



Washington State Ferries 2040 Long Range Plan

Reliable service



Customer experience



Manage growth



Sustainability and resilience



January 2019

January 2, 2019

Secretary of the Senate
PO Box 40482
Olympia, WA 98504-0482

Chief Clerk of the House
PO Box 40600
Olympia, WA 98504-0600

Dear Members of the Washington State Senate and House of Representatives:

On behalf of the Washington State Department of Transportation (WSDOT), I am pleased to present to you the Washington State Ferries 2040 Long Range Plan. Updated once a decade, WSF's long-range plan provides a blueprint to guide WSF's investments and service for the next 20 years while considering the changing needs of ferry system users and associated funding opportunities and challenges.

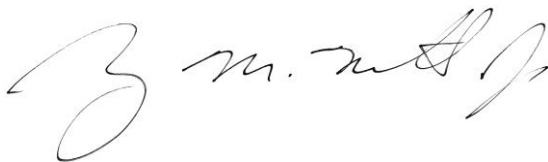
WSF's Long Range Plan exemplifies WSDOT's Strategic Plan goals of Inclusion, Practical Solutions, and Workforce Development. First and foremost, it is the reflection of an extensive, robust engagement of ferry riders, community members, government agencies and officials, Ferry Advisory Committees, businesses, transit partners, and others—more than 7,000 participants weighed in at open houses, online forums, and on multiple advisory groups to help shape the plan.

In addition, where Practical Solutions allows us to leverage our limited resources to get the most capacity and safety out of the ferry system, WSF proposes several recommendations for improving reliability, enhancing multimodal connections, and making modest increases to capacity on the system's most congested routes. It also recommends strategies for bolstering its workforce at a time when the agency faces unprecedented retirement rates of highly skilled employees.

The Plan is organized around four themes that emerged from the community engagement process: reliable service, the customer experience, managing growth, and sustainability and resilience. While a sizable focus of the Plan is centered on stabilizing an aging ferry fleet and needed investments in new, greener vessels through electrification, it also suggests several ways to modernize and enhance the customer experience through technology, transportation demand management solutions, and increased multimodal connections.

WSF is committed to using the plan as a roadmap for the future and will be continually reviewing its progress and evaluating its goals and objectives. I look forward to your feedback on the Plan and working with you to make the Plan's vision a reality for the 25 million users who ride the state's ferry system each year.

Sincerely,



Roger Millar, PE, AICP
Secretary of Transportation

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Executive summary

Reliable service 

Customer experience 

Manage growth 

Sustainability and resilience 

Washington State Ferries' (WSF) ridership is expected to grow more than 30 percent by 2040, climbing to nearly 32 million passengers a year. However, WSF feels the pressure of this phenomenal growth today, as it struggles to meet demand with an overburdened fleet and aging infrastructure. The 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 an aging population requires more special transportation services. All of these factors compound the challenge of WSF's aging fleet and retiring workforce, which have led to service disruptions and decreased reliability.

At the same time, advances in technology present opportunities for WSF's customers to access more up-to-date information about the ferry system and connect with the rest of the region's transportation network in innovative new ways. For example, many ferry customers are already able to plan trips and pay for tickets via smartphone apps and other tools, which allows them to make a more seamless door-to-door trip. WSF must seize on opportunities for technology to play a 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 agency should continue to invest in shoring up vulnerable assets and contingency planning for the key role it plays in the inevitable emergency.

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 **24.5 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 (BC).

Every day, WSF ferries carry thousands of commuters, recreational travelers, 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. The ferry system brings **economic opportunities** to island communities through tourism and trade, and provides a **critical lifeline** to island residents who need medical services on the mainland.

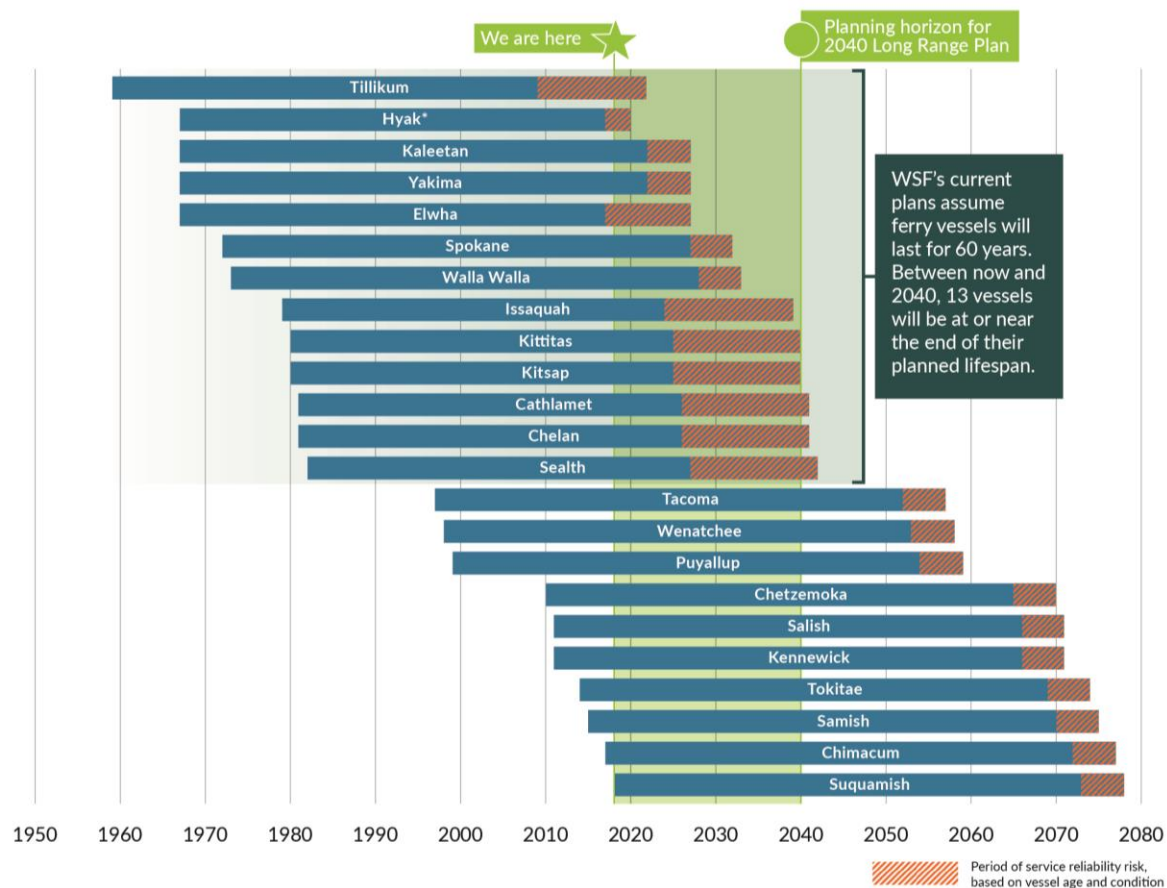
The 2040 Long Range Plan (the Plan) identifies opportunities and challenges and then recommends near-, medium- and long-term actions for WSF to pursue to address opportunities and challenges within the context of Washington State Department of Transportation (WSDOT) goals of inclusion, practical solutions and workforce development. These recommendations provide 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. The last Long Range Plan was completed in 2009 and in the midst of the Great Recession. Since then, ridership has grown and technology has continued to evolve. A new guide for future service needs and investments in vessels, terminals, technology and workforce development is needed. This Plan provides that blueprint for WSF to meet customer needs and accommodate the next generation of ferry riders.

Successful implementation of this 2040 vision will depend on a coordinated set of investments in WSF's fleet, terminal infrastructure, workforce and technology over the next 20 years—with a focus on building a reliable fleet that has a lighter footprint on the environment and outperforms CO₂ reduction targets. This electric-hybrid propulsion fleet will also cost less to operate. In addition, WSF's retiring vessels should be replaced with those that are strategically designed to more easily accommodate growing ridership, with flexible passenger and car-deck space to better serve the particular demands of a route. A more efficient fleet needs to be supported by resilient terminals that support vessel charging infrastructure, enhanced technology for efficient fare collection, and better access to transit and other modes of transportation. The WSF workforce must be further strengthened with more active recruitment, development, and retention.



Over the next 20 years, 13 of Washington's ferries will need to be replaced. Additionally, an increased number of relief or "standby" vessels are required to ensure reliable service and adequate time for vessel maintenance and preservation to keep ferries operating for up to 50 and 60 years, depending on the condition of the vessel. In addition to the need for more relief vessels to ensure the fleet receives the maintenance time it needs, over half of the fleet will be retired over the next 20 years. The graphic below depicts the aging vessels which make up the current WSF fleet.

Vessel retirement outlook



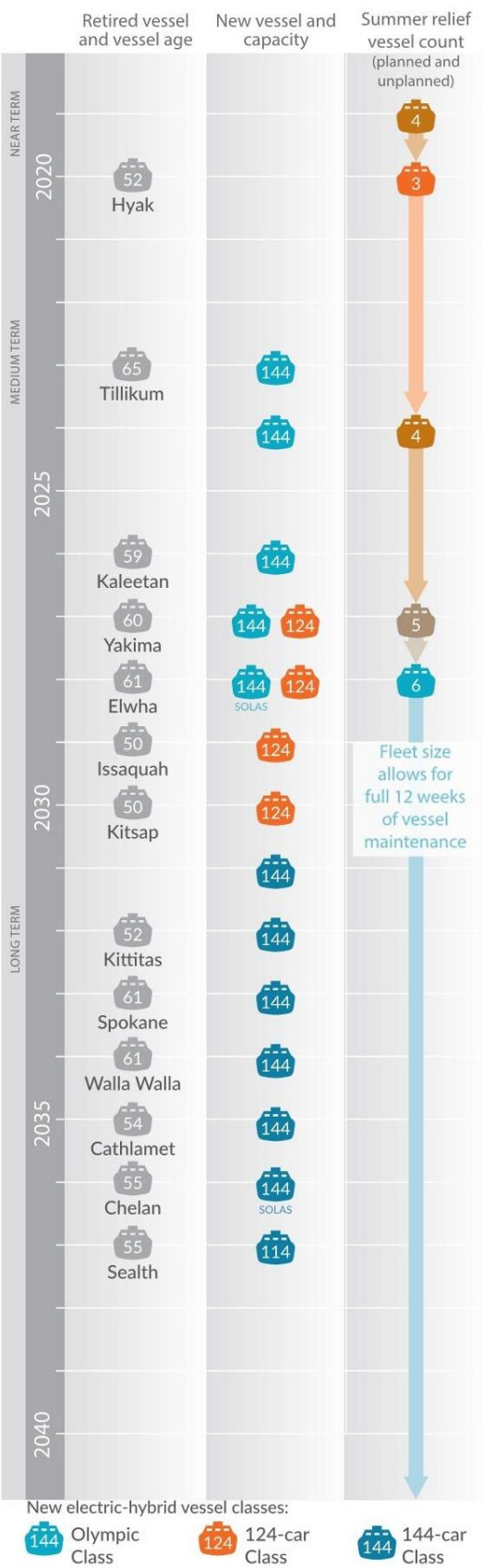
*The *Hyak* did not have a midlife refurbishment. Currently, capital and operating budgets identify retirement of this vessel in mid-2019. This Plan calls for the *Hyak* to be retired in 2020.

WSF recommends building 16 new vessels over the next 20 years to keep pace with an aging fleet and ensure necessary relief vessels to maintain reliable service. As the graphic to the right shows, the first five vessels would be delivered as soon as possible (estimated delivery 2022 to 2028) through the extension of an existing Olympic Class vessel construction contract. An additional 11 vessels would require additional industry investment and would be delivered every year from 2027 to 2038.

By 2040, the WSF fleet would consist of 26 vessels, three more than the current fleet, including a larger relief fleet and additional service vessels, as illustrated on the fleet composition graphic to the right.

This coordinated set of investments will stabilize the WSF system, allow WSF to maintain its current baseline service, and implement a very modest growth in service capacity. It is worth noting that this Plan as presented will not fully meet the demand for ferry service that is projected. Rather, it is a fiscally prudent and realistic look at what is required to keep this important state asset healthy and viable for the next two decades.

The consequences of not implementing the Plan—either not funding the full range of investments or not implementing various recommendations—would likely result in a degradation of ferry service, with WSF postponing much-needed capital improvements and making difficult choices to reduce or eliminate some service altogether. Not only would vessel maintenance suffer, but terminals would also be left vulnerable to the ravages of old age and seismic activity. The public would experience longer queues at terminals and more frequent cancellations, while congestion on roadways would increase.

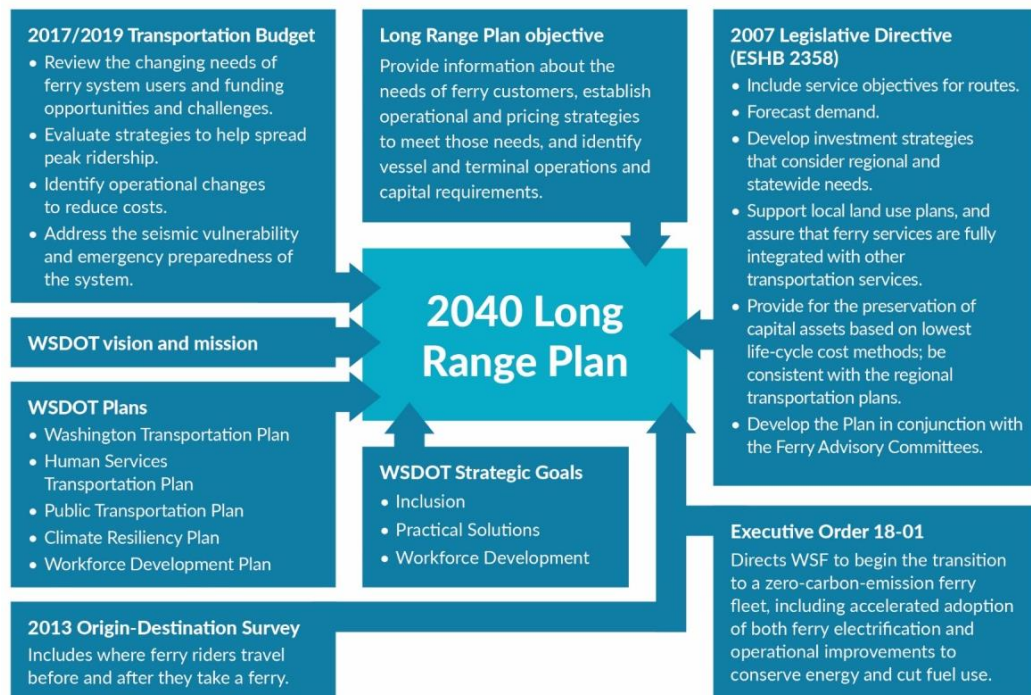


2040 Plan development and key themes

The Plan is not merely for the long term. It presents a series of investments for near-term, medium-term and long-term actions to both stabilize the ferry system and respond to forecasted growth.

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

Development of the Plan started in 2017 by identifying issues and priorities through community and stakeholder engagement. The scope and areas of emphasis in the Plan were shaped by several pieces of legislation and policies, including:



In addition to hosting public meetings and online open houses, WSF convened three advisory groups, whose members included:

- Ferry Advisory Committee (FAC) members
- Local, regional, state and transit agencies
- Tribal representatives
- Emergency service providers
- Special user groups (customers with disabilities)
- Bicycle, transit and pedestrian groups
- U.S. Coast Guard representatives
- Business and tourism interests, including major employers and freight interests
- Elected and appointed officials
- Local public works and planning staff

WSF heard a broad range of concerns, questions, and advice from meetings with advisory groups—which were ongoing throughout the planning process—and through extensive public outreach in the spring and fall of 2018. Four clear themes emerged from the community engagement process, and the Plan is organized around them.



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 address maintenance needs for its vessels before expanding service.

Investment and implementation

WSF's priority in the near and medium term is to invest in the reliability of the system through the construction of new maintenance and service 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 through technology investments that provide opportunities for customers to plan for and complete their ferry trip and make multimodal connections more easily.

The medium- and long-term actions outlined in the Plan focus on easing congestion and increasing system capacity for both cars and passengers, while improving the customer experience through additional technology and terminal improvements. WSF will accomplish this goal with service enhancements throughout the system, continued vessel replacements, and continued terminal and information technology infrastructure investments. Although WSF proposes the addition of limited service hours to routes before 2028, it recommends applying strategies to promote mode-shift, spread peak ridership, and streamline operations throughout the planning timeframe from 2019 to 2040.

The investment needs accompanying the Plan have been carefully conceived to meet WSDOT's strategic goals:

Inclusion: Strengthen commitment to diversity and engagement in all of WSDOT's business processes, functions and services to ensure every voice is heard.

Practical Solutions: Prioritize innovative, timely and cost-effective decisions, with our partners, to operate, maintain, plan and build our multimodal transportation system.

Workforce Development: Be an employer of choice, creating a modern workforce while attracting and retaining quality workers to deliver our legislative, regulatory and service requirements.

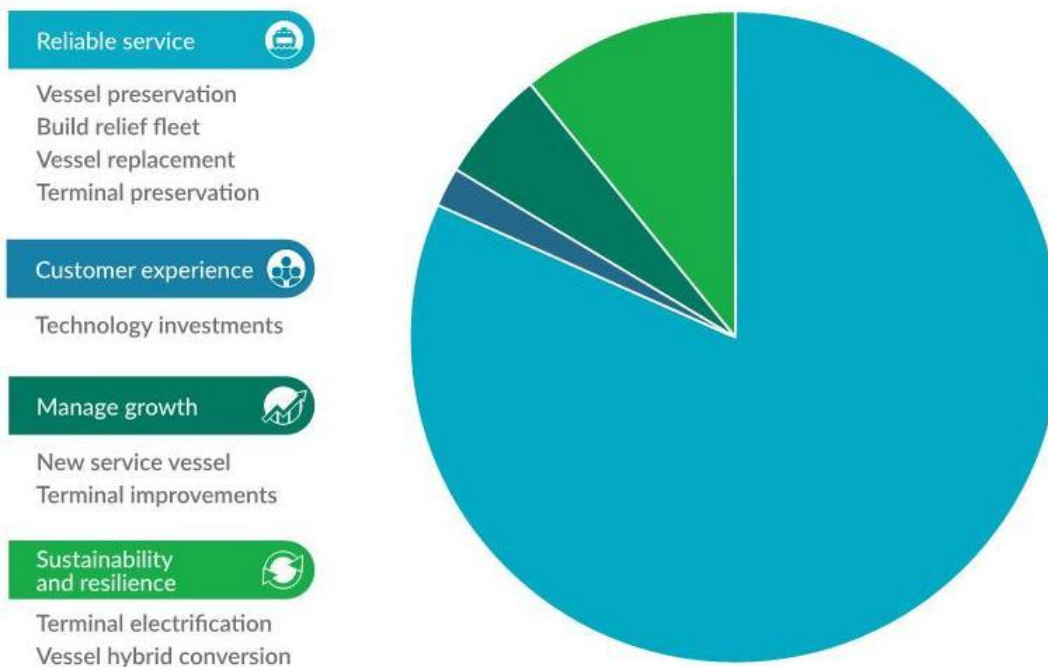
The graphic below represents the capital investments identified in the Plan by element. The majority of the capital expense is to maintain service reliability through the replacement and construction of service and relief vessels and the preservation of the fleet to fully support scheduled service. Terminal preservation projects also contribute to service reliability, as well as the technology infrastructure to support system operations.

Electric-hybrid propulsion and terminal electrification is the second highest capital expenditure of this roughly 20-year period. This investment will reduce carbon emissions from the fleet as early as the near term with the electric-hybrid conversion of the fleet's largest vessels, and continue to reduce emissions with the construction of new electric-hybrid vessels and the terminal charging infrastructure.

Capital investments to manage growth focus on moving more people. Vessel investments include the increase of passenger capacity on existing vessels and the addition of a service vessel on the Edmonds/Kingston route. Terminal infrastructure projects are also focused on moving passengers more efficiently.

Customer experience capital investments are focused around technology upgrades to support a better trip for the customer.

2040 Level of capital investment dollars by theme



2040 Plan cost and funding

WSF recommends a modest increase in service and operating costs, focusing on addressing congestion. Recommended capital investments are needed to renew the fleet and bring the ferry system to a state of good repair through 2040. Investments in the Plan are necessary to ensure system reliability and resilience, with the added benefit of increased operating efficiency.

This Plan is estimated to cost \$14.6 billion over the next 20 years. However, dedicated tax revenue and fare collection, which is projected to provide for nearly 80 percent of WSF’s operating costs in 2040, should cover \$7.7 billion of these costs. This level of fare revenue recovery is remarkable when compared to 20 and 30 percent recovery experienced by most transit operators around the State.

Funding capital investments (\$ in billions)



Funding operations (\$ in billions)



Historically the Legislature has appropriated additional revenues to cover the shortfall between dedicated WSF revenues and WSF funding needs. Over the 20-year planning horizon, WSF’s total funding needs exceed operating and dedicated revenue by a combined capital and operating amount of \$6.9 billion. Addressing the funding shortfall will entail consideration of new revenue sources, contracting procedures, and careful attention to all factors that drive system costs. Many of the steps needed to make this plan a reality will require action by the Legislature.

WSF’s proposed investments will improve reliability, increase operating efficiency while constraining operating costs, and respond to growing demand. The consequences of not investing in the system are dire, with vessels and terminals continuing to deteriorate without replacement and inevitable reductions in ferry service. The state’s transportation network, especially WSF’s customers and ferry-served communities, would suffer as a result.

To view the implementation plan in detail, as well as proposed service, vessel and terminal modifications by route, please refer to Section 7: Implementation, Investments, and Financial Overview.

2040 Plan recommendations

Replace and upgrade aging infrastructure

- Build new vessels to replace vessels that must be retired.
- 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

- WSF will electrify all terminals to serve electric-hybrid vessels, with the exceptions of Shaw and Lopez Islands and Sidney, BC.
- This investment will bring down fuel consumption and therefore reduce carbon emissions significantly over the 20-year planning horizon.

Add service hours

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

Increase capacity

Increase passenger capacity for:

- Seattle/Bainbridge Island
- Seattle/Bremerton

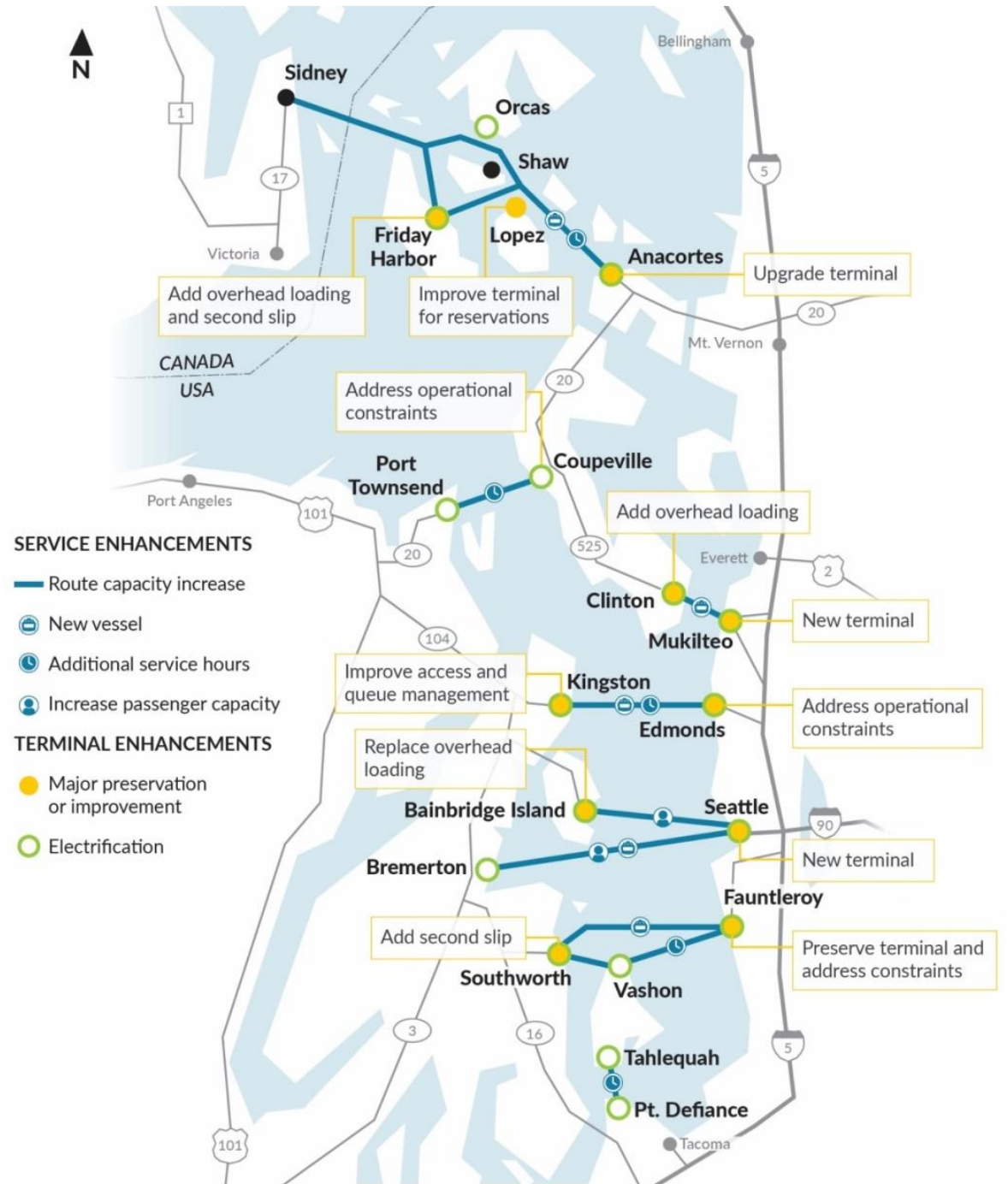
Increase vehicle capacity through new vessels serving:

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

Enhance customer experience

- Provide enhanced customer information
- Local and regional agency mobility plan coordination
- Continued partnership with passenger-only ferry operators

2040 Service and terminal enhancements



Recommendations by theme include:

Reliable service

Stabilize the system to maintain reliable service through 2040.

Vessels

- **Extend the open contract for Olympic Class vessels to build five new electric-hybrid vessels:** two to stabilize the fleet and three to replace vessels due to retire—the first five in a total of 16 new vessels.
- **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 every vessel in the fleet to achieve the 60-year life expectancy goal.
- **Invest in 11 additional new vessels** after the first five Olympic Class ferries to replace retiring vessels and support fleet maintenance needs, for a total construction of 16 new vessels.
- **Streamline the fleet composition** to realize enhanced efficiencies and redundancy.

Terminals

- **Plan for reliable terminal infrastructure** with seismic upgrade planning, a new terminal building in Anacortes, queuing space to accommodate reservations on Lopez Island, and the addition of a second slip at Southworth to support partnership with regional passenger-only service.
- **Monitor terminal maintenance trends** through 2040 to enable strategic decisions as it relates to future material use and maintenance needs in terminal projects.
- **Program terminal preservation projects** to support reliable service, such as projects to maintain operating efficiencies at Fauntleroy, Edmonds, Coupeville, Kingston and overhead loading facilities at Bainbridge Island and Friday Harbor.
- **Invest in the Eagle Harbor maintenance facility** to serve system needs through 2040.

Workforce

- **Establish a workforce development plan unique to maritime conditions.**
- **Retain skilled labor at the Eagle Harbor maintenance facility.**

Technology

- **Invest in technology to support management of vessel and terminal assets.**
- **Invest in technology that supports more reliable and efficient workforce deployment and communication.**



Customer experience

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

- 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 vessels and terminals to be flexible and adaptable** to emerging technologies and new transportation options.
- **Enhance parking opportunities for customers** that encourage walk-on ridership and carpooling.



Manage growth

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

- **Refine existing metrics and define new metrics** to monitor data for system planning and that prioritize the movement of people while improving the customer experience.
- **Maximize utilization of system capacity through adaptive management strategies** such as an expanded reservation system, an improved fare structure and fare collection methods, and others that increase efficiency, spread out demand, and prioritize walk-on and bicycle customers.
- **Increase system capacity with additional service hours** and by leveraging new vessel construction, terminal improvements and modifications to facilities.



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

Sustainability

- **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.
- **Reduce vehicle emissions** by optimizing terminal operational efficiencies and employing adaptive management strategies that spread out peak demand and minimize wait times.
- **Highlight sustainability through organizational structure, decision-making, and reporting.**

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.
- **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 spare vessels to support regional emergency response** and consider designing new vessels with emergency side-loading capabilities.
- **Invest in updated communication technology** to provide enhanced response capabilities.

Summary and next steps

WSF plays a vital role in the economic, transportation, and recreational health of Washington State. Ferries provide mobility and opportunity to those living and working in Puget Sound communities, they connect businesses east of Puget Sound to some of the most remote areas of the U.S. and Canada, and they attract millions of visitors to experience the unique beauty of Washington State. In some ferry-served communities, WSF is the only link to medical and emergency services, providing residents with a vital lifeline.

This Plan presents a coordinated set of investments and service enhancements to be implemented over 20 years and is organized over the near, medium and long term and by route for easy reference by the reader. However, the key themes of this Plan, WSF's investment needs, and the recommendations included in the Plan are interrelated. For example, a decision about technology and improving the customer experience has potential effects on operational efficiency and reliable service.

WSF considers the Plan a “living document” or blueprint that will guide decisions and allow WSF to adapt to changing conditions. As such, progress reports and further study on some of the Plan's recommendations will be necessary.

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 nearly 25 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. The 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.

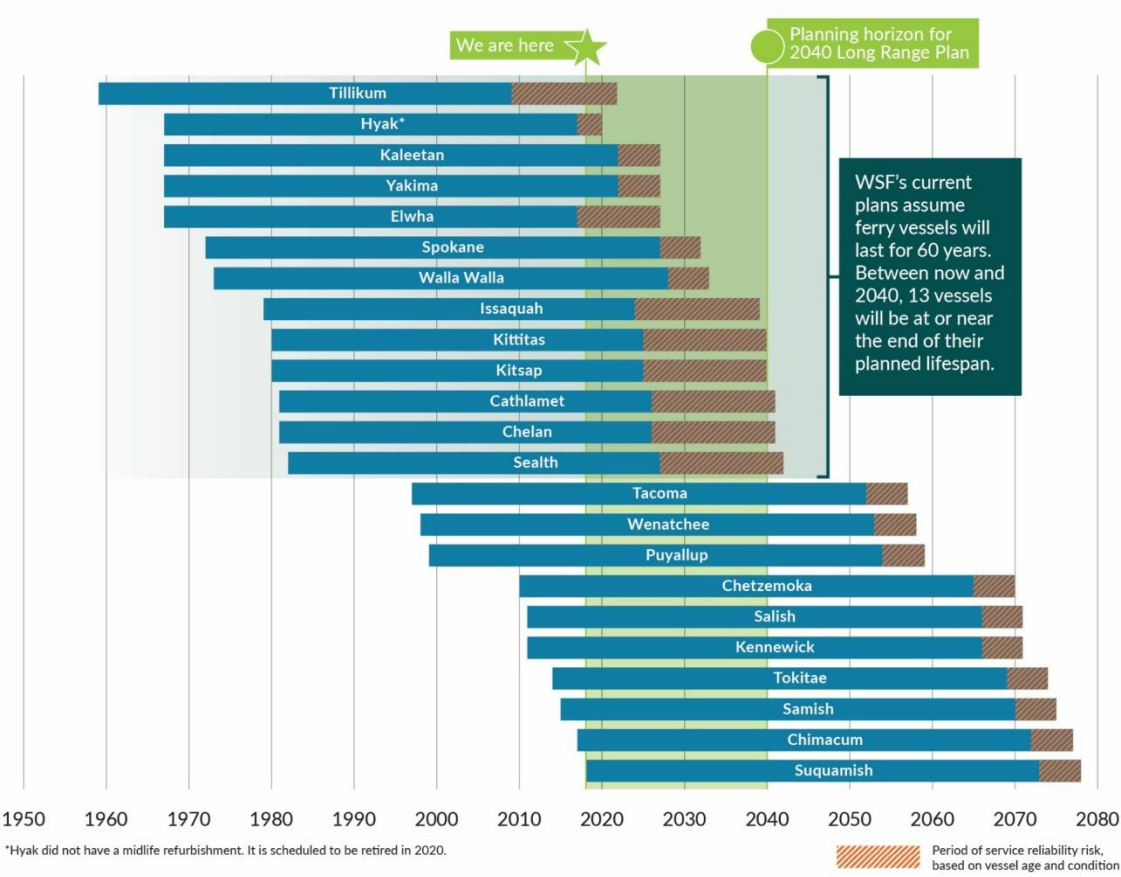
Implementation of this Plan depends on investments in WSF's fleet, terminal infrastructure, workforce, and technology. Washington's ferry system is at a crossroads, where service reliability is beginning to deteriorate despite efforts to prioritize service over other competing needs. Funding challenges over the last decade are becoming more evident in the increased number of sailings missed due to vessel mechanical issues and aging infrastructure as well as the deterioration of on-time performance.

Washington State Ferries system map



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 by allowing for sufficient 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



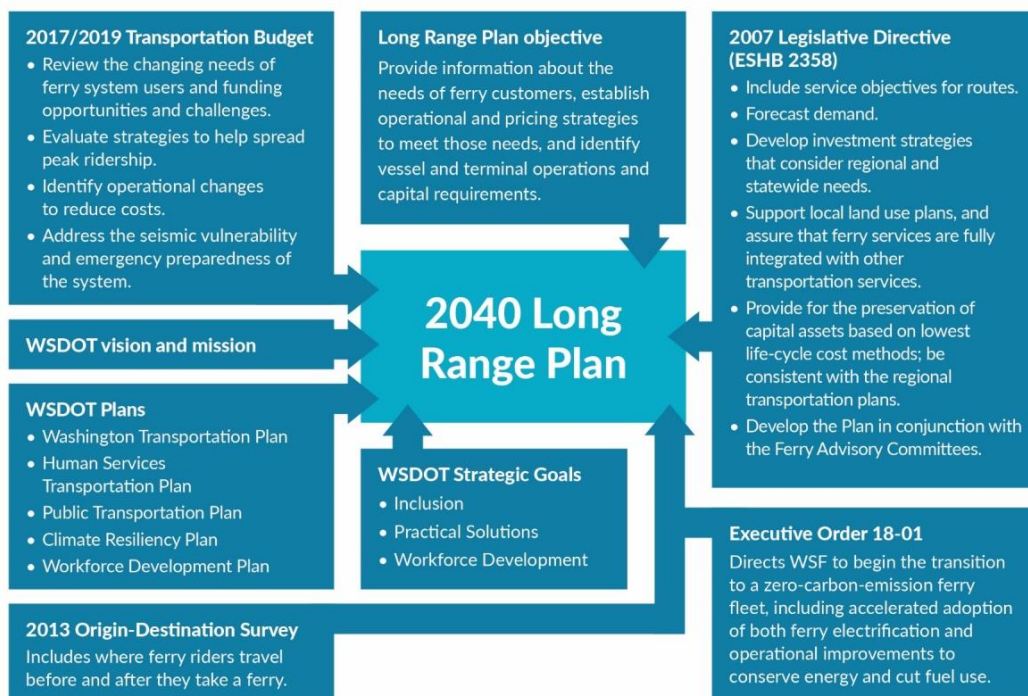
Purpose

To plan for the region's coming challenges in growth and evolving transportation needs, WSF presents its 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, highlighting 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.
- Other WSDOT plans and strategic goals, such as the Washington Transportation Plan, the Workforce Development Plan, and the Public Transportation Plan.



Background and progress since the 2009 Plan

WSF completed its last Long Range Plan in 2009 (the 2009 Plan) with 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 to:

- Identify 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.
- Propose an investment program for vessel replacement and terminal preservation.
- Adopt a new decision framework for managing congestion; this is referred to as 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, capital investments such as the new Colman Dock and Mukilteo ferry terminals, and building new Olympic Class vessels. However, several challenges remain in the implementation of the 2009 Plan: Some recommended projects encountered funding gaps, and there was insufficient time for vessel maintenance because WSF needed to prioritize keeping vessels in service without the necessary 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

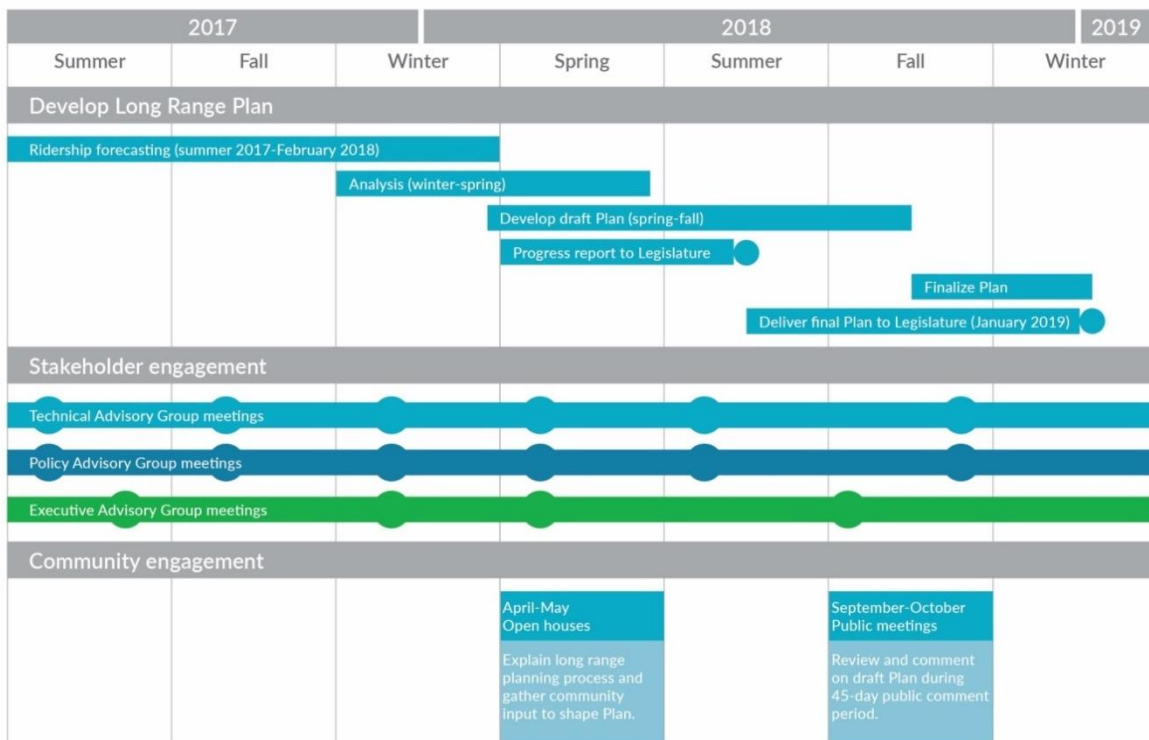
The Plan was informed by a technical analysis of the ferry system and an extensive community engagement process.

WSF facilitated two phases of community engagement: spring 2018 outreach to gather input on public priorities for the ferry system, and fall 2018 outreach to present the Draft Plan for public review and provide a 45-day comment period. A total of 7,411 people participated in online and in-person outreach events, and WSF received 1,741 comments and survey responses.

WSF also completed a technical analysis with consultant support as described in a scope of work composed of 22 distinct tasks (see *Appendix B*). The following timeline graphic outlines the key milestones and parallel efforts involved in the Plan's development, while the following section describes the processes to inform and develop the Plan.



2040 Plan development timeline



Consultant team analysis

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

- 2009 Plan and implementation progress.
- Adaptive management strategies.
- Emergency response and preparedness.
- Resilience and sustainability.
- Related plans and projects.
- Performance measures and level of service.
- Vessel lifespan, maintenance, preservation and reliability trends.
- Technology capabilities.
- Cost efficiencies.
- Terminal infrastructure.
- Route-by-route operations.

The consultant team reviewed the existing conditions and history of each topic area to develop a baseline understanding. They then researched best practices, identified opportunities for improvement and prepared recommendations for implementation. Refer to *Appendix B* for the scope of the technical analysis.

Stakeholder engagement

WSF developed a comprehensive community engagement plan to guide public and stakeholder engagement (see *Appendix C*). In summer 2017, WSF convened three advisory groups to help steer the Plan's development:

Policy Advisory Group (PAG):

The PAG focused on ferry customers and other community interests, with members representing Ferry Advisory Committees (FAC); people with disabilities; bicycle, transit and pedestrian interests; the U.S. Coast Guard; business and tourism interests; tribes; community service providers; and government agencies.

Technical Advisory Group (TAG):

The TAG focused on agency review and response to WSF technical analyses, with members representing FACs; local, regional and state agencies; transit agencies; tribes; and WSDOT.

Executive Advisory Group (EAG):

The EAG provided WSF with strategic advice on need prioritization; constituent interests; feedback on key policy elements; and support for Plan delivery. Members include state and local elected and appointed officials, including a tribal representative.

The PAG and TAG first met in July 2017, and then approximately every other month until WSF delivered the Final Plan. The EAG first met in September 2017 and then quarterly until WSF delivered the Plan.

Ferry Advisory Committees (FAC)

Washington state law directs WSF to work with FACs to develop optimal ferry schedules, resolve customer problems, and understand regional issues. FACs exist in 13 ferry-served communities, with members appointed by local elected officials.

Tribal consultation

The project team worked with WSDOT tribal liaisons to ensure tribal leaders were 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 also participated in the Executive, Policy and Technical Advisory Groups.



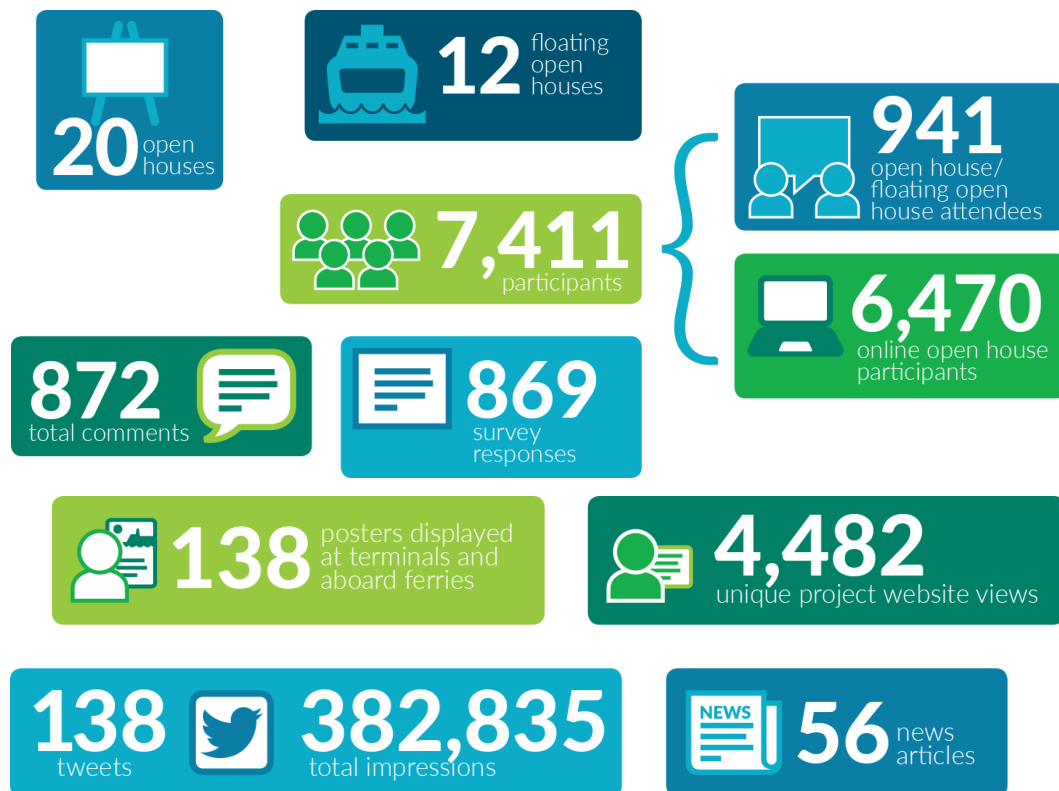
Community engagement

In 2017, WSF initiated a community engagement process to inform the Plan with diverse perspectives.

Community engagement goals:

- 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. FAC members 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.
- Provide opportunities for public input.

Community engagement summaries are included as Appendices D and E.



Plan development – Phase 1: identify issues and priorities

In Phase 1 of Plan development, WSF sought public and stakeholder input and conducted technical analyses to better understand ferry system needs and opportunities.

During the first round of community engagement, WSF introduced the planning process and gathered community input on ferry system priorities. Activities included nine in-person open houses with project staff, six on-board or “floating” open houses during the afternoon commute, a six-week online open house and a feedback survey available online or at in-person events. WSF provided the same information at in-person and online open houses; however, in-person events provided the public with opportunities to connect with project staff. There were no formal presentations.

Nearly 4,000 people participated in spring in-person or online outreach events. Between April 11 and May 24, WSF received a total of 869 survey responses and 482 comments submitted at in-person events, the online open house comment form, email and standard mail.

The following key themes emerged from public comments and survey responses and shaped the development of the Plan:

Service reliability: The majority of participants think the Plan should prioritize reliable service through the construction of new vessels, maintenance of the current fleet and preparation of enough standby vessels to minimize service disruptions.

Managing growth: Many participants think the Plan should prioritize riders and ridership growth, with strategies to expand vehicle reservations, adjust ferry schedules, provide more frequent service, consider new routes and improve terminals to handle more customers and reduce wait times.



Multimodal connections and

accessibility: Participants also desire improved access to ferries via transit, walking, biking, parking and carpool amenities. They encouraged WSF to ensure access for people with disabilities or financial constraints.

Customer experience and

technology: Participants expressed interest in investments to improve customer experience, including real-time travel information, advanced ticket technology, better Wi-Fi connections, access to parking and additional amenities like healthy onboard food options and leisure activities.

Sustainability and resilience:

Participants encouraged WSF to include strategies that reduce carbon emissions, create a more environmentally friendly fleet (“greening the fleet”), and prepare for climate change and emergencies. Some expressed concern about the resiliency of the ferry system to not only sustain core service, but to service the public when highways or bridges are down during a major emergency event like an earthquake.

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

Engaging underrepresented communities

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 VI 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.

Plan development – key themes

WSF drafted the Plan around the key themes that emerged from the first round of community and stakeholder engagement.

Within each of these themes, the Plan establishes goals to meet customer needs, improve efficiency and advance the state's environmental agenda. It also outlines key considerations and challenges, implementation tactics, and recommendations for capital investments, service modifications and policy changes. The recommendations consider WSDOT's mission and vision to plan for reliability and resiliency with limited resources, focused priorities, and clear identification of action areas and investment decisions. The goals and strategies in the Plan align with the WSDOT Strategic Plan, as well as other state initiatives like Maritime Blue, that strive for innovation, partnerships and sustainability. More on the relationship of the Maritime Blue initiative can be found in the Reliable Service section where the goals of the initiative and the Plan are in the strongest alignment.

Plan development – Phase 2: review draft plan

WSF released the Draft Plan in September 2018 for a 45-day public comment period and second round of community engagement activities. During the comment period, WSF engaged the public through an online open house; six onboard or “floating” open houses during the afternoon commute; and 11 in-person open houses in ferry-served communities.

At in-person open houses, WSF invited community members to drop in during a two-hour evening window to view display boards and engage with staff; there were no formal presentations. Attendees could provide comments in writing or verbally to a court reporter. They could also submit comments through the online open house form.

Approximately 3,772 people participated in fall outreach sessions through the online or in-person open houses. Between September 10 and October 25, WSF received a total of 390 comments in person, by email, standard mail and the online open house comment form. See *Appendix E* for a complete summary of the fall community engagement process.



Comments received during fall 2018 outreach confirmed public interest and support for the four key themes prioritized in the Draft Plan:

Reliable service: The majority of participants said the Plan should focus on replacing aging vessels, ensuring enough service relief vessels, and decreasing wait times. Several participants also expressed concerns over the retiring WSF workforce.

Customer experience: Participants expressed interest in improving connections to transit. Many participants requested better real-time schedule information and travel alerts, and improved Wi-Fi access, loading processes, and terminal and ferry amenities.

Manage growth: Participants supported WSF's efforts to manage growth by advancing adaptive management strategies, such as shifting to other modes of travel, including transit, biking, walking, and carpools, adjusting fares, and expanding vehicle reservations. Many participants supported providing system capacity enhancements through improving terminal operational efficiencies, increasing service hours, adjusting schedules, and increasing capacity through vessel design. Some participants commented on refining existing metrics and defining new metrics.

Sustainability and resiliency: Participants provided comments in support of reducing carbon emissions, building electric-hybrid ferries, limiting noise impacts to marine life, and preparing for climate change and emergencies. Several participants suggested creating a wildlife sanctuary on WSDOT-owned land near the Edmonds ferry terminal.

Public comments summary

The majority of participants expressed their overall support for the Draft Plan and emphasized the need for stabilizing the system and managing growth. The following top priorities emerged from public comments:

- Prioritize reliable service through building new vessels.
- Use technology to improve operational efficiencies and accessibility.
- Encourage multimodal transportation through transit connections and improved amenities.
- Provide system capacity enhancements to meet growing ridership demands.
- Define new metrics and implement strategies to manage growth.
- Design resilient and environmentally friendly vessels and terminal areas.

This feedback shaped the structure of the Plan, reviewing and addressing goals, recommendations and strategies to meet these priorities communicated from the public and stakeholders.

In addition to support for the general direction of the Draft Plan, WSF received public feedback that the Draft Plan should go farther than it does to recommend significant capacity increases on its increasingly congested routes. Ferry users felt this could be accomplished by suggesting additional and larger vessels on some routes. Some of these suggestions are included in the "Future opportunities" write-up in the Implementation and Financial Outlook section of this Plan.

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 anticipate large ridership increases. Both passenger and vehicle 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 that were 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 Washington State Office of Financial Management (OFM) 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 like those on number of households, which were then estimated using available household size data.



Major findings of the ridership forecast analysis include:

- Consistent with population growth, **annual ferry ridership is expected to grow by 30 percent between 2017 and 2040**, or 1.2 percent annually.
- **Within the WSF service area between 2017 and 2040, overall population is expected to grow about 1 percent annually**, the number of households is expected to grow by about 1.2 percent annually, and the number of jobs is expected to grow by about 1.3 percent annually.
- The **route projected to have the most vehicle growth between 2017 and 2040 is Port Townsend/Coupeville**, with a 49 percent increase (334,300 vehicles and drivers in 2017, increasing to 498,200 vehicles and drivers in 2040).
- **The largest numerical walk-on passenger increase is on the Seattle/Bainbridge Island route, which currently has the largest walk-on passenger ridership.** The walk-on ridership in 2017 is 3.25 million passengers, which is projected to rise to 4.59 million passengers in 2040 (a 41 percent increase).

Future ferry ridership analysis and estimates

The 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 (the 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:

1. The Model took the base year of afternoon peak period origin-destination ferry riders (collected via survey in 2013), and adjusted these ridership numbers to 2017 levels using the growth rate in the land use forecasts for the WSF service areas.
2. The 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 and also took into account the existing and programmed transit service and traffic congestion levels on the land side.
3. WSF added future recreational and bicycle traffic to the Model. This final analysis resulted in complete annual ridership estimates for 2030 and 2040 for all WSF routes, including recreational ridership.

See *Appendix F* for specific methodological descriptions and additional demographic information related to the WSF Travel Forecasting Model.

Forecast ridership by route

Systemwide ridership is projected to increase 30 percent by 2040. The Long Range Plan will help WSF determine how to accommodate future growth. Ridership forecasts are based on rider survey results and local and regional forecast data from the Puget Sound Regional Council and local jurisdictions.

Port Townsend/Coupeville		
	Passengers	Vehicles/Drivers
2017	462,100	334,300
2040	721,800	498,200

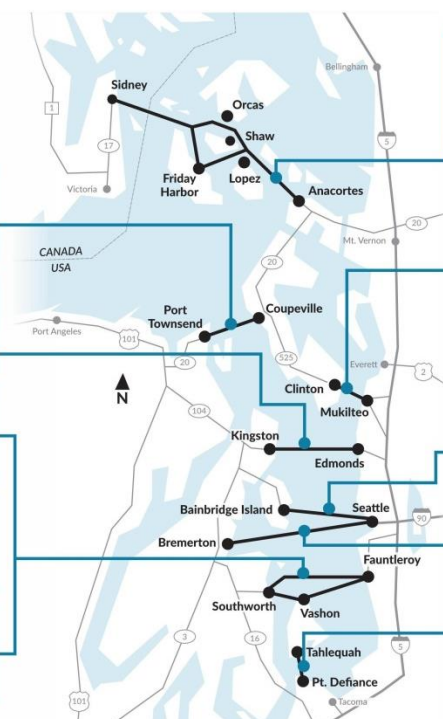
Edmonds/Kingston		
	Passengers	Vehicles/Drivers
2017	1,914,100	2,068,800
2040	3,360,000	2,514,400

Southworth/Vashon		
	Passengers	Vehicles/Drivers
2017	110,500	88,300
2040	136,000	175,900

Fauntleroy/Vashon		
	Passengers	Vehicles/Drivers
2017	890,800	1,094,400
2040	1,112,000	1,241,600

Fauntleroy/Southworth		
	Passengers	Vehicles/Drivers
2017	356,200	556,600
2040	588,900	663,800

Note: all data is from 2017 fiscal year.



Anacortes/San Juan Islands		
	Passengers	Vehicles/Drivers
2017	1,060,200	950,000
2040	1,444,100	1,299,800

Anacortes/Sidney, B.C.		
	Passengers	Vehicles/Drivers
2017	94,100	47,600
2040	138,400	69,200

Mukilteo/Clinton		
	Passengers	Vehicles/Drivers
2017	1,811,600	2,221,000
2040	2,155,800	2,643,000

Seattle/Bainbridge Island		
	Passengers	Vehicles/Drivers
2017	4,548,800	1,997,100
2040	6,422,500	2,344,200

Seattle/Bremerton		
	Passengers	Vehicles/Drivers
2017	2,125,100	689,600
2040	3,101,800	846,700

Point Defiance/Tahlequah		
	Passengers	Vehicles/Drivers
2017	309,400	469,300
2040	599,300	547,400

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

Relationship between ridership forecasts and regional growth

WSF's goal is to accommodate the anticipated growth in ridership to ensure the ferry system is effectively meeting service demand. As a public transportation provider, it is 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

The 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, 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.

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.

Continued on next page

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 accurately predict 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.

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.

A Practical Solutions approach: WSDOT convened a stakeholder group that includes WSF, Kitsap County, the Port of Kingston, Kitsap Transit, Ferry Advisory Committee (FAC) members, local businesses and others to identify short-term and long-term improvements that address the operational problem caused by growing volumes of ferry traffic. Their assessment builds on findings of the 2016 Kingston Complete Streets study led by Kitsap County. Possible improvements identified 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.

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 for WSF to assess the feasibility of a remote holding facility. The stakeholder 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.

The majority of passenger-only ferry services operate adjacent to WSF terminal facilities. WSF will continue to partner with the passenger-only ferry services to improve accessibility for customers. A broader discussion of passenger-only service can be found in the Manage Growth section of the Plan.

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.

Despite this support, 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 legislative session, the Legislature appropriated funding for the University of Washington's Evans School of Public Policy to undertake a study of the Fauntleroy/Vashon Island/Southworth route—also known as the “Triangle route”—to help address the route's many constraints and challenges. The resulting report, “Improving Loading, Ticketing, and Rider/Community Relations for the Washington State Ferries' Triangle Route,” began in June of 2018 and was completed in December 2018. Its key recommendations include upgrades to technology, training and communication.



Section 2

Plan elements

Based on issues of importance to customers and stakeholders, WSF developed the Plan around four major themes: reliable service, customer experience, managing 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 interdependencies and underscores efficiencies and opportunities where possible.



Understanding the Plan

Additions to service capacity are only possible if WSF's infrastructure is reliable and if a skilled workforce exists to support them. This Plan is intended to provide a framework for supporting policy decisions and future studies regarding WSF service and infrastructure. Within each theme are the following components:

- **Goals:** what WSF will strive toward within each key theme
- **Recommendations:** what course of action WSF supports toward achieving the established goals
- **Strategies:** what actions WSF includes to carry out its recommendations, such as example strategies include specific performance metrics that WSF can use to track, monitor and share with the public to measure effectiveness

Following the theme sections is the Plan's "Implementation, Investments and Financial Outlook" section that describes the investment needed to achieve the Plan recommendations. The implementation timeline is presented in near-, medium-, and long-term stages by route, while the financial outlook outlines investment needs by capital and operating costs as well as revenues. The end of this section presents the next steps, as well as other future service and vessel deployment considerations, which can be considered at key decision milestones on the path to 2040.

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



Reliable service

The Plan places particular attention to stabilizing the ferry fleet with new vessels, 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, 1970s and 1980s will reach the end of their expected life—some of them before their anticipated 60-year anniversary. The Plan lays out a fleet replacement schedule and identifies the functional requirements for new vessels, including how to respond to growing demand and meet 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.

Knowing when each component of the system requires maintenance allows for better coordination of maintenance projects and can reduce service interruptions. The Plan recommends investing in integrated technology systems to increase reliability.

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.
- Implement technology-based solutions that improve system-wide reliability.



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 commute.

- 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 more than 30 percent by 2040. WSF will need to move more people and manage demand during busy peak periods—with limited opportunities to increase capacity.

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.

Recognizing WSF's limited ability to expand, the Plan recommends increasing accessibility through adaptive management strategies that move people to and from WSF terminals in efficient ways. And because growth management requires partnerships with local communities, transit agencies, and the private sector in addition to investment in terminal infrastructure, the Plan reviews opportunities to improve multimodal connections at terminals and ensure that proposed service and facility improvements are compatible with local plans.



Sustainability and resilience

There is a growing awareness of the need for system resilience and sustainability, especially in long-range plans that provide vital transportation services. To address this need, the Plan looks at ways to reduce the ferry system's vulnerability to abrupt, emergent events. It also considers the environmental impacts of ferry service and suggests strategies for making WSF greener and more energy-efficient.

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 car-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.

Proposed service enhancements

Replace and upgrade aging infrastructure

- Build new vessels to replace an 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 and Lopez Islands and Sidney, BC, would be electrified to serve their corresponding vessel.
- This investment will bring down fuel consumption and therefore reduce carbon emissions significantly over the 20-year planning horizon.

Add service hours

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

Increase vessel carrying capacity

Increase passenger capacity for:

- Seattle/Bainbridge Island
- Seattle/Bremerton

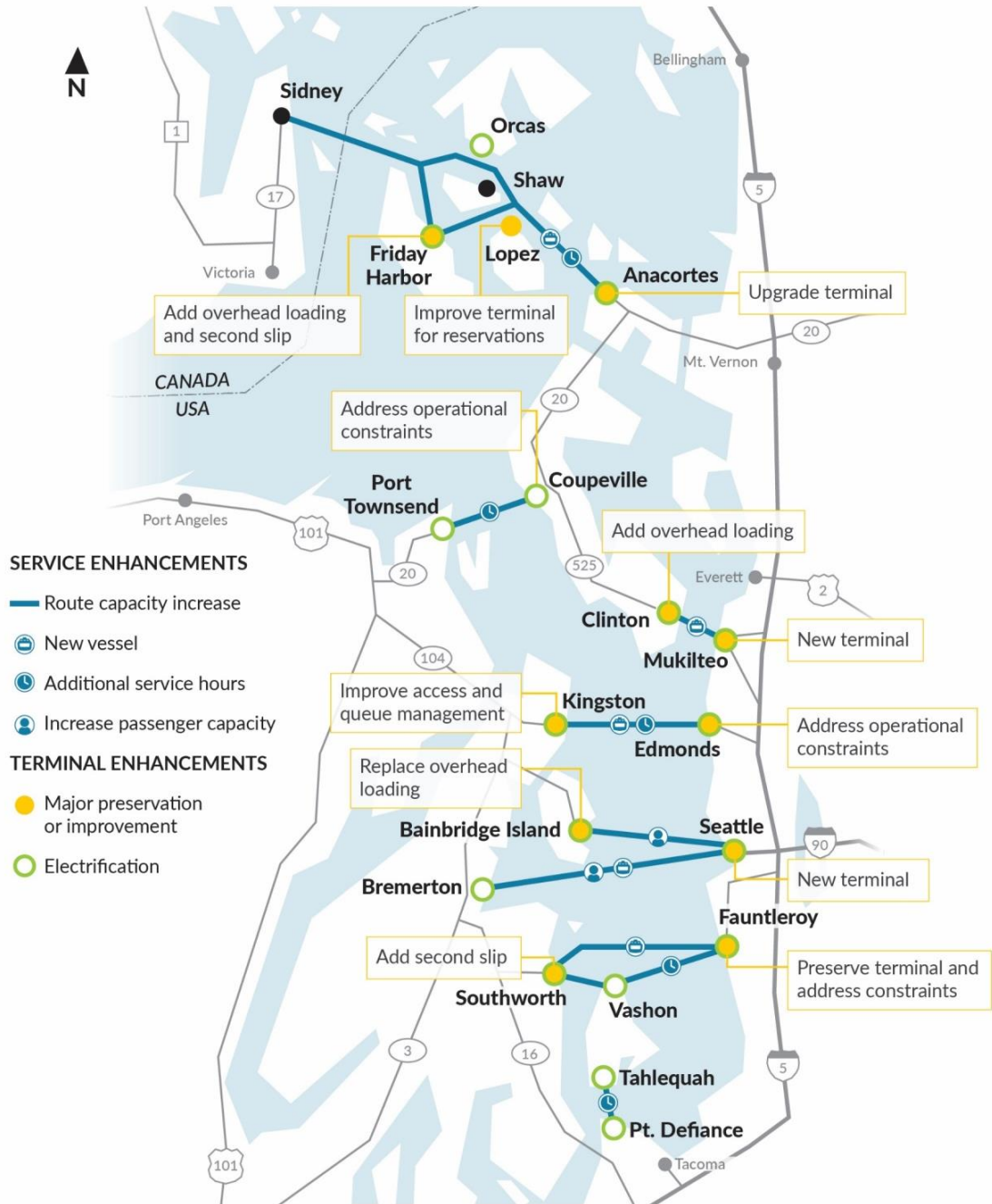
Increase vehicle capacity through new vessels serving:

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

Enhance customer experience

- Provide enhanced information
- Local and regional mobility plan coordination
- Continued partnership with passenger-only ferry operators

Proposed service and terminal enhancements map





Section 3

Reliable service

Stabilize the system to maintain reliable service through 2040.

Reliable service is by far the greatest priority for ferry customers, according to feedback received during extensive public and stakeholder outreach. Although service reliability is an important performance measure that WSF does its best to achieve, the degrading condition of its 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.

Technology infrastructure also supports system reliability and can improve the accuracy of and speed with which information is provided to the customer. Technology improvements that improve the customer's experience are discussed in the Customer Experience section of the Plan.

This section of the Plan focuses on the four essential elements of service reliability: vessels, terminals, workforce and technology. 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.
- Implement technology-based solutions that improve system-wide reliability.

Service schedules and other operating efficiencies also play a role in reliable service. These elements are discussed further in the Manage Growth section of the Plan.

WSDOT Strategic Plan Goals

The WSF Long Range Plan reflects WSDOT's Strategic Plan goals. This Section in particular aligns with:

- **Practical Solutions:** Integrated asset management
- **Workforce Development:** Investing in workforce

Washington Maritime Blue

Launched by the Governor in 2017, this initiative aims to ensure that Washington State is home to the most sustainable maritime industry by 2050. This Plans—specifically components of the Reliability theme—fit well with Maritime Blue and other Washington state plans that call for carbon reduction, innovation and workforce development.

Vessels

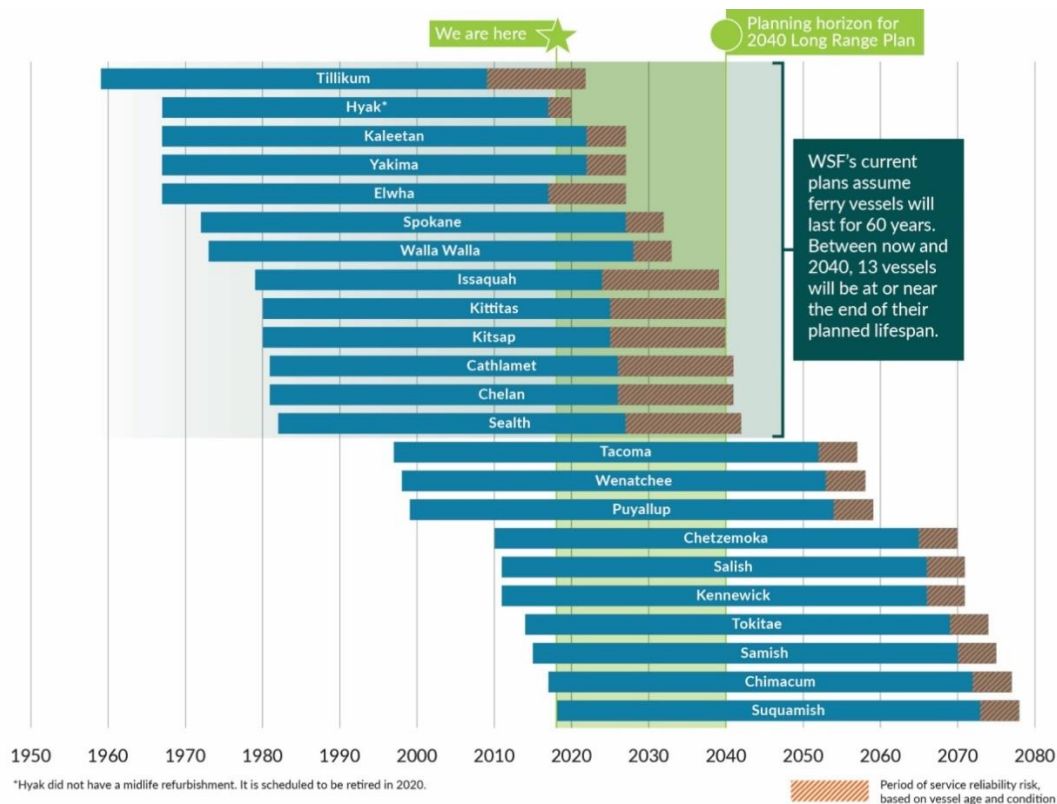
Replace aging vessels and invest in new vessels to maintain reliable service.

Status of the current 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 23-vessel fleet (22 when the *Hyak* retires in 2020) will need to be retired, as shown in the vessel replacement schedule below.

The 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 time required for preventative maintenance, repairs, and midlife overhauls that maintain vessel reliability and allow them to safely and effectively operate throughout their anticipated useful lifespan of 60 years.

Vessel retirement outlook



**The Hyak did not receive its customary mid-life refurbishment and therefore will not meet the 60-year useful lifespan previously expected. The Plan calls for the Hyak to be retired in 2020; however, current capital and operating budgets are only funded through mid-2019. The Plan recommends that vessel life expectancy be reconsidered for all vessels in that have not received the required planned maintenance and preservation.*



Fleet limitations

During summer seasons when ridership is at its peak, WSF's sailing schedule calls for 19 vessels to provide full service on its ten routes. Each route has unique characteristics and very specific requirements for navigating while carrying vehicles and passengers. Additionally, vessels traveling between Anacortes and Sidney, BC have international certification requirements. Because of these differing needs, the number of vessels in the fleet is not the only consideration for providing service. 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 over the past few summers, when some vessels required immediate and unexpected maintenance. This work required several vessel reassignments and temporary service reductions throughout the system. Although WSF tries very hard to minimize disruption to customers, vessel 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 or if a vessel has missed multiple scheduled sailings. While WSF and its customers also experience costs in the schedule, delays associated with making these complicated adjustments in an already busy travel season contribute to less reliability and customer frustration.

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 and preservation 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 preservation and condition of the vessel and its systems.

To keep in a state of good repair, vessels require time either at the Eagle Harbor maintenance facility or at a local shipyard to take care of the many systems: propulsion and steering systems, electronics, and other interior and exterior components vital to both the operation of the vessel and comfort and safety of the passengers. To perform the regular and preventative maintenance to meet a 60-year useful lifespan, more maintenance time is needed for each vessel every year. When accounting for the backlog of maintenance needs as identified in the Life Cycle Cost Model, the asset management and budgeting tool for the vessels in the fleet, 12 weeks of maintenance time is needed on average for each vessel. This maintenance must be scheduled around current scheduled service. More vessels receive maintenance in the winter, off-peak season and less in the summer season when scheduled service requires 19 service vessels and a minimum of one vessel to be on service relief.

Relief vessels are vessels on stand-by, at the ready, should a vessel that is in service require immediate maintenance. This relief vessel can only receive very minor maintenance while on stand-by for service relief as it may need to be deployed within several hours of notice. This need for service relief is becoming more and more common as the fleet ages and each vessel's condition deteriorates.



Reliable service

With an overall fleet size of 23 vessels in 2019, and more vessels scheduled for retirement each subsequent year, it is clear that without investment in vessel replacement, a growing risk to service reliability accumulates every year. Even with a 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 productivity is constrained by a fixed workforce (currently a single shift) and restrictions on some activities due to its proximity to surrounding residential properties. The facility also needs improvements to infrastructure and workforce retention, as discussed in more detail in the Terminals and Workforce sections.

Better Information to Support Informed Decisions

To better inform capital investment decisions, WSF is currently refining its Asset Management Plans, incorporating risk management and state-of-good-repairs measures and targets for fleet and terminal assets.

WSF has not fully met the fleet's preservation needs, which are the larger repair efforts that prolong the life of the vessel. This is because of a combination of inadequate funding, lack of relief vessels, and the prioritization of service over maintenance and preservation. This prioritization of service reliability over maintenance can be observed through the reported 99 percent service reliability last year. This reliability metric is likely to decline in the next several years before additional vessels can be added to the fleet. 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 the rest of the marine sector, including the U.S. Navy, result in tremendous scheduling difficulties.

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 maintenance. 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. However, this cycle ultimately results in a growing backlog of work and an increased risk of vessel breakdowns, further exacerbated by the disruption of 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 electric-hybrid vessels: two to stabilize the fleet and three to replace vessels due to retire— the first five in a total of 16 new vessels.**
- + **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 every vessel in the fleet to achieve the 60-year life expectancy goal.**
- + **Invest in 11 additional new vessels after the first five Olympic Class ferries to replace retiring vessels and support fleet maintenance needs, for a total construction of 16 new 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 electric-hybrid vessels: two to stabilize the fleet and three to replace vessels due to retire—the first five in a total of 16 new vessels.

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 on average for 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 an 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 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, BC 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 highest, in part because of the large number of retiring vessels and because of the condition of the Issaquah Class vessels, among the oldest vessels 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 every vessel in the fleet to achieve the 60-year life expectancy goal.

WSF is currently held to a performance measure that limits maintenance time to eight weeks per year for each vessel in the fleet. However, there are not enough vessels in the fleet to ensure that 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 and WSF's inability to consume the entire maintenance budget in spite of a growing backlog of maintenance costs. This vessel lifespan expectation is much greater than those used by other comparable ferry operators, such as the Staten Island Ferry and B.C. Ferries.

Unplanned maintenance occurs for a number of reasons, mechanical or otherwise. Whether planned or unplanned, a vessel must be taken out of service when it requires maintenance, and a relief vessel is needed to take its place. This multifaceted issue requires a multi-step solution—increasing the fleet size to have more reliability and redundancy, and also providing 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 relief vessels on 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.



Reliable service

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)
 - A minimum of two vessels to provide service for unplanned maintenance relief during the summer months
 - Four vessels to provide service during planned summer maintenance, and seven vessels to provide service during winter maintenance
- **Revise the vessel out-of-service performance metric:** Revise this metric to allow adequate time for maintenance and accountability for swift and efficient work. This metric would be replaced by a state-of-good-repair metric based on the Life Cycle Cost Model that assigns a condition score for each system on the vessel. Elements of this metric may include:
 - Vessel age relative to Useful Life benchmark
 - Vessel systems and components are properly maintained or replaced in accordance with owner's procedures or industry standards
 - Vessel systems satisfactorily perform intended function
 - Vessel systems are maintained and replaced before their condition deteriorates to the point of presenting a safety risk
 - Vessel meets customer expectations for comfort and reliability
- **Revise service reliability performance metric:** Revise this metric to accurately reflect what the customer experiences and to complement the fleet's maintenance needs.

+ Recommended performance metric

Replace vessel out-of-service metric with a state-of-good-repair metric to align with WSDOT's evolving asset management system.



+ Invest in 11 additional new vessels after the first five Olympic Class ferries to replace retiring vessels and support fleet maintenance needs, for a total construction of 16 new 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. Local shipyards have limited capacity and may be reluctant to invest in existing facilities because the State of Washington's biennial budget and allocation process supports only short-term funding commitments.

The shipyard capacity problem is compounded by the requirement that vessels be built within Washington State. With only one or two viable builders in the state, WSF's ability to seek competitive bids is very limited.

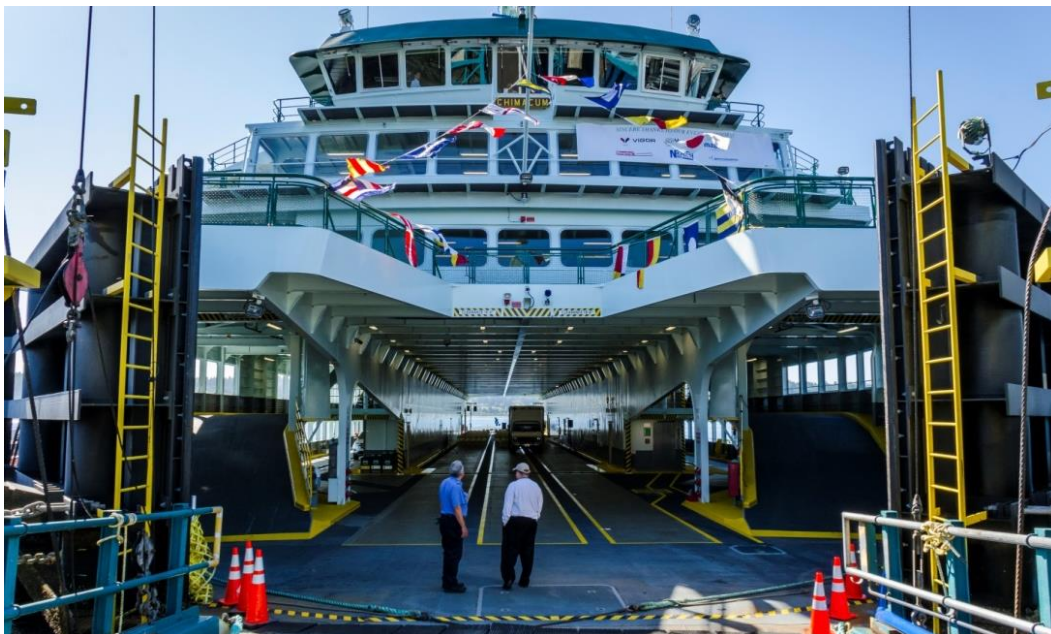
Meanwhile, existing vessels will continue to age and are likely to have more unplanned maintenance needs because WSF cannot both provide out-of-service time for planned maintenance and also prioritize service reliability. In short, maintenance needs and service disruptions are likely to grow before an improvement in reliability is realized.

Shipyard constraints

Many WSF vessels are large and require adequately sized facilities to meet maintenance and new vessel construction needs. WSF competes for this shipyard space and availability with many other maritime businesses and agencies. WA State statute also requires WSF vessel maintenance and preservation to be completed by shipyards with State approved apprenticeship programs which further narrows availability.

Because of the economic benefits associated with these large projects, current legislation looks to keep construction of new vessels within the state.

Any new build program will need to compete for this shipyard space. In addition, the vessel replacement needs of the system may be greater than existing shipyard capacity.





Reliable service

This Plan recommends the following strategy:

- **Promote investment in the Washington shipyard industry and explore opportunities for swift construction:** Catalyze local investment through the development of and legislative commitment to a long-term capital investment construction plan.
- **Retire and replace 13 vessels over the planning horizon:** The recommended retirement schedule will result in an overall younger and better-maintained fleet.
- **Grow the fleet to support maintenance needs:** Add two* additional vessels to the fleet to support service during times of maintenance and allow the fleet to receive adequate maintenance time.

**To support enhanced service frequency at Kingston-Edmonds, two retiring vessels will be replaced with three, bringing the total vessels procured over this planning horizon to 16.*

+ 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). An electric-hybrid capable fleet would also 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 life of a vessel.

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 (down from the current seven vessel classes).



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. As described in more detail in the Sustainability and Resilience Section of the Plan, the 2040 fleet would consist of nearly all plug-in electric-hybrid propulsion that will save on energy costs and greatly reduce carbon emissions.

Because of the inherently complex combination of route demands 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.

2040 WSF fleet by vessel classes

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

Vehicle capacities represented in this table are approximate based on an average vehicle length and equal spacing between vehicles. During operations, vehicle types, lengths and spacing can vary, which would change the number of vehicles carried on a vessel.

The next sections describe the considerations for these new vessels.



New 124-Car vessels

This Plan recommends new 124-Car Class vessels specifically for the Fauntleroy/Vashon Island/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.

Characteristics:

- Capacity: approximately 124 cars
- Passenger capacity: 750/1,500
- Propulsion system: Plug-in hybrid capable with Tier 4 diesel engines

The new 124-Car Class vessels would have similar passenger- and car-carrying capacity as the existing Issaquah (124-Car) Class, with the inclusion of gallery vehicle 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.

The Plan recognizes the need for vessel replacement on this route and identifies a decision milestone to re-visit vessel design on this route as part of the Fauntleroy dock preservation project. This project is planned for construction in the 2025-2027 biennium, and will look at opportunities for more efficient operations as part of dock seismic upgrade and replacement project. This is a unique opportunity to meet the needs of the route and improve efficiencies with coordinated design timeframes for both vessels and terminal.

New 144-Car Class

The new 144-Car Class vessel is intended to be a versatile vessel that provides a slight capacity increase over the remaining Issaquah Class vessels and can serve as relief vessels on most routes. The Plan recommends using the new 144-Car and Olympic Class vessels as the backbone of the 2040 fleet, meeting the goals of streamlined fleet composition.

Characteristics:

- Capacity: approximately 144 cars
- Single-deck variant vehicle capacity: 114 (to accommodate San Juan Island freight traffic needs)
- Passenger capacity: 750/1,500
- Propulsion system: Plug-in hybrid capable with Tier 4 diesel engines

With a similar projected vehicle capacity, the new 144-Car Class would be similar to the Olympic Class. However, this new vessel class should be designed to include industry best practices as much 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 and the flexibility to facilitate freight movement.



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, understanding of environmental considerations and mechanical systems, and other technologies 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 resilience through changing climate conditions and geologic events.

Specific recommendations for terminal maintenance and preservation include:

- + **Plan for reliable terminal infrastructure with seismic upgrade planning, a new terminal building in Anacortes, queuing space to accommodate reservations on Lopez Island, and the addition of a second slip at Southworth to support partnership with regional passenger-only service.**
- + **Monitor terminal maintenance trends through 2040 to enable strategic decisions as it relates to future material and maintenance use in terminal projects.**
- + **Program terminal preservation projects to support reliable service, such as projects to improve operational efficiencies at Fauntleroy, Edmonds, Coupeville, Kingston and overhead loading facilities at Bainbridge Island and Friday Harbor.**
- + **Invest in the Eagle Harbor maintenance facility to serve system needs through 2040.**



+ Plan for reliable terminal infrastructure with seismic upgrade planning, a new terminal building in Anacortes, queuing space to accommodate reservations on Lopez Island, and the addition of a second slip at Southworth to support partnership with regional passenger-only service.

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:

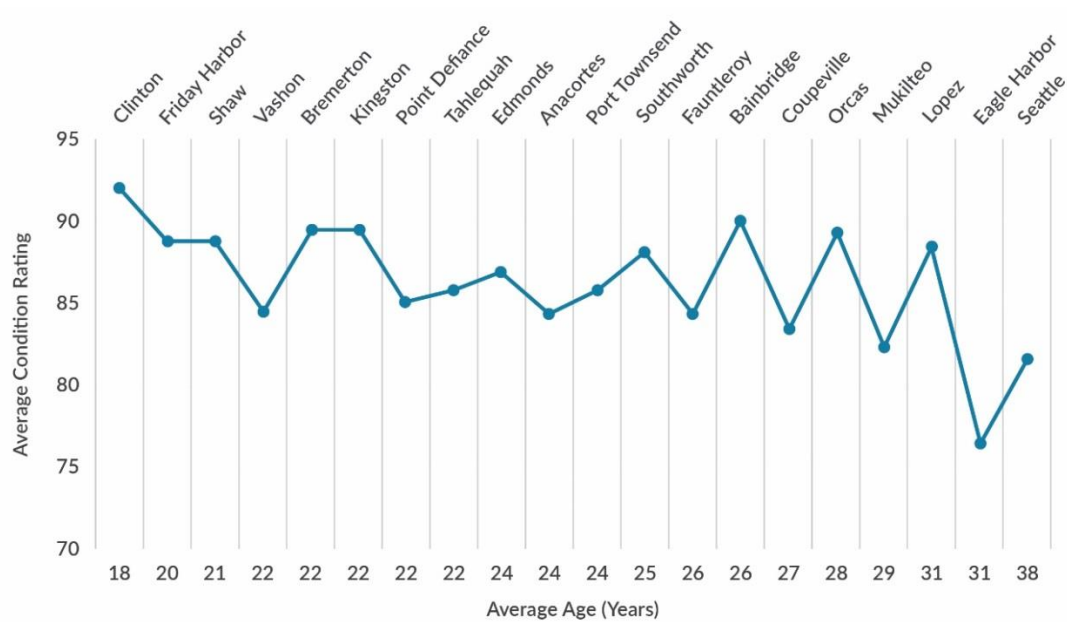
- **Continue to enhance the asset management model:** Prioritize projects that increase reliability and resiliency.

+ Monitor terminal maintenance trends through 2040 to enable strategic decisions as it relates to future material and maintenance use in terminal projects.

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, a score assigned to each terminal element based on its degradation and replacement need. WSF's two oldest facilities (Colman Dock in Seattle and the Eagle Harbor maintenance facility) have the lowest average condition ratings. The average age and condition rating for each terminal is represented in the following figure.



Average terminal condition rating and age



Over the past 20 to 25 years, WSF has worked to replace 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 will 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:**
 Complete 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, such as projects to improve operational efficiencies at Fauntleroy, Edmonds, Coupeville, Kingston and overhead loading facilities at Bainbridge Island and Friday Harbor.

Conducting terminal maintenance while maintaining operations is difficult because of limited space; it is especially challenging at terminals with only one operating slip for vessels. Having two slips allows vessels to maintain operations during maintenance. It also provides redundancy and enhances service reliability during emergencies. 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. Electrification of most terminals is proposed as part of this plan to support a future electric fleet. This is discussed in more detail in the Sustainability section of the plan, with improvements planned in association with diesel vessel retirement and replacement with electric-hybrid vessels.

The largest preservation projects over the next 20 years are expected to be upgrades to the terminal facility at Fauntleroy, Edmonds, Coupeville, and the new 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. Planned improvements and substantial preservation projects by route are outlined in the Investments and Implementation section of the Plan.

The Plan recommends the following strategies for terminal preservation projects:

- **Continue to monitor opportunities to enhance and support reliable service through preservation and improvement projects.**
 - Plan for critical preservation work to upgrade the Fauntleroy terminal.
 - Work with the community and stakeholders to determine the best solution for operational challenges at the Edmonds terminal.
 - Plan for a new terminal building at Anacortes.
 - Work with the community and stakeholders to determine the best solution for operational challenges at the Coupeville terminal.
- **Continue to update the Terminal Design Manual to support technological innovation and evolving operations at the terminal to support reliable service.**



+ Invest in the Eagle Harbor maintenance facility to serve system needs through 2040.

The Eagle Harbor maintenance facility is one of WSF's oldest facilities, with assets that represent one of the oldest average ages for terminals in the system and one of the lowest condition ratings. As a result, the facility with its aging infrastructure and increasing maintenance requirements has limited slip availability restricts WSF's 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.

2040 WSF terminals

With each terminal capital investment project, whether preservation or improvement, is designed to meet the requirements in the Terminal Design Manual and other legislative requirements. These requirements include dimensional standards that allow for more efficient and reliable operations and the safe movement of motorized and non-motorized vehicles and pedestrians on and off the vessel, through the terminal, and ultimately connecting them to their transit or other means of transportation. Other requirements include the requirement for environmentally friendly means and methods of construction, with a focus on locally sourced materials when possible, and the reduction of waste and energy use at the facility.

As ridership continues to grow, more and more pressure will be placed on terminals to move customers through as efficiently as possible to maintain service schedules. At the same time, emerging mobility technologies and partnership opportunities will call upon WSF to reassess terminal configurations and operations to best meet the needs of the system and customer. Partnerships with regional and local transit

Designing for mobility and new technologies

New terminal design will look to the goals of the Plan, seizing opportunities to enhance the mobility of its customers by connecting transit and non-motorized connections and providing space for mobility-on-demand services. It is still unknown how automated vehicle technology will interact with terminals and on which routes this type of technology will be present. As outlined in the Sustainability Section of this Plan, terminals should be designed with flexibility in mind.



Reliable service

agencies to enhance customer mobility will be pursued throughout the system. The Plan also calls for partnership with regional passenger-only ferry planning and implementation through coordination of operations, including exploring opportunities for adding slips at some terminals supporting these services. This will provide yet another transportation option for WSF customers.

Future efforts, tied to recommendations of this Plan, such as the review of fare structure and collection, as well as the expansion or implementation of a reservations system, will affect how terminals are designed and staffed.

The Plan calls for a large investment in the electrification of the fleet by 2040. To realize the benefits of plug-in electric-hybrid propulsion, the electrification of 17 terminals is proposed. Electrification of terminals requires coordination with local power agencies, for the delivery of additional power capacity to the terminals and the construction of charging infrastructure at the terminal. A rendering of the future Mukilteo Ferry Terminal, currently under construction is shown below. This terminal brings together green design elements such as solar panels, natural ventilation, rainwater harvesting, enhanced stormwater treatment, and native plantings, in a multimodal facility design that provides connections with transit, pedestrians and bicycles.



Visualization of new Mukilteo ferry terminal by LMN Architects.



Workforce

Invest in attracting, retaining and strengthening the workforce.

WSF employs more than 1,900 people 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 a number of 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. Slightly more than 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.

Hiring enough qualified deck officers presents a challenge because of the many years of training required. 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 this work must be accomplished on an employee's own time. Approximately 75 percent of WSF's Masters and Staff Masters will be retirement-eligible in the next five years.

To obtain a Master position at WSF, an individual must enter service 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; these people can advance more quickly to a Mate position, often within 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.

Staff Master: Highest classification of deck officer

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.

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.



Reliable service

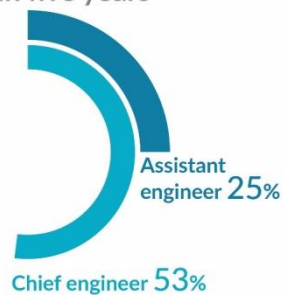
Licensed engineering positions face similar challenges, with over 53 percent of Chief Engineers eligible for retirement in the next five years. Similar to deck officers, becoming a licensed Engineer requires training and experience that are both generalized and specific to WSF vessels. The advancement path requires training, testing and sea time requirements, which can take approximately five years for Assistant Engineers and 10 additional years to earn a Chief Engineer's 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 budget cuts over the past 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.

Deck officers eligible to retire in five years



Licensed engineers eligible to retire in five years



WSF will continue to feel this shortage in licensed deck and engine room positions in the near term, 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 it may pose a challenge to recruiting. On-call and relief workers may be required to commute especially long distances.

In addition to the specialized workforce that operates the vessels and terminals necessary to maintain reliable service, reliability is also contingent upon the staff that plan, permit, track, and schedule current and future vessel, terminal, workforce and technology efforts or engage with the public in support of those efforts. This workforce faces similar retirement and retention challenges.



As a division of WSDOT, WSF is committed to Workforce Development and Inclusion, which is outlined as two of three organizational goal areas in WSDOT's Strategic Plan. These goal areas strive to provide an inclusive and diverse workforce with opportunity for growth, development and engagement in a modern work environment.

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 industry.**
- + **Retain skilled labor at the Eagle Harbor maintenance facility.**

+ Establish a workforce development plan unique to maritime industry.

WSDOT recognizes the importance of workforce development through the identification of two specific agency goal areas—Inclusion and Workforce Development, 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 focuses on WSF's unique maritime conditions and requirements. The Plan also recommends the following strategies to strengthen the workforce:

- **Establish and invest in ongoing programs:** Ongoing recruitment, training, apprenticeships, and mentoring programs to be established or enhanced for all WSF positions.
- **Develop and implement retention and recruitment strategies:** To encourage the retention of qualified and experienced workforce while attracting and retaining a younger workforce.
- **Update salary survey data regularly:** To remain competitive for attracting additional workforce and retaining existing workforce, understand competitive salary for wage adjustments to reflect market conditions.

"WSDOT wants to be an employer of choice and is creating a modern work environment. We are 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."

'Our Strategic Plan' available at:
www.wsdot.wa.gov/about/secretary/results-wsdot

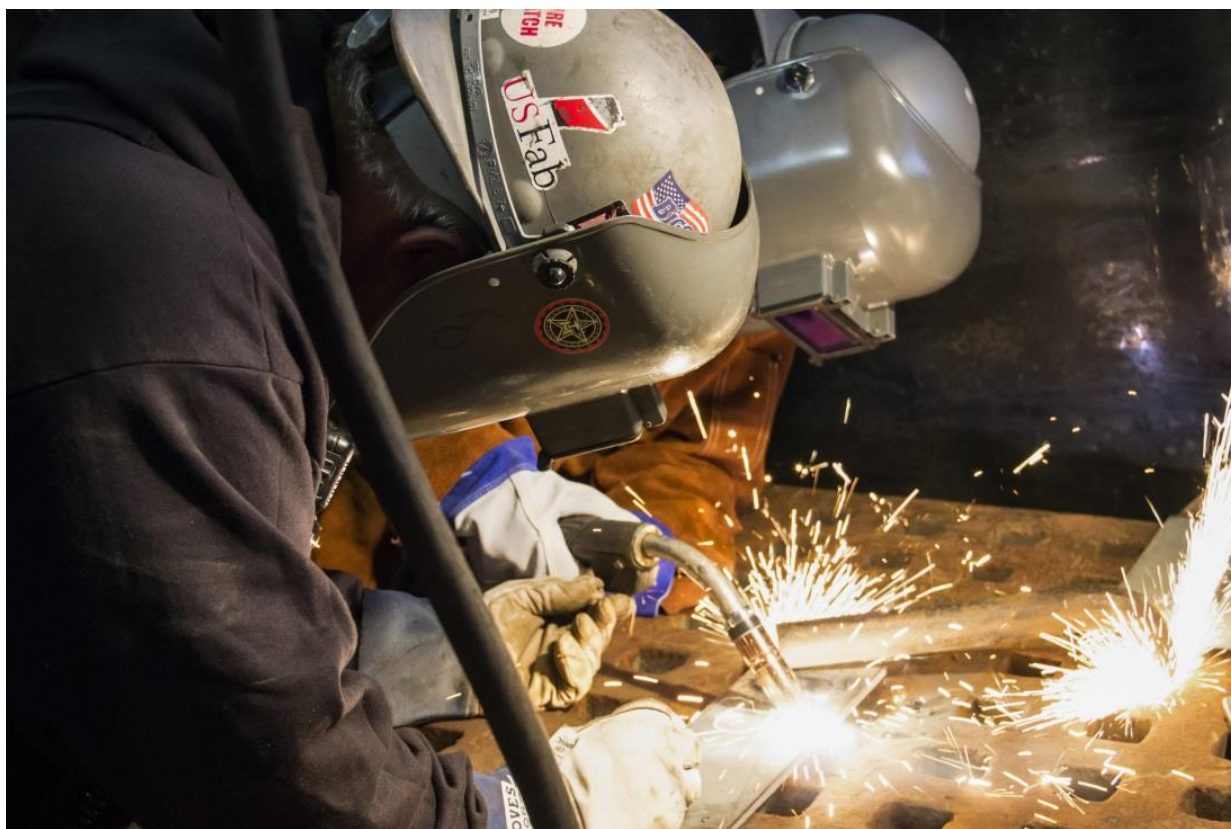


+ Retain skilled labor at the Eagle Harbor maintenance facility.

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. There may also be need to grow the Eagle Harbor workforce as the fleet grows.

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, ensure competitive market salary data is known.
- **Explore opportunities to expand the apprentice program:** Expanding this program will advance workforce retention goals and build from within the organization.





Technology

Implement technology-based solutions that improve system-wide reliability.

Technology plays an integral role in WSF operations, much of it behind the scenes, and touches each element of the WSF system. Information technology (IT) is comprised of a number of systems that are responsible for core operational activities including asset management, data collection, schedule and workforce management and deployment. However, these systems are of varying ages and do not “talk” to each other, and the lack of integrated systems restricts WSF’s ability to share and analyze data between systems.

WSF assets have different needs for tracking their condition and maintenance; however these investment decisions are interconnected. The terminal infrastructure must be maintained to a condition that supports the vessel and vice versa. When the asset management systems are separate, the impact of maintenance activities on one asset to another is not accounted for in the maintenance programs and can affect service.

Plan recommendations

The Plan recommends that WSF invest in and replace asset management systems and internal scheduling and communications with a unified system that supports more proactive and effective operation, including lifecycle management of all WSF assets. A unified look at each asset as it fits in the system could improve lifecycle management and system reliability.

Improvements in IT systems would also allow WSF to monitor vessel data and observe trends and adjust operations or maintenance activities to service reliability.

The Plan recommends the following strategies to improve IT systems that support service reliability and the customer experience:

- + **Invest in technology to support management of vessel and terminal assets.**
- + **Invest in technology that supports more reliable and efficient workforce deployment and communication.**



+ Invest in technology to support management of vessel and terminal assets.

There is an initiative within WSDOT to unify all asset management systems within the organization and manage them at an enterprise level. As a result, the currently segmented asset management systems within WSF would unify within this larger WSDOT asset management system. The Plan also recommends the following strategies to improve reliability of the system through technological investments:

- **Invest in integrated IT systems that support proactive lifecycle management and data collection:** To be more proactive in asset management and optimizing maintenance of assets.
- **Implementation of a vessel monitoring system:** To provide health and status information about onboard equipment in real time enabling quick operational adjustments, as needed, to maintain service.

+ Invest in technology that supports more reliable and efficient workforce deployment and communication.

System operation relies heavily on tools to assist in the scheduling, deployment, communication and certification of its workforce. Many systems are utilized to ensure that qualified staff are scheduled to sail the vessel and move customers safely through the terminal. A common and centralized schedule database would inform other systems, providing more efficiencies and real-time information to make more informed decisions and communicate any schedule changes to the workforce and public more quickly.

Once the vessel is underway, communications infrastructure from the vessel to the shore (to both the terminal where the vessel is landing and to WSF operations headquarters in Seattle) is critical to supporting reliable service. There are numerous challenges with maintaining connectivity from ship to shore, especially on island routes and through passages. Beyond the security and safety functions of communications, other business applications, such as the parts ordering and work order system, rely on connectivity.

The Plan recommends the following strategies to improve communications that enhance reliability:

- **Implementation of a new ship-to-shore communications system:** To support reliability and efficient business operations and safety and security of customers.
- **Implementation of a Common Schedule Database:** To provide an integrated system for scheduling and deployment of resources.

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 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. Online they can find scheduled ferry departure and predicted arrival times through VesselWatch, check 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?"

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



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 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 vessels, terminals/terminal design, and spaces that are adjacent to the terminal (e.g., transit connections and infrastructure) can affect the customer experience. Knowing how to navigate between the vessel and the terminal and the ease of traveling through the terminal can affect how customers make their connections to continue their trip—this is especially important for customers with disabilities. 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.

WSDOT Strategic Plan goals

- **Inclusion:** Strategies for improved customer experience
- **Practical solutions:** Integrate systems and modes

Plan Recommendations

The 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 vessels and terminals to be flexible and adaptable to emerging technologies and new transportation options.**
- + **Enhance parking opportunities for customers that encourage walk-on ridership and carpooling.**

The following sections describe specific strategies to 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 using resources most efficiently and allowing customers to make informed decisions about how and when they travel.

WSF already manages several information databases, many of them accessible through the WSF website. However, the right information is sometimes hard to find and not always as updated as customers need to help them make travel decisions. Currently, Wave2Go ticketing, Save-A-Spot reservations, and e-mailed service alert subscriptions require a separate login and password for each system. 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 unavailable, providing uncertainty about which sailing time a customer may take and whether they are better served by walking on or driving onto the ferry. A unified, multi-platform system would allow travelers to be able to access ticketing and real-time travel information using one login.

Ferry Riders' Opinion Group (F.R.O.G) surveys

One way for ferry customers to provide feedback to WSF is through the F.R.O.G. surveys, which are hosted by the Washington State Transportation Commission. The Commission collects these surveys periodically throughout the year from ferry customers who have volunteered, and passes along the surveys to WSF. Concerns, suggestions, and other issues that customers express in the surveys are directed to the appropriate WSF department. Each department uses this input, in combination with other factors, to make decisions about WSF service and amenities.

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.

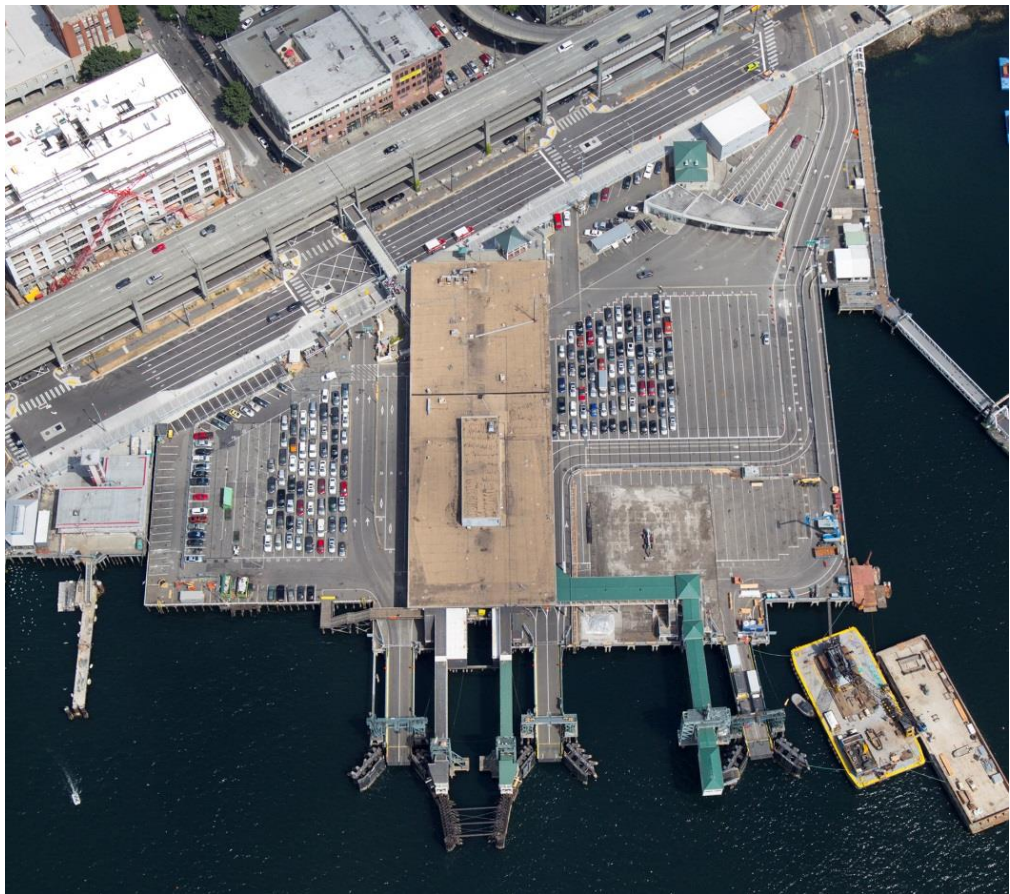
The following strategies could be implemented in the near term to help improve data collection and communication of information to customers:

- **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 alert system:** Automate the dissemination of service alerts—including queues and wait times—across multiple channels.



Customer experience

- **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 efficient vessel loading; however, this technology is considered to be emerging.
- **Automatic vehicle passenger counting:** Implementation of technology that automatically detects the number of passengers in a vehicle could allow prepaid vehicles to drive directly onto the ferry without stopping for inspection. If 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.

Accessibility to and from the terminals and on the vessels will continue to be an important component of the customer experience, especially as the population ages and connections from transit and rideshares become more common.

Accessible wayfinding that is compliant with the Americans with Disabilities Act (ADA) in and around the terminal and on the vessel 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. Additionally, electronic signage can provide customers with real-time arrival and departure information for these connections both in the terminal and on the vessel. As funding becomes available or other terminal projects are undertaken, the Plan recommends the following strategy:

- **Implement ADA-compliant electronic signage at terminals and on vessels:**
Provide directional information, service alerts and real-time schedule information, such as the time until the next sailing, notification of arrivals and other important information.





+ Enhance mobility by improving pedestrian, bike and transit connections to and from terminals.

Traffic congestion approaching WSF's terminals is an issue that affects ferry customers and several surrounding communities. WSF has already begun coordinating 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 reduce traffic congestion. This may include partnering with companies that provide emerging technologies for mobility-on-demand and providing space for these on-demand mobility options. Improving traffic control at terminal access points can also improve vehicular traffic flow and safety for bikes and pedestrians.

Mobility planning

Improvement of pedestrian, bike and transit connections to and from the terminals is not possible without coordination with local and regional transit agencies. WSF will continue to work with its partners to define the role of ferries in mobility planning, and to determine how future vessel and terminal designs can strengthen mobility for customers of all abilities.

WSF is currently working with the City of Seattle and King County Metro with implementation of their mobility programs and is in partnership with Kitsap Transit to implement passenger-only service at several WSF terminals.

Although increasing bike and pedestrian connections can reduce traffic congestion, pedestrian traffic is forecasted 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; these walkways increase pedestrian safety and efficiency of terminal operations. Another example is providing bike storage facilities at terminals when designing terminal preservation projects.



Customer experience

- **Continue to partner with local agencies when programming terminal projects:** Synchronizing capital projects could improve connections for customers beyond the terminal for bikes and pedestrians such as bike paths and sidewalks.
- **Pursue partnerships with mobility on demand services:** Look for opportunities at terminals to partner with mobility-on-demand services, such as bike share and other emerging technologies.





+ **Plan vessels and terminals to be flexible and adaptable 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 and application-based mobility-on-demand options become more 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 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 strategies:

- **Assess the evolution and expansion of pick-up/drop-off areas at terminals** as part of capital improvements planning.
- **Further study how mobility can be enhanced at each terminal** based on the unique characteristics of the terminal and its ridership.
- **Look for partnership opportunities with other agencies** to test mobility-on-demand services.

Operationally, autonomous vehicles brought onboard ferries will likely 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 vessel crews 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 onboard as possible.

As technology changes, demand for space on the ferry is also anticipated to change, but it is unknown how demand will shift in the future. Flexible design of new vessels would maximize WSF’s ability to manage passenger and vehicle space as demand potentially shifts. 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.



+ Enhance parking opportunities for customers that encourage walk-on ridership and carpooling.

Flexible design of new vessels would maximize WSF's ability to manage passenger and vehicle demand and allow for more passenger capacity. Providing opportunities for passengers to drive and park near the terminal could make walking onto the ferry more convenient and less expensive than driving onto the ferry. Providing the infrastructure needed for customers to shift from driving onto the vessel is also an adaptive management strategy to manage growth; it is further discussed in that section.

Expanding WSF parking facilities is challenging because parking is not typically a desired land use along the waterfront. Additionally, while WSF controls some parking facilities adjacent to terminals, other parking areas are privately owned or controlled by local agencies. The following strategies are recommended to enhance parking for customers and encourage walk-on ridership:

- **Provide real-time parking availability information:** when customers can see how much parking is available and where it is located, they can better plan their trip.
- **Explore shared-use parking opportunities with surplus parking:** some parking areas adjacent to terminals are underutilized and could provide additional parking for customers.
- **Conduct a system-wide parking study to assess options:** completing a comprehensive parking study would allow WSF to identify specific opportunities to improve parking.

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 by using existing resources as efficiently as possible.

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 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 fares 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.

Projected growth is expected to exceed existing capacities.

The Plan focuses on the stabilization of existing service that so many customers rely on every day for travel to and from their employment and recreational and cultural activities around the region. New investments in vessels, terminals and technology will be leveraged to enhance the system through vessel carrying capacity. Once the system has a fleet and workforce that can meet both the service and maintenance requirements to provide existing service, additional service could be considered. These enhancements are outlined in the following

The expansion of passenger-only ferry service in King, Kitsap and potentially other counties provides opportunities for promoting alternatives to personal vehicles. Partnerships and cooperation provide an opportunity to meet the goals of moving more people and working within the current legislative framework that consigns governance of passenger-only operations to local agencies.

The Plan reviewed the WSF system holistically, including how WSF can respond to growth through terminal and vessel infrastructure, communication to customers, information technology and other adaptive management strategies. Because of limited available resources, *the Plan puts highest priority on identifying investments needed to maintain the existing system.* WSF takes a conservative approach to increasing how many people they can carry through the ferry system. Thus, the Plan considers opportunities for improving operations through adaptive management strategies before turning to more expensive capital investments.

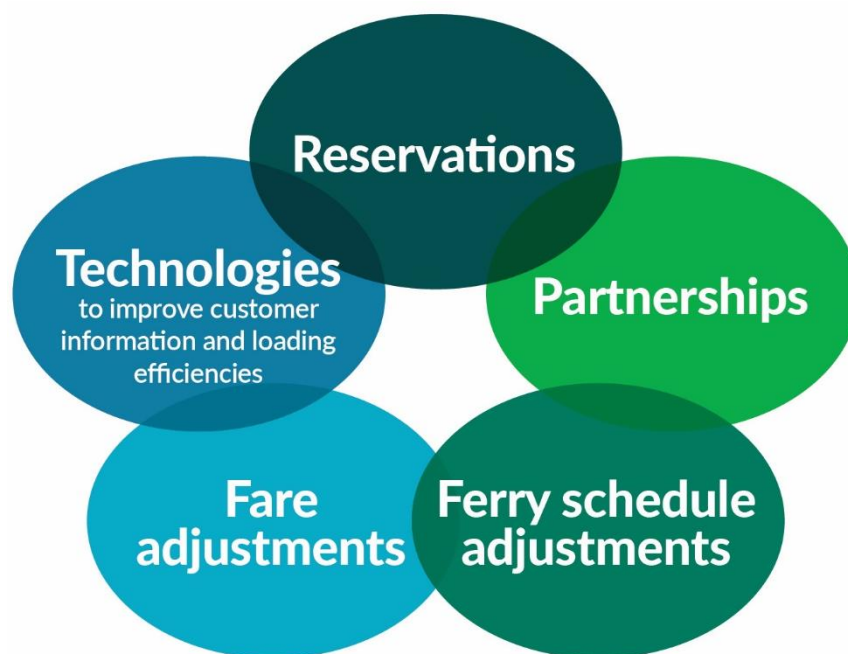
Although implementation of some adaptive management strategies have associated costs, those costs are generally lower than building larger vessels or increasing the size of the ferry fleet. These management strategies have two main goals:

- **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.
- **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.

Adaptive management strategies as a practical solution

The goal of adaptive management strategies is to use existing assets most efficiently. Strategic technology investments are needed to make that possible. Strategies also emphasize partnership with transit agencies that provide connecting or complimentary service.

The toolbox of adaptive growth management strategies includes:





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 that they cannot get a reservation). Additionally, WSF is unable to add a reservation program to 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. Future analysis would be required on a route-by-route basis.

Transit enhancements: By working in partnership with transit agencies to coordinate and improve connections for commuters who rely on the ferry, WSF has helped provide more options for taking transit 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: Under the umbrella of technology, WSF has provided more information about vessel space availability and terminal line lengths on its website to help customers make informed travel decisions.





Plan recommendations

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

- + Refine existing metrics and define new metrics to offer better data for future system planning, prioritizing the movement of people and improving 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, prioritizing the movement of people and improving 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 system-wide 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.

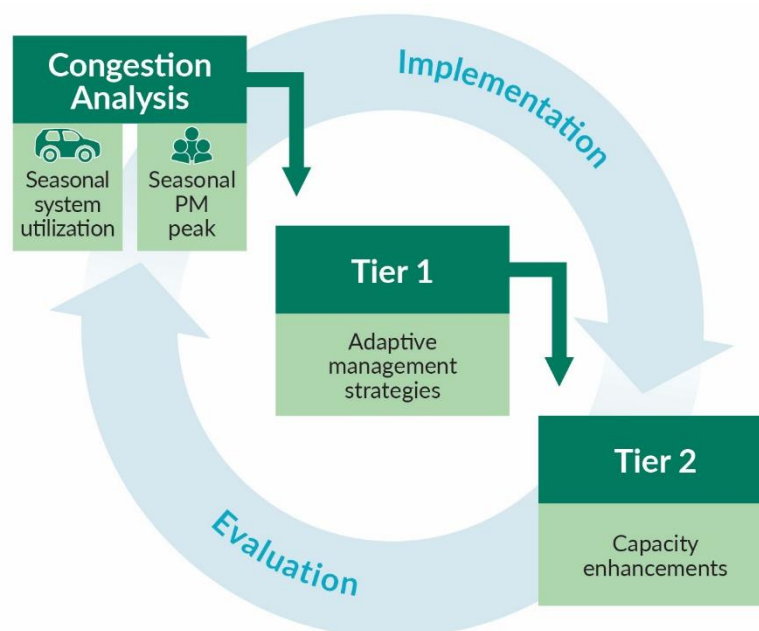


The ridership growth projections through 2040 include a significant increase in walk-on and bike-on passengers. These forecasts indicate that some of the Central Puget Sound routes would exceed their existing passenger carrying capacity during the evening peak period. To strengthen the priority of moving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

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 more 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, among 17 WSF-specific metrics, and reported to the Legislature. WSF could implement wait-time tracking in the near 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.

+ Recommended Performance Metric
Monitor real-time peak and off-peak wait times to aid in future planning and scheduling. The implementation of this metric requires investment in technology.

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 service planning by allowing WSF to monitor the available capacity of reservations.

+ Maximize utilization of system capacity through adaptive management strategies such as an expanded reservation system, an improved fare structure and fare collection methods, and others that increase efficiency, spread out demand, and prioritize walk-on and bicycle customers.

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

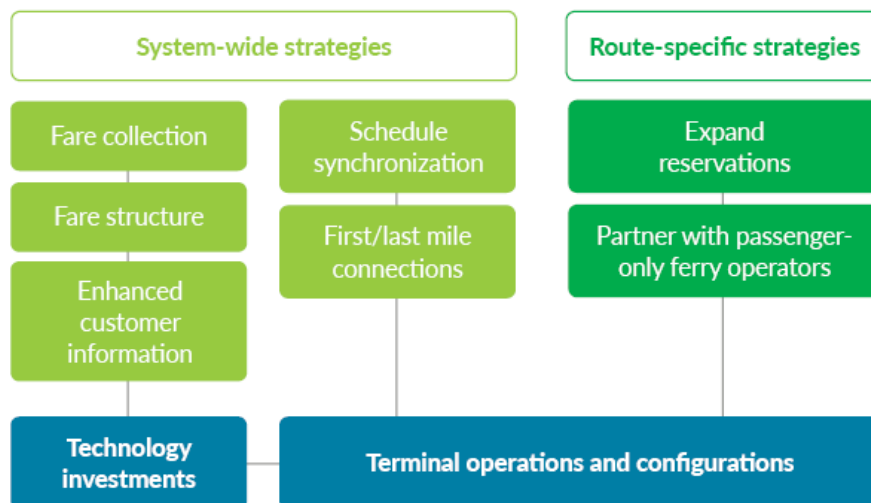
WSF has implemented adaptive management strategies based on tiered Level of Service standards. Once congestion levels have reached the first tier, adaptive management strategies should be applied. WSF's best practice is to implement management strategies that require little investment on an ongoing basis.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



The Plan recommends adaptive management strategies focused on the same general categories outlined in the 2009 Plan, emphasizing the need for investment in technology to implement many of these strategies and improve on and expand what WSF has already achieved. It is also important to consider how these strategies are implemented at the terminals and whether there is space or proper configuration to make these strategies most successful.

Adaptive management strategies can be categorized in two ways: system-wide strategies and route-specific strategies. System-wide strategies focus on fare structure and collection, overall improved customer information, first- and last-mile connections for customers (or how they get from door-to-door), and how schedules can be better synchronized with connecting transit. Route-specific strategies focus on opportunities unique to that route based on its characteristics. These strategies may include the expansion of reservations and partnership with passenger-only ferry operators at the terminals where they provide service. Both system-wide and route-specific strategies require some level of investment in technology or terminal operations considerations, as shown in the following graphic.

Implementation considerations of adaptive management strategies



The following specific strategies to improve system utilization and operational efficiencies through 2040 are described in the following sections:

- Expand vehicle reservations
- Fare structure and pricing strategies
- Schedule modifications
- Passenger-only ferry coordination
- Non-motorized enhancements
- First- and last-mile connections
- Parking



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 meet in the future the Tier 1 Level of Service, which means that WSF must examine adaptive management strategies such as reservations.

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 insufficient holding space, there is a risk that customers can lose their spot on the vessel by getting caught in line before reaching the tollbooth.

- **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 at Edmonds.

- **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 that have long lines and high volumes of recreational traffic.

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



- **Lopez Island and Shaw Island:** These terminals are the only locations within the Anacortes/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 long lines with many recreational travelers. 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 long lines with high volumes of recreational traffic.

>>Implementation needs: Improved on-time performance.

- **Fauntleroy/Vashon Island/Southworth:** The Fauntleroy/Vashon Island/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, increased vehicle holding capacity at each terminal and resources (technology and staff) to manage enhanced reservation system.



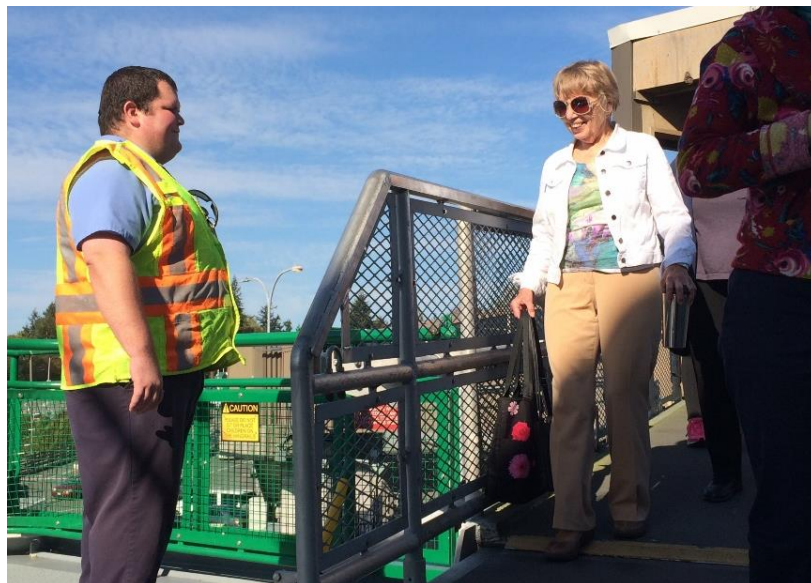
Fare structure and pricing strategies

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 and generate revenue to meet budget requirements.

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 to comply with 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.





Schedule modifications

Service planning and scheduling is an important core function at WSF and results in the schedule and vessels that WSF's customers and transportation partners rely upon. Scheduling is built upon a framework of legislative and regulatory requirements; the capabilities, capacity, and availability of the fleet, terminals and workforce; and customer needs and anticipated ridership demand. It is a complex planning process that balances requirements, capabilities and needs.

In addition, all schedule changes are reviewed with the stakeholder groups that may be affected by the change. These groups include Ferry Advisory Committees, transit partners, the traveling public and internal WSF departments. While schedule planning is a complex and lengthy process, there will be opportunities to implement schedules as a tool to manage growth.

- **Loading and off-loading time:** With a growing population and a focus toward shifting people out of cars and into other forms of motorized and non-motorized transportation, there will be pressure on the loading and unloading or "dwell" time identified in current schedules. Scheduling modifications can work in partnership with other adaptive management strategies that focus on terminal operational efficiencies. These include reservations, fare structure and collection, and terminal improvements that support pedestrians and bicycles such as overhead loading.
- **Two season schedule:** Schedules currently change four times a year to reflect service increases in the peak summer seasons and reductions in the winter months. The Plan proposes moving toward a two-season schedule by 2028, increasing the summer schedule from 14 to 22 weeks. This strategy brings opportunities for more streamlined coordination with transit partners and eases WSF workforce disruption, which changes with every seasonal sailing schedule.

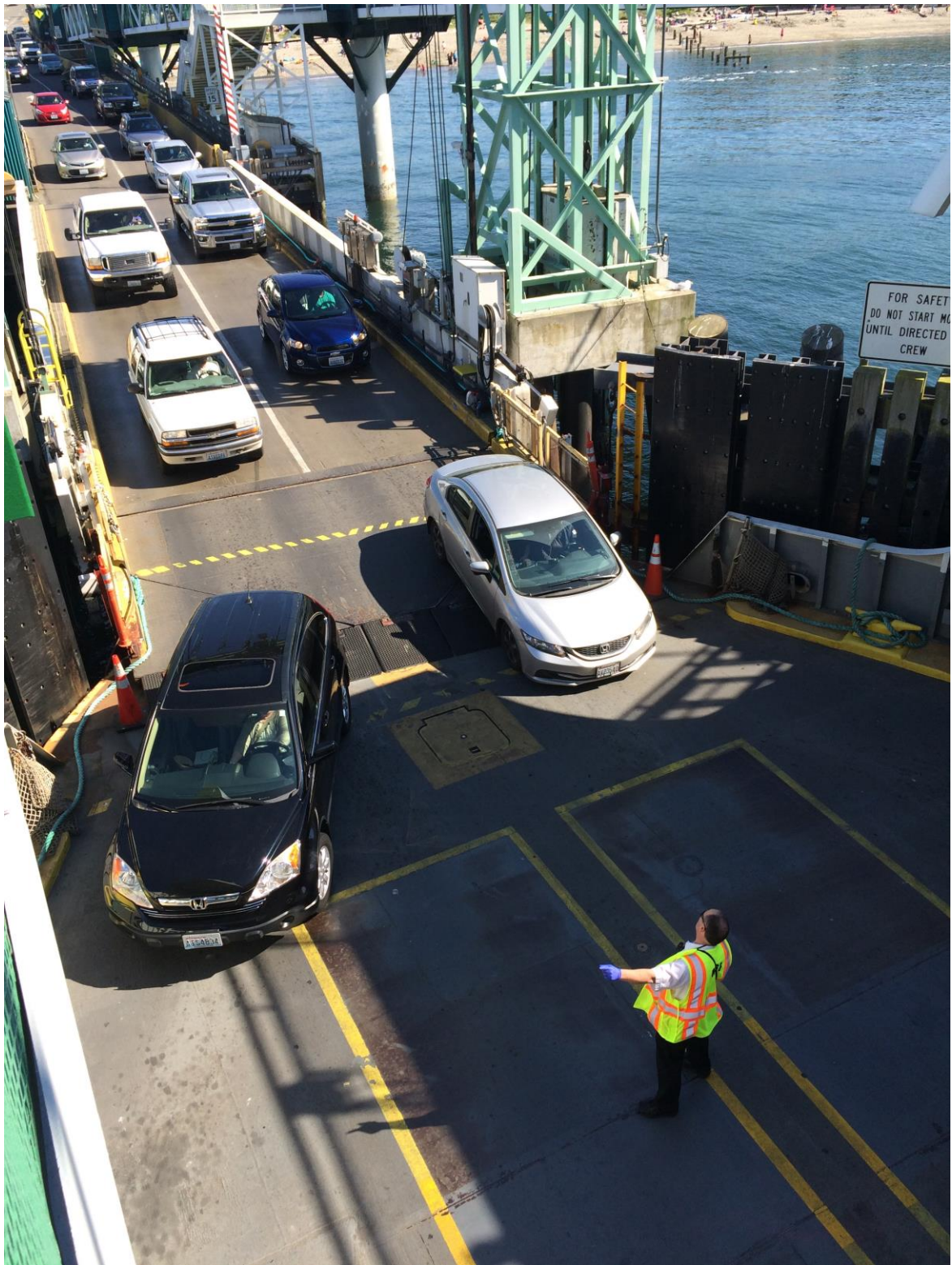
It should be noted that WSF currently does not have all of the data or the technological applications it needs to automate the scheduling/service planning process; much of it is done manually. As WSF contemplates investments in technology to help improve the customer experience and streamline operations, so should it consider investing in a transit planning and scheduling solution.

Future schedule modifications

With the addition of vessels to the fleet and increases in service hours identified in the Plan, schedules will be significantly modified, at a minimum, on the following routes accompanying new vessel deployment:

- **2019:** Fauntleroy/Vashon/Southworth
- **2019/2026:** Port Townsend/Coupeville
- **2023:** Seattle/Bainbridge and Seattle/Bremerton (reassess schedules once Colman Dock project is complete)
- **2028:** Anacortes/San Juans/Sidney, B.C.
- **2032:** Edmonds/Kingston

The schedules for these routes or others may be reevaluated sooner than the dates identified above, dependent upon legislative requirements, as well as fleet or workforce availability.





Passenger-only ferry coordination

WSF does not currently operate passenger-only ferries (POF). WSF did provide POF service in the 1990s, but legislative direction discontinued it a decade later once operating funds were restricted with the scaling back of Motor Vehicle Excise Tax (MVET). POF service is not an allowable use for gas tax revenue.

For many WSF customers, POF routes provide more options to find the right sailing that fits their schedule. King and Kitsap counties both now operate POF service with voter-approved, local revenue sources, with plans for additional route implementation. Private operators also contribute to the POF network, providing service from Port Townsend to Friday Harbor and to the San Juan Islands and Victoria, B.C. Other local agencies throughout the Puget Sound Region have also been assessing POF feasibility as an additional transportation alternative for their residents.

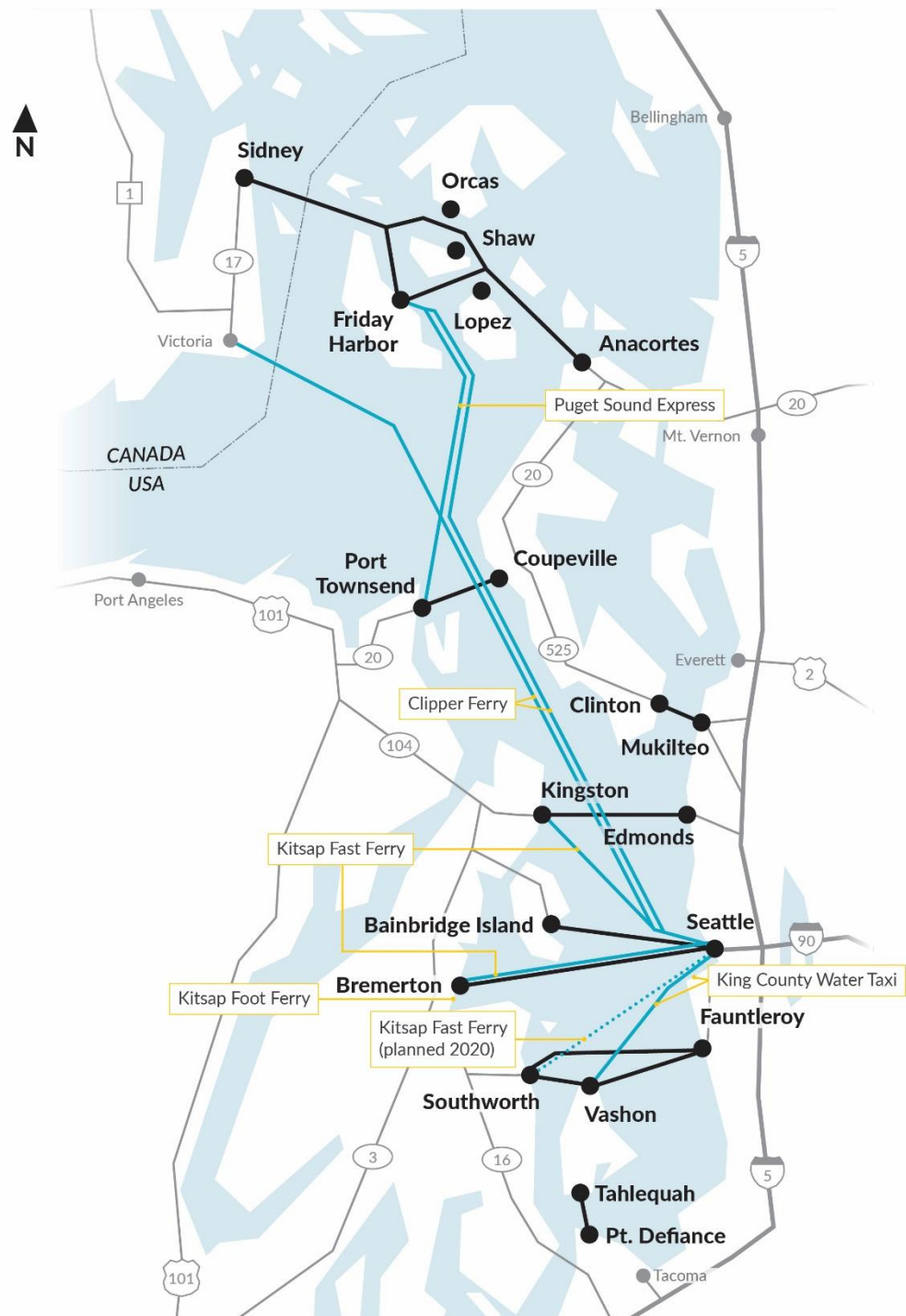
Most POF services are adjacent to or share WSF terminal facilities, including Seattle, Bremerton, Kingston and Vashon Island terminals and seasonally at the Friday Harbor and Port Townsend terminals. The planned service at Southworth is anticipated to connect to the WSF terminal. These connections are illustrated in route map on the following page.

The implementation of new POF service provides opportunity for complementary services to WSF and the need for additional or modified landside terminal infrastructure to accommodate this service. As a partner ferry service, WSF is committed to supporting additional modes of transportation and will support POF service implementation and their infrastructure needs when programming future infrastructure projects. This includes operational considerations in the terminal facilities as well as coordinated schedules to best serve the customer.



"M/V Sally Fox" (CC BY-2.0) photo by Ricky Courtney,
<https://www.flickr.com/photos/131539917@N04/>

Passenger-only ferry routes¹



¹ Puget Sound Express and Clipper Ferry Seattle to Friday Harbor routes operate seasonally.



+ 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.

The 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. The 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 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 the route. Service hours on each route are consistent throughout the year, generally with additional hours provided in the summer months; exceptions are the Anacortes/San Juan Islands and Port Townsend/Coupeville routes that vary by season as well as the Fauntleroy/Vashon Island/Southworth and Mukilteo/Clinton routes that vary seasonally on weekends. 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 vessel size):**

Vessel capacity, which refers to the number of vehicles and passengers carried per sailing, is based on the vessels assigned to each route 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.

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.

- **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 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.



Seattle/Bremerton

Ridership on this high commuter route is expected to increase significantly by 2040, with 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 marine evacuation systems, 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

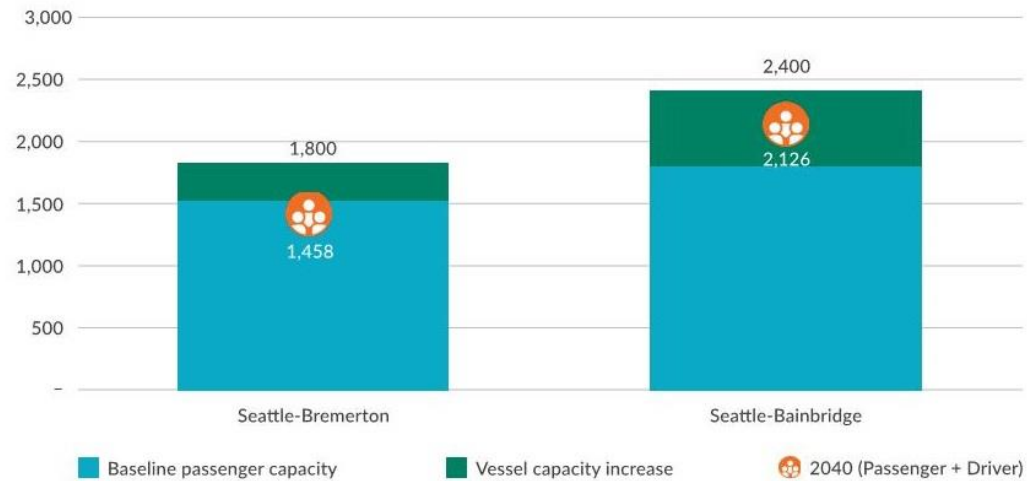
Similar to the Seattle/Bremerton route, walk-on and bicycle traffic is expected to grow at a high rate by 2040. Traffic exiting the Bainbridge Island terminal adds to congestion along State Route 305, and encouraging greater use of transit, walking and biking could help relieve this congestion. The Plan's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

- **Terminal operational efficiency enhancements:** Replace the existing overhead loading walkway to increase passenger throughput and improve safety.
- **Vessel capacity modifications:** Increase passenger capacity from 1,800 passengers to 2,400 passengers through addition of life rafts and marine evacuation systems, and enclosure of deck space. A comparison of 2040 forecast peak sailing ridership (shown with the orange passenger icon) with the proposed capacity increase (shown in green at the top of the bar) is provided in the following figure. With improvements to vessels to increase passenger capacity, projected passenger demand will be met.

+ Recommended Performance Metric

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

Peak sailing ridership with vessel passenger capacity increases



Fauntleroy/Vashon Island/Southworth

The Fauntleroy/Vashon Island/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-vehicle capacity vessel. Enhance winter service by adding a third 124-vehicle capacity vessel on weekends.
- **Vessel capacity modifications:** Add capacity by replacing the 90-vehicle capacity Sealth with a 124-vehicle capacity 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 recreational, 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, crossing delays can occur during loading and unloading. When vehicle holding at the Kingston terminal is full, vehicle backups extend up along SR 104.

The Kingston terminal is located on the Kitsap Peninsula, which means capacity enhancements on the Edmonds/Kingston route could create some congestion relief for other Kitsap routes, particularly the west-side terminals of Bainbridge Island and Bremerton. Because of this unique opportunity, the Plan recommends capacity improvements for the Edmonds/Kingston route include:

- **Service enhancements:** Increase service frequency to 30-minute headways from 45- to 50-minute headways. This service level increase requires vessel capacity modifications.
- **Vessel capacity modifications:** Replace the 188- and 202-vehicle vessel operation to operate three smaller 144-vehicle 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, including a study of current and future WSF property in coordination with the City of Edmonds and other stakeholders, to improve terminal operations and the customer experience at the terminal. Continue to work with stakeholders to address congestion in the town of Kingston.

Benefits of three-vessel operations at Edmonds/Kingston

- **Congestion Relief:** additional alternatives for Kitsap customers, which may alleviate congestion on other routes.
- **Increased service:** ability to move more passengers and cars with more frequent service.
- **Pulsing of traffic:** fewer cars and passengers will be loading and off-loading at each sailing, providing some benefits to the local transportation network.
- **Transit Schedule Synchronization:** service every 30 minutes better aligns with transit partner



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-vehicle Olympic Class vessel to replace the 124-vehicle Issaquah Class vessel by 2019 during the peak season and by 2024 in the fall, winter and spring months.
- **Terminal operational efficiency enhancements:** Construct overhead loading at the Clinton terminal and consider options for modifying vehicle holding. Reservations would be challenging to implement on this route because of the configuration of vehicle holding at both terminals (long and linear lanes 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 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, and operational efficiencies to increase vehicle holding capacity to better manage reservations and navigability at Coupeville as part of a Keystone Harbor safety and navigation study.



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. Sailings on this route have multiple stops leading to compounded delays. 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. Add the interisland service on winter season weekends. 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-vehicle *Sealth* with a 114-vehicle 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 Innovative Partnership

WSDOT is exploring innovative partnership opportunities to improve or construct a new Anacortes ferry terminal. The existing terminal building is more than 50 years old, undersized and in deteriorating condition. A new or enhanced facility would improve efficiencies and meet current safety, security and accessibility requirements.

Through a proviso in the 2018 transportation budget (ESSB 5096, Section 214), WSDOT's Innovative Partnerships Office is pursuing possible public-private partnerships to generate revenue for the ferry terminal site through commercial ventures such as lodging, conference and meeting facilities, food service, shopping or other retail operations. WSDOT is engaging the Anacortes and San Juan Islands communities to ensure potential opportunities meet their priorities and needs.

Community and stakeholder feedback will guide development of a solicitation package to generate interest and ideas from developers.

Anacortes/Sidney, B.C.

The Anacortes/Sidney, B.C. route does not operate in the winter months and has high tourist ridership in the summer. 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 resilience. The section will focus on how each element of the Plan supports agency sustainability goals and how 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 the Plan, sustainability strategies focus on environmental stewardship and provide proactive strategies to address climate change.

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. The Plan focuses on resilience related to reacting to the effects of climate change and other abrupt disruptive events.

Sustainability and resilience are identified as underlying themes of the Plan and interwoven throughout each of the Plan elements and recommended strategies. 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.

Sustainability and environmental stewardship

The 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 the Plan's development. For example, in January 2018, Governor Jay Inslee signed Executive Order 18-01, directing 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 monitors results.

Internally, WSF continues to integrate decision-making that ensures consideration of the “three E’s” of sustainability—economy, environment and equity. WSF has formed strategic working groups to analyze operational improvements that would reduce fuel consumption and minimize WSF's carbon footprint. Despite these strides, WSF's 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:

- + **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.**
 - + **Reduce vehicle emissions by optimizing terminal operational efficiencies and employing adaptive management strategies that spread out peak demand and minimize wait times.**
 - + **Highlight sustainability through organizational structure, decision-making, and reporting.**
-
- + **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, burning more than 18 million gallons each year. Because of this, WSF's operations generate the most carbon and other greenhouse gas emissions within the state transportation system. The 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, potentially 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 plug-in electric-hybrid propulsion with charging connections at the terminals. 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 the Plan, by 2040 the agency will have replaced 13 existing diesel vessels with electric-hybrid vessels and will have converted six vessels to plug-in hybrid. All hybrid vessels will be capable of charging at the terminal to realize the maximum benefit of hybrid propulsion. With the installation of terminal charging equipment, some vessels will be capable of full electric operation on shorter routes and others will use the plug-in hybrid system to supplement onboard engines. The following table 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.

Why electrify vessels?

The electrification of the WSF fleet provides measurable benefits in fuel/energy cost savings over the 20-year planning horizon and beyond. More importantly, measureable benefits in the CO₂ emissions into the atmosphere are projected at below 2050 reduction targets by 2034. That means moving more people in and around our region with less impact on our environment.



Planned fleet composition

	2019	2023	2030	2040
Plug-in Hybrid	0	4	12	22
Diesel	23	18	13	4
Total Fleet Size	23	22	25	26

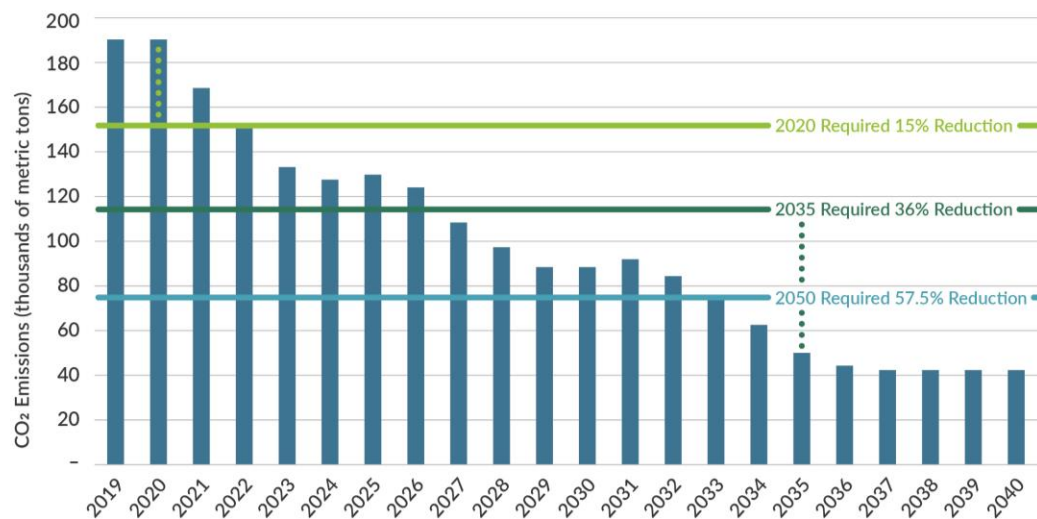
With this new, greener composition, the WSF fleet would achieve a 50 percent reduction in emissions and annual fuel consumption compared to today's fleet, from approximately 19 million gallons consumed in 2018 to approximately 9.5 million gallons consumed in 2040. Not only does this have significant positive effects on the environment, but also tremendous cost savings, as discussed in more detail in the Implementation, Investments and Financial Outlook section of the Plan.

2018 fuel consumption
19 million gallons

2040 fuel consumption
9.5 million gallons

The figure below shows the corresponding change in carbon emissions, which include meeting and exceeding state law requirements of a 36 percent reduction to 2005 emissions by 2035 and a 57.5 percent reduction by 2050. The Jumbo Mark II Class vessel conversions represent an initial 25 percent reduction in emissions upon the completion in 2023.

Annual CO₂ emissions and RCW 70.235.050 reduction requirements



While vessel fuel consumption, emissions and noise are central to the Plan's strategies and investments related to vessels, 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. This would be particularly relevant in the context of WSF's vendor contracts—for instance, galley service providers onboard vessels or other food service providers at terminals.

Although there are currently no set targets or requirements for this type of 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, the Plan recommends the following strategies, which are explained in more detail in the Reliable Service section, which outlines future vessel programming:

- **Invest in electric-hybrid propulsion and terminal electrification infrastructure:** Invest in converting six existing diesel propulsion vessels to electric-hybrid, and design new vessels to use electric-hybrid propulsion with shoreside charging 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. Terminal charging infrastructure is needed to realize the benefits of plug-in, electric-hybrid vessel propulsion.
- **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.
- **Implement performance measure:** Track greenhouse gas emissions and travel time saving benefits of ferries.

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.

+ Recommended performance measure

Report Greenhouse Gas Emissions (GHG) and travel time savings per the Corridor Capacity Report.



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, the 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.





+ 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 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 waiting at or traveling to and from WSF terminals. WSF is currently exploring adaptive management strategies like expanding the reservations system and implementing demand-based pricing 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 high-demand periods 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 proposed in the 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.



The Plan recommends the following strategies to optimize terminal operations, which also appear and are explained in more detail in the Manage Growth 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:** Implement automated 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.

+ Highlight sustainability through organizational structure, decision-making, and reporting.

Because sustainability regulations 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 to focus on sustainability initiatives would allow for better cross-departmental integration of strategies. It would also hold WSF more accountable to various tracking and reporting requirements, which is helpful for monitoring performance and ensuring that WSF continues to move toward achieving its 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.



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 planning for resilient 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 spare vessels to support regional emergency response and consider designing new vessels with emergency side-loading capabilities.**
- + **Invest in updated communication technology to provide enhanced response capabilities.**

**Lifeline routes are defined and mapped at the following reference:
<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 level. The disaster response and preparedness plan should clearly define WSF's role as a maritime entity in disaster recovery. It 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 so that walk-on customers can exit the vessel if it is tied up in an alternative landing site during an emergency.
- **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 regular terminal is unavailable.
- **Fuel/energy access plans:** Prepare alternative plans for how diesel fuel 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.

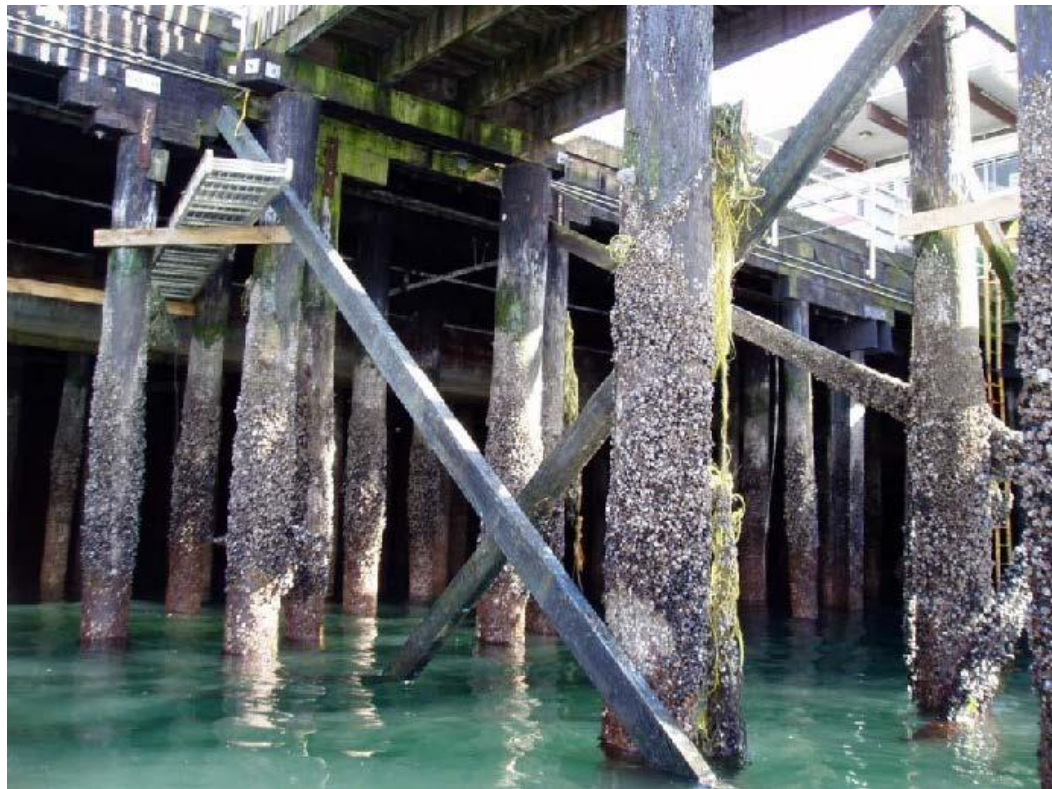


Sustainability and resilience

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 developing an emergency response plan and the following emergency preparedness strategy:

- **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 also 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 spare vessels to support regional emergency response and consider designing new vessels with emergency side-loading capabilities.

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.



+ Invest in updated communication technology to provide enhanced response capabilities.

As discussed in the Reliability Service section of the Plan, the upgrading of ship-to-shore communications will strengthen the resiliency of system operations and allow WSF to be more responsive in a potential abrupt event.

- **Implementation of a new ship-to-shore communications system:** Support reliability and efficient business operations and safety and security of customers.
- **Equip vessels and terminals with latest security monitoring and identification technologies:** Keep up to date with the latest technologies to ensure safety and security of customers and employees.

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 the Plan have been carefully conceived to meet the agency's objectives in a cost-effective and prudent manner, in keeping with WSDOT goals for Inclusion, Practical Solutions and Workforce Development.

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 near-term operating cost reductions expected once WSF converts diesel propulsion vessels to electric propulsion. However, it is difficult to quantify the long-term effects of energy reduction on climate change.

Service hour increases and modest increases in vessel size on certain routes will alleviate some congestion but will add pressure to an already overburdened fleet of vessels. To ensure that service hours can be added without degrading WSF's ability to maintain its fleet and jeopardize service overall, WSF must first strengthen reliability by increasing the time dedicated for maintenance programs and expanding the size of the maintenance relief fleet.

Thus, the Plan's priority in the near term is to invest in the reliability of the system through the construction of new maintenance and service 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 through technology investments that provide opportunities for customers to plan for and complete their ferry trip and connect to transit or other modes more easily.

Within the Plan's medium-term timeframe, WSF's focus will shift toward easing congestion and increasing system capacity for both vehicles and passengers and improving the customer experience through additional technology and terminal improvements. WSF will accomplish this goal by implementing service enhancements throughout the system, continued vessel replacements, and continued terminal and information technology infrastructure investments. Although the Plan proposes the addition of limited service hours to routes before 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 within the system's capacity and resources 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. The Plan does, however, take into account the limitations of local shipyards for near-term vessel construction. 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 through investment.**
- **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.

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, the two-year fiscal planning periods used by Washington State.

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 vessels for delivery as early as 2023 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. Unfortunately, WSF's options for building new vessels are extremely limited—the 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 approximately 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 electric-hybrid propulsion, and the Bainbridge Island and Seattle terminals will be equipped to support electric charging. There is opportunity within this timeframe to explore the possibility of adding this infrastructure at the Mukilteo terminal during construction of the new terminal, estimated for opening in 2020.

One existing vessel, the *Hyak*, is currently scheduled for retirement in 2020 (however, operations and capital is currently funded only until mid-2019) as it reaches 52 years of age. Unfortunately, this vessel has not received the midlife refurbishment needed to meet a 60-year useful lifespan 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, with only one service relief vessel—the *Tillikum*, built in 1959. During this time period, 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; it also 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 2019 and 2026 on the Port Townsend/Coupeville route. Two additional trips will be provided daily during the peak season, requiring some additional crew labor and fuel costs, followed by expansion of summer service hours. This added service is the only proposed service hour adjustments until 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 to support the installation of a second slip at the Southworth terminal and further studies system-wide. Planned preservation projects occur throughout the system and terminal electrification to support electric-hybrid propulsion vessels will be further studied.

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 possibly the acceptance of *Good To Go!* toll passes for payment. WSF has already planned for integration with the Next Generation ORCA system. Technology investments are critical to the implementation of adaptive management strategies identified in the Plan, which strive to best use existing resources and system capacities through enhanced customer trip planning information and data for WSF to use to make informed decisions about service and infrastructure.

Until vessel delivery keeps pace with vessel retirements toward the end of the medium term, this near-term 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 those in highly specialized, licensed positions—also presents a risk to service reliability during this period. 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 period.

Vessels

During these six years, the remaining two largest consumers of diesel—the Jumbo Mark II Class vessels—will be converted to electric-hybrid propulsion. The Plan recommends that five new vessels be built: four of the five new Olympic Class vessels and one 124-car capacity vessel will have been delivered. These vessels will serve to expand the maintenance fleet and 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 2028 when the fleet size reaches 25.

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 horizon.

Service

The Plan does not propose any additional 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. Additionally, some vessel replacements during this timeframe will allow for some additional service capacity.

Terminals

The Plan proposes terminal upgrades to support electric-hybrid 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.

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 technology 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 easily find ticketing and travel information. Similar to the website refresh, a unified, multi-platform e-mail alert 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. 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.

The Plan's proposed enhancements fit well within existing schedules and crew labor windows. Once the fleet has an adequate number of relief vessels, service hours could expand without reducing the maintenance time each vessel needs in order to maintain its reliability for service. These proposed additional service hours will bring some congestion relief to routes that are approaching their maximum utilization through the Level of Service metric.

However, not all projected growth will be met with the proposed enhancements. This stresses the importance of technology investments and policy decisions to support operational efficiencies. These operational efficiency strategies support a Practical Solutions approach, which emphasizes utilizing existing system capacities.

Vessels

Over the long term, vessels will continue to be retired and replaced as they reach the end of their service life; nine vessels are scheduled to be retired and replaced from 2028 to 2040. In the early years of the 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 11 vessels, two delivered in 2028 and one every year after from 2029 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 to 55 years, up to 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 available out-of-service time is insufficient to provide the maintenance needed to reach the 60-year mark. Retiring these vessels at 50 to 55 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 with the three-boat operation on the Edmonds/Kingston route in 2031 , 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 vessel maintenance prior to retirement.

Service

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 13,000 service hours, or over 11.5 percent, during the planning period.

Terminals

Over this timeframe, the Plan proposes additional terminal upgrades to support electric-hybrid propulsion vessels that enter into service. The Plan outlines improvements at the terminal facility at Edmonds to address operational constraints 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.

Technology

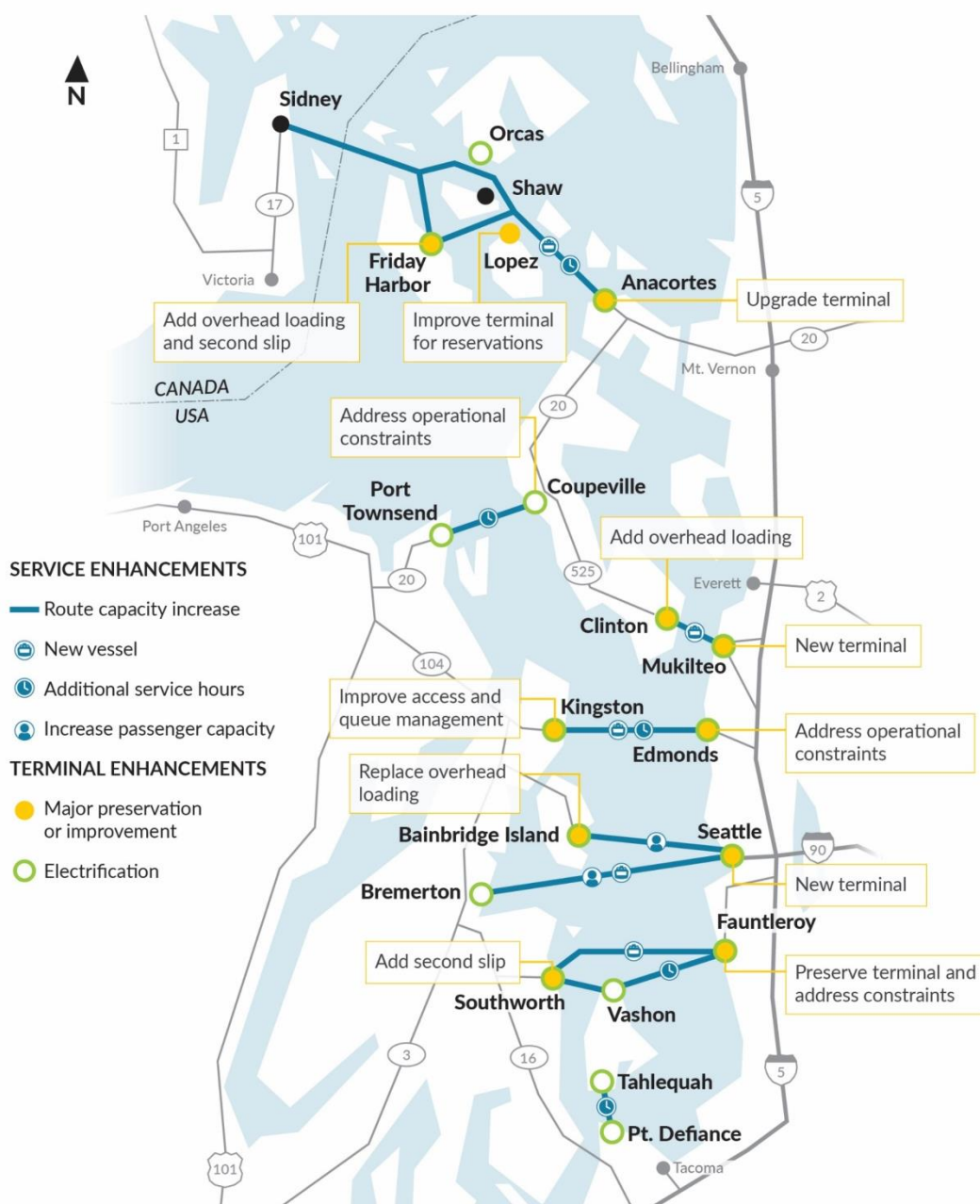
The Plan recommends additional technology investments for consideration as suitable technology becomes available in the long term. These investments include automatic vehicle length detection and automatic vehicle passenger counting systems that would automate pieces of the fare- and data-collection process and reduce the time needed 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 rate in the 2027-2029 biennium at nearly 9 percent, due primarily to proposed service enhancements programed in 2028 and expansion of the vessel relief fleet. Operating costs related to service enhancements again will increase in 2028 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.

Service and terminal enhancements 2040



Seattle/Bremerton

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

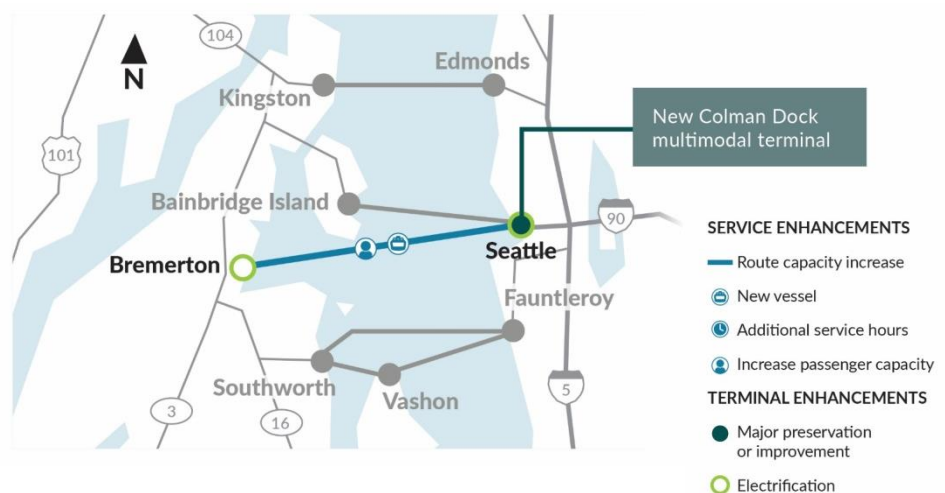
Medium term

- **Vessels:** Replace an existing diesel Super Class (*Kaleetan*) with a new electric-hybrid Olympic Class (144-car) vessel in 2026 (fall/winter/spring) and replace the diesel Olympic class with a new electric-hybrid Olympic class in 2027. This change will allow the retirement of the *Kaleetan* and realize fuel cost savings and reduced carbon emissions.
- **Service enhancements:** None are proposed in the medium term.
- **Terminals:** Modifications for electric-hybrid vessel plug-in capability at Bremerton in coordination with vessel deployment. 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 ongoing preservation needs in the medium term. Preservation for terminal elements is planned at Bremerton in the medium term.

Long term

- **Vessels:** Replace existing summer season jumbo class vessel with plug-in hybrid Jumbo Mark II 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:

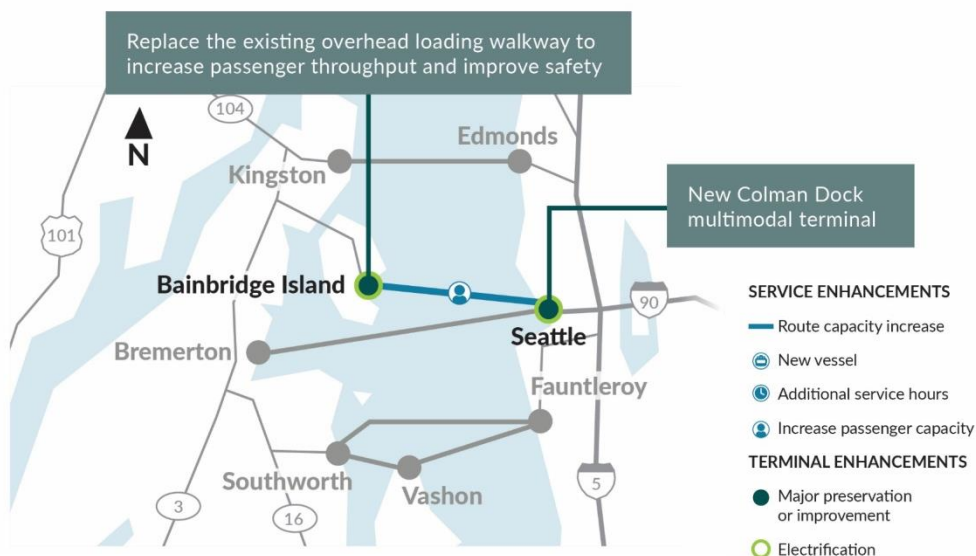
Medium term

- **Vessels:** Convert the current Jumbo Mark II Class vessels to electric-hybrid propulsion in 2021 and all-electric operation in 2022.
- **Service enhancements:** None are proposed in the medium term.
- **Terminals:** Terminal electrification at Bainbridge Island to coordinate with vessel propulsion conversion 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 are planned in the near term, and parking lots are planned in the medium term. Overhead loading at Bainbridge will be wider to accommodate future passenger volumes.

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 that allow more passengers to be carried within the same service hours
- **Terminals:** None are planned for this timeframe.



Fauntleroy/Vashon Island/Southworth

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

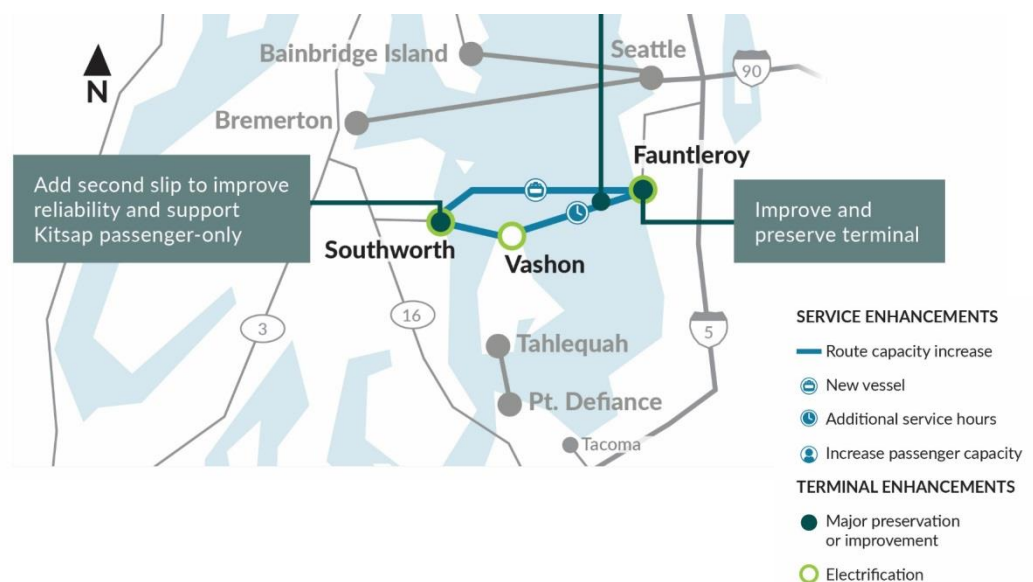
Medium term

- **Vessels:** In 2027, the route will receive the first of three new electric-hybrid propulsion, 124-car vessels.
- **Service enhancements:** None are proposed in the medium-term.
- **Terminals:** Electrification at the Fauntleroy, Vashon Island, and Southworth terminals is planned by to be in sync with terminal preservation projects taking place in the 2025-2027 timeframe. The Southworth second slip project is programmed for completion in the medium term.

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

Long term

- **Vessels:** Replace remaining two Issaquah Class vessels with electric-hybrid 124-car vessels in 2028 and 2029.
- **Service enhancements:** Add late spring/early fall and winter weekend 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

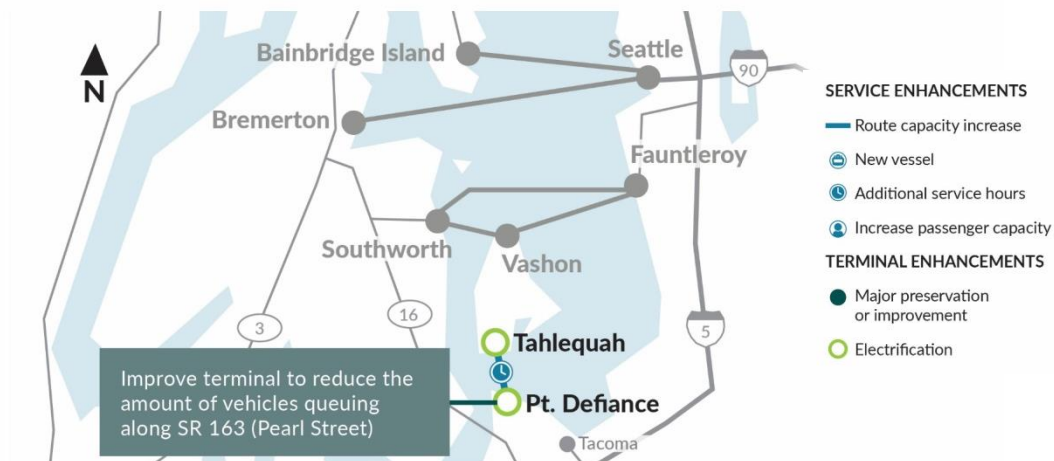
- **Vessels:** None are proposed in this timeframe.
- **Service enhancements:** None are proposed in the medium term.
- **Terminals:** No additional improvements are proposed in the Plan.

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 electric-hybrid propulsion in 2031.
- **Service enhancements:** Add one additional roundtrip per day.
- **Terminals:** Electrification to accommodate vessel plug-in planned in coordination with vessel electrification and terminal preservation projects.

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

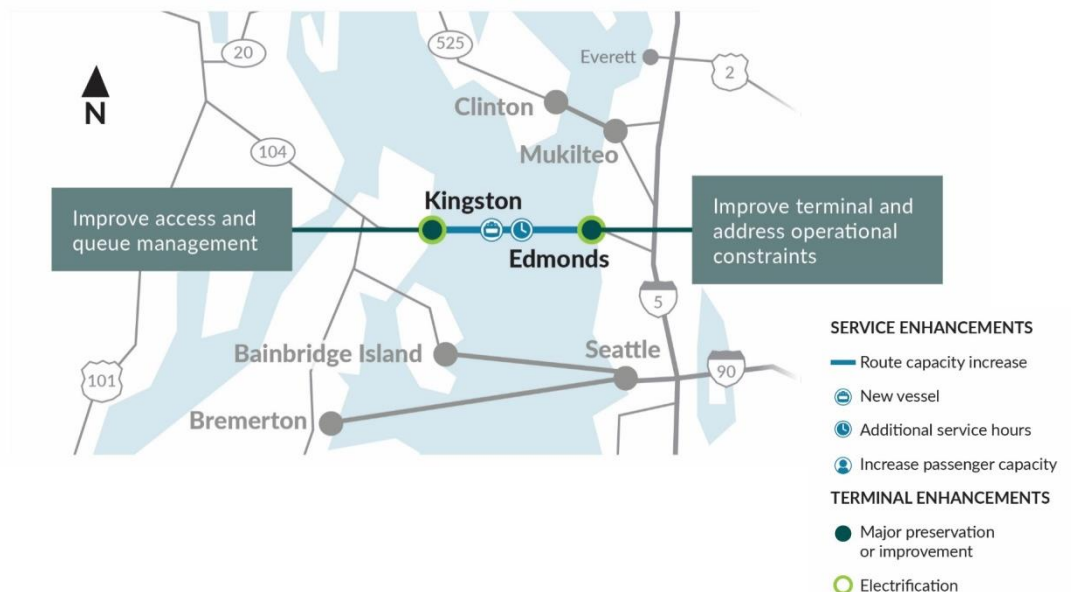
- **Vessels:** One of the two service vessels, the *Puyallup*, will be converted to electric-hybrid conversion and will operate all-electric in 2023.
- **Service enhancements:** None are proposed in this timeframe.
- **Terminals:** Vessel plug-in capabilities at both the Edmonds and Kingston terminals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

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

- **Vessels:** Replace two existing (202-vehicle and 188-vehicle) vessels with three electric-hybrid propulsion vessels to operate all-electric 144-vehicle 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.



Mukilteo/Clinton

Improvements recommended for the Mukilteo/Clinton route include:

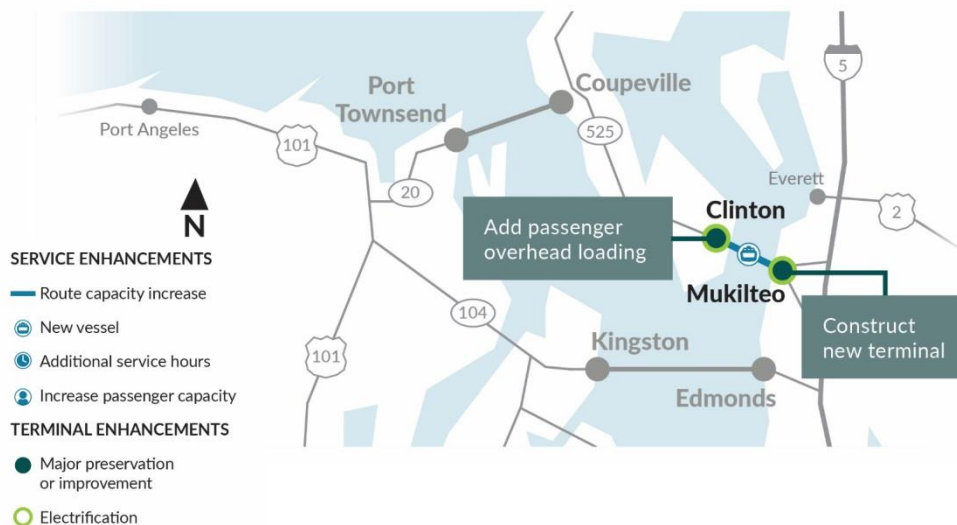
Medium term

- **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. In 2023 and 2024, those vessels will be replaced year-round with two new electric-hybrid 144-car capacity vessels. This vessel replacement will also increase off-peak season capacity.
- **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. Vessel plug-in capabilities at both the Mukilteo and Clinton terminals are planned in coordination with electric-hybrid vessel deployment.

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

Long term

- **Vessels:** Enhancements on this route are focused in the medium term.
- **Service enhancements:** Enhancements on this route are focused in the medium term.
- **Terminals:** Enhancements on this route are focused in the medium term.



Port Townsend/Coupeville

The Port Townsend/Coupeville route improvements include:

Near term

- **Service enhancements:** Extend the service day one round trip for the second vessel in 2019 and expand summer service hours beginning in 2026.

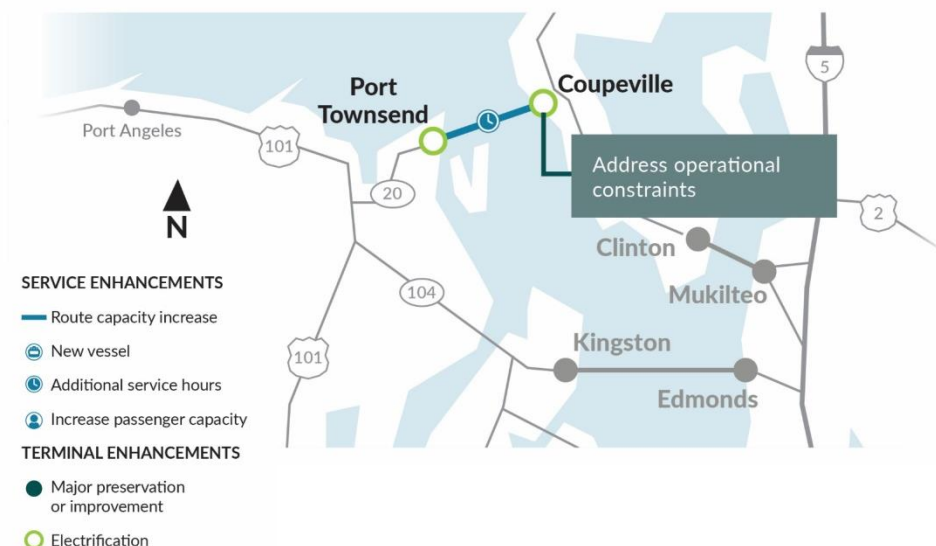
Medium term

- **Vessels:** None are proposed in this timeframe.
- **Service enhancements:** None are proposed in this timeframe.
- **Terminals:** Perform further study of the terminal and harbor improvements to address service reliability on the route. This route has experienced three vessel groundings in the last two years.

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 electric-hybrid propulsion to operate all-electric in 2032 and 2033.
- **Service enhancements:** Extend the second boat operation into the early spring in 2028 once the fleet has the relief vessels to support extended service.
- **Terminals:** Electrification improvements at both terminals are planned in coordination with electric-hybrid vessel deployment.



Anacortes/San Juan Islands

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

Medium term

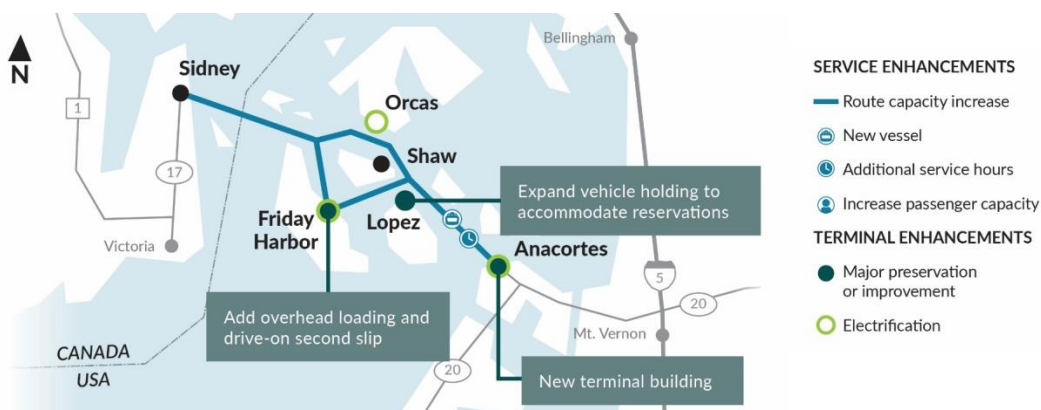
- **Vessels:** One vessel serving this route will be retired and replaced with a electric-hybrid, international certified (SOLAS) Olympic Class vessel (144-car) in 2028.
- **Service hour enhancements:** None are proposed in the medium term.
- **Terminals:** Terminal electrification is planned at Orcas Island, Friday Harbor and Anacortes in coordination with electric-hybrid vessel deployment and terminal preservation and improvement projects. 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 three vessels with 144-car capacity electric-hybrid vessels between 2034 and 2036. Replace the 90-car capacity interisland vessel with a 114-car capacity electric-hybrid vessel in 2037.
- **Service enhancements:** Adding additional peak season, late-night service to accommodate commercial traffic, therefore freeing up capacity during the day hours. Extending the summer service schedule into May and October in 2028. Winter enhancements would also occur in 2028, adding an additional 2,160 hours. This increase in service hours also represents an opportunity to add back winter service to Sidney, B.C. that was eliminated in 2005 but is not currently included in the Plan's operating costs and recommendations.
- **Terminals:** No additional improvements are proposed in the Plan.

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



Anacortes/Sidney, B.C.

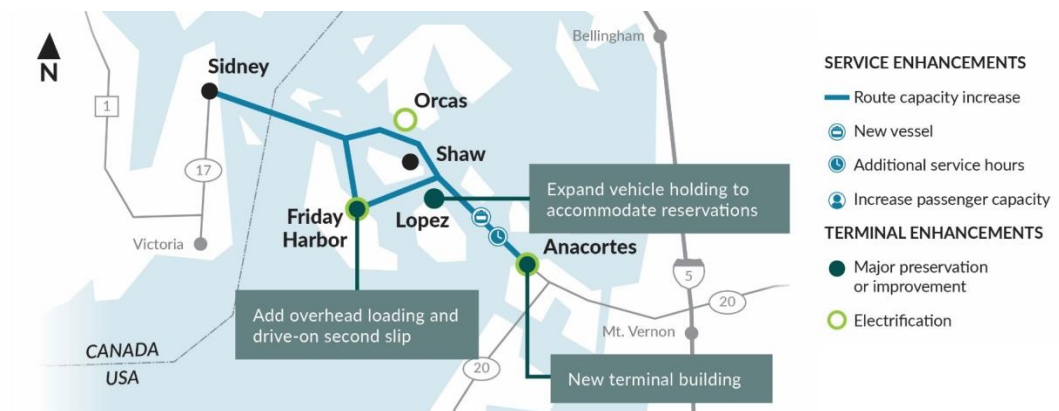
Improvements to the Anacortes/Sidney, B.C. route include:

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

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. Like most public transportation systems, WSF's operating costs are subsidized, a large portion of them accounted for with fare revenues. Fares and other operating revenues currently recover approximately 75 percent of the costs of operation. The remaining operating costs are funded through a variety of taxes and fees.

The Plan identifies capital improvements in vessel and terminal electrification that will reduce operating costs, and service enhancements that will increase costs due to labor and energy requirements. Including both operating and capital improvement costs, the total cost to implement this plan over the next 20 years is estimated at \$14.6 billion. The costs and revenues are escalated over time to reflect inflation.

Capital program costs

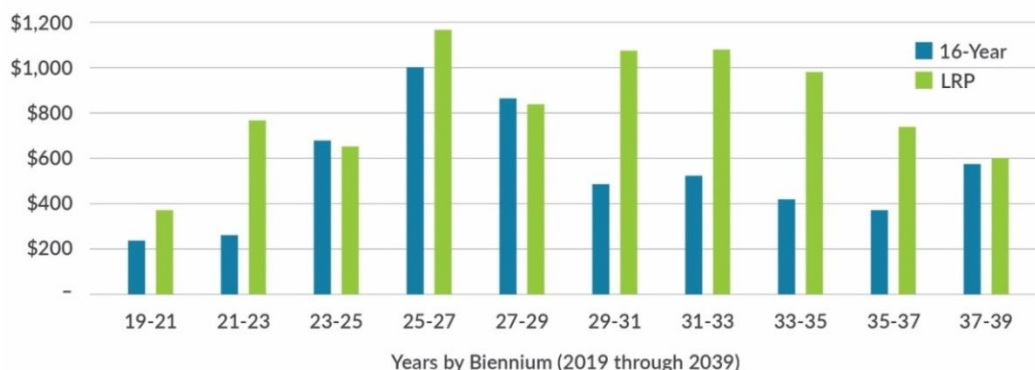
To accomplish its goals, the Plan proposes new investments that are not currently included in WSF's 16-year capital improvement and preservation plan for fiscal year (FY) 2018 through FY 2033. Washington State agencies prepare a capital investment plan to support decision-making about how to allocate 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 following charts; investments appear lower in the remaining four years of the six years (biennium 2019-2021 and 2021-2023), suppressed by available funding, and 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 insufficient to meet the reliability, customer experience, growth management and sustainability needs of the system. **Total capital investments outlined in the Plan are \$7.97 billion.**

The greatest capital investment and difference from the current 16-year plan to the investment proposed in the Plan is new vessel construction. The Plan looks past the current 16-year plan; the latter's 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 following chart.

Sixteen-year plan compared to plan investment level (\$ in millions)



The investments proposed in the Plan over the 20-year planning horizon ramp up quickly 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 \$340 million, investments in the first biennium of the planning horizon are 35 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*, which usually serves 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 vessel electrification at Edmonds, Kingston, Mukilteo, Clinton, Fauntleroy, Vashon, Southworth, Bremerton, Anacortes, Orcas Island and Friday Harbor terminals. Four of the five new Olympic Class vessels will be built and construction will begin for the first of the new 124-car capacity vessels, which will replace the retiring Issaquah Class vessels.

Over the six-year, medium-term period, total planned capital investment—including preservation and improvements—is projected to be \$2.5 billion. Technology improvements to ticketing and reservation systems, among other preservation costs, amount to \$39.3 million of investments.

Long term (2028-2040)

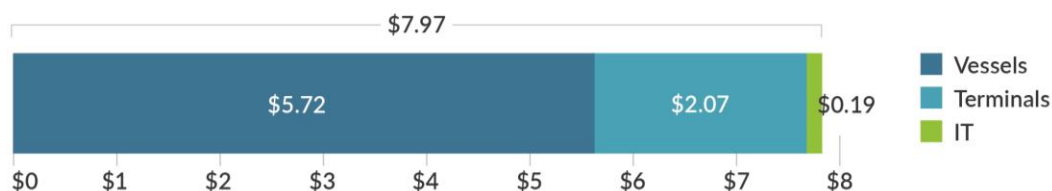
By 2040, the new vessel construction program will be complete. Four 124-car capacity vessels, six new 144-car vessels, and one 114-car vessel will be delivered within this period. The electrification program will also be complete with conversion of the three Kwa-di Tabil Class vessels and installation of terminal shoreside charging infrastructure for the final six terminals. Roughly \$5.1 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 \$7.97 billion. New vessel construction and preservation of existing vessels accounts for the largest investment, at nearly \$5.7 billion, or 72 percent of the total investment over the 20-year period. Terminals accounts for 26 percent of the total at approximately \$2.1 billion. Electrification of terminals accounts for \$425.2 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.

Plan capital investment (\$ in billions)



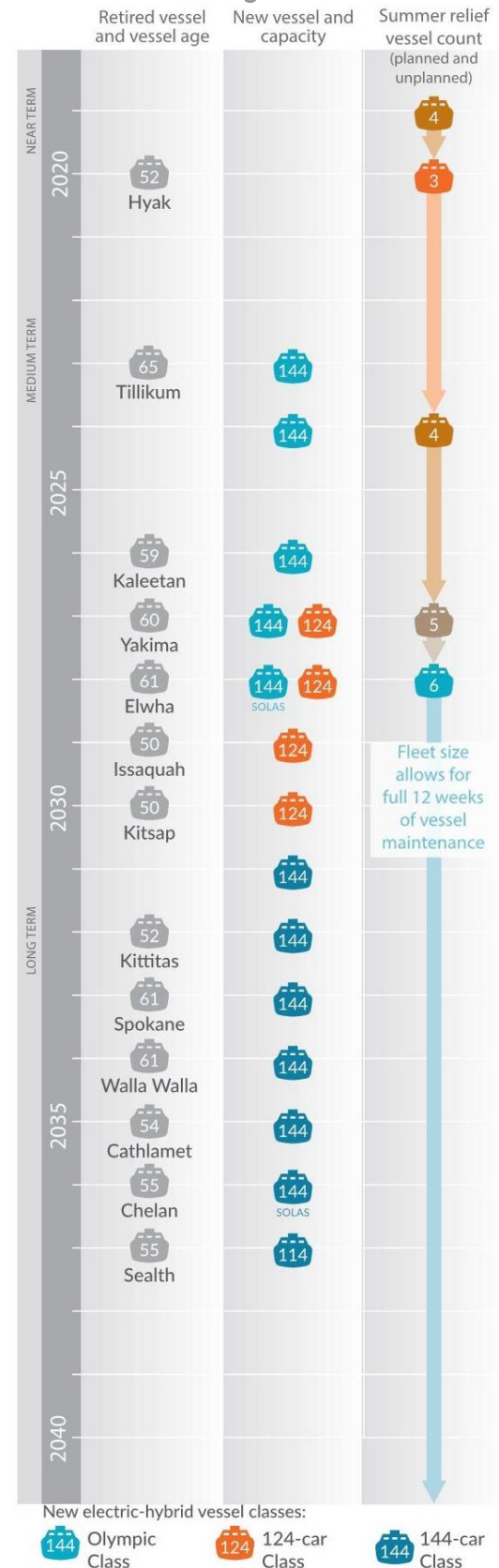
Vessels

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-car capacity).
- Four new 124-car capacity vessels.
- Six new 144-car capacity vessels.
- One 114-car capacity vessel.
- Three hybrid conversions (Jumbo Mark II Class).
- Three hybrid conversions and propulsion system upgrades for the Kwa-di Tabil Class.
- The modification of four existing vessels to carry additional passengers.

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

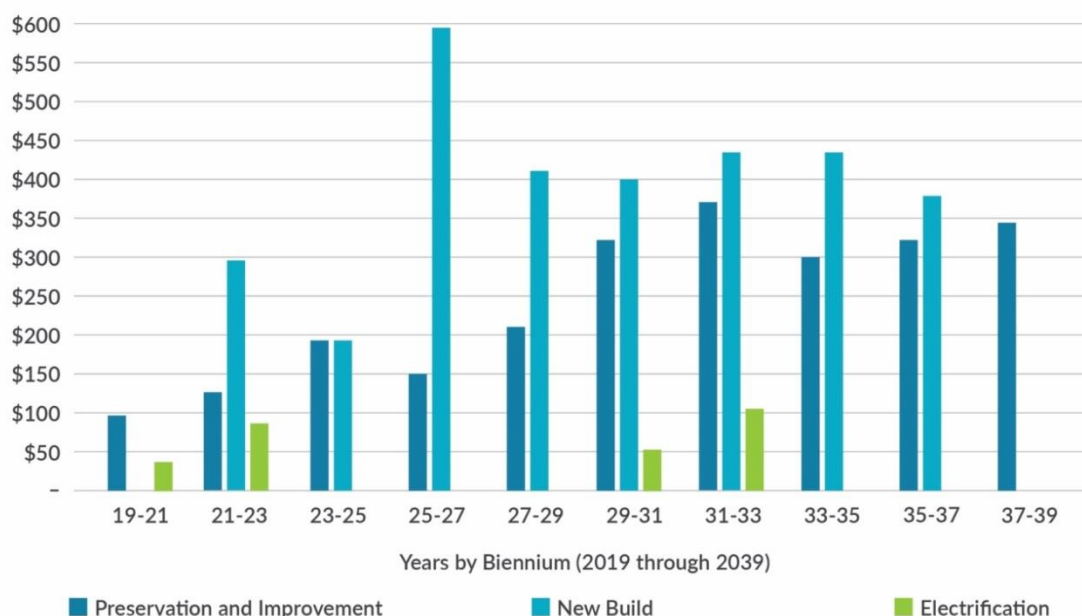
2040 Plan Fleet configuration



The first step in vessel investment is the proposed extension of the Olympic Class contract to build five new vessels by 2028. The vessel capital investment needs grow quickly in the 2021-2023 biennium to support this proposal. Construction would begin on the four new 124-car capacity vessels between 2026 and 2030, overlapping with the Olympic Class contract in 2027 and 2028, followed by six 144-car and one 114-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 2037 once the replacement program is completed. These investments will increase the size of the fleet from 22 (anticipated in 2020) 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 below, along with the planned preservation and conversion of remaining fleet to electric-hybrid 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. Before 2040, with the investments identified in the Plan, each vessel will have the out-of-service time needed to maintain and preserve its systems. Once this time is available and used, WSF can work toward extending the life of vessels to the planned 60-year life expectancy.

Terminals

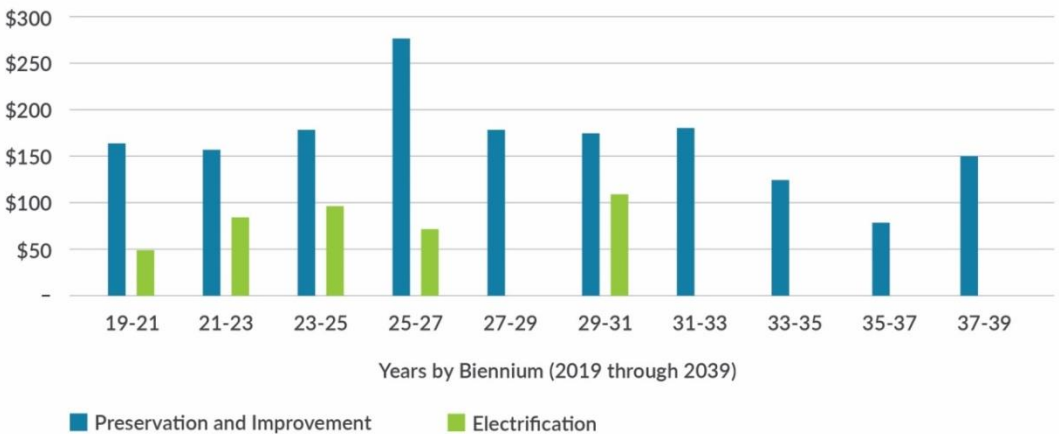
The Plan recommends investment in terminal infrastructure to support electrification of the fleet, improve passenger and vessel queuing and loading, and accommodate expansion of the reservation system to additional routes. The investment category of Terminals also includes the Eagle Harbor maintenance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

- Modification of 17 terminals to support plug-in, electric-hybrid 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)



Technology

Investments in technology 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 technology 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 available 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 \$1.48 billion. This predictable funding is more than \$6 billion short of the \$7.97 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
Capital Vessel Replacement	198
Connecting Washington	98
Transportation Partnership	23
Treasury Earnings	1
Less Debt Service	(34)
	\$ 1,482

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 the Plan, it is possible that WSF could benefit from this type of funding source in the future.

Operating costs

The 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 proposed service level enhancements.
- Costs of operating the expanded service and maintenance relief vessels.
- Expanded workforce development programs.
- Reduction and stabilization of energy costs due to fleet electrification.

All operating costs outlined in this section reflect estimated annual inflation and 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 23 vessels in the 2017-2019 biennium to 26 vessels in the 2037-2039 biennium.

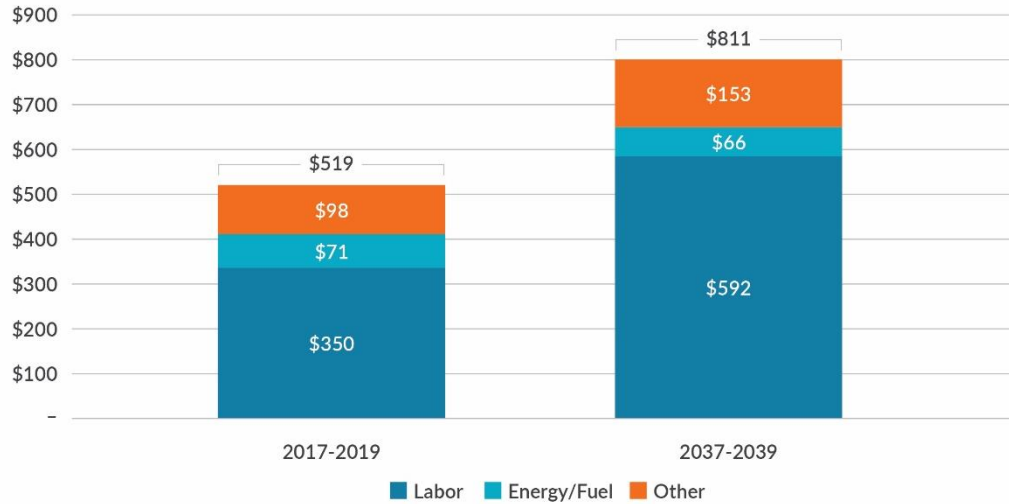
Another operating cost is the leased office space for WSF headquarters in downtown Seattle. As part of the Plan, the Legislature instructed WSF to evaluate leased and state-owned property locations outside of downtown Seattle for its headquarters. This evaluation is included as Appendix L.

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 continues over the planning horizon, accounting for nearly 73 percent of expenses in the 2037-2039 biennium.

Energy and fuel expenditures will decrease due to the investments in electrification of terminals and new electric-hybrid fleet. This is a dramatic change from the past, where fuel prices can be volatile and energy costs can increase quickly. 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, it shows the general trends in this primary cost categories.

It is worth noting the decline in 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.

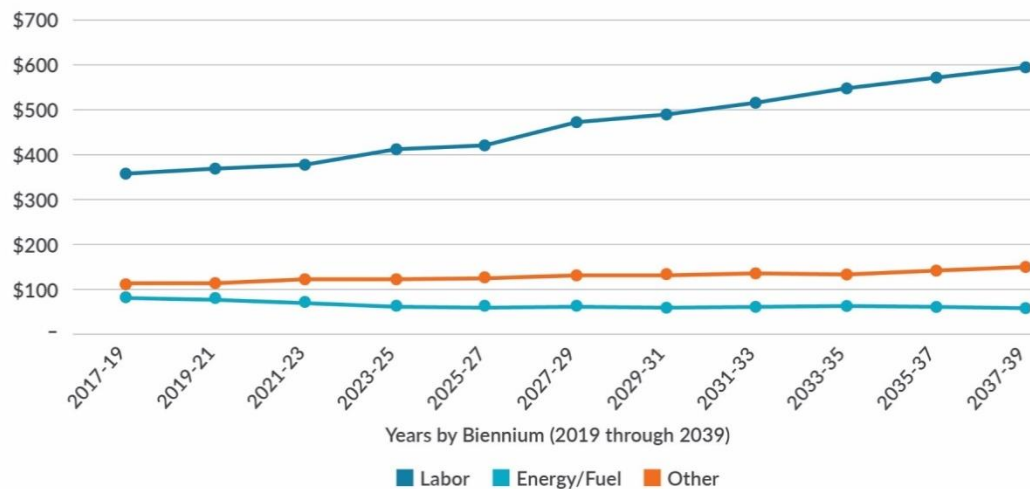
Operating expenditures for 2017-2019 compared to 2037-2039 (\$ in millions)



The proposed conversion to electric propulsion will lead to considerable cost efficiencies. Despite an increase in service hours of nearly 11.5 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 and the increase of the relief fleet. WSF maintains a 24-hour engine room crew on vessels 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 following shows these trends.

Operating expenditures 2020-2039 (\$ in millions)



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 and 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 2024 when the size of the relief vessel fleet increases and as service enhancements continue. Fuel/energy costs will continue to decrease despite increases in the price of diesel because of the 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 first grow in 2024 as additional crew is added to support passenger capacity increases on two central sound routes. Service hour increases will be implemented on four routes in 2028 and again in 2033, 2035, and 2037. In 2033 the Edmonds/Kingston route will be served by three new 144-car 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 and cost savings from having one less vessel class in the system.

Fuel/energy savings (green dividend)

The capital investment in electric propulsion is anticipated to lead to long-term fuel savings. The State estimates diesel cost over time, and while costs are relatively low today, they can be quite volatile and are projected to rise. Despite the expansion of service hours by 11.5 percent over the planning horizon, fuel/energy costs are expected to decrease by \$4.5 million or about 12 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, as shown on the chart below.

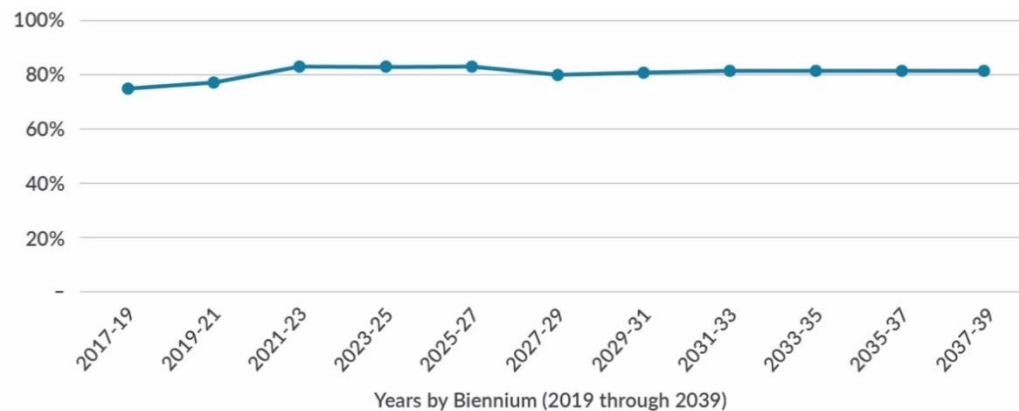
Compared energy costs by service plan (\$ in millions)



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. This is also an incredibly high revenue recovery as compared to other public transit operators which typically recover anywhere from 25 to 30 percent of operating costs.

Projected operating revenue recovery percentage



The operating revenue recovery ratio is expected to increase in the 2019-21 biennium to 79 percent. This timeframe is the identified point of highest service reliability risk, when the fleet is down to 22 vessels total; many will be close to retirement, with heightened maintenance needs and an inadequate 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 79 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 \$170 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 levels proposed in the Plan is estimated to cost nearly \$6.7 billion over the 20-year period, leaving a shortfall of about \$424 million dollars.

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

Fares	4,433
Miscellaneous Operating Revenue	154
Gas Tax Distribution	599
License Fees and 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 \$6.9 billion. Total capital investments amount to \$7.97 billion and operating costs total \$6.7 billion.

Funding capital investments (\$ in billions)



Funding operations (\$ in billions)



The Plan's proposed capital investments will benefit the ferry system by 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 does not assume increases in fare levels or fare structure but assumes fares will increase at approximately the rate of inflation. Additional study and next steps are outlined below, which identify policy and planning efforts that will help with the implementation of adaptive management strategies. These efforts will also contribute to more efficient terminal operations leading up to the delivery of new vessels and planned terminal investments.

Future Opportunities

With additional funding outside of what is outlined in the Plan, there are other opportunities to increase service to WSF customers. While the Plan proposes modest increases to capacity on some of WSF's most congested routes, the recommendations herein will not fully accommodate all of the anticipated growth and demand for ferry service over the next 20 years. This is not only so that WSF can present a fiscally prudent Plan to the Legislature, but it is also because the recommendations above are the most urgent and necessary before future capacity expansion can take place.

Throughout the public engagement process, several jurisdictions, agencies, and Ferry Advisory Committees made suggestions on how to increase capacity and reliability on specific routes beyond what was proposed in the Draft Plan. Many suggestions from the engagement process were incorporated into the Final Plan, including suggestions that did not require capital investment beyond what was already included in the Plan, or those that could be potentially implemented with the existing fleet and workforce. Other suggestions that require additional funding are outlined in this section as opportunities that will require additional planning, analysis and coordination with the public and stakeholders.

Planning for WSF system improvements is multifaceted, with ripple effects on capital investment and operational decisions. For this reason, the Plan recommends revisiting these future opportunities by 2025, which will coordinate with currently planned vessel acquisitions the Plan outlines to stabilize current fleet reliability.

These components are discussed as a single package to simplify the discussion of long-term fleet needs; however, they could be considered individually or in smaller groupings.

Additional opportunities for route capacity improvements, with community proponents in parentheses:

- **Seattle/Bainbridge Island:** Operate three 144-car vessels in place of two larger 202-car vessels. (*Bainbridge FAC*)
- **Edmonds/Kingston:** Operate two large 202-car vessels on the route and supplement with a third medium-sized, 124- or 144-car vessel. (*Kingston FAC, other Kingston groups*)
- **Mukilteo/Clinton:** Operate a third vessel, which would require the construction of one additional operating slip at each terminal. (*Clinton FAC*)
- **Port Townsend/Coupeville:** Increase service capacity and reliability with an additional back-up vessel capable of serving the unique navigation needs of the harbor and terminal. (*Jefferson County, Port Townsend*)
- **Point Defiance/Tahlequah:** Improve service capacity to provide additional and enhanced alternatives. (*Vashon public open house comments*)

The interrelationships between these comments point to a coordinated option that would build four more single-deck, 114-car vessels and two fewer 144-car vessels in the 2030 decade. More specifically:

- **Increase overall fleet size to a minimum of 28 vessels**, altering the fleet configuration with additional, smaller vessels (114-car, single-deck variant) to free up another vessel to operate on the Port Townsend/Coupeville route and provide three-vessel service at Mukilteo/Clinton. Two Jumbo Mark II vessels would be assigned to the Edmonds/Kingston route, which would allow distribution of new 144-car vessels to Seattle/Bainbridge Island. This could be in place by 2032 with changes to the 2040 Plan vessel acquisition; it would require assessment of vessel relief fleet needs and capacity at the Eagle Harbor maintenance facility.
- **Explore unscheduled additional service with a third vessel** (using the second peak season service relief vessel) to provide additional capacity for the Edmonds/Kingston route during peak times on weekends where commuter and recreational travel overlap and lead to long wait times. Potential for implementation in 2028, provided workforce and vessel maintenance requirements can be met.
- **Operate three 114-car vessels at Mukilteo/Clinton** to more fully accommodate the projected growth in vehicle traffic. To support this service, one additional operating slip would be required at each terminal. This could be in place by 2037 with changes to the 2040 Plan vessel acquisition and terminal improvements.
- **Operate one 114-car vessel at Point Defiance/Tahlequah** to fully accommodate projected vehicle growth on the route. This would replace the current 64-car *Chetzemoka* that serves the route. To support this service, terminal vehicle holding space would need to be increased at Point Defiance. This could be in place by 2039.
- **Reassign the 64-car *Chetzemoka*** to provide additional peak season service and vessel relief for the Port Townsend/Coupeville route. This could be in place by 2039.

As noted above, this service expansion scenario would require substantial expenditures for terminal improvements, additional vessels, and operating costs. These costs have not been estimated. Further evaluation of relief vessels to support this service configuration would also be needed. That analysis could result in a 29-vessel fleet if the need for another relief vessel is demonstrated. The Eagle Harbor maintenance facility would also need to be reassessed, not only for workforce requirements but also for the number of slips at the facility. The benefits of these additions have not been quantified, but they would include more frequent service on several routes, and increased system reliability as a result of more vessels and slips.

Conclusion

As the nation's largest ferry system, Washington State Ferries have become as iconic as the majestic waterways and landscapes they sail 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.

Shifting demographics—including explosive growth in Washington state and the increasing popularity of ferry travel—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.

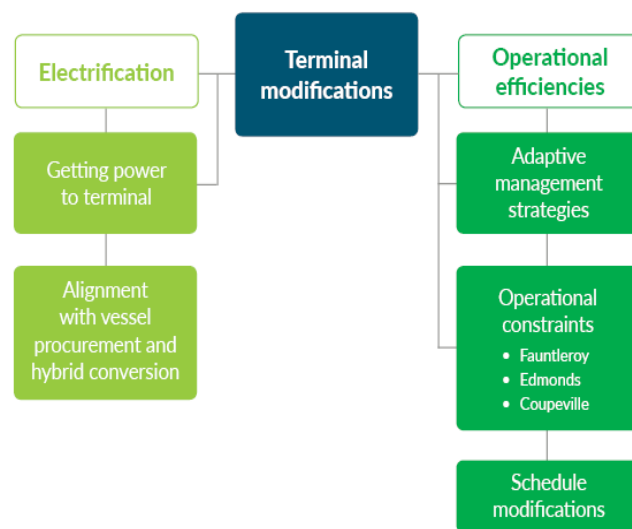
The 2040 Long Range Plan suggests several strategies to address these challenges. Similar to WSF's 2009 Long Range Plan, the 2040 Plan identifies tools and strategies to manage demand and encourage the spread of ridership across non-peak travel times. However, the Plan focuses on first stabilizing WSF's 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 Washington State. In addition to people and goods moving more freely across our waterways, the Plan provides for a ferry system that contributes to 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.

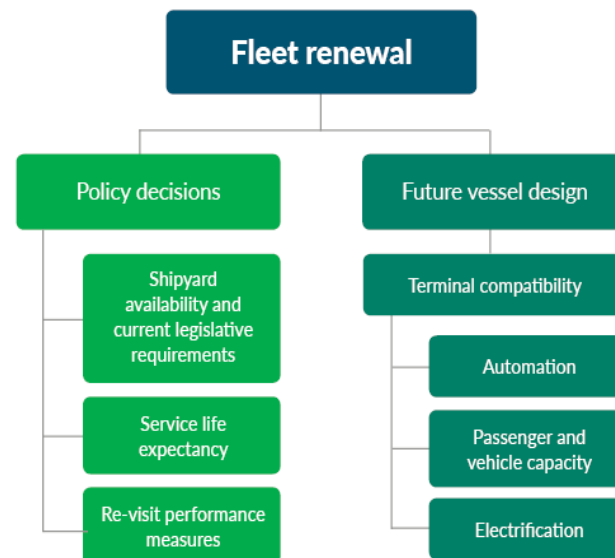


Next steps and further study

The Plan provides a vision for the Ferry System that describes service and facility investments to be implemented over the next 20 years. Many of the improvements will require further study for implementation. As outlined in the Plan, the service and infrastructure decisions are interconnected. Vessel electrification, design and deployment can necessitate terminal facility infrastructure and operational adjustments. Just as many adaptive management strategies require investment in technology and may also guide future terminal operations and design.



The Plan also raises a number of policy questions that will need to be addressed before decisions can be made regarding Plan investments. This is particularly true of the fleet renewal program, which will require the review of existing vessel construction policies to guide the characteristics and construction timeframe of new vessels. This interconnectedness with vessel, terminal and technology investments can be observed in the fleet renewal program, where vessel decisions influence other investment decisions in technology, terminal operations and capacity improvements.



What is known about future study and analysis is outlined by biennium below, beginning with 2019 and through 2029. As mentioned in the Introduction of this document, the Plan is a living document for WSF; it will guide decision-making through the stabilization of the fleet and service reliability, invest in infrastructure, and provide opportunities for growth. Future study and analysis includes:

2019 – 2021

Reliable service:

- Fleet renewal—Funding and contract extension approval for electric-hybrid Olympic Class vessel construction
- Fleet renewal – Finalize recommendations and design requirements for four 124-car vessels, initiate discussion of vessel procurement options
- Vessel automated docking – Feasibility study

Customer experience and manage growth:

- Tariff Review – Fare simplification and implementation as part of Tariff Review process
- New fare collection system – Definition, in conjunction with regional next generation ORCA card planning
- New fare collection system—Plan for *Good To Go!* pilot program
- Operational efficiencies—develop operational strategies plan with the Transportation Commission
- Fauntleroy terminal – Begin EIS process for preservation project that addresses operational constraints
- Parking studies – Review utilization and pricing, assess mode shift potential, establish policy
- Mobility on-demand and other “first and last mile” analysis – Ongoing review of opportunities and partnerships, to be updated biennially

Sustainability:

- Terminal electrification – Study to refine cost estimates and develop implementation plans

2021-2023

Reliable service:

- Keystone Harbor – Safety and navigation study, informs vessel and terminal needs

Customer experience and manage growth:

- Expansion of vehicle reservations – pre-design/community efforts
 - Edmonds/Kingston
 - Edmonds terminal – Improvements and alternatives study, informed by reservation study
 - Mobility on-demand and other “first- and last-mile” analysis – Ongoing review of opportunities and partnerships, to be updated biennially
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- Tariff review – To include study of incentives enabled by new fare collection system
 - Expansion of vehicle reservations – pre-design/community efforts:
 - Mukilteo/Clinton
 - Lopez and Shaw islands (eastbound)
 - Vessel automated docking – Feasibility study

2023 – 2025

Long Range Plan – Mid-decade update, to include decisions on vessel needs, adaptive management strategies, and terminal improvements

Reliable service:

- Fleet – Recommendations/design requirements for new 144- and 114-car vessels

Manage growth:

- Mobility on-demand and other “first and last mile” analysis – Ongoing review of opportunities and partnerships, updated biennially
- Tariff Review – Adjust fares and address policy issues

2025 – 2027

Manage growth:

- Expansion of vehicle reservations – pre-design/community efforts, follows completion of Seattle Department of Transportation Alaskan Way project in Seattle
 - Seattle/Bainbridge
 - Seattle/Bremerton
- Mobility on-demand and other “first- and last-mile” analysis – Ongoing review of opportunities and partnerships, updated biennially
- Tariff Review – Adjust fares and address policy issues

2027 – 2029

Long Range Plan – Ten-year update incorporating improvements made pursuant to the January 2019 Plan, updating performance trends and plan assumptions, ridership forecasts and identifying additional adaptive management strategies to balance demand with capacity.

Reliable service:

- Vessels – Review options for the propulsion conversion of the Kwa-di Tabil Class ferries

Manage growth:

- Expansion of vehicle reservations – Evaluate expansion of reservations to remaining terminals, Mobility on-demand and other “first- and last-mile” analysis – Develop list of WSF actions based on prior biennial reviews and WSDOT autonomous vehicle technology research
 - Tariff Review – Adjust fares and address policy issues
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