



Washington State Ferries

# Washington State Department of Transportation Ferries Division

## Final Vehicle Reservation System Predesign Study

January 11, 2010



Washington State  
Department of Transportation



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# WASHINGTON STATE DEPARTMENT OF TRANSPORTATION FERRIES DIVISION (WSF) FINAL VEHICLE RESERVATION SYSTEM PREDESIGN STUDY

## EXECUTIVE SUMMARY

### 1.1 Introduction

The 2009 Washington State Department of Transportation Ferries Division (WSF) Long-Range Plan proposed a reservation system as the primary strategy to manage demand, spread peak vehicle traffic, improve asset utilization, reduce wait times, and minimize the need for costly terminal and vessel expansion projects. The first step in the process of implementing a reservation system is to conduct a predesign study, per a proviso in the 2009-11 transportation Budget.

A vehicle reservation system will reduce queuing and congestion without major terminal and vessel investments and provide enhanced customer service and increased travel predictability. The preferred alternative identified in this study will offer reservations to all vehicle customers on all but four ferry routes. On the remaining routes, where terminal capacity issues limit options for reservations, WSF would offer reservations for commercial traffic as part of its commitment to improve freight mobility. Routes proposed for full reservations account for 60% of all passengers traveling in vehicles.

In addition the preferred alternative proposes significant enhancements to communication systems for all customers on all routes, providing real-time information about congestion, expected delays, available boat capacity and departure times. The improvements to the communication system will address both the reliability of travel information collected by WSF and the means of communicating this information to the traveling public, including expanded use of highway signs, travel advisory radio and direct methods such as text and email broadcasts.

The proposed vehicle reservation system would offer reservations on select commuter-oriented routes making WSF one of the few ferry systems in the world that does this. Implementing reservations on high volume commuter routes will be challenging. Therefore, the system has been designed to be an adaptive system, complete with data gathering and analysis functions that will provide WSF with information to ensure that the system is continually monitored and adjusted as necessary to meet the needs of customers, communities and WSF.

WSF will gradually roll out and implement the reservation system, with purposeful phasing that allows for testing, education, and outreach as reservations become available on each route. WSF may also choose to implement reservations gradually on individual routes, by offering reservations first to a certain customer group (like commercial customers), for a limited number of sailings (like weekends only), or by making a small percentage of vessel capacity available. During the rollout process, the Legislature will have two major decision points, at which times it can evaluate the benefits and success of the reservation system in its funding decisions.

## 1.2 Purpose

This report has been designed to meet the requirements of a transportation predesign report as laid out in the Office of Financial Management (OFM) Transportation Budget instructions for 2009-2011. This predesign report generally follows the instructions provided by the Office of Financial Management (OFM) for transportation projects, but a predesign for a reservation system for ferry service is a unique project on many levels. This predesign has been formulated to meet the intent of a predesign report, and exact instructions were followed where possible.

## 1.3 Reservation System Goals

The overarching goal of a successful reservation system would be to improve service and meet the needs of ferry customers, ferry communities and WSF.

- Goal 1: The reservation system needs to benefit customers by being easy to use and offering an adequate degree of predictability, spontaneity, and flexibility for all customers.
- Goal 2: The reservation system needs to benefit ferry communities by reducing the negative impacts of queuing outside terminals and allowing WSF customers and local residents to access local businesses, and by reducing congestion in residential neighborhoods.
- Goal 3: The reservation system needs to benefit WSF by recognizing the unique circumstances of its different routes, helping the agency manage demand, improving asset utilization, and responding to legislative direction.

## 1.4 Study Approach

As envisioned in the Long-Range Plan, a vehicle reservation system would dramatically improve how most customers interact with the Ferry System, resulting in significant benefits for customers, ferry communities, and WSF. However, given the potential impacts on each of these groups, it was important to design a process that brought together the best resources from within WSF and from outside the agency to critically analyze the opportunities, challenges, and technical aspects of this project. The approach included three key elements:

**Build the design on real experiences at WSF and other ferry operators (don't reinvent the wheel).** The predesign process included research and analysis of WSF's own experiences with reservations and research from the experiences of other systems, including (1) a review of recent experience at Port Townsend-Keystone and Anacortes-Sidney B.C.; and (2) extensive outreach to other systems to understand how reservations work elsewhere.

**Engage all of the key departments at WSF in the process.** Internal WSF technical teams were organized to work through the key elements of the predesign analysis.

**Engage with customer and community representatives.** A group of stakeholders and members of the public provided perspectives on customer needs and concerns and gave feedback on potential business rules, vehicle processing, terminal operation, and information technology options.

An Edmonds-Kingston Partnership Group was formed, bringing together representatives from different customer groups (commuters, regular riders, tourism interests, commercial and freight), as well as representatives from Ferry Advisory Committees, ports, and cities in the Edmonds and Kingston areas. The Edmonds-Kingston route was selected because it provided a clear view of the likely challenges facing a successful implementation of a reservation system. It includes a mix of commuters, ferry

dependent residents, recreational users, and commercial users; short turnaround in between departures, diverse terminals, and serious community congestion problems.

### 1.5 Lessons Learned

The development of the conceptual design for a WSF reservation system was significantly shaped by the following major lessons learned:

- Customers plan for trips in different ways and want flexibility to meet their needs.
- For regular customers, the return trip presents greater uncertainty around exact travel time.
- On-time performance is a necessary pre-condition to a reservation system.
- Reliable real-time communication is crucial to the success of the system.
- A reservation system can and should be implemented differently on different routes.
- Most large ferry operators have a reservation system and they generally have more terminal capacity than WSF.
- For recreational routes, there are comparable systems to learn from.
- For short, commuter routes, there are no direct comparables.
- Reservations are a key feature of the freight programs offered by other ferry operators.

To better understand the technology options available to support a reservation system, a Request for Information (RFI) was issued in May 2009. Five of the six responses received addressed the issues in the RFI and four have software currently in use by a ferry system somewhere in the world. All of the current systems were described as very flexible and customizable to meet customer requirements. All respondents provided useful information for the evaluation of options, such as system features and capabilities, ability to integrate with existing technology (i.e. fare collection), customer service issues and options, some cost information (though not very detailed), and references for current customers.

### 1.6 Key Elements of Reservation System

There are four major elements of a potential WSF reservation system: (1) A communication system, (2) business rules, (3) terminal and vehicle processing, and (4) information technology and back office systems. On-time performance is a precondition for a reservation system and WSF should focus initially on reviewing and modifying route schedules where schedule delay is a significant determinant of local terminal congestion and customer delays.

**Regional ferry information systems and improved communications.** Improved communications would be deployed system-wide and must include improvement and further development of the following: highway/ferry advisory radio, variable messaging regional highway signs, local signs, email and texts to customers regarding their specific reservations, and improvements to traveler information on the WSF website. It is particularly important to significantly increase the quality of the information delivered so customers have enough confidence to use the system to make real-time travel choices.

**Business rules.** The business rules define how the reservation system will work, including how reservations will be made, when they will be made, how much of the boat is available for reservations and what the change and cancelation policies will be. The key business rules that support the system design goals include:

- Up to 90% of the vessel available for reservations during peak and commute periods; minimum of 50% of the vessel available for reservations during off-peak periods. The share of the boat available for reservations during peak times would be phased in over time, with the share starting much lower and gradually increasing as customers adapt to the new system. Ultimately the share will depend on when congestion at terminals is mitigated, which could be at levels below 90%.
- Reservations on commute period sailings made available 4 weeks in advance, all other sailings available up to 6 months in advance to provide extra incentives for customers with schedule flexibility to reserve non-commute period sailings.
- To address concerns that reservations will favor tourists over residents of ferry communities, there will be two priority access programs to provide regular users with space on all sailings. One will focus on commercial customers while the other on non-commercial regular and frequent users.
- Regular reservations (non-priority access) will require pre-payment of fare.
- There will be no extra fee for reservations.
- There will be flexibility to change or cancel reservations at no charge, though cancellation fees might apply in some cases.
- Customers would need to arrive between 15 and 30 minutes before departure to guarantee their spot on the sailing. During peak periods, a customer arriving late could lose their reservation and be directed to the drive-up queue.

**Vehicle processing and terminal operations.** Each of WSF's terminals has unique characteristics that affect how reservations will be implemented. The analysis suggests that a reservation system as described in the business rules would work best if: (1) there is at least 120%-150% of a vessel's capacity available for vehicle holding area; or (2) there is more than an hour between departures. Based on these criteria:

- Reservations could be made to work at 17 of 20 WSF terminals (all except Fautleroy, Tahlequah, and Vashon Island).
- While Edmonds does not meet the holding capacity and headway thresholds noted above, there are opportunities to support reservations with some modest modifications to the business rules or method of operation at terminals.
- Mukilteo currently meets the minimal operating needs, however the holding area includes leased land that is available for five years. Without a long-term solution at Mukilteo, it may not be possible to effectively support reservations on this route.
- Fautleroy presents the greatest challenge for implementing reservations due to the inadequate holding area, short headways and turnaround times on the route and multiple destinations. These challenges cannot be overcome without significant terminal expansion or operational changes, such as shifting Southworth traffic to downtown Seattle.
- Customers need to be able to make informed choices with real time information that is available through multiple communications methods.
- Prepayment of fares should be encouraged as a means of speeding the processing time at terminals.

**Information technology.** Information technology will be needed to support the reservations as defined in the business rules. While the system improvements are feasible, there will be some system

development challenges, particularly around the type of enhanced communications that are necessary to make reservations work effectively on WSF's higher-volume, commuter routes.

The most critical technology link for reservations is with the ticketing system. WSF has recently invested considerable time, effort and resources into a complete overhaul of its ticketing system. Since reservations will offer a way to provide a guaranteed trip, it is best to think of a reservation as pre-selling the space of the boat.

Currently all tickets issued in the Wave2Go system can be redeemed for travel on any sailing within a 90-day window. When a reservation is made, the issued ticket is linked to a specific sailing. If the reservation is canceled, the ticket can also be canceled, or its status returned to "open." The ticketing system integration will address these key requirements:

- The ticketing system is independent from the reservation system, but must be able to share information back and forth.
- At the time of vehicle processing, information available to toll booth operators needs to include reservation confirmations plus any amount pre-paid so the ticket seller can verify that the appropriate fare has been paid and complete the transaction.
- Ticket seller must have the ability to add to any prepaid amounts to account for the final transaction costs reflecting actual vehicle used for the trip and the number of passengers.
- The system must work with the existing multi-ride products.
- To facilitate and speed vehicle processing, the reservation system must accommodate the option of fully pre-paying applicable fares (vehicle and passengers).

These elements of integration will be part of the minimum requirements in any reservation system procurement or development effort.

## 1.7 Alternatives Considered & Preferred Alternative

The costs and risks associated with developing and implementing the reservation program described above will vary according to specific service and route characteristics. Predesign alternatives were thereby constructed to assess the relative costs and benefits of different deployment concepts. To demonstrate how costs, benefits, and risks change as more elements are added to the WSF reservation system, the alternatives build on each other (beginning with the easiest to the most difficult), until the final option presents an alternative with full reservations implementation on all WSF routes.

Exhibit ES-1 presents the summary assessment of the following five alternatives:

- **Alternative 1: Industry Standard Package Upgrades to Routes that Currently Offer Reservations.** WSF currently operates a basic reservation system on three routes, Anacortes-Sidney, Port Townsend-Keystone, and commercial reservations for the San Juan Islands. Alternative 1 would upgrade the current reservation system with an industry standard reservation package that encourages online bookings. It would be linked to the current ticketing system and would include enhanced communication around general travel-related information.
- **Alternative 2: Alternative 1 plus Expanding Reservations to San Juan Islands vehicle trips and Commercial Reservations System-Wide.** This alternative would build on Alternative 1 by expanding reservations from commercial customers to all service on the Anacortes-San Juan Islands routes

(except Interisland). Commercial reservations would be made available on all routes throughout the system.

- Alternative 3: Alternative 2 plus Intelligent Transportation System (ITS) Communication.** This alternative would develop and build a regional ITS communication system comprised of variable messaging signage, highway advisory radio, and web cameras to notify customers at key travel decision points of congestion at terminals and service disruptions. Alternative 3 would reduce congestion by helping customers make better decisions about which routes and sailings to take and directing them to less congested terminals. An effective real-time communication system that works on a large scale is a key factor for successful implementation of reservations in the Central Sound, and must therefore be in place before reservations are extended to additional routes.
- Alternative 4: Alternative 3 plus Reservations Extended to Seattle – Bremerton, Seattle – Bainbridge, and Edmonds - Kingston.** This alternative makes reservations available for all vehicle traffic on routes where terminal facilities are determined to be adequate (in the case of Edmonds, with minor modifications) to support reservations. All Central Sound routes have been included in order to prevent a shifting of traffic that could potentially occur if one or two Central Sound routes had a reservation system and one or two routes did not.
- Alternative 5: Alternative 4 plus Extend Full Reservations to All Routes.** This option includes implementation of a reservation system for all customers in the system by adding the Vashon Island and Southworth routes plus Mukilteo-Clinton.

### Exhibit ES-1 Assessment of Alternatives

		Queue Reduction Potential	Number of Riders who Benefit	Risk	Capital Cost (2009\$)
1	Standard Package Upgrades (current routes w/reservations)	High (on select routes)	4% of vehicle drivers and their passengers would benefit	Low	\$4.1M
2	Alternative 1 plus all San Juan Islands & commercial reservations all routes	High (on select routes)	13% of total vehicle drivers and vehicle passengers benefit	Low	\$6.2M
3	Alternative 2 plus Regional ITS communication system	Medium across the system and high on select routes	13% benefit from reservations; Most riders (including passengers) receive some benefits	Low	\$17.7M
4	Alternative 3 plus full reservations extended to Central Sound routes	High on most routes, with medium on remaining routes	60% of vehicle drivers passengers benefit from reservations; Most riders receive some benefits	Medium	\$23.7M
5	Full reservations & communications on all routes	High	Most riders receive maximum benefits	High	\$26.4M

**Preferred Alternative.** Alternative 4 is the preferred alternative because it results in the greatest overall benefits in terms of customer time savings and demand management potential. This option offers these benefits to the majority of the system while keeping costs per rider low and implementation risks manageable. South Sound routes and Mukilteo-Clinton, which would not have access to the full reservation program under this option, will still realize benefits through an improved communication system, reliable real-time traveler information and commercial-only reservations.

Without a relocated Mukilteo terminal or a permanent solution at the current site (the Buzz Inn property is secured for only a five year lease term) the implementation risk for full reservation deployment is too high to justify the additional terminal investments needed. If the terminal situation is resolved in such a way as to reduce the operational risks, then extending reservations to this route could be revisited at that time.

On South Sound routes, where terminal and operating constraints are greatest, supporting reservations would require either major terminal investments or major operational changes (like connecting Southworth to Colman Dock, rather than Fauntleroy). Without major investments, reservations would not be feasible at these terminals and the benefits of reservations are not sufficient to justify these much larger capital investments or operational changes.

Exhibit ES-2 shows the improvements that implementation of the preferred alternative would bring to each of WSF's terminals and routes.

## Exhibit ES-2 Summary of Preferred Alternative Improvements by Terminal

Terminal	Reservation Availability	Communication Improvements			Terminal-Related Improvements			
		Regional VMS Signs	Highway Advisory Radio	Queue Detection	Local VMS	Traffic Management Signs	Ferry Advisory Radio	Other
Anacortes	All Customers		X			X	X	
Bainbridge	All Customers	X	X	X	Existing	X	X	
Bremerton	All Customers	X	X		Existing	X	X	
Clinton	Commercial Only		X	X		X	X	
Edmonds	All Customers	X	X	X	Existing	X	X	Additional tollbooth, traffic gate
Faultleroy	Commercial Only	X	X					
Friday Harbor	All Customers *		X			X		3 Web cameras
Keystone	All Customers		X			X	X	
Kingston	All Customers	X				X	X	
Lopez Island	All Customers *		X			X	X	
Mukilteo	Commercial Only	X	X	X		X	X	
Orcas Island	All Customers *		X				X	
Point Defiance	Commercial Only		X			X	X	2 Web cameras
Port Townsend	All Customers		X			X	X	
Seattle	All Customers	X	X				X	
Shaw	All Customers *						X	
Sidney	All Customers							
Southworth	Commercial Only	X	X		Existing	X	X	
Tahlequah	Commercial Only		X				X	
Vashon Island	Commercial Only		X					2 Web cameras

\* Excludes inter-island sailings

## 1.8 Implementation

The proposed implementation program was developed based on balancing several goals: (1) a desire to minimize implementation risk; (2) to create opportunities for early successes to build customer confidence in the new system; and (3) to offer enhancements where the need is greatest. Toward these ends, the following three-phase approach is proposed:

- Phase 1: Initial acquisition and testing of the “industry-standard” reservation system (May 2010 through June 2011).** In this phase WSF would procure an industry-standard reservation system and integrate this system with the Wave2Go ticketing system and the rest of the core IT infrastructure. The system would then be deployed on the routes that currently have reservations (likely in spring 2011) and fully tested. These include the International Routes to Sidney, the Port Townsend-Keystone route and commercial reservations in the San Juan Islands. Also, in this phase the basic information collection enhancements to accurately calculate wait times at terminals would be built.
- Phase 2: Full implementation on the northern routes (July 2011-June 2014).** Once the initial system deployment has been fully tested (likely fall 2012), then the next step for reservations would be to extend the availability of reservations to all of the Anacortes-San Juan Island routes. This phase would also include extending reservations for commercial account customers throughout the WSF route network and implementation of the remaining portions of the regional ferry ITS.
- Phase 3: Expansion to the Central Sound commuter-oriented routes (July 2015-June 2018).** By this time, the reservation system, including the priority access programs, should have a track record of success and the regional ITS program would be fully operational. These factors will be significant elements of a risk mitigation strategy for fully deploying reservations on the high volume and commuter-oriented routes at Seattle-Bainbridge, Seattle-Bremerton, and Edmonds-Kingston. It will likely take a year to develop the IT system enhancements necessary to support these routes. A pilot would then be tested on one of the Central Sound routes for 3-6 months, prior to extending reservations to all these routes.

One of the benefits of this phased implementation schedule is it allows for a break between Phase 2 and Phase 3. Before committing funding to the final phase where the implementation risks are highest, WSF will have more than two years of operating experience with reservations in the north sound, an understanding of the impact of the ITS investments on demand management in the Central Sound and an opportunity to revisit and refine the approach to reservations on the commuter routes based on these inputs.

**Route-level implementation measures.** Another key element of the phasing program will be close coordination with local communities and customers on routes where reservations are planned. To support the introduction and early implementation phase on a new route, WSF will organize a Partnership Group for that route as a mechanism to engage key local stakeholders in the decision making process. These Partnership Groups will be modeled on the successful process used for the Port Townsend-Keystone terminal and vessel studies and the Edmonds-Kingston group used to assist in the development of this predesign report. These groups would meet to evaluate how the system should work on their route, comment on terminal modifications/vehicle processing changes and review business rule phasing.

## 1.9 Budget Analysis

The budget analysis takes the total estimated capital investment needs and spreads these costs over the 16-year Legislative Financial Plan horizon to show both the magnitude and timing of the funding required to implement the preferred alternative. The capital cost estimate of \$24.5 million shown in Exhibit ES-1 is spread out according to an implementation schedule and escalated to year of expenditure dollars, using the forecast implicit price deflator (IPD) as per OFM budget instructions.

Once escalated, total costs are estimated to be \$25.0 million in year of expenditure dollars, and the costs are spread over five biennia. As a point of comparison, in the Long-Range Plan, the investment needs for a WSF reservation system were estimated to be \$18 million over the next five biennia, approximately \$7 million less than current estimates. These estimates were included in the legislative 16-year financial plan.

There are several important differences between the preferred alternative and the Long-Range Plan assumptions, but the one change that has the biggest impact on the budget is the proposed investments in a regional Ferry ITS program. The regional highway variable message signs (VMS) in particular account for a large portion of this difference.

It is possible to think of the preferred alternative as two separate but related projects: (1) a \$12.9 million regional ferry ITS program; and, (2) an \$12.1 million reservations system. The ITS investments will have demand management benefits, irrespective of reservations, and, in fact, could proceed without the reservations element.

By contrast, the reservations investments would provide WSF a much more robust demand management capability in places where the system can reasonably be deployed. However, to maximize the effectiveness of the reservation system investments and support a smooth implementation process, the regional ferry ITS program would need to be in place prior to reservations rolling out to Central Sound routes. If these communications improvements were already in place, then reservations would be an \$12.1 million project.

Another important budget-related factor is the fact that the Phase 3 funding decision does not need to be finalized until the 2015-17 Budget. The cost of deploying full reservations for the Central Sound routes is \$6.7 million. Before the legislature needs to commit to this phase, WSF will be able to demonstrate both how well reservations are working and the demand management benefits of the investments in real-time information.

For the operating budget, the analysis suggests that initially the operating impacts will be relatively minor, with cost impacts of less than \$1 million for each of the first two biennia. Costs are expected to jump to \$1.4 million in 2013-15, \$2.3 million in 2015-2017 and to over \$3.2 million per biennium starting in 2017-2019. Costs are based primarily on staffing impacts for terminal operations (3.7 FTE's), Information Technology support (2.0 FTE's) and additional customer service requirements, primarily related to call center support and the commercial program (7.0 FTE's). The biggest factor in the increased costs in later biennia is a jump in call center staffing needs related to Phase 3 of the reservation system deployment, when reservations are extended to the Central Sound routes.

During the development of the Long-Range Plan, the operating impacts of a potential reservation system were not fully evaluated. However, an annual allowance of \$500,000, or \$1 million per biennium, was included in the long-term financial analysis as a way to account for some unknown impacts.

### 1.10 Next Steps

Subsequent steps in the implementation will be dependent on legislative action during the 2010 session. Assuming the legislature directs WSF to proceed with the preferred alternative, the steps to implementing Phase 1 will likely be as follows:

- Complete schedule review and realignment (in progress)
- Begin final design of the project elements
- Procure a reservation system through a request for proposal (RFP) process
- Integrate the new reservation system with WSF's existing IT infrastructure
- Convene a local Partnership Group for the Port Townsend-Keystone route to discuss implementation and phasing of the new system on that route
- Complete necessary terminal modifications at the Phase 1 terminals
- Launch the new reservation system on the routes which currently have reservations (Port Townsend-Keystone, International routes, and commercial-only in the San Juan Islands).

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