Emergency response and preparedness plans for other ferry systems or maritime organizations, such as the Water Emergency Transportation Authority in San Francisco Bay and Staten Island Ferries in New York City, provide good examples of partnerships, infrastructure planning and funding opportunities related to the potential role of ferries in regional disaster response and recovery. Alternate funding resources might help WSF improve disaster preparedness and resilience, similar to the federal grant funding New York City received to protect its ferry system against flood damage and add emergency ferry landings.

Currently, WSF vessels are equipped to load and unload from either end of the vessel, which requires a terminal facility where the vessel can safely tie up. The ability to load and unload from the side of the vessel could expand options for passenger loading and unloading during an emergency situation. To pursue this option, the Plan recommends WSF perform an engineering analysis to determine the best location and method for providing side-loading capabilities to WSF vessels.

The Plan recommends the following strategies to increase WSF's preparedness for emergency situations:

- **Develop a disaster response and preparedness plan:** Develop a comprehensive disaster response and preparedness plan that coordinates with other regional and agency plans.
- **Assess the potential for emergency side-loading:** Assess the current fleet and new vessel design for side-loading capability if a different terminal is used that will allow walk-on customers to exit the vessel if tied up in an alternative landing site during emergency situations.
- **Identify alternative landing sites:** Identify and practice landings at alternative sites other than current terminals to know where each vessel is capable of landing if the terminal is unavailable.



- **Fuel/energy access plans:** Prepare alternative plans for how diesel fueling would be accessed if current means are unavailable in an emergency. Once the fleet is more reliant on electricity, redundancy plans will need to be made to allow for ongoing operations if charging facilities are damaged.

To cope with potential situations where multiple terminals or vessels sustain damage in the region, WSF should consider establishing vessel, terminal, and route priorities in advance to aid emergency decision-making. Establishing priorities would also allow WSF to allocate and focus limited resources to the critical components of the system. These priorities might be tied to competing factors, such as major population centers or isolated island communities, and should be considered in advance of an emergency to be prepared if an event occurs.

The Plan recommends the following strategies, in conjunction with development of an emergency response plan, for prioritizing projects related to emergency preparedness:

- **Plan for disruptive events:** Prepare for and determine how to restore ferry service if an abrupt, disruptive event leads to significant staff shortages and limited resources.

Prioritize terminal maintenance needs with the most seismic risk, vulnerability to sea level rise and “lifeline routes” that provide access to major population centers or critical facilities.

Terminals require sufficient maintenance and upgrades to maintain operations in abrupt disruptive events and adapt to sea level rise. Incorporating emergency preparedness when prioritizing maintenance projects would better equip the WSF system to respond to an event. Risks from seismic events, sea-level rise and increasing intensity of storms should be assessed and included in the prioritization of terminal maintenance and preservation projects. WSF should use current coastal flooding standards to evaluate the design elevations at each terminal.

WSDOT is currently reviewing lifeline routes that prioritize the highways that are most critical to response and recovery during emergency situations. Lifeline routes are defined as an interstate or major highway that is the sole access to a population center or critical facility. Because WSF routes are part of the state highway system, its emergency planning should be linked to those identified landside lifeline routes. WSF should work with local agencies to determine how to maintain lifelines from Interstate 5 to ferry terminals as an overall integrated system.

The following strategies are recommended for prioritization of terminal maintenance and preservation projects to maintain a resilient system:

- **Prioritize maintenance:** Work within the existing asset management model to prioritize maintenance for terminals with higher seismic risk and sea-level rise vulnerabilities, as well as lifeline routes.
- **Assess seismic risk:** Continue to assess and prioritize necessary upgrades to terminals to protect against seismic risks.
- **Prepare for climate change and sea level rise:** Evaluate the effects of climate change and sea level rise on terminal assets and develop a plan to mitigate those potential effects and prioritize capital investments.
- **Incorporate coastal design standards:** Review coastal design standards to identify future ferry terminal construction work that would provide the most resilient design, both for terminal structures and for mechanical, electrical and hydraulic equipment.
- **Identify lifeline routes:** Use identification of emergency lifeline routes, in coordination with WSDOT emergency plans, to inform maintenance plans and establish priority terminals and routes that will be the focus of resources in response to an emergency event.

Increase the number of relief vessels to support regional emergency response

Vessels provide a unique transportation connection because they travel via waterways, which do not experience the same damage as roadways in an emergency event. Currently, WSF does not have a sufficient number of spare vessels to respond to a regional event. In order to strengthen WSF's ability to respond to an emergency situation, the Plan recommends the following fleet planning element, outlined in more detail in the Reliable service section of the Plan:

- **Grow the relief fleet:** Maintain a sufficient relief fleet to allow WSF to respond to an emergency event without removing vessels from everyday service. The Plan recommends expanding the relief fleet to a total of six vessels over the 20-year planning horizon.

The next section of the Plan outlines the implementation, investment and financial outlook for the next 20 years as WSF implements the Plan's goals and strategies. This section focuses on implementation of strategies in the near, medium and long term over this 20-year period. The section outlines costs for capital investments and the operating costs associated with service levels identified in the Plan.

Section 7

Implementation, investments and financial outlook

Introduction

Implementing the 2040 vision of reliable, sustainable, and resilient ferry service will require broad commitment and strategic investments. These investments will be incremental over the approximately 20-year planning horizon in both capital and operating budgets. The Plan identifies strategies to address challenges such as the age of the fleet, changing technologies, and preservation in a maritime environment, which will require greater investment than the existing 16-year capital investment plan anticipates. The investment needs accompanying this Plan have been carefully conceived to meet the agency's objectives in a cost-effective and prudent manner, in keeping with WSDOT goals for Practical Solutions.

This section of the Plan focuses on the timing of proposed service enhancements and infrastructure projects, as well as the overall capital and operating investments needed to support the Plan.

Not all capital investments will result in easily measured benefits. For example, it is easy to quantify the immediate operating cost reductions expected once WSF converts current diesel propulsion vessels to electric propulsion. However, it is difficult to quantify the long-term effects of energy reduction on climate change, which is an equally important element of the Plan.

Service hour increases will alleviate some congestion, although this will impact vessel reliability. To ensure that the needed additional hours can be added without degrading the ability to provide service and maintain its fleet, WSF must first strengthen reliability by increasing the time dedicated for maintenance programs and expanding the size of the maintenance relief fleet.

The Plan's leading up to 2027 is to invest in the reliability of the system through the construction of new maintenance relief vessels, replacing retiring vessels and enhancing the recruitment and retention of the ferry workforce. This period also includes enhancements to terminal infrastructure and customer information that provide opportunities for customers to plan for and complete their ferry trip and connect to transit or other modes more efficiently.

The second decade of the Plan will shift its focus to easing congestion and increasing system capacity for both vehicles and passengers, while improving the customer experience through technology and terminal improvements. WSF will accomplish this goal through service enhancements throughout the system, continued vessel replacements, and continued terminal and information technology infrastructure investments. Although this Plan does not propose adding service hours to routes until 2028, it recommends applying strategies to promote mode-shift, spread peak ridership, and streamline operations throughout the planning timeframe from 2019 to 2040.

The Plan is not merely for the long term. It incorporates immediate goals to stabilize the fleet in the near term, followed by strategies to build infrastructure over the medium term (to 2027) and respond to growth overall in the long term (through 2040). In an effort to fully understand the level of investment necessary to meet the operating challenges, the Plan is not constrained to current, known revenue sources. Each timeframe, based on WSF's fiscal years rather than calendar years, is outlined in more detail in the following sections, which include:

- **Near term (0-2 years)—stabilizing the system.**
- **Medium term (3-7 years)—building the infrastructure.**
- **Long term (8-20 years)—responding to growth.**

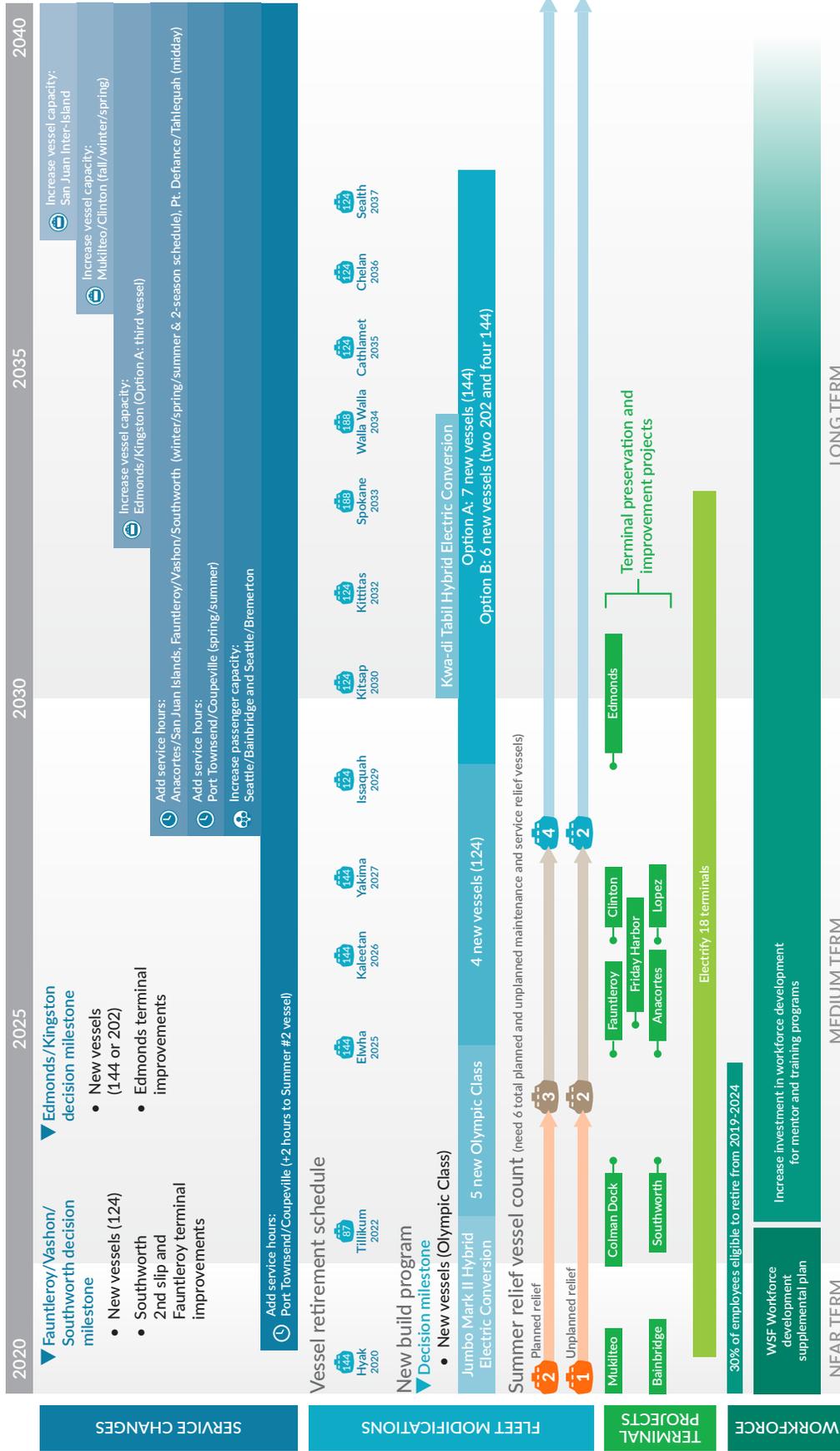
Each timeframe narrative includes a discussion of proposed investments by focus area:

- Vessels
- Workforce
- Service
- Terminals
- Technology

The Plan organizes system improvements by route for the medium- and long-term timeframes when vessel replacements, terminal improvements and service enhancements take place. The implementation timeline on the next page illustrates near-, medium- and long-term investments.

This section concludes with a financial outlook for both capital investments and operating costs throughout the 20-year planning horizon. The financial outlook identifies costs and revenues by biennium, which are the two-year fiscal planning periods used by Washington state.

2040 Plan implementation timeline



Near term (0-2 years)—Stabilizing the system

From 2019 to approximately 2021, the focus of the Plan is to guide key decisions about funding vessel construction to support service reliability and strengthen the attraction, promotion and retention of the specialized ferry workforce. Focusing on these critical needs will help stabilize ferry service by starting the construction of planned and unplanned maintenance relief vessels for delivery as early as 2022 and ensuring that WSF has the sufficiently trained and skilled workforce to operate the system.

Vessels

The Plan recommends that WSF's current open vessel construction contract for the Olympic Class vessels be amended to include the construction of five new vessels. Two of these vessels would be used for planned and unplanned maintenance relief, while the other three would replace retiring vessels within this 20-year planning period. Unfortunately, WSF's options for building new vessels are extremely limited: Delivery of new vessels within this timeframe is only possible through the extension of the existing Olympic Class vessel build contract. By any other current contracting means, it is estimated that bringing a new vessel online would take seven years.

In addition to funding and construction of new vessels, the first of three existing vessels, the Jumbo Mark II Class, will be converted to hybrid-electric propulsion, and the Bainbridge Island and Seattle terminals will be equipped to support electric charging.

One existing vessel, the *Hyak*, is currently scheduled for retirement in 2019 as it reaches 51 years of age. This vessel has not received the midlife refurbishment needed to meet a 60-year useful life and requires a high level of maintenance. There is no suitable replacement vessel to take the *Hyak*'s place as a relief vessel for several years. During the next few years, the fleet size will be at 22 total vessels and at the greatest service reliability risk in the planning horizon. During this time, planned replacements have not yet been delivered, the existing fleet continues to age, and vessels are either retired or require higher levels of maintenance.

Workforce

The Plan calls for preparation of a workforce development plan over the next two years and recommends ongoing increases in the level of investment in training and outreach to attract and retain the operations, maintenance and administrative personnel that make ferry service possible.

Service

The Plan recommends minor service hour adjustments for 2021 on the Port Townsend/Coupeville route. Two additional trips will be provided daily, requiring some additional crew labor and fuel costs. These added sailings are the only proposed service hour adjustments until 2028 when the fleet is large enough to allow adequate maintenance time.

Terminals

Within the next two years, construction at the Colman Dock and Mukilteo terminals will be at or nearing completion. Other terminal preservation planning will be underway at Fauntleroy, and WSF will explore partnership opportunities with passenger-only ferries for the installation of a second slip at the Southworth terminal. Planned preservation projects occur throughout the system.

Technology

In the near term, WSF is working to enhance the existing ticketing and reservations systems. Potential updates include options for mobile ticketing and integration with vehicle reservations, and potentially acceptance of *Good To Go!* toll passes for payment. WSF has already planned for integration with the Next Generation ORCA system.

This timeframe represents a high risk in service reliability because of the limited availability of relief vessels to provide both planned and unplanned maintenance relief. Retirement of WSF personnel, specifically licensed positions also presents a risk to service reliability during this timeframe. The fleet and workforce investments proposed within this timeframe are intended to work toward stabilizing the fleet.

Medium term (3-7 years)—Building the infrastructure

In the medium-term planning horizon, from 2021 to approximately 2027, the Plan recommends that WSF focus on building the infrastructure needed to maintain reliable service. Vessel construction and delivery, as well as terminal preservation and electrification to support the vessels, will be ongoing during this timeframe.

Vessels

During these six years, the remaining two largest consumers of diesel—the Jumbo Mark II Class vessels—will be converted to hybrid-electric propulsion. The Plan recommends that six new vessels be built: five new Olympic Class vessels and one 124-car capacity vessel. The Olympic Class vessels will be delivered first: two to expand the maintenance fleet, and the remaining three and the 124-car capacity vessel to replace retiring service vessels. By the end of this time period, the overall fleet size will have increased from 22 to 25. With the increased relief fleet, there will be an increase in the level of maintenance each vessel can receive, allowing approximately 10 weeks of out-of-service time per vessel. The recommended 12 weeks out of service time per vessel will not be attained until 2031.

Workforce

The supplemental WSF workforce development plan will be complete, with the realization and implementation of some workforce development strategies. To accomplish its workforce development goals, the Plan calls for an increased level of investment in training and outreach over the current 2019 programmed budget. The Plan carries this increased investment throughout the end of the 2040 planning period.

Service

The Plan does not propose service hour enhancements during this time because of fleet size constraints (lack of maintenance relief vessels). The Plan proposes adaptive management strategies that work to spread peak demand and encourage walk and bike-on passengers through technology and terminal preservation and enhancements.

Terminals

The Plan proposes terminal upgrades to support hybrid-electric propulsion vessels that enter into service. The Plan outlines improvements at Southworth and Friday Harbor to add or convert an existing slip to a second operational vessel slip. Overhead loading and park and ride improvements are planned at the Clinton terminal. A new terminal building at Anacortes is planned, as well as terminal enhancements

to accommodate reservations at Lopez Island. Improvements also include terminal charging infrastructure at the Eagle Harbor Maintenance Facility.

In addition to Plan recommendations, programmed preservation projects during this timeframe include upgrading the Fauntleroy terminal facility and preserving elements of the Bremerton, Kingston and Lopez Island terminals and other programmed preservation projects.

Technology

Medium-term IT investments focus on further improving the systems for fare collection, customer service and traveler information. The Plan recommends a website refresh, in coordination with WSDOT, to offer a more user-friendly interface that helps customers to easily find ticketing and travel information. Similar to the website refresh, a unified, multi-platform alerts system would automate the delivery of service alerts across multiple channels, such as the website, text alerts, email, social media and electronic signs, freeing up staff time that is currently required for manual processes and quickly informing customers of service changes.

The Plan also outlines opportunities for investment in other technology systems that can help increase operational efficiencies and provide enhanced information to customers. These improvements include automated queue detection, electronic signage at the terminals, ship-to-shore communications system, common schedule database upgrade and real-time parking availability around terminals.

Stable service reliability means having a larger, more maintained fleet. The investments proposed in the Plan would achieve this stability at the end of this timeframe, increasing service reliability and laying the foundation for expanding service for the growing projected demand.

Long Term (~10-20 years)—Responding to growth

The long-term timeframe spans from 2028 to 2040. Once the fleet is stabilized with replacement and relief vessels to achieve needed maintenance time for each vessel, service enhancements can occur. The Plan's proposed enhancements are in many ways the restoration of hours cut in the past, and therefore fit well within existing schedules and crew labor windows. These proposed additional service hours will bring some congestion relief to routes that have shown they are maximizing their utilization, through the Level of Service metric.

During this time, the long-term focus of preservation and improvement projects shifts to managing forecasted growth through vessel capacity modifications, service enhancements, and investing in technology for more efficient operations and a better customer experience.

Vessels

Over the long term, vessels will continue to be retired and replaced as they reach the end of their service life; eight vessels are scheduled to be retired and replaced from 2028 to 2040. In the early years of this planning period, an additional two new vessels will enable WSF to increase the relief fleet by one vessel and allow service enhancements on many routes. This timeframe includes a total vessel delivery of 10 vessels, one every year from 2028 through 2037. Because of vessel replacements or modifications, many routes will experience improvements through more sailings or increased capacities for vehicles, passengers and sometimes both depending on the demands of the route and desires of the local communities.

The Issaquah Class vessels are programmed for retirement around the age of 50 years, a decade short of the 60-year lifespan that is WSF's current standard. As noted in previous sections of the Plan, the condition of these vessels continues to deteriorate, and out-of-service time is insufficient to provide the maintenance needed to reach the 60-year mark. Retiring these vessels at 50 years of age will reduce reliability risks as they continue to age. Mechanical and other systems are currently issues for these vessels and will continue to be until retirement.

If the Plan's recommendations are adopted, WSF's fleet will consist of 26 vessels by 2031 and throughout the rest of the 2040 planning horizon. In the peak summer season, 20 of these vessels would be in service if a three-boat operation moves forward on the Edmonds/Kingston route in 2031 (Option A), with six vessels reserved for planned and unplanned maintenance in the summer and eight vessels in the winter. Each vessel in the fleet would have the required 12 weeks of maintenance, made possible by continuing to fund maintenance vessels prior to retirement.

Service enhancements

By 2028, the intent of the Plan is that fleet reliability will have improved, paving the way for service enhancements that address capacity constraints and growing ridership demand. Overall service will be augmented by approximately 12,000 service hours, or nearly 11 percent during this planning period.

Terminal improvements

Over this timeframe, the Plan proposes additional terminal upgrades to support hybrid-electric propulsion vessels that enter into service. The Plan outlines improvements at the terminal facility at Edmonds and converting the tie-up slip to a slip with vehicle access at the Eagle Harbor Maintenance Facility.

In addition to Plan recommendations, programmed preservation projects during this timeframe include preserving elements of the Orcas Island, Friday Harbor, Coupeville, Anacortes, Kingston, Fauntleroy, Vashon, Southworth, Point Defiance, Tahlequah, Bremerton, Eagle Harbor, Bainbridge, Seattle and Clinton terminals. These preservation projects are based on the condition of terminal assets.

IT investments

The Plan recommends additional IT investments for consideration as suitable technology becomes available in the long term. These investments include automatic vehicle length detection and automatic vehicle passenger counting systems that would automate pieces of the fare- and data-collection process and reduce the time required for vessel loading.

Operating expenses will increase during this long-term timeframe because of service hour and capacity enhancements that rely on added crew and fuel costs. Additionally, the fleet will be at its largest size in the planning horizon (although not yet at the largest historically). Operating costs will increase at the greatest amount in the 2027-2029 biennium (8.5 percent), related to proposed service enhancements programmed in 2028. Operating costs related to service enhancements again will increase in 2033 with programmed enhancements on the Anacortes/San Juan Islands and Edmonds/Kingston routes.

Route-by-route breakdown

The following list details vessel, service, and terminal enhancements or changes outlined in the Plan, separated into medium-term (2021 to 2027) and long-term (2028 to 2040) categories. Capacity enhancements are also outlined in the Manage growth section of the plan. New terminal enhancements proposed in the Plan are identified first, followed by already programmed preservation projects.

Seattle/Bremerton

The following improvements are included in the Plan for the Seattle/Bremerton route:

Medium term

- **Vessels:** Replace the existing diesel Olympic Class with a new hybrid electric Olympic Class (144-car) vessel in 2026. This change will allow the existing diesel vessel to serve in the maintenance relief fleet and realize fuel cost savings and reduced carbon emissions.
- **Service enhancements:** None are proposed in the medium term.
- **Terminals:** Modifications for vessel hybrid-electric plug-in capability at Bremerton in 2025. Seattle terminal electrification is planned in two phases, both the near term and mid term

The Colman Dock preservation project in Seattle will be completed in 2023 with on-going preservation needs in the medium term. Preservation for terminal elements are planned at Bremerton in the medium-term.

Long term

- **Vessels:** Replace existing vessel with plug-in hybrid Olympic Class vessel in 2034. Increase passenger capacity from 1,500 passengers to 1,800 passengers by 2028 through the addition of life rafts to add capacity and enclosure of vessel deck space.
- **Service enhancements:** Make passenger capacity improvements, allowing more passengers to be carried within the same service hours.
- **Terminals:** No additional improvements are proposed in the Plan. Preservation projects for terminal elements are planned for Bremerton and Seattle in the long term.

Seattle/Bainbridge Island

The following improvements are included in the Plan for the Seattle/Bainbridge Island route:

Medium term

- **Vessels:** Convert the current Jumbo Mark II Class vessels to hybrid-electric propulsion in 2021 and all-electric operation in 2022.
- **Service enhancements:** None are proposed in the medium term.
- **Terminals:** Terminal electrification at Bainbridge Island in 2021 and Seattle in phases in both the near and medium term.

The Colman Dock preservation project in Seattle will be completed in 2023.

Bainbridge Island terminal preservation projects for overhead loading is planned in the near term, and parking lot are planned in the medium term.

Long term

- **Vessels:** Increase passenger capacity from 1,800 passengers to 2,400 passengers by 2028 through addition of life rafts and enclosure of deck space.
- **Service enhancements:** Make passenger capacity improvements allowing more passengers to be carried within the same service hours
- **Terminals:** None are planned for this timeframe.

Fauntleroy/Vashon/Southworth

The following improvements are recommended for the Fauntleroy/Vashon-/ route as part of this Plan:

Medium term

- **Vessels:** In 2027 the route will receive the first of three new hybrid-electric propulsion, 124-car vessels.
- **Service enhancements:** None are proposed in the medium term.
- **Terminals:** Electrification at the Fauntleroy, Vashon and Southworth terminals is planned by 2024. The Southworth second slip project is programmed for completion in the medium term.

Additionally preservation projects are programmed at the Fauntleroy and Vashon terminals in the 2025-2027 biennium.

Long term

- **Vessels:** Replace remaining two Issaquah Class vessels with hybrid-electric 124-car vessels in 2028 and 2029.
- **Service enhancements:** Add summer and winter service hours with 124-car/variable passenger capacity vessel.
- **Terminals:** None are planned in this timeframe.

Point Defiance/Tahlequah

Improvements to the Point Defiance/Tahlequah route include:

Medium term

- **Vessels:** None are proposed in this timeframe.
- **Service enhancements:** None are proposed in the medium term.
- **Terminals:** No additional improvements are proposed in the Plan.

Trestle and terminal building preservation projects are programmed for Point Defiance in the medium to long term. At Tahlequah, trestle preservation projects are programmed for the medium term.

Long term

- **Vessels:** Existing vessel will be converted to hybrid-electric propulsion in 2031.
- **Service enhancements:** Add one additional roundtrip per day.
- **Terminals:** Electrification to accommodate vessel plug-in planned in 2030.

Trestle and terminal building preservation projects are programmed for Point Defiance in the medium to long term. At Tahlequah, trestle preservation projects are programmed in the long term.

Edmonds/Kingston

Improvements to the Edmonds/Kingston route include:

Medium term

- **Vessels:** One of the two service vessels, the *Puyallup* will be converted to hybrid-electric conversion and will operate all-electric in 2023.
- **Service enhancements:** None are proposed in this timeframe.
- **Terminals:** Vessel plug-in capabilities at both the Edmonds and Kingston terminals are planned by 2022.

Preservation projects are planned for the trestle, bridge, landing aids and restrooms at Kingston from 2019 to 2027. Preservation is also planned at the Edmonds terminal in the medium term.

Long term

Scenario A

- **Vessels:** Replace two existing (202-car and 188-car) vessels with three hybrid-electric propulsion vessels to operate all-electric 144-car vessels in 2031, 2032 and 2033.
- **Service enhancements:** Increase service frequency to 30-minute headways, served with three vessels.
- **Terminals:** Edmonds multimodal terminal improvements are proposed in the long term.
Additionally, preservation is planned for the Kingston terminal in the long term.

Scenario B

- **Vessel capacity modifications:** Replace the two existing vessels with two 202-car capacity hybrid-electric vessels.
- **Service enhancements:** No change proposed.
- **Terminals:** No change from Scenario A.

Mukilteo/Clinton

Improvements recommended for the Mukilteo/Clinton route include:

Medium term

- **Vessels:** None are proposed in this timeframe. In 2019, the route will experience vessel replacement, which will increase vehicle capacity.
- **Service enhancements:** in 2019, vessel replacement will increase vehicle capacity on the route, expanding from 124-car capacity to 144-car capacity during the peak season. No additional enhancements are proposed in this timeframe.
- **Terminals:** Construction of overhead loading is proposed at the Clinton terminal in the 2025-2027 biennium. Expansion of park and ride facility is proposed in 2027-2029.

The new Mukilteo terminal is expected to be operational by 2020.

Long term

- **Vessels:** Replace the two existing 144-vehicle diesel vessels during the peak season and one 144-car and one 124-car Issaquah Class vessel during the off peak season with two 144-car capacity hybrid-electric propulsion vessels year round, to operate all-electric in 2034 and 2035.
- **Service enhancements:** Increased off-peak season capacity due to vessel assignment.

-
- **Terminals:** Installation of utility infrastructure to support all-electric vessels is planned for 2034 at the Clinton and Mukilteo terminals.

Port Townsend/Coupeville

The Port Townsend/Coupeville route improvements include:

Medium term

- **Vessels:** None are proposed in this timeframe. The addition of one summer round trip is proposed in 2020.
- **Service enhancements:** None are proposed in this timeframe.
- **Terminals:** No additional improvements are proposed in the Plan. Preservation projects associated with the trestle and bridge structures at Port Townsend are planned for the 2027-2029 biennium.

Long term

- **Vessels:** Convert the existing vessels to hybrid-electric propulsion to operate all-electric in 2032 and 2033.
- **Service enhancements:** Add service hours and extend the spring season in 2028.
- **Terminals:** Terminal electrification improvements are planned for 2031 at the Port Townsend and Coupeville terminals to support hybrid-electric vessels.

Anacortes/San Juan Islands

The Anacortes/San Juan Islands route includes the following improvements:

Medium term

- **Vessels:** Two of the vessels serving this route will be retired and replaced with two hybrid-electric, international certified (SOLAS) Olympic Class vessels (144-car) in 2022 and 2023.
- **Service hour enhancements:** None are proposed in the medium term.
- **Terminals:** Terminal electrification is planned at Orcas Island, Friday Harbor and Anacortes in 2022. Construction of a new terminal building at Anacortes and expansion of vehicle holding at Lopez Island to accommodate reservations is planned for the 2025-2027 biennium. Construction of overhead loading and converting second slip at Friday Harbor is planned for the 2025-2027 biennium.

Preservation of the trestle and bridge structures at Orcas and Lopez Island is planned in the medium term.

Long term

- **Vessels:** Replace the 90-car capacity vessel with a 114-car capacity all-electric vessel in 2036. Then replace two additional vessels with 144-car capacity hybrid-electric vessels in 2037.
- **Service enhancements:** Extend the summer service schedule into May and October in 2028 and then make winter enhancements in 2033, adding an additional 2,160 hours. Restore weekend interisland service in 2033 in the winter season for an additional 480 service hours. This increase in service hours also represents opportunity to restore winter service to Sidney (cut in 2005), but is not currently included in this Plan operating costs and recommendations.
- **Terminals:** No additional improvements are proposed in the Plan.

Preservation of the trestle and transfer span structures at Orcas Island continue in the long term. Additional preservation occurs at Shaw and Lopez in the long term.

Anacortes/Sidney, B.C.

Improvements to the Anacortes/Sidney, B.C. route include:

Medium term

- **Vessels:** See Anacortes/San Juan Islands vessel program.
- **Service enhancements:** None are proposed in the medium term.
- **Terminals:** Construction of a new terminal building at Anacortes is planned for the 2025-2027 biennium.

Long term

- **Vessels:** See Anacortes/San Juan Islands vessel program.
- **Service enhancements:** Expand summer service into May and October in 2028.
- **Terminals:** None are planned for this timeframe.

2040 financial outlook

Capital program costs

To accomplish its goals, the Plan proposes new investments that are not currently included in WSF's 16-year capital improvement and preservation plan for fiscal year (FY) 2018 through FY 2033. Washington State agencies prepare a capital investment plan to support decision making about how to allocate limited funding. The WSF capital improvement and preservation plan is reviewed each biennium, with investments projected out 16 years. The costs identified in these plans are based on comprehensive information about an asset's condition and replacement needs.

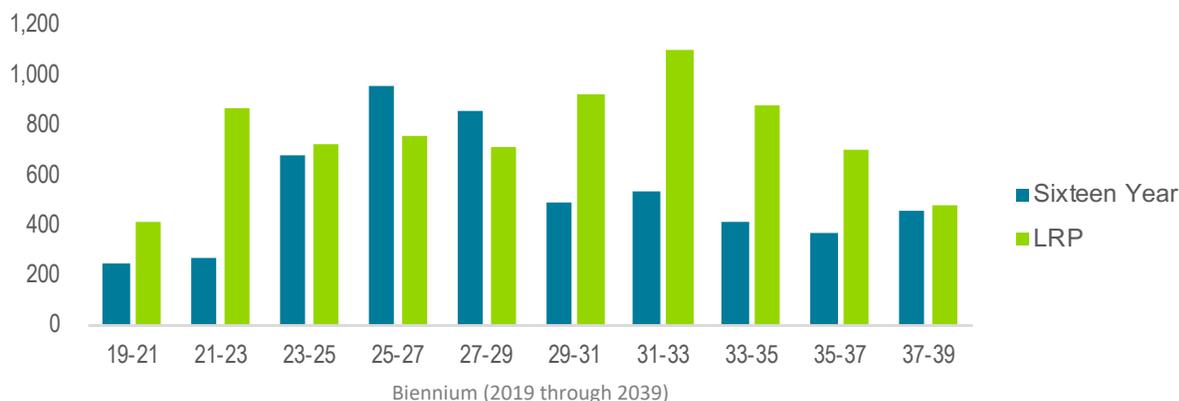
Using the information in the 16-year plan, the state Legislature allocates funding for the first six years of the plan. In most cases, the funding allocated does not fully meet the projected need. This trend can be observed in the charts below; investments appear lower in the remaining four years of the six years (biennium 2019-2021 and 2021-2023), suppressed by available funding, and are higher after this timeframe when spending is not constrained to existing sources.

The current 16-year improvement and preservation plan, projected out to 2040, identifies investments of \$5.3 billion in vessels, terminal and technology improvements over the next 20 years. This 2040 Long Range Plan includes these costs and adds further investments where the current 16-year plan level of investment is not enough to meet the reliability, customer experience, growth management and sustainability needs of the system. Total capital investments outlined in this Plan are \$7.6 billion.

The greatest capital investment and difference from the current 16-year plan to the investment proposed in this Plan is new vessel construction. The Plan looks past the current 16-year plan, whose planning horizon ends in 2033. The 2040 Plan proposes six additional vessels above the current 16-year plan estimates. The six additional vessels include three for the service and maintenance relief pool, one to support a three-vessel service plan on the Edmonds/Kingston route, and two to begin replacing the Issaquah Class vessels at approximately 50 years of age. This comparison is shown in the chart on the next page.

The investments proposed in the Plan over the 20-year planning horizon ramp up quickly

Comparison of 16-year and Long Range Plan investment levels (\$ in millions)



in the next few years due to the immediate need of new vessels to sustain reliable service. This investment in vessel replacement and terminal and technology enhancements continues until the end of the planning period.

Near term (2019-2021)

At nearly \$410 million, investments in the first biennium of the planning horizon are 60 percent higher than the level identified in the current 16-year capital plan. Initiation of the vessel electrification program will begin with the first of three Jumbo Mark II Class vessels, the *Tacoma*, serving the Bainbridge Island and Seattle terminals. Technology improvements to improve customer experience and information account for \$3.5 million of investments.

Medium term (2022-2027)

During this time period, electrification of the remaining two Jumbo Mark II Class vessels will continue, along with installation of the terminal charging infrastructure to support the vessel electrification at the Eagle Harbor Maintenance Facility, Edmonds, Kingston, Bremerton, Fauntleroy, Vashon, Southworth, Anacortes and three interisland terminals. The five new Olympic Class vessel will be built and construction will begin for the first of the new 124-car capacity vessels, which will replace the retired Issaquah Class vessels.

Over the six-year, medium-term period, total planned capital investment, including preservation and improvements, is projected at \$2.4 billion. Technology improvements, to improve ticketing and reservation systems, among other preservation costs, amount to \$39.3 million of investments.

Long term (2028-2040)

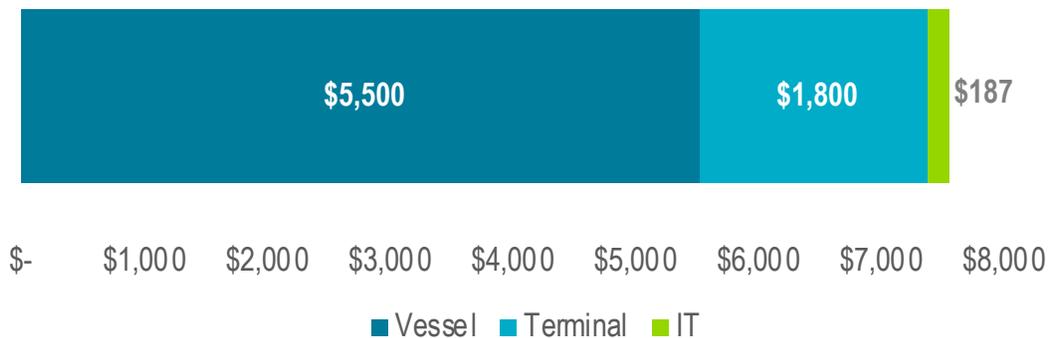
By 2028, the new vessel construction program will be complete. Four 124-car capacity vessels, six new 144-car vessels and one 114-vehicle vessel will be delivered within this timeframe. The electrification program will also be complete with conversion of the three Kwa-di Tabil Class vessels and installation of shoreside charging infrastructure for the final six terminals. Nearly \$4.8 billion will be invested during this period. Technology improvements, to improve fare collection and customer information, amount to \$144.4 million of investments.

Capital investments

The capital investments to implement this 2040 Plan can be classified into three primary categories: vessels, terminals and IT. The costs associated with these three types of investments encompass environmental review, design, construction, construction management and program support. As noted above, capital investment for the 20-year period totals \$7.6 billion. New vessel construction and preservation of existing vessels accounts for the largest investment at nearly \$5.5 billion, or 73 percent of the total investment. Terminals accounts for 25 percent of the total at approximately \$1.8 billion. Electrification of terminals accounts for \$175.6 million of total terminal investments. Improvements in IT account for 2 percent of total investment, at \$187 million over the 20-year planning horizon. The graphic below shows this breakdown of investment needs over the 20-year planning period.

The costs and funding shown over time are escalated to account for inflation and predicted revenue growth.*

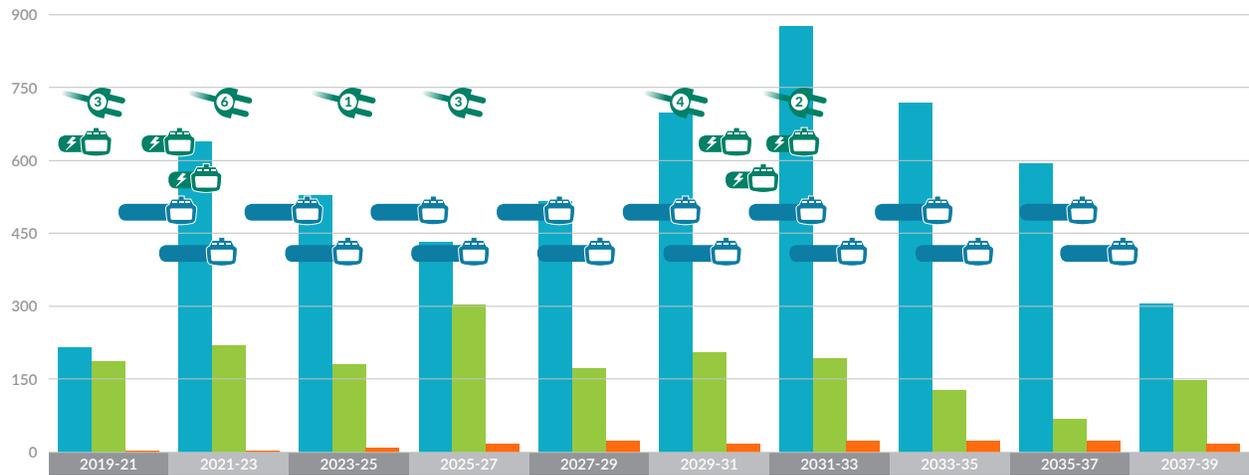
2040 Plan capital investments (\$ in millions)



*Expenditures inflated annually at predicted price escalation rates. Annual price escalation is on average about 2 percent over the planning period.

Capital costs are outlined below, with vessel delivery, electrification and terminal projects identified by biennium.

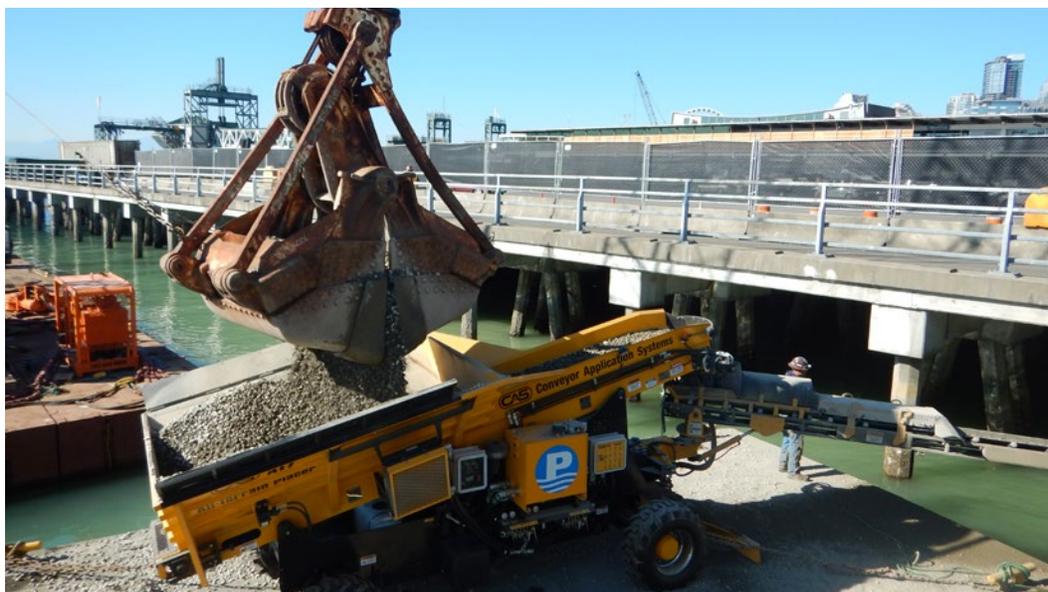
Capital investments (\$ in millions)



KEY:

Preservation and improvement dollars:

- Vessels
- Terminals
- Information Technology
- Vessel Electrified
- Terminal Electrified
- Vessel Built



Vessels

A major focus of the Plan is new vessel construction to replace retiring vessels and build the relief vessel capacity required to promote reliable service. The Plan recommends the construction of 16 new vessels with delivery between 2022 and 2037 and electric conversion of six existing vessels:

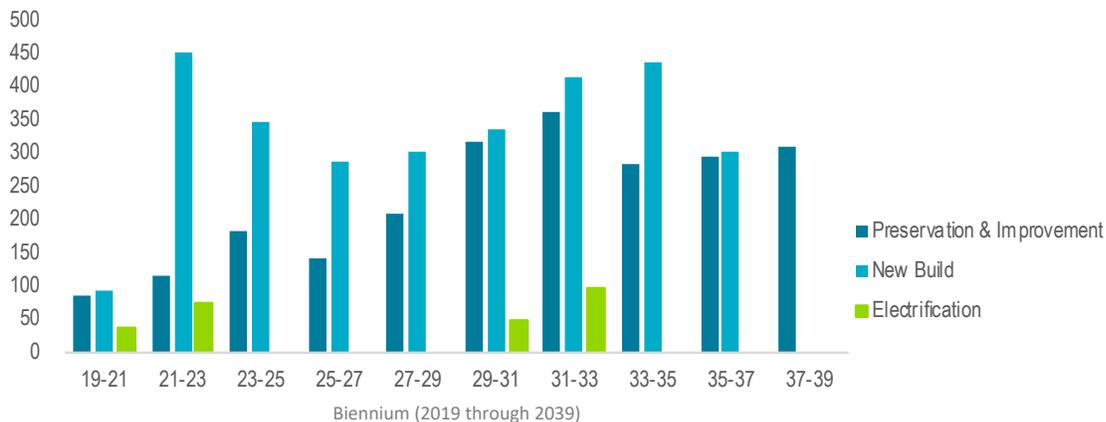
- Five new Olympic Class vessels (144-vehicle capacity).
- Four new 124-car capacity vessels.
- Seven new 144-car capacity vessels.
- Three hybrid conversions (Jumbo Mark II Class).
- Three hybrid conversions and propulsion system upgrades (Kwa-di Tabil Class).
- The modification of four existing vessels to carry additional passengers.

All new constructed vessels would rely on hybrid-electric propulsion and would operate at either full electric power—or on routes where the distances are too great, hybrid electric propulsion. As discussed further in the operating costs section, electric or hybrid-electric operations will reduce the reliance on diesel fuel and produce fuel savings over the next 20 years.

The first step in vessel investment is the proposed extension of the Olympic Class contract to build five new vessels by 2026. The vessel capital investment needs grow quickly in the 2021-2023 biennium to support this proposal. As the final Olympic Class vessel is delivered, construction would begin on the four new 124-car capacity vessels between 2026 and 2030, followed by seven 144-car capacity vessels by 2037.

Preservation and improvement investments rise as the remaining fleet ages and more vessels approach either mid-life refurbishment or retirement. New vessel investment needs start to decrease in 2035 once the replacement program is completed. These investments will increase the size of the fleet from the current 22 to 26, allowing an additional vessel to be deployed in regular service (on the Edmonds/Kingston route) and increasing the relief fleet to enhance reliability through both planned and unplanned service disruptions. The new vessel investments are shown graphically on the next page, along with the planned preservation and conversion of remaining fleet to hybrid-electric propulsion.

Vessel capital investment (\$ in millions)



In addition to new vessels, the Plan also identifies costs required to preserve and improve the fleet as prescribed in the life cycle cost model. This model is an estimation tool used to project maintenance costs over time. Currently, the fleet size is so low that WSF is not able to perform all the maintenance required and projected. By 2040, with the investments identified in this Plan, each vessel will have the out-of-service time needed to maintain and preserve its systems. Once this time is available and utilized, WSF can work toward extending the life of vessels to the planned 60-year life expectancy.

Terminals

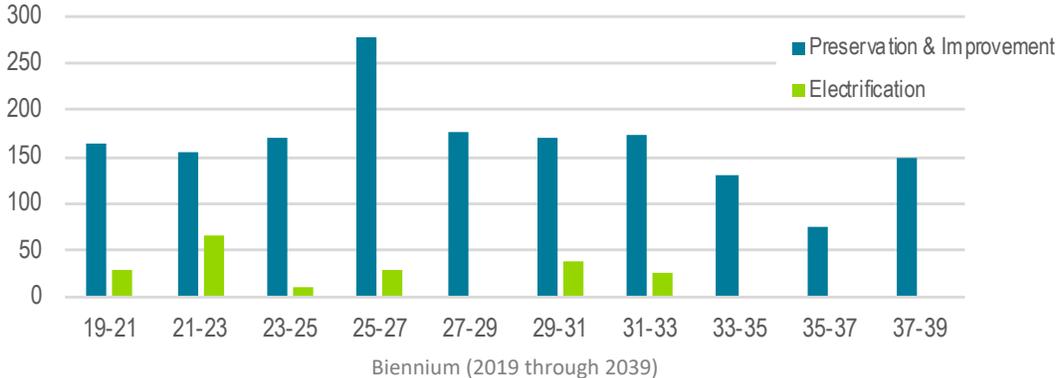
The Plan recommends investment in terminal infrastructure to support electrification of the fleet, improve passenger and vessel queuing and loading, and accommodate expansion of the reservation system to additional routes. The investment category of Terminals also includes the Eagle Harbor Maintenance Facility, which plays a critical role in the reliability of the system. The terminal investments in the Plan include:

- Modification of 18 terminals and Eagle Harbor to support hybrid-electric vessels.
- Enhancements of passenger processing at six terminals.
- Enhancements of vehicle queuing and loading at three terminals.
- Expansion and enhancement of holding lanes to accommodate reservations at one terminal.

The investment Plan also identifies costs required to preserve and improve the fleet as prescribed in the asset management model for terminals. This model is an estimation tool used to project maintenance and preservation costs over time. This includes costs for in-water and landside work to replace aging assets such as piles used to aid in landing, paving of loading areas, painting and other maintenance needs.

Terminal capital investments for preservation and improvements stay relatively constant over the next 20 years, with a small decrease in the near term due to the completion of two major terminal projects at Mukilteo and Colman Dock. Preservation and improvement costs become less detailed over time and are expected to remain somewhat constant. The Plan terminal investments over the planning horizon are shown in the chart below.

Terminal capital investment (\$ in millions)



Information technology

Investments in information technology (IT) are recommended to expand or replace the existing core systems and to respond to evolving advancements and customer needs and expectations. Key projects include:

- Next-generation ticketing and reservation system including next generation of *Good To Go!* fare payment.
- Next generation regional fare integration (ORCA).
- Terminal queue detection and wait times.
- Automated passenger counting.
- Real-time information systems.

Overall the Plan calls for a capital investment in IT of nearly \$190 million over the 20-year planning period.

Capital program funding

Funding for WSF's capital program comes from a combination of sources. Many of these funding sources are statutorily defined, such as distributions from the state's fuel tax, periodic special transportation funding packages such as the 2015 Connecting Washington package, transfers from other state transportation accounts, and federal grant programs. Known revenue sources to WSF for capital investment fall far short of the identified need. Over the 20-year planning horizon, predictable funding is estimated to total nearly \$1.3 billion. This predictable funding is more than \$6 billion short of the \$7.6 billion in capital investments called for in this 2040 Plan.

Twenty-year projected capital funding sources (\$ in millions)

Federal funds	793
Local funds	1
Fuel tax distribution	402
Connecting Washington	98
Transportation Partnership	23
Treasury earnings	1
Less debt service	(34)
	\$ 1,284

Historically the legislature has provided additional funding for WSF's capital program through transfers from existing broad purpose transportation revenue accounts and through special funding packages. Two past transportation funding initiatives, Transportation Partnership (2005) and Connecting Washington (2015), while not sufficient to cover all future capital investment requirement, are anticipated to fund some level of WSF's capital requirements beyond the current biennium. Although an additional special funding package was not assumed in the financial outlook of this Plan, it is possible that WSF could benefit from this type of funding source in the future.

Operations

WSF is a major component of the state's transportation system, expending hundreds of millions of dollars each year to provide critical public transportation across the Puget Sound. Operating costs, like most public transportation systems, are subsidized, with fare revenues accounting for a large portion of operating costs. Fares and other operating revenues currently recover more than 75 percent of the costs of operation. The remaining operating costs are funded through tax revenues. The Plan identifies capital improvements in vessel and terminal electrification that will reduce operating costs and service enhancements that will increase labor and energy requirements. The costs and revenues over time are escalated to represent inflation.

Operating costs

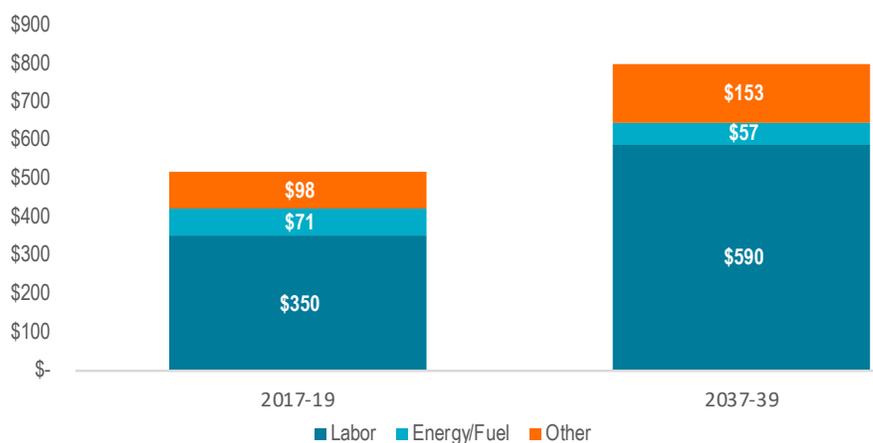
This Plan promotes operating strategies to sustain current service, manage growth, and enhance the customer experience while at the same time controlling or reducing costs. In addition to sustaining current service levels, the forecasted costs for the 20-year planning horizon include:

- Additional costs associated with the proposed service level enhancements.
- Costs of operating the expanded service and maintenance relief vessel pool.
- Expanded workforce development programs.
- Reduction and stabilization of energy costs due to fleet electrification.

Operating costs can be classified into three primary categories: labor, fuel/energy, and other operating expenses, such as insurance and other costs that directly relate to the number of staff and vessels in operation. These "other" operating costs change slightly due to the increase in fleet size from 22 vessels in the 2017-2019 biennium to 26 vessels in the 2037-2039 biennium. Another "other" operating cost is the leased office space for WSF headquarters in downtown Seattle. As part of this Plan, the Legislature instructed WSF to evaluate leased and state-owned property locations outside of downtown Seattle for its headquarters. This evaluation is underway as part of the Office of Financial Management's Six-Year Facilities Plan. Labor, which includes wages for vessel crew, engineering, maintenance, and administrative and management personnel, accounts for nearly 68 percent of operating expenditures the 2017-19 biennium. This trend continued over the planning horizon, accounting for nearly 74 percent of expenses in the 2037-2039 biennium.

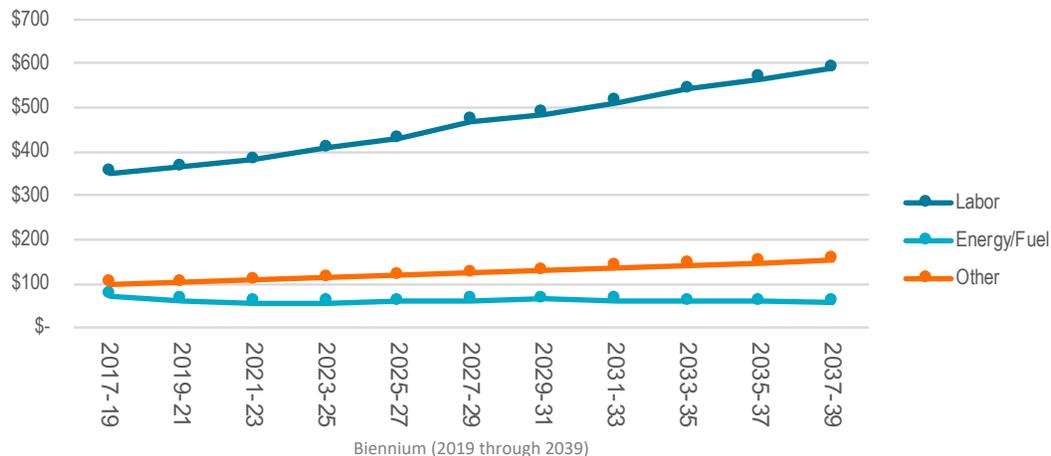
Energy and fuel expenditures will decrease due to the investments in electrification of terminals and new hybrid-electric fleet. This is a dramatic change from the past where fuel prices can be volatile. The operating costs today, as compared to 20 years from now, are shown in the graph comparison below. Although this is not an apples-to-apples comparison due to the cost inflation represented in these costs, it shows the general trends in the primary cost categories. What is notable is the decline of fuel/energy costs from today's condition to 20 years from now, even with a larger fleet and more service hours provided. This change results from the capital investments in electrification of vessels and terminals described earlier in this section and in more detail on the next page.

Operating expenditures for 2017-19 compared to 2037-39 (\$ in millions)



The proposed conversion to electric propulsion will lead to considerable cost efficiencies. Despite an increase in service hours of nearly 11 percent, the energy/fuel expenditures in the last biennium of the planning periods will be nearly 50 percent lower than what costs would be if all vessels continued to operate with full diesel propulsion. Labor is expected to increase at the highest rate, due to increased service hours proposed for 2028 and the increase of the relief fleet. WSF maintains a 24-hour engine room crew on vessels and that are in-service or in maintenance relief. Although labor costs increase, cost efficiencies associated with crewing requirements on new vessels as part of more cost-efficient vessel design have been factored into the operating costs of the future fleet. Other costs are expected to increase at a slow rate, and fuel and energy costs are projected to be overall less in 2040 than today. The graph on the next page shows these trends.

Operating expenditures FY 2020 - FY 2039*



*Expenditures inflated annually at predicted price escalation rates. Annual price escalation is on average about 2 percent over the planning period.

Near term

Labor costs are expected to grow at a slightly lower rate than inflation in the 2019-21 biennium due to the retirement of one maintenance relief vessel because the engine room crew assigned to that vessel will no longer be required. As stated above, this timeframe presents a high risk in service reliability due to the undersized fleet because of the limited availability of relief vessels to provide both planned and unplanned maintenance relief. Fuel/energy costs are expected to decrease during this period because of lower predicted fuel prices and the first electrification-related energy savings in 2021.

Medium term

Labor costs are expected to grow beginning in 2023 when the size of the relief vessel fleet increases. Fuel/energy costs will continue to decrease despite increases in the price of diesel because of the to completion of the Jumbo Mark II electrification project.

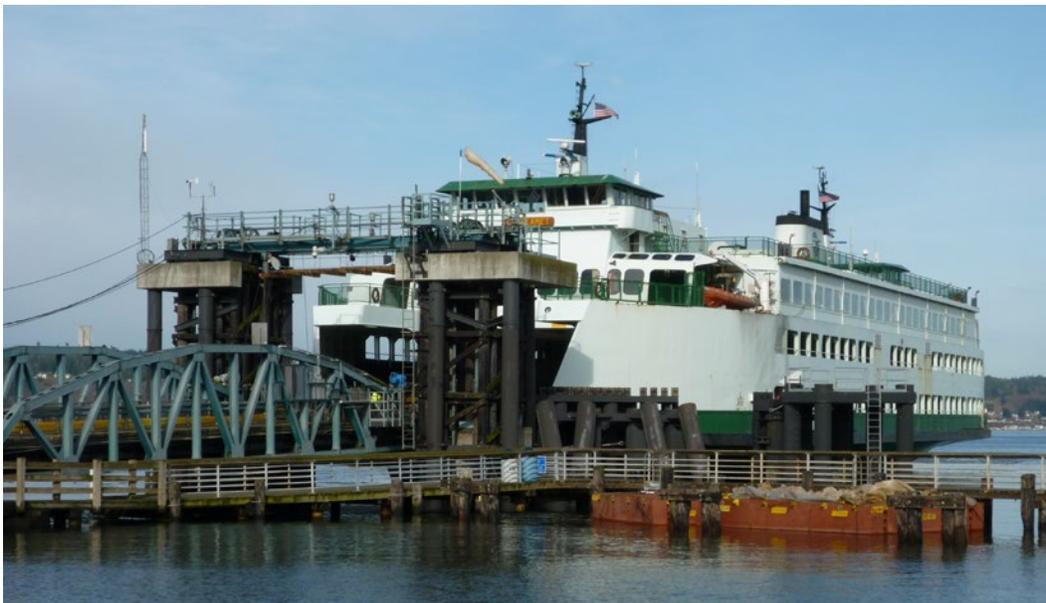
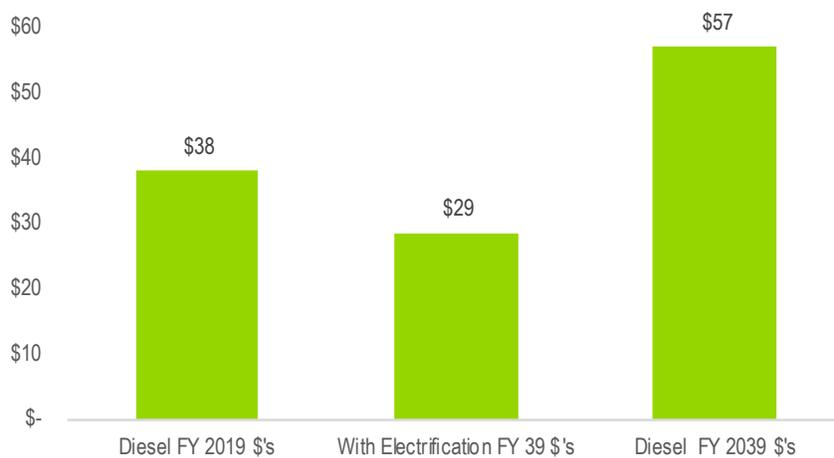
Long term

Labor costs are expected to continue to increase as the relief fleet grows and more engine rooms are staffed. Deck crew labor costs will grow first in 2024 as additional crew is added to support passenger capacity increases on two central sound routes. Once service hour increases are implemented on four routes in 2028 and again in 2033, 2035 and 2037 as the service hours on more routes are expanded. In 2033 the Edmonds/Kingston route will be served by three new 144-vehicle capacity vessels leading to increases in both deck and engine room labor costs. These costs will be offset to a small degree by fuel savings associated with the more fuel-efficient, electrically powered vessels.

Fuel/energy savings (green dividend)

The capital investment in electric propulsion leads to long-term fuel savings. The State estimates diesel cost over time. Although costs are relatively low today, they can be quite volatile and are projected to rise over time. Despite the expansion of service hours by 11 percent over the planning horizon, fuel/energy costs are expected to decrease by \$9 million or about 25 percent due to more efficient vessel deployment and increased reliance on electric propulsion. Without electrification, diesel fuel costs are estimated to grow nearly 50 percent by 2039.

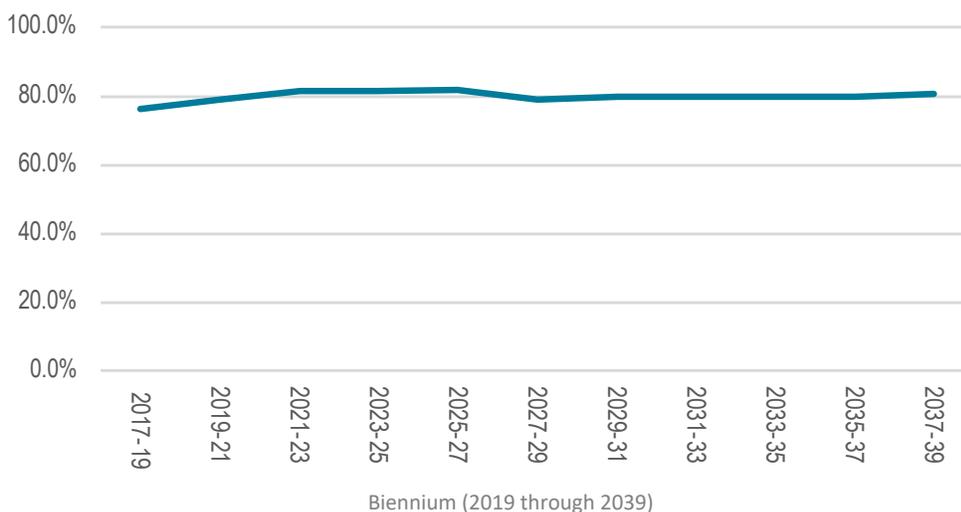
Cost of proposed service plan (\$ in millions)



Operating revenue

Currently, WSF recovers 76 percent of operating costs through fares and other operating revenues. This trend is projected to see a slight increase over the next 20 years. Farebox recovery is projected to be between 79 and 82 percent, which is above the range of what WSF has experienced over the past 20 years.

Projected operating revenue recovery



The operating revenue recovery ratio is expected to increase in the next biennium, 2019-21, to over 79 percent. This timeframe is the identified point of highest service reliability risk, when the fleet is down to 22 vessels total, and many will be close to retirement with heightened maintenance needs and not enough relief fleet to support this maintenance. This is also the period of time when maintenance and preservation needs grow and yet there are not enough vessels to allow this maintenance to occur while maintaining service reliability.

The operating revenue recovery is projected at 80 percent by the 2037-39 biennium. This timeframe is projected to bring high service reliability, a well-maintained fleet and increased service hours on many routes. This relates to a subsidy-level growth from \$124 million in 2017-2019 to \$158 million in 2037-2039. This projection takes into account anticipated growth of currently dedicated tax revenue, which is expected to generate \$5.5 billion over the 20-year period. The service level proposed in this Plan is estimated to cost more than \$6.5 billion over the 20-year period, leaving a shortfall of about \$378 million dollars.

Twenty year operating and tax revenue (\$ in millions)

Fares	4,433
Miscellaneous operating revenue	154
Gas tax distribution	599
License fees & permits	218
Federal funds	107
Local funds	2
	\$ 5,513

Financial overview

Like any transportation operator, WSF’s financial plans must address both the costs of ongoing operations and the level of investment required to build and preserve the required capital infrastructure. The financial overview below projects operating costs and capital investment embodied in the Plan along with anticipated revenues over the 20-year planning horizon.

As noted earlier, historically the Legislature has appropriated additional revenues to cover the shortfall between dedicated WSF revenues and WSF operating and capital funding needs. The financial overview identifies those short falls by biennium and cumulatively. Over the 20-year planning horizon, WSF’s total funding needs exceed dedicated revenue by a combined capital and operating amount of \$6.7 billion.

Funding capital investments (\$ in millions)



Funding operations (\$ in millions)



The Plan's proposed capital investments will benefit the ferry system through both improving reliability and constraining operating cost growth, or in the case of fuel/energy, reducing operating costs. Investment in electric propulsion for vessels and terminals allows WSF to realize operating expenses savings as early as 2021. Expansion of the fleet will allow WSF to stop the current decline in the condition of the fleet, improve reliability and support service level enhancements to meet rider demand and grow ridership.

Improving reliability and enhancing service levels will cause operating costs to grow, primarily through increased fleet labor costs. Operating revenue recovery ratios are projected to increase over the next 20 years and remain relatively consistent. The Plan makes no recommendations about fare structure or fare levels but assumes fares will increase at approximately the rate of inflation.

Conclusion

As the nation's largest ferry system, Washington State Ferries has become as iconic as the majestic waterways and landscapes it sails through. More than just a transportation system, the ferries mean many things to many people: a scenic ride to work or school, a popular attraction for sightseeing visitors, a critical connection to health and wellbeing, or a fundamental link to economic prosperity. In addition, WSF has a long history of community service and an impeccable safety record that make the system a model for ferry operators around the globe.

However, shifting demographics—including explosive growth in Washington state and the increasing popularity of the ferry system—presents WSF with many challenges to overcome. A large number of WSF's skilled maritime workforce is retiring. Past prioritization of maintaining service over maintaining vessels is catching up to the ferry fleet, and WSF finds itself unable to meet the growing demand for its services. Service disruptions are growing more common as WSF assets age and are pushed to their limits. In addition, WSF's diesel fuel consumption makes it the largest generator of carbon and other greenhouse gas emissions within the state transportation system.

The 2040 Long Range Plan suggests several strategies to address these challenges. Similar to WSF's 2009 Long Range Plan, the 2040 Plan identifies tools and strategies to manage demand and encourage the spread of ridership across non-peak travel times. However, the 2040 Plan focuses on first stabilizing WSF's fleet and service reliability. The Plan also emphasizes WSF's need to improve the customer experience through better technology, multimodal connections, and accessibility. Last but not least, the Plan calls for WSF to invest in a sustainable, resilient infrastructure and reduce the system's effects on the environment.

Although implementing the 2040 Plan will require the approval of and investment from Washington's leaders in Olympia, the benefits of a vibrant, reliable ferry system will be felt across the state. In addition to people and goods moving more freely across our waterways, there will be less traffic congestion in idyllic ferry communities, cleaner air and healthier marine life on our coasts, a more seismically sound transportation infrastructure—and most of all, a consistent, reliable transportation network that contributes to Washingtonians' economic health and quality of life for the next 20 years and beyond.



Washington State Ferries