

Improving Loading, Ticketing, and Community Relations for the Washington State Ferries' Triangle Route

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EXECUTIVE SUMMARY

The Fauntleroy ferry terminal in West Seattle has one of the oldest and smallest docks in the Washington State Ferries (WSF) system. Among its constraints, the dock lacks capacity to stage enough vehicles to fill even the smallest vessel serving the route. Vehicles in excess of capacity queue upstream of the toll booth in a holding lane that runs north along Fauntleroy Way. Because the Fauntleroy terminal serves two destinations on WSF's Triangle Route, cars bound for Vashon Island and Southworth are intermixed in the single-lane queue, which further complicates ticketing and loading. These physical constraints, along with the requirement that all vehicles, pre-ticketed or not, pass through one of two toll booths, slow loading and contribute to delays and occasional difficulties filling vessels during peak travel periods. While the Fauntleroy dock is slated for a rebuild beginning in 2025, ferry riders and community members view the Status Quo as undesirable and unsustainable in the short run.

The 2018 Washington State Legislature approved appropriations for the University of Washington's Evans School of Public Policy and Governance to conduct an independent analysis of operational alternatives to improve ticketing and loading at the Fauntleroy terminal. In addition, our research team developed recommendations for improving community engagement, while WSF staff worked to improve sailing schedules and to implement a long-range plan that includes upgrading the dock at Fauntleroy.

Study Approach and Research Methods: Our approach gauges potential gains associated with ticketing and loading changes against a consistent set of criteria for defining success, while recognizing existing infrastructure and technology constraints. We also explore tradeoffs and constraints related to engaging the community. The research was informed by publicly available qualitative and quantitative information; WSF's responses to our data requests; targeted interviews with community members and WSF staff; attendance at public meetings and open houses; and direct observations at all three terminals and on boats serving the route. Combining systematic analysis of available empirical data with field observations and interviews, the report examines the challenges and possibilities for improving ticketing and loading at Fauntleroy in the short run, while suggesting implications for long-run improvements as well.

Recommendations: Our research confirmed that easy fixes to the ticketing and loading challenges at Fauntleroy are elusive in the short run. We examined numerous alternatives suggested by others, and the barriers that have thwarted their implementation to date. Our analysis reveals that some of these alternatives hold potential to improve ticketing and loading, and would be feasible with adequate support and funding.

Specifically, the report recommends improvements in technology, training, public engagement, and data collection and analysis, while stressing that successful and sustainable change will require new resources and targeted information to support implementation:

- In the long run, the Legislature should provide funding for WSF to rebuild the Fauntleroy dock with the capacity to incorporate WSDOT's **Good To Go!** tolling technology to collect fares. The Washington State Transportation Commission should support this change by factoring *Good To Go!*'s fare-collection capabilities and limitations into the upcoming fare restructuring effort.
- In the short run, the Legislature should provide funding for WSF to experiment with combinations of additional staff, upgrades to WiFi coverage (or mobile data access), and devices to enable **mobile ticket sales and validation** in the holding lane.
- To support the implementation of these recommendations, the Legislature should provide funding for WSF to:
 - **improve staff training, management, and retention** at Fauntleroy;
 - **expand data collection and analysis** to measure the impact of changes to ticketing and loading at Fauntleroy and to improve the quality of information WSF reports publicly; and
 - **engage the served communities** more consistently and through a wider variety of approaches.
- The Legislature should **revise WSF performance measures** to better reflect service delivery considerations. Such a change could 1) allow crews to be more responsive to real-time operational challenges of ticketing and loading, and 2) increase WSF's ability to collect and disseminate meaningful information, increasing trust and improving community satisfaction.

In conducting our research, we worked closely with WSF staff and stakeholders in the communities the Triangle Route serves. The staff we interviewed at WSF headquarters, on the docks, and onboard the ferries recognize the opportunities and challenges of improving ticketing and loading at Fauntleroy. The community members we interviewed, including members of the Triangle Task Force and Ferry Advisory Committees, recognize the constraints and limitations WSF faces and suggested a variety of solutions. Despite their differences of perspective and opinions, everyone we spoke with is dedicated to improving operations at Fauntleroy as well as the Triangle Route more generally. Although our primary audience is the Washington State Legislature, which commissioned our study, these findings can also inform the work of WSF staff and management, as well as improve understanding among all stakeholders.

INTRODUCTION

The 2018 Washington State Legislature approved appropriations for the University of Washington's Evans School of Public Policy and Governance to analyze alternatives to improve ticketing and loading procedures at Washington State Ferries' Fauntleroy terminal in West Seattle, given the constraints of the dock's size, configuration, and its function as a dual-destination terminal.

The Fauntleroy terminal is part of a three-destination route commonly referred to as the Triangle Route. The Fauntleroy dock is one of Washington State Ferries' (WSF) oldest and smallest in operation.¹ Over the past five years, WSF has replaced smaller vessels with larger ones to address growing demand in the communities served by the route, which has exposed key weaknesses in the Triangle Route's operations - especially those at the Fauntleroy dock.

Operations at the Fauntleroy terminal are complex compared to those at other WSF terminals. Among its constraints, the dock does not have the capacity to hold enough vehicles to fill even the smallest of three vessels on the route. Additional vehicles queue beyond the toll booth in a holding lane that runs north up Fauntleroy Way. Because Fauntleroy serves two destinations - Vashon Island and Southworth - cars bound for Vashon and Southworth are mixed in the single-lane queue, which further complicates and delays ticketing and loading. These physical constraints, along with the requirement that all vehicles, pre-ticketed or not, pass through one of two tollbooths, slows loading, contributing to delays and occasional difficulty filling vessels during peak travel periods.

Lengthy wait times coupled with the perception that boats routinely depart late, or depart on-time, but with available spaces despite waiting cars, have created palpable tension between ferry riders, WSF employees and management, and residents of the Fauntleroy community concerned with disruptions to the neighborhood from cars queued on Fauntleroy Way. All parties acknowledge that change is necessary, and the Status Quo, undesirable.

To fulfill the Legislature's directive, this study explores potential outcomes and consequences associated with alternative procedures for ticketing and loading at Fauntleroy, while WSF staff work to improve sailing schedules and implement a long-range plan to upgrade the dock at Fauntleroy. Consistent with our charge from the Legislature, this report focuses on alternative procedures to improve ticketing and loading at the Fauntleroy terminal relative to current operations. We also recommend ways to improve understanding among riders and community stakeholders of the operational challenges and opportunities that Washington State Ferries faces operating the Triangle Route.

¹ Gutman, D. (2018, January 24). Study: Half-empty ferries leave Fauntleroy as cars wait in line. *The Seattle Times*.

Our research was informed by publicly available qualitative and quantitative information; responses to data requests; targeted interviews with community members and WSF staff; attendance at public meetings and open houses; and direct observations at all three terminals and on boats serving the route. In developing our findings, we worked closely with WSF staff and stakeholders in the communities the Triangle Route serves. The WSF staff that we spoke with at headquarters, at the docks, and onboard the ferries recognize the opportunities and challenges of improving ticketing and loading at Fauntleroy. The community members we spoke with recognize the constraints facing WSF and the structural limitations of the current dock and expressed a variety of ideas for improvement. Despite their differences of perspective and opinions, everyone we spoke with is dedicated to improving ticketing and loading at Fauntleroy as well as the overall operations of the Triangle Route. Although the primary audience for this report is the Washington State Legislature, which commissioned the study, our findings can also inform the work of WSF staff and management and improve understanding among the Triangle Route stakeholders.

BACKGROUND

WSF is among the largest ferry operators in the world and carries more passengers than any ferry system in the United States.² Twenty-three ferries on ten routes serve twenty different ports of call across the Puget Sound and its inland waterways, including an international route to Sidney, British Columbia (see Appendix A, *Map of WSF Routes*). The ferry system transported almost 25 million passengers in 2017 with an average of 450 sailings each day.³

I. The Triangle Route

The triple-destination route that runs to and from Fauntleroy in West Seattle, the north end of Vashon Island, and Southworth on the Olympic Peninsula, is commonly known as the Triangle Route. In the current schedule configuration, three vessels serve the route, making both single and dual destination trips between the three terminals.

The Triangle Route serves three distinct communities spread across two legislative districts (District 34 and District 26) and governed by multiple municipal authorities (Kitsap County, King County, unincorporated King County, and the City of Seattle). WSF is required to collaborate with several governing bodies and local/regional transportation partners to coordinate service (see Figure 1: *Stakeholder Map*). The geographic, cultural, and political diversity surrounding the Triangle Route gives rise to myriad perspectives and pressures on the operations of the route. Furthermore, the route exhibits unique characteristics within the ferry system:

1. Ridership on the Southworth-Fauntleroy leg grew faster in 2017 than that on other legs in the system;
2. the Vashon route has the highest percentage of single occupancy vehicles (SOVs) in the entire system; and
3. the Fauntleroy dock is the oldest and smallest dock in the system.

II. Community Characteristics and Description Profiles

The following community profiles are adapted from stakeholder interviews and first-hand observations. Common themes from our interviews and observations have been aggregated and synthesized.

² Lester, J. T. (2015, March). A 2015 Comparison of Operational Performance: Washington State Ferries to Ferry Operators Worldwide.

³ Washington State Department of Transportation. (2017, January). FY 2016 WSDOT Ferries Division Performance Report.



Figure 1: Stakeholder Map

Vashon

The ferries are widely seen as a lifeline that connects Vashon Island residents to necessary goods and services. Vashon stakeholders prioritize frequent, reliable service with boats filled efficiently to support movement between home, work, and recreation. Vashon has two ferry terminals, one on the north end that provides service to and from Fauntleroy and Southworth, and one on the south end that connects the island to Point Defiance, in Tacoma. Vashon residents rely on the ferries to transport fuel, food, construction materials, employees of local businesses, and, notably, people in need of emergency medical care. Over the last nine years, Vashon has had, on average, 68 evacuations and 500 medical priority loadings each year, with the number of medical priority loadings increasing more than 100% over that time.⁴

Southworth

For South Kitsap County residents, the ferries provide an important connection to higher paying jobs and urban amenities in the Seattle metro area. Stakeholders from Southworth

⁴ Washington State Ferries Sailing Schedule Revision Public Meeting, October 23, 2018.

prioritize a reliable ferry schedule that accommodates the area's commuters and accessibility to Seattle and other destinations. Ferry ridership on the Fauntleroy to Southworth leg of the triangle route grew 8.2% from 2016 to 2017, the highest rate of growth in the system.⁵ Ridership forecasts expect this fast growth to continue through 2040, while the other two legs are likely to see more modest growth.⁶ Travelers going from southern Kitsap County to Seattle can either take one of two ferries (from Bremerton to Seattle or from Southworth to Fauntleroy) or use the highway system to cross the Tacoma Narrows Bridge and enter the I-5 corridor. Kitsap residents commuting to downtown Seattle can also ride the Triangle Route as foot passengers from Southworth to Vashon and take the King County Water Taxi from Vashon to downtown.

Fauntleroy

In West Seattle, the coexistence of a ferry terminal and the residential neighborhood of Fauntleroy is a long-standing feature of life; immediately adjacent to the dock are residential houses. The Fauntleroy community prioritizes minimizing safety risks caused by ferry traffic and congestion on Fauntleroy Way, as well as protecting their neighborhood from threats to property values, environmental degradation, or quality of life. Many in Fauntleroy express concern that their neighborhood is simply a "pass-through" for ferry users who have no vested interest in preserving the community. In 1997, the Fauntleroy Community Association and other neighborhood groups successfully lobbied the Seattle City Council to adopt a resolution requesting that WSF 1) initiate no expansion of the Fauntleroy ferry dock, and 2) take all practicable steps to reduce existing ferry traffic and mitigate the impacts of the ferry dock on the surrounding neighborhood.⁷ (However, WSF is not bound to Seattle City Council resolutions.⁸) Though the majority of Fauntleroy residents we talked to cared more about the physical impact of the terminal and operations on the community than about the quality of service for ferry riders, hundreds of youth from West Seattle and surrounding areas commute to Vashon schools via the Triangle Route every weekday during the school year.

Implications

Conflicting interests and perspectives among the three Triangle Route communities complicate WSF's attempts to make appreciable changes to operations at the Fauntleroy terminal. Though WSF and interested stakeholders have made efforts to bring representatives from the three communities together, our research uncovered a general perception that when one community benefits from a change in ferry schedules or operations, another community necessarily loses.

⁵ Washington State Ferries. (2017, January - 2018, September). On-time Performance Reports.

⁶ Washington State Ferries. (2018, September). 2040 Long Range Plan: Draft Plan, p.27.

⁷ City of Seattle. (1997, April 28). Resolution Number: 29566.

⁸ Office of the City Clerk. (2018). Types of Council Action.



Image 1: The Fauntleroy Dock (image from West Seattle Blog, March 19, 2018)

III. System Characteristics and Description

Figure 2 is a representation of operations and system features at the Fauntleroy Ferry Terminal. Please refer to this diagram as a visual aid as we describe how features of the infrastructure and WSF operations contribute to or constrain the overall ticketing and loading process.

A. Infrastructure

Dock Capacity (Figure 2, D)

The Fauntleroy dock is the oldest in the WSF system, and currently maintains the same footprint as when it was constructed almost sixty years ago. The dock has four loading lanes, with a total capacity of about 80 vehicles (depending on length), and two exit lanes for unloading ferries, one of which is sometimes used for staging additional vehicles after the arriving ferry has finished unloading.

Fleet (Figure 2, B)

In 2014, WSF began retiring its aging 90-vehicle vessels that served the Triangle Route, replacing them with larger 124-vehicle Issaquah-class ferries. At the time of this report, two of the three vessels on the Triangle Route have been replaced, with the last one to be replaced in 2019. WSF recommends that a dock's capacity should equal one and a half times the vehicle capacity of the ferries that the dock serves; however, the Fauntleroy dock

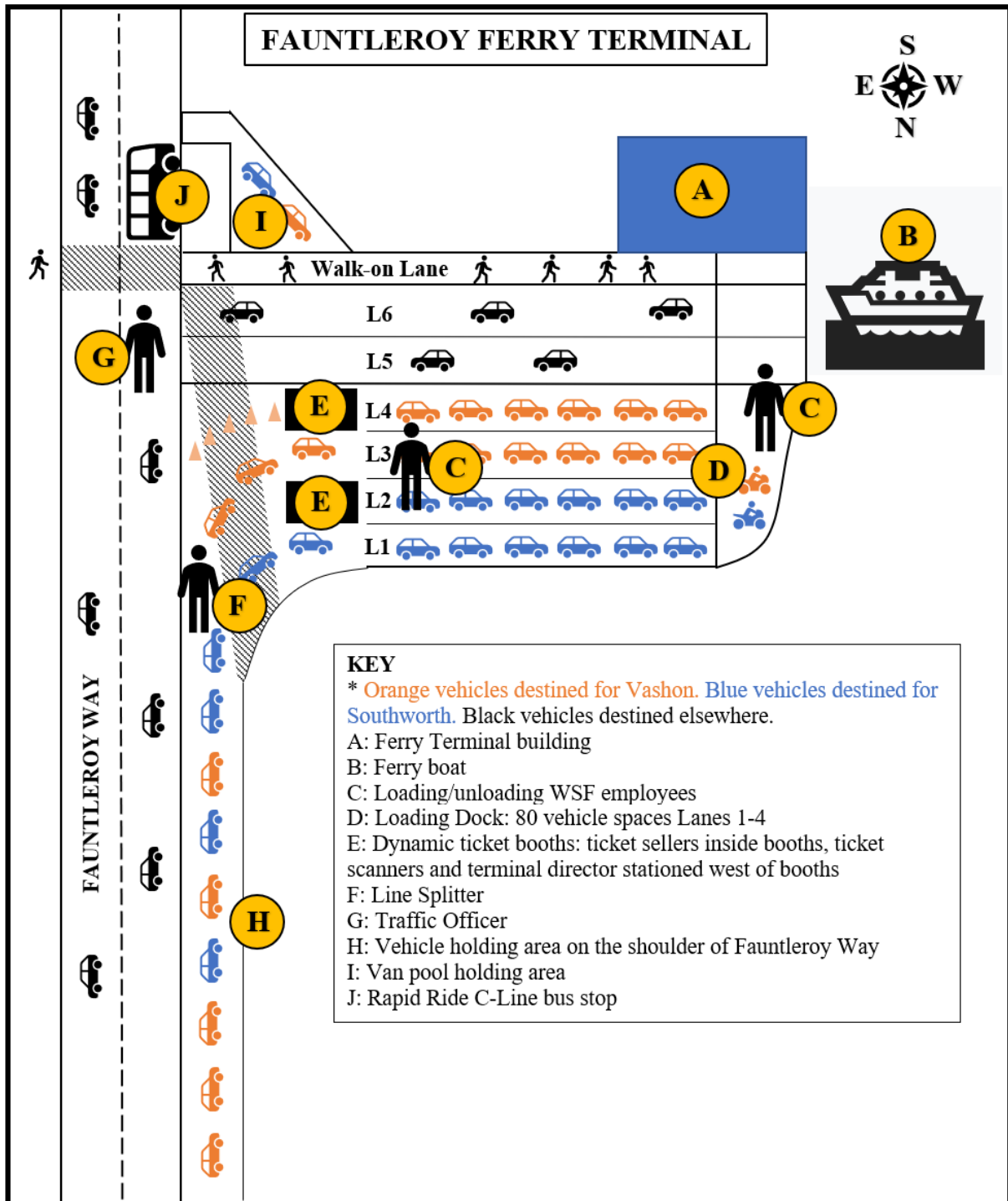


Figure 2: Dock Diagram at Fauntleroy Terminal

Note: The diagram is not to scale and is meant only to help readers understand current Fauntleroy dock operations and procedures.

lacks space to hold even the 90-vehicle capacity of the smallest vessel serving it.⁹ Mechanical issues are a chronic problem with vessels reaching the end of their lifetime, causing delays and even cancellations of trips on the route. In FY 2018, approximately 91.5% of sailings were on time, and over 600 of the roughly 40,000 sailings on the Triangle Route were canceled due to the use of an emergency two-boat schedule when one of the route's three vessels was taken out of service temporarily for repairs. These figures for on-time departures and cancellations both underperformed WSF's annual goals for on-time performance and service reliability.^{10, 11}

Holding Lane on Fauntleroy (Figure 2, H)

The single holding lane functions as a parking lane for Fauntleroy residents and visitors for most of the day. SDOT prohibits parking in the lane during peak travel times, from 2pm-7pm, to allow cars to queue for the next ferry and keep the main roadway clear for local traffic (see Figure 3: *Map of Fauntleroy Neighborhood and Terminal*). During these hours, the line of vehicles waiting in the holding lane can stretch as much as 1.5 miles north up Fauntleroy Way. Occasionally, parked cars in the holding lane block the ferry queue and disrupt traffic flow.

During peak travel times, a contracted officer from the Seattle Police Department (SPD) helps direct traffic at the terminal's entrance. Sometimes the officer walks along the holding lane to pull out Vashon- or Southworth-bound cars to fill a single destination boat. This procedure creates unsafe traffic conditions on Fauntleroy Way and at the terminal entrance as drivers merge back and forth. Neighborhood residents and queued ferry riders share concern about the heightened risk of traffic accidents.

Walk-on (Foot) Passengers (Figure 2, A-B)

Unlike other ferry terminals in densely developed environments, the Fauntleroy ferry terminal has no grade-separated walkway for foot passengers. Foot passengers who depart the terminal to connect to King County Metro bus service on the far (east) side of Fauntleroy Way must cross the street while ferry traffic unloads and local traffic filters through. During peak hours, the contracted SPD officer facilitates these pedestrian crossings. When large groups of foot passengers disembark, the time required to unload increases, which can delay the loading of vehicles onto the next sailing and hold up local traffic on Fauntleroy Way.

B. WSF Operations

Ticketing and Loading Procedures (Figure 2, C, D, E, F, and G)

Two ticket booths are located at the east end of the Fauntleroy dock (see Figure 2, E). In summer 2018, every car stopped at one of the ticket booths to either purchase a ticket or to

⁹ Washington State Ferries, personal communication, July 2018.

¹⁰ Washington State Department of Transportation. (2018, March). *Gray Notebook: Quarterly performance analysis of WSDOT's multimodal systems and programs, Edition 69*.

¹¹ Washington State Ferries. (2017, January - 2018, September). On-time Performance Reports.

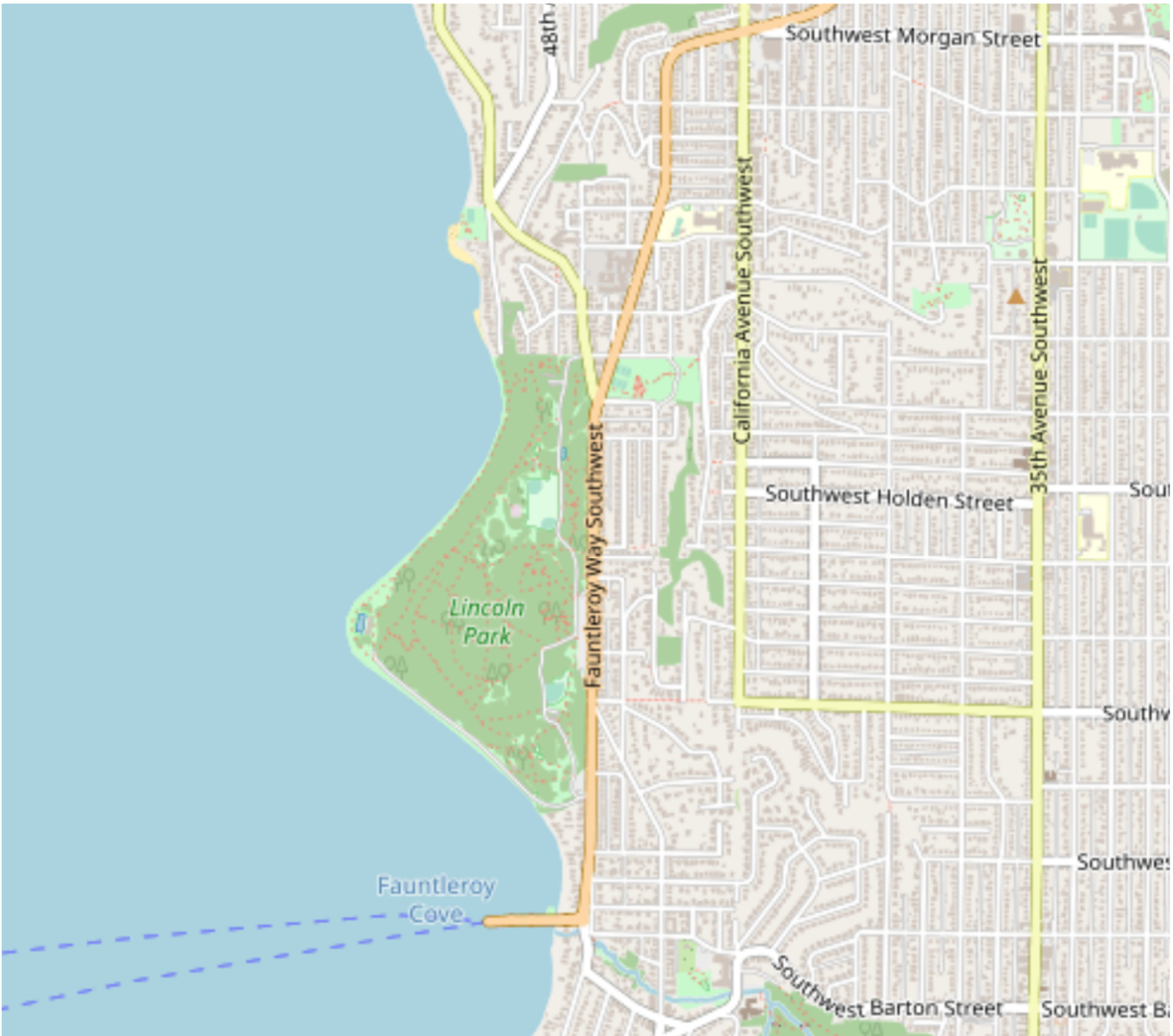


Figure 3: Map of Fautleroy Neighborhood and Terminal

validate a prepaid ticket. The speed at which cars are processed through the booths is limited by technology at the toll booth and the transaction between customer and toll booth operator. Because the capacity of the vessels exceeds the capacity of the dock, the processing speed at the toll booth is a limiting factor in loading times.

Fare Structure

Further complicating ticketing is WSF's fare structure, which features dozens of possible fares for riders. Fares are designated by destination, mode of transport (vehicle, walk-on, bicycle, motorcycle, vanpool), number and age of passengers in a vehicle, vehicle length, vehicle height, and whether or not the rider qualifies for senior/disability/Medicare discounts.¹² Occasionally, the toll booth attendant will have to measure a vehicle or verify passengers' ages in order to apply the correct fare, adding extra time to the ticketing

¹² Cedar River Group. (2012, January). WSF Fare Media Study, Final Report, p.38.

process. Travelers unfamiliar with the fare structure or the ticketing and loading process can further slow the flow of vehicles.

Staffing

Two sets of WSF staff administer ticketing and loading at Fauntleroy:

1. The terminal staff handle ticketing, initiate loading, and direct disembarking vehicles. They include: terminal supervisor (Figure 2, A), staging employees (C), toll booth operators (E), terminal director (E), traffic splitter (F), traffic officer (G-H).
2. The vessel staff complete loading and direct vehicles into specific lanes on the vessel, operate the vessel between ports, and manage unloading from the boat. They include: ferry captain (B), able-bodied seaman (B).

For position descriptions see Appendix B, *Dock Diagram Table*.

C. Population and Ridership Trends

The Puget Sound region has experienced rapid population growth in the past decade, although growth has not been uniformly distributed (see Figure 4: *Population of Communities Served by the Triangle Route*). Seattle and Kitsap County's populations have grown 20% and 6.4%, respectively, since 2010, while the population on Vashon Island has declined by 7.3%.^{13, 14, 15}

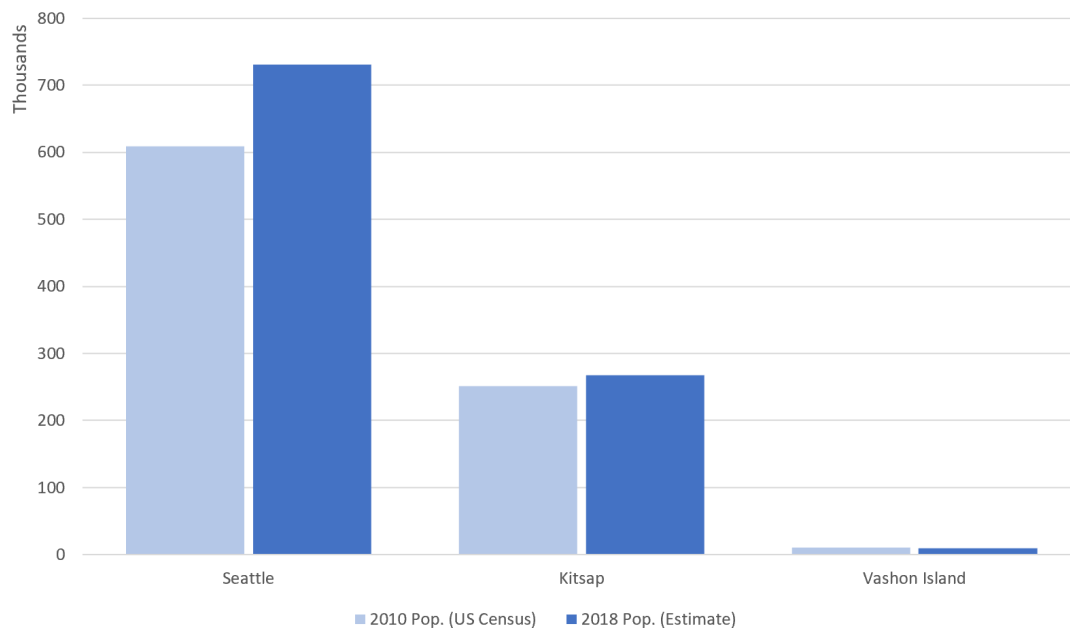


Figure 4: *Population of Communities Served by the Triangle Route*

¹³ WA State Office of Financial Management, Forecasting and Research Division (2018, July). 2018 Population Trends.

¹⁴ United States Census Bureau. (2018). QuickFacts: Vashon CDP, Washington.

¹⁵ DataUSA. (2018). Vashon, WA.

The region has also seen housing prices rise dramatically in recent decades, commensurate with increasing population and economic growth. In Kitsap County and other areas surrounding Seattle, population growth is driven in part by buyers seeking affordable housing within commuting distance of the Seattle core.^{16, 17}

These dynamics have affected ridership on the Triangle Route over the past decade. Ridership fell in the wake of the Great Recession but has steadily increased as the economy recovered and population increased (see Figure 5: *Base Year Comparison of Triangle Route Ridership Over Time*). However, vehicle ridership in recent years has not returned to its peak in 2003, when the Triangle Route transported over 1,840,000 vehicles per year. In 2017, WSF transported 1,761,762 vehicles on the Triangle Route, a 5.2% increase from the 1,674,168 vehicles transported in 2012.¹⁸



Figure 5: Base Year Comparison of Triangle Route Ridership Over Time

In the past few years, the King County Water Taxi has taken some commuter traffic away from the Triangle Route. The Water Taxi transports walk-on passengers between Vashon and downtown Seattle during the morning and afternoon rush hours. The water taxi served 221,546 passengers to and from Vashon in 2016, and 224,023 passengers in 2017.^{19, 20} Travel between Fauntleroy and Vashon currently constitutes roughly two-thirds of overall vehicle traffic out of the Fauntleroy terminal, of which approximately 40% are SOVs carrying only a driver.²¹ In 2017, 65.8% of vehicles transported from Fauntleroy went to

¹⁶ Rosenberg, M. (2017, June 6). No escape for priced-out Seattleites: Home prices set record for hour drive in every direction. *The Seattle Times*.

¹⁷ Stanford, J. (2018, April 6). Kitsap County home prices reach five-year high. *Kitsap Sun*.

¹⁸ Washington State Ferries. (2002-2017). Traffic Statistics Rider Segment Report.

¹⁹ King County. (2017) 2016 King County Water Taxi Facts and Figures.

²⁰ King County. (2018). 2017 King County Water Taxi Facts and Figures.

²¹ Washington State Ferries. (2013). WSF 2013 Origin-Destination Travel Survey Report. Page 7-8.

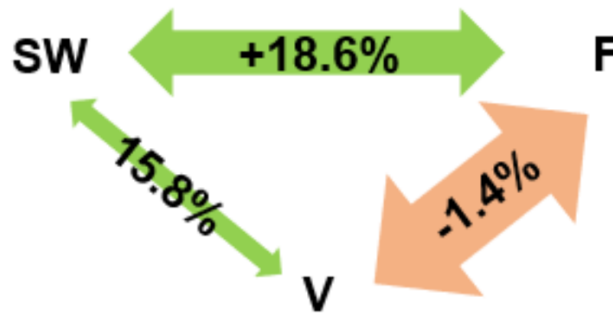


Figure 6: Ridership Change from 2012 – 2017

Note: The width of each arrow represents each leg's proportion of the total ridership.

Vashon and 34.2% went to Southworth. However, over the last five years, growth in ridership on the Triangle Route is attributable to increased demand from Southworth customers. From 2012 to 2017, Fauntleroy-Southworth ridership increased by 88,170 vehicles (18.6%); Southworth-Vashon increased by 14,380 vehicles (15.8%) (see Figures 6 and 7). The Southworth to Fauntleroy leg has the highest rate of one-way ridership on the Triangle Route: ferry riders take 25% more trips traveling eastbound than westbound as a result of the option to return by road.²²

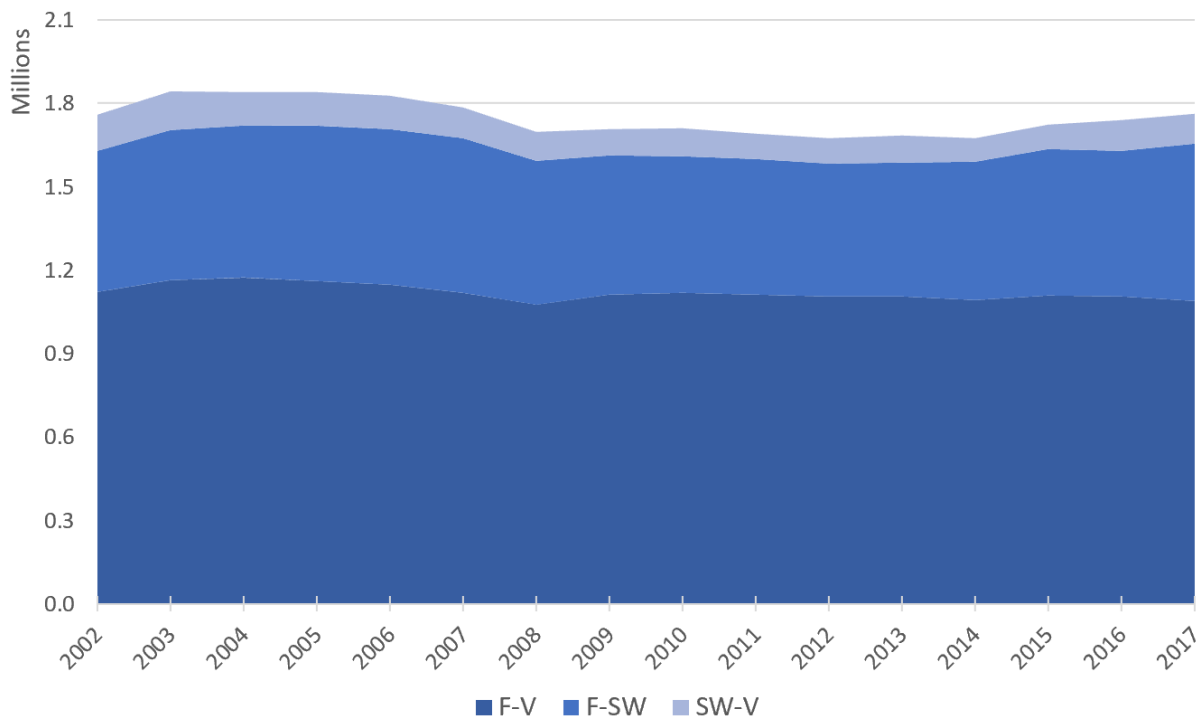


Figure 7: Total Ridership Over Time, by Leg

²² Cedar River Group. (2012, January). WSF Fare Media Study, Final Report, p.35, 62.

WSF staff are taking these ridership and demographic trends into consideration when planning future changes in service on the Triangle Route. The recent increase in Southworth's share of ridership to and from Fauntleroy has direct implications for ticketing and loading procedures, because it is changing the mix of Vashon and Southworth cars waiting on the dock and in the queue on Fauntleroy Way.

D. Rider Origins and Destinations

To evaluate traffic patterns and identify opportunities to reduce congestion at Fauntleroy, WSF conducts an origin-destination survey for the Triangle Route every seven years. The two most recent surveys were conducted in 2006 and 2013. These data on riders' origins and destinations provide further context to the challenges of managing demand at Fauntleroy beyond demographic trends.

The Origin-Destination survey data indicate that vehicle traffic to and from the Fauntleroy Dock does not come from any one region (see Figures 8a and 8b). Among westbound travelers, those departing from downtown Seattle constitute only 14% of Vashon-bound riders and 20% of Southworth-bound riders. About half (49%) of Vashon-bound riders originate from downtown Seattle, West Seattle, Sea-Tac, and the Industrial Area; 45% of Southworth-bound riders originate from downtown, West Seattle, and the Industrial Area.²³ The majority of riders departing from Fauntleroy originate from other areas, including Renton, Bellevue, North Seattle, and South King County. This heterogeneity among riders makes providing efficient transportation connections and alternatives for customers of the Triangle Route difficult to plan and implement.

²³ Washington State Ferries. (2013). WSF 2013 Origin-Destination Travel Survey Report.

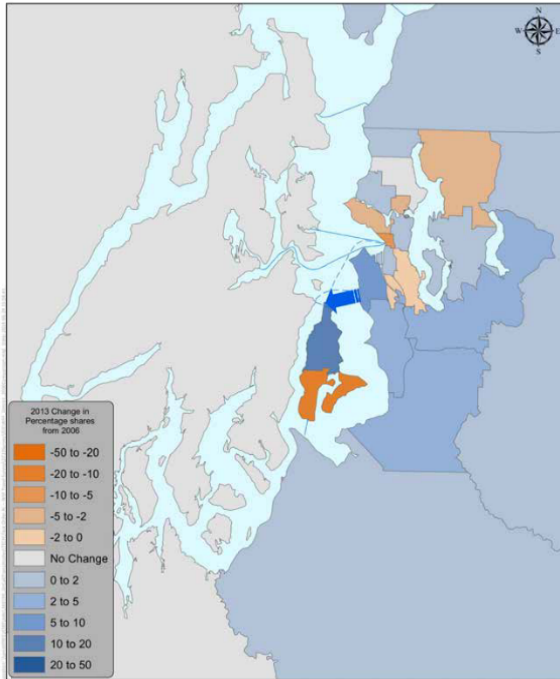


Figure 8a: Fauntleroy - Vashon
Afternoon Origin Patterns

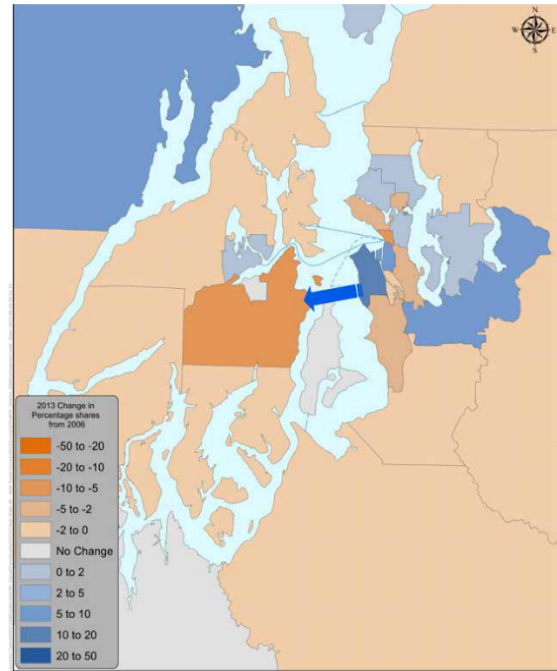


Figure 8b: Fauntleroy - Southworth
Afternoon Origin Patterns

Figure 8: Change in Westbound Travel Patterns from 2006 to 2013

These plots depict weekday afternoon traffic departing from Fauntleroy dock to Vashon (panel 8a) and Southworth (panel 8b). The proportion of riders leaving downtown Seattle for both Southworth and Vashon decreased between 2006 and 2013, while the proportion originating in West Seattle and bound for these destinations increased.

STUDY APPROACH

This study analyzes and compares alternatives for improvements in ticketing and loading at the Fauntleroy terminal given its constraints (which include the dock's size, configuration, and its function as a dual-destination terminal with boats bound for Vashon Island and Southworth). We also explore ways to improve riders' and community stakeholders' understanding of the operational challenges of ticketing and loading at Fauntleroy dock.

The study was designed and executed in phases:

- Assemble information and extract data
- Develop criteria
- Identify operational alternatives
- Compare alternatives based on criteria and explore tradeoffs
- Consider implications of relaxing various constraints
- Identify system-wide considerations and structures with implications for ticketing and loading

I. Information Assembly and Data Extraction

This study, and the development of ticketing and loading alternatives and the criteria by which they are compared, was informed by qualitative and quantitative information obtained through public sources and data requests; interviews and consultations; direct observations around docks and terminals; attendance at public meetings and open houses; and review of prior studies, public documents and other materials. Our information base is described below with additional detail provided in Appendix C, *Information Assembly*.

A. On-site Observations and Targeted Communication/Consultation

The research team observed and consulted dock crew and WSF staff regarding terminal and ferry operations on four separate occasions. For two of these visits, members of the research team gathered independent observations and on the other occasions they were accompanied by WSF staff. Appendix C, *Information Assembly*, enumerates the focus of each visit.

B. Key Informant Interviews and Consultation with WSF Administrative Staff

Interviews with WSF senior administrative staff provided historical context and information about current issues for the ferry system as a whole, the Triangle Route, and Fauntleroy dock operations. The staff described the challenges and constraints facing implementation of each alternative at Fauntleroy.

C. Attendance at Triangle Task Force and Long Range Plan Public Meetings

The Triangle Task Force (TTF) convened monthly over the summer of 2018 to deliberate on proposed schedule changes for Summer 2019. The research team attended these meetings in order to observe WSF community engagement efforts. On one occasion, July 19, 2018, the research team led an activity with task force members to glean insight on the favorability of specific ticketing and loading alternatives, as well as to learn the criteria for optimal performance as seen from the community perspective.

D. Interviews with Community Representatives

During July and August of 2018, the research team interviewed fourteen individuals who are part of the TTF and/or one of the route's three Ferry Advisory Committees (FAC) (see Appendix D, *Interview Protocol*). The interviews had two purposes: 1) to better understand the relationship between WSF and the Triangle Route communities, and 2) to gain historical and technical perspective on the relative successes and failures of past attempts to address the challenges with ticketing and loading at the Fauntleroy terminal. We found that TTF and FAC members have a broad and deep understanding of the challenges on the route, and that each of the three communities represented has unique and well-defined priorities (see *Community Profiles* section on pages 3-5).

E. Key Documents, Reports, and Data Sources

Our study was informed by reports, data sources, memos, and directives produced by Washington State agencies and independent parties. These documents are listed in Appendix C, *Information Assembly*. We did not have full access to the underlying data for every report, and, even where data were accessible, there were limitations related to sampling and measurement approaches. In a later section, *Data Landscape*, on pages 48-50, we highlight data limitations, as well as needs and opportunities for additional data collection that would enable improved analysis of specific changes to ticketing and loading processes and their expected impact at Fauntleroy.

II. Criteria

To evaluate and compare alternatives to improve ticketing and loading on the Triangle Route this study applied a targeted set of criteria (see Table 1: *Criteria*). The development of criteria for this analysis was informed and shaped by 1) our charge from the Legislature, 2) WSF's existing performance measures laid out in state directives, and 3) the many approaches, observations and sources detailed in the above section, *Information Assembly and Data Extraction*, on pages 15-16.

A set of clear and consistent criteria against which to assess the relative desirability of alternatives to the Status Quo is essential for systematic analysis. Developing such criteria is challenging, however, since reasonable people may view the importance of various criteria differently, and even have different expectations about what improvements might be realized along specific margins in implementing one alternative or another.

Table 1: Criteria

Community Satisfaction	This criterion captures the public perception of WSF and its ability to effectively and transparently communicate with riders and the community at large. Its component parts are customer satisfaction, customer understanding of process, and the relationship between WSF and communities.
Ability to Meet Demand	This criterion captures operational efficiency. Component parts are shorter lines, used capacity on boats, time spent getting through the toll booth, and on-time performance.
Equity	This criterion is defined by fairness and access to service across constituent communities proportionate to demand. Component parts are equity of fares, service, and wait times.
Safety	This criterion includes concern for potential risk of injury to ferry passengers, WSF employees, neighborhood residents and vehicle occupants on the Fauntleroy dock and neighboring roadways impacted by ferry traffic, as well as physical and security concerns for infrastructure, watercraft, and motor vehicles.
Farebox Recovery	This criterion represents cost containment and revenue considerations for WSF. Component parts are impact on revenue, upfront cost, and ongoing cost.
Environmental Sustainability	This criterion encompasses carbon footprint related to vehicle traffic, vessel speeds, public transit connections and other elements. All of the particulars of ticketing and loading are expected to impact environmental sustainability; we discuss this criterion holistically in section on pages 37-38, looking across all of the alternatives we considered.

To develop criteria for assessing ticketing and loading alternatives, we first examined Washington State Department of Transportation (WSDOT) system policy goals as laid out in RCW 47.04.280:

- a) Economic vitality
- b) Preservation
- c) Safety
- d) Mobility
- e) Environment
- f) Stewardship

WSDOT's six goals form the basis for the WSF performance measures, which appear in RCW 47.64.360. Since 2011, RCW 47.64.360 has mandated that WSF complete a management and accountability performance report assessing its performance on 17 performance measures determined by comparison with final data from 2009-2011. They include measures of safety performance, cost containment, capital program effectiveness, and service effectiveness (see Appendix E, *Performance Measures*). We interviewed WSF staff at all levels about their interpretations and priorities for these performance measures, as well as the conflicts and tradeoffs that some of them present. While WSF terminal staff, vessel staff, and management emphasized slightly different priorities among the measures, the ones we heard about most pertained to on-time departures, the ability to meet demand, and safety on the Triangle Route.

To identify the most prevalent priorities among Triangle Route customers and communities, the research team interviewed community representatives and frontline staff, attended public meetings, and reviewed public comments from the WSTC FROG surveys. The performance measures most commonly cited in interviews were reliability and ability to meet demand (filling boats to capacity and on-time performance), although many other measures were raised at least once (see Appendix F, *Criteria Presented at TTF Meeting*). In July 2018, the research team led breakout groups on potential criteria with Triangle Task Force members, during which TTF members were shown an initial list of criteria and were asked to identify those that were most important to them as individuals and to their communities. TTF members were also asked to suggest additional candidate criteria that they found to be missing. The purpose of the activity was to glean community-wide perspective on WSF performance and how it should be measured. This activity generated additional performance measures relevant to the communities, specifically equity of service and fares, as well as, environmental and safety concerns. It is important to note the heterogeneous nature of public perception of WSF performance, as well as how to assess it, both between and within each community.

In order to evaluate ticketing and loading alternatives effectively, our research team distilled the many metrics, measures, and priorities we heard about relative to WSF performance into a focused set of criteria. The analysis below draws on the data extraction and information assembly described above, as well as deliberation and judgment. After substantial discussion about how to best reflect variation across stakeholders, we arrived at the set of six principal criteria enumerated in Table 1: *Criteria*, which we apply to assess and compare the ticketing and loading alternatives. Each criterion encompasses a number of supporting objectives that can be measured or inductively reasoned subject to available data. As is the case with the 17 performance measures on which WSF is currently evaluated, there are tradeoffs among criteria, and not every criterion can be simultaneously satisfied by any one alternative. Further, alternatives rise or fall in importance depending on an individual stakeholder's perspective and priorities.

The six criteria reflect the many perspectives expressed during our team's document reviews, interviews, and field observations, making them a robust set for the assessment of ticketing and loading alternatives that follows. Taken together, the criteria reflect WSF's

central mission, vision, and commitments to its stakeholders.²⁴ They also capture state-level initiatives and priorities such as environmental sustainability and the carbon footprint of state operations.

The following paragraphs lay the groundwork for applying the criteria to ticketing and loading alternatives. We describe each criterion as well as the Triangle Route's current challenges and opportunities in fulfilling them.

A. Community Satisfaction

Community satisfaction is a vital consideration for any public service. In operating the Triangle Route, WSF seeks to satisfy not only regular and occasional ferry passengers, but also the residents of the three communities the route serves. Satisfying community members requires predictable and user-friendly ferry service, courteous and professional interactions between passengers and staff, transparent information and expectation management about delays or changes to service, and the mitigation of negative impacts of service delays or changes on passengers as well as community residents whose neighborhood is affected by ferry traffic. The Triangle Route currently has the highest proportion of dissatisfied customers of any route that WSF operates.²⁵

Community satisfaction with ferry service depends substantially on the quality and reliability of sailings and the experience of passengers during ticketing and loading. The daily interactions between WSF dock and terminal staff and ferry riders therefore have a considerable impact on community satisfaction. The design of the dock and the current ticketing and loading procedures at Fauntleroy nevertheless create substantial challenges for the staff working on the ferries, at the terminal, and on the dock. The behavior of the occasional frustrated passenger only exacerbates these challenges.

Because the Fauntleroy dock provides a gateway to and from the bulk of the metropolitan Seattle region for Vashon and Southworth drivers, it would be a potential flashpoint for the different needs, concerns, and sensibilities of the drivers from those two communities even if it operated at peak efficiency. The current challenges of ticketing and loading at Fauntleroy exacerbate the tensions between the preferences of the drivers from those two communities. In addition, and equally important, the queuing and maneuvering of cars waiting to enter the dock on Fauntleroy Way create additional traffic and disruption for nearby West Seattle residents.

B. Ability to Meet Demand

Ability to meet demand is a core criterion for performance for any transit system. On the Triangle Route, WSF seeks to meet demand by providing adequate capacity to carry those who need ferry transit, while avoiding an oversupply of service (which results in unfilled boats). To do so, WSF must respond to fluctuations of demand throughout the day, the

²⁴ Washington State Department of Transportation. (2011, June 18). WSF Mission, Vision, Commitments.

²⁵ Washington State Transportation Commission. (2017). WSF 2017 Winter Performance Final Report, p.11.

season and the year. In short, this criterion represents operational efficiency, because it requires appropriate frequency of sailing with well-calibrated dwell times, such that ticketing and loading operate efficiently - minimizing the time passengers spend waiting in line and navigating the tolling system.

Meeting demand has been a challenge on the Triangle Route in recent years as outlined in *Population and Ridership Trends* on pages 10-13. Insufficient dwell times (the periods of time during which a vessel is docked) can create concern about tradeoffs between filling available space on boats and departing on time during peak hours, despite additional vehicles waiting in the holding lane. Over time, trends in population and ridership have only exacerbated the situation, while passengers and neighborhood residents who feel increasingly ill-served and frustrated have called on WSF to modify loading procedures or to change the schedule to better meet present demand. Ability to meet demand reflects the Triangle Route's ability to carry those who wish to travel with reasonable frequency, to minimize wait times, and to load vehicles efficiently within available dwell times to maintain a predictable schedule.

C. Equity

To achieve equity is to deliver service to all customers fairly, in a way that meets the needs of each individual or community. Each of the three Triangle Route communities has a slightly different definition of fair and equitable ferry service (see *Community Profiles* section on pages 3-5) which has led to tensions between WSF and each constituent community, as well as among the communities themselves. In this report, we use equity as a criterion to measure operational alternatives at the Fautleroy Ferry Terminal from several different perspectives; equity in service, fares, and wait times. For example, an alternative that scores high in equitable service would offer comparable sailings to each destination community based on the percentage of travelers bound for each community.

D. Safety

Safety is a multi-faceted criterion characterized by consideration of risk on the water and on the land. It includes the management of potential physical harm to people, motor vehicles, ferry boats, small craft, docks and neighborhood infrastructure. With the number of people, vehicles and vessels that must move efficiently through limited spaces during queuing, loading, passage, and unloading, maintaining safety on the Triangle Route is a highly complex undertaking. WSF staff deem safety their top priority for sailings, acknowledging that operating large car ferries on open water in all types of weather, and in the presence of a broad range of small craft, poses numerous safety challenges for which staff plan and take responsibility. In 2013, the WSF implemented a Coast Guard approved security protocol, handled by Washington State Patrol's Vessel and Terminal Security (VATS) division, which falls under Homeland Security.^{26, 27} This protocol includes passenger headcount and vehicle screening via a video monitoring center, relative to a

²⁶ Washington State Department of Transportation. (2018). Security at Washington State Ferries.

²⁷ Washington State Patrol. (2016, May 13). A Closer Look at the Washington State Patrol's Vessel and Terminal Security Division [web log comment].

specified set of restrictions. Finally, residents who live and work in proximity to docks, and ferry passengers alike, strongly prioritize concern for safety.

The Fauntleroy dock, queuing lane, and loading operation pose special safety considerations, including:

1. limited dock space that puts staff, walk-on passengers, and bicycles in vehicle traffic lanes during loading and disembarking procedures;²⁸
2. the presence on neighboring roadways and on the dock of drivers who may hurry and exhibit aggressive or reckless behavior, including sudden lane changes or line interruptions; and
3. the occasional presence of stalled or parked cars on Fauntleroy Way, which can block driveways or divert neighborhood traffic flow.

E. Farebox Recovery

Farebox recovery refers to the ratio of operating expenses that are covered by the fares paid. The majority of WSF's operating expenses go to payroll, pensions, vessel maintenance, and fuel.²⁹ Over the years, WSF's system-wide farebox recovery ratio has steadily increased to 75.8% in FY17. Declining fuel prices have had a large impact on the farebox recovery ratio, since fuel expense is a large percentage of WSF's operating budget.³⁰ The Triangle Route faces particular difficulties with farebox recovery due to its short routes and smaller vessel sizes (which limit the number of passengers and hence fares that WSF can collect on each sailing).

F. Environmental Sustainability

WSF has a firm and long-standing commitment to environmental sustainability, supported and encouraged by Washington state. We define this criterion to refer to both short- and long-term metrics related to the health of air, water and waterways, ecosystems and the human populations who live in and depend on these systems. These metrics include short term incentives and directives related to ticketing and loading, such as those that lead to reductions in consumption of fossil fuel by both ferries and passenger vehicles. Examples include operational performance measures for WSF and customer incentives including fare structures, transit connections and consumer efficiency gains on public transit. In addition, this criterion encompasses the short- and long-term impacts related to the presence of the Fauntleroy terminal adjacent to the Puget Sound, involving vehicles, vessels, docks, roadways and parking lanes.

²⁸ In 2017, there were 6.8 OSHA recorded crew injuries per 10,000 revenue service hours and 0.7 passengers per million injured, system-wide (per 2017 performance measures).

²⁹ Washington State Department of Transportation. (2017, December). 2017-2019 WSDOT Enacted Budget Book, p.43.

³⁰ Washington State Ferries. (2017, December 15). Route Statements for Fiscal Years 2012 to 2017, p.2.

EVALUATION AND ASSESSMENT

I. Operational Alternatives

This section reviews ticketing and loading alternatives that the research team compared using the criteria established above. The alternatives describe actions which WSF and its partners could take to improve ticketing and loading procedures on the Triangle Route.

Many previously identified alternatives were available for the research team to consider. For example, WSF employees have spent considerable time developing and experimenting with alternatives. Also, the Triangle Task Force, the WSF's citizen advisory group for the Triangle Route, was originally formed to recommend ways to improve service at Fautleroy. Finally, many reports and community comments have considered alternatives for various aspects of WSF operations. Thus, we gathered a comprehensive set of alternatives from a wide range of sources, including written reports, interviews, consultations, public meetings (and meeting records), and on-the-ground observations as described in the above section, *Data Assembly and Information*, on pages 15-16.

We initially identified approximately thirty different alternatives and presented them to the Triangle Task Force in July 2018 for input. They included changes in ticketing, loading, queuing, fares, operations, and communication (see Appendix G, *Alternatives*). Alternatives with the potential to improve ticketing and loading were identified for focused consideration based on feedback from task force members, WSF staff and the community, as well as deliberations within the research team. Through this process we narrowed the list of alternatives to a set of six for comparison against our established criteria for measuring performance, including the Status Quo which serves as a baseline (see Figure 9). The impacts of longer-term considerations on ticketing and loading -- such as potential updates to infrastructure and schedule, both of which are ongoing activities of WSF independent of this study -- are discussed separately below, along with several other important system-wide considerations.

Figure 9 summarizes the research team's overall assessment of each criterion based on our analysis. The sub-sections that follow describe the alternatives and explain the assessments.

		CRITERIA				
		Community Satisfaction/ Relationship	Ability to Meet Demand	Equity	Safety	Farebox Recovery
ALTERNATIVES	Status Quo					
	Implement <i>Good To Go!</i> System					
	Reinstitute Bypass Lane					
	Improve WiFi/Scanner Connectivity and Implement Upstream Mobile Transactions					
	Improve Training, Management, and Retention of Triangle Route Staff					
	Staff a Second Traffic Officer at Fauntleroy Dock During Rush Hour					

Figure 9: Assessment of Alternatives for Ticketing and Loading Operations for the Triangle Route

Note: Green cells in the matrix represent satisfactory attainment relative to the criterion, yellow cells indicate partial attainment, and red cells indicate a lack of attainment.

1. Status Quo

The Status Quo alternative reflects the current ticketing and loading process for the Triangle Route. The Triangle Route requires WSF staff to coordinate a diverse set of functions to move large numbers of passengers and cars across a complex route. For an overview of the ticketing and loading in the Status Quo, see *System Characteristics and Description* above on pages 6-14.

CRITERIA

Maintaining the Status Quo is the simplest path in the near future and requires no extra resources.

Community Satisfaction

Community satisfaction with the Status Quo is very low; nearly 40% of respondents to the 2017 FROG survey say that they are dissatisfied with the Triangle Route.³¹ This is primarily due to long wait times during peak hours and inefficiencies in ticketing and loading

Ability to Meet Demand

The Status Quo meets demand insofar as customers eventually make it to their destination. However, wait times tend to be extremely long, especially during peak hours, and WSF occasionally struggles to fully load ferries due to slow ticket processing at toll booths and a lack of vehicle staging space on the dock. For example, during peak summer travel periods,

³¹ Washington State Transportation Commission. (2017). WSF 2017 Winter Performance Final Report.

vehicles routinely wait over an hour to load and, despite backlogged demand, ferries are reported to sometimes depart with available vehicle spaces in order to stay on schedule.³²

To gauge the Status Quo’s ability to meet demand, we analyzed data from observations made by WSF staff of available vehicle spaces on boats departing Fauntleroy. Seven hundred sixteen observations were provided to us, from between the 1415 sailing and the 1905 sailing on weekdays in the summer of 2017, June 19 to October 2. See Appendix H for a summary of dates missing from the raw dataset. After removing sailings that occurred during use of a “two-boat schedule,” and observations that consisted of non-numeric information, 629 observations sailings remained in the dataset. Although these data do not include critical information about whether any cars were waiting in line when the vessel sailed, and are subject to other limitations, they provide some insight into the efficiency of ticketing and loading during peak summer hours.

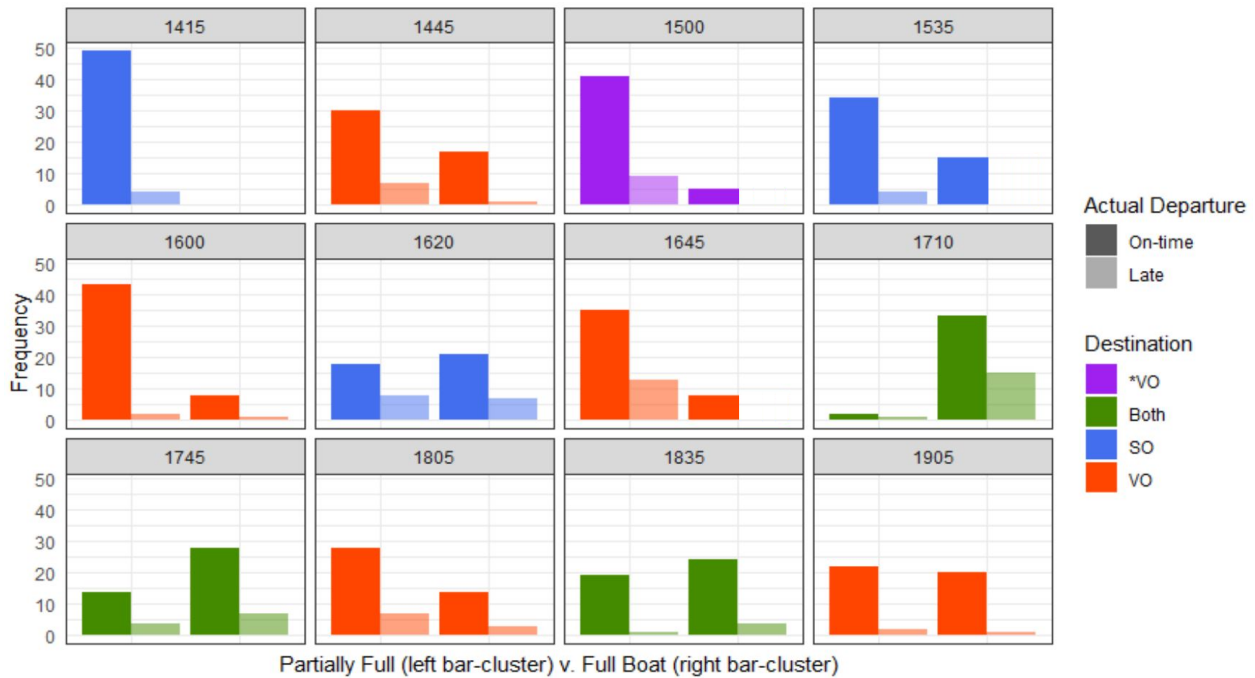


Figure 10: Fullness of Boats Departing Fauntleroy by Departure Time

Destination color codes:
 *VO (purple) = Vashon only for vehicles, but includes foot passengers for Southworth;
 Both (green) = dual destination vessels;
 SO (blue) = vessels bound for Southworth only; and
 VO (red) = vessels bound for Vashon only

Figure 10 depicts the instances when departing boats were found to be full or not.³³ Each panel represents a single departure time as indicated in the header (e.g., 1415 is the 2:15 PM sailing). The height of each bar represents the frequency of the departure status. Within

³² Gutman, D. (2018, January 24). Study: Half-empty ferries leave Fauntleroy as cars wait in line. *The Seattle Times*.

³³ Washington State Ferries. (2017). Fauntleroy Toll Booth Redemptions.

each panel, bar-clusters represent the frequency of on-time departures (dark colored bar) and late departures (light colored bar). Instances in which the departing vessel left partially full are plotted in the left bar-cluster of each panel, while instances in which the departing vessel left full are plotted in the right bar-cluster. Missing bars or clusters indicate an absence of relevant observations and colors represent vessels' destinations. We find that generally, sailings after 5:00 PM are observed to be at capacity more often than preceding sailings. This figure also shows that dual-destination sailings are more frequently at capacity than single-destination sailings. Still, it should not be assumed that dual-destination loading is always more efficient, as the higher frequency of full sailings may be attributed to elevated demand after 5:00 PM.

Figure 11 compares the estimated number of available spaces (vertical axis) for on-time versus late departures (dark and light bars) for each scheduled sailing time. We observe that for the majority of departure times, the median number of available spaces is smaller for on-time departures than for late departures (the median is plotted as a horizontal black line in each colored box). There are marginally more available spaces observed on vessels that depart late. We report these results while acknowledging the limitations of the analysis due to small samples, missing observations over the observation period and the inconsistencies of the record keeping, as laid out on pages 48-50 and in Appendix H.

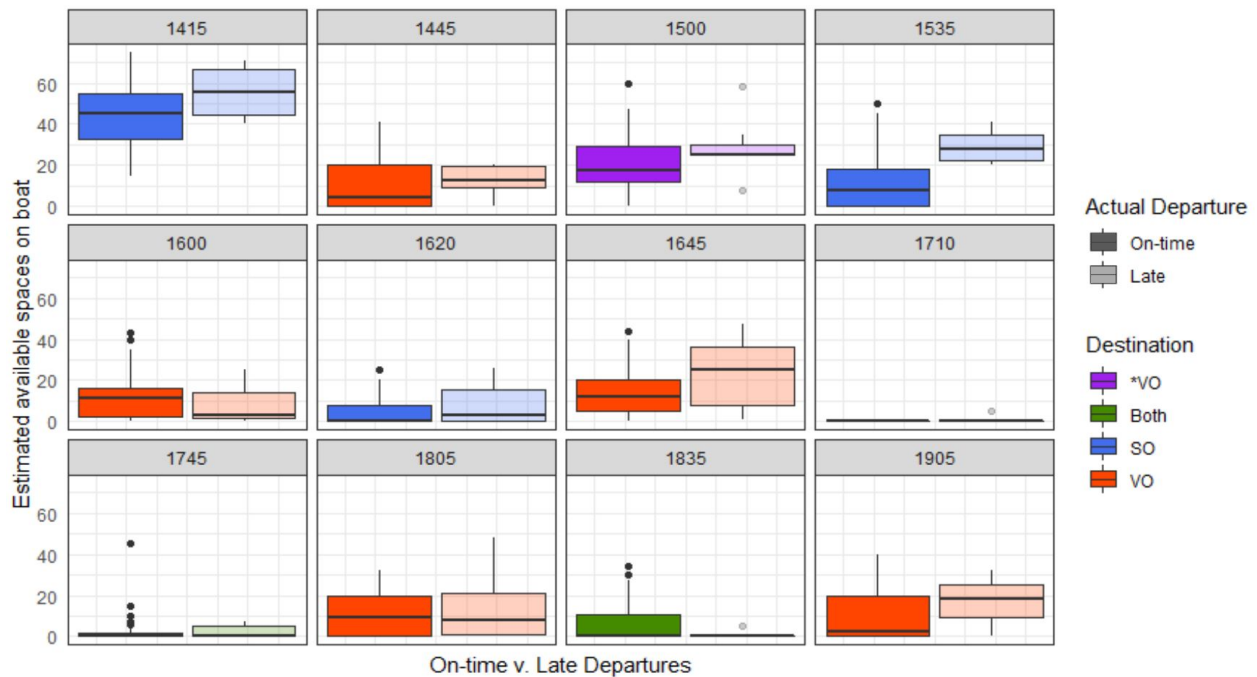


Figure 11: Boxplots - Observed Available Spaces Remaining on Vessels Leaving Fauntleroy

Notes:

- 1) The centerline in each boxplot represents the median number of available spaces while the box itself represents the interquartile range. Several boxplots draw on extremely small sample sizes, see Figure 14.
- 2) Destination color codes:
 - *VO (purple) = Vashon only for vehicles, but includes foot passengers for Southworth;
 - Both (green) = dual destination vessels;
 - SO (blue) = vessels bound for Southworth only; and
 - VO (red) = vessels bound for Vashon only

Figures 10 and 11 explore the community perception that WSF prioritizes being on-time more highly than filling boats. Within the observed data transmitted to us for summer season weekday peak travel departures in 2017 (subject to the limitations mentioned earlier) on-time boats are no more likely to contain available spaces than late boats.³⁴ We recommend improved data collection (pages 48-50) as critical for the future since data limitations result in an inability to draw conclusions about this perception more broadly.

Additional summary statistics for available spaces are included in Appendix H. Across all sailings between the 1415 departure and the 1905 departure, WSF observed and recorded an estimated 13 available spaces per sailing, on average. This overall average is made up of approximately 13 available spaces on average associated with on-time departures and approximately 14 available spaces on average associated with late departures. Alternatively, looking at medians across all sailings, we find that half of the sailings in this time window were recorded as leaving with 7 or fewer available spaces, i.e., a median composed of 7 or fewer available spaces for on-time and 6 or fewer for late departures.

Across sailings scheduled to depart between 1600 and 1905 inclusive (a subset of the data restricted to reflect the peak of rush hour), we find that on average the on-time boats left with approximately 8 available spaces while late boats left with approximately 9 available spaces, for an overall average of 8 estimated spaces on all sailings in this more restricted time period. Half of these departures were recorded as leaving with 2 or fewer available spaces. Additional analysis of the space count data appears below in the *Schedule* section of *System-wide Considerations* on pages 44-47.

Equity

Overall, service provided under the Status Quo is somewhat equitable. Ridership between Vashon and Fauntleroy is roughly double that of Southworth and Fauntleroy, so consequently more sailings go to Vashon each day. Vashon and Southworth weekday passengers reported wait times of greater than 30 minutes at roughly equivalent percentages (20%) in 2013.³⁵ However, demand from Southworth is increasing, as discussed in *Population and Ridership Trends* on pages 10-13, and allotments should be responsive to that.

Safety

Safety at the Fauntleroy dock is a priority for WSF, and under the Status Quo safety is adequate. WSF terminal staff face some safety risk when navigating through traffic lanes to direct vanpools and other pre-ticketed vehicles, as well as to manage misdirected vehicles and sometimes aggressive drivers who are eager to board after waiting in line. There is also concern for foot passengers who load and unload in close proximity to vehicles. However, a lot of risk is alleviated by current ticketing and loading protocols refined over time. Nonetheless, the public perceives that safety at Fauntleroy suffers from uneven traffic flow during loading. In the absence of a dock-specific evidence-based analysis, we refer to WSF's

³⁴ Washington State Ferries. (2017). Fauntleroy Toll Booth Redemptions.

³⁵ Washington State Ferries. (2013). WSF 2013 Origin-Destination Travel Survey Report.

aggregate record of any occurrence of accidents and safety infractions that result in injury, which reports few incidents across the entire ferry system.³⁶

Farebox Recovery

Over the last five years, the Triangle Route consistently recovered 50 to 60% of its operation costs through passenger fares -- substantially below WSF's system-wide average (see Figure 12: *Farebox Recovery Rate for Triangle Route from FY2012-FY2017*).³⁷ The route costs about \$33 million each year to operate and is currently running at a deficit of \$13 - \$15 million per year. Reductions in farebox revenue below the Status Quo are likely to raise concerns.

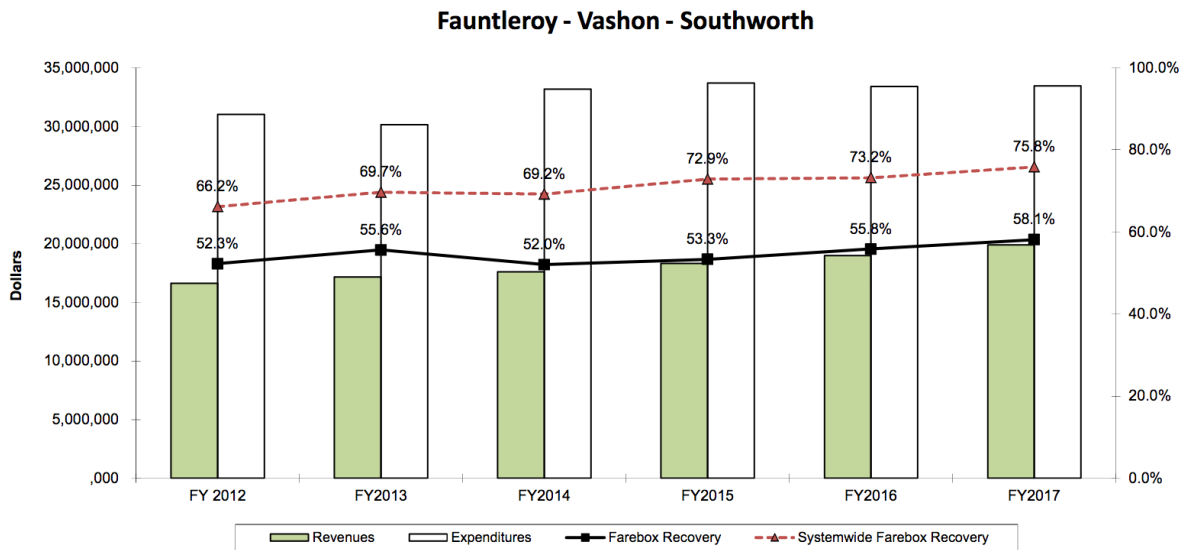


Figure 12: *Farebox Recovery Rate for Triangle Route from FY2012 - FY2017*

2. Implement *Good To Go!* System

A *Good To Go!* (GTG) system could substantially reduce ticketing and loading time. GTG is an electronic tolling system developed by the Washington State Department of Transportation (WSDOT) and currently used on some Washington state highways. Implementing GTG at WSF docks would enable direct loading of vehicles without the need to stop for toll collection. At Fauntleroy, where stopping at the toll booth slows the pace of loading, GTG can increase both the loading rate of vehicles and the total number of vehicles per sailing. Adopting GTG nevertheless involves substantial upfront costs, planning, design, and implementation challenges, including complex decisions about fare structure and collection as well as camera scanning technology and capabilities. To avoid installation both before and after the dock rebuild, investment in permanent GTG infrastructure should be timed to dovetail with the planned dock replacement. Interim or temporary GTG options

³⁶ According to Washington State Ferries (2016) Performance Measures Report, passenger injuries per million passengers was .42 and OSHA recordable crew injuries per 10,000 revenue service hours was 5.6.

³⁷ Washington State Ferries. (2017, December 15). Route Statements for Fiscal Years 2012 to 2017, p.12.

could also be explored before the dock replacement. Below we highlight just a few examples of issues that a full scoping would need to include, each of which would carry costs.

GTG currently operates on state highways under a flat fare structure, without regard to the passengers in the vehicle. The system's cameras are designed to only read a transmitter on the vehicle's windshield or photograph its license plate. Using GTG to collect WSF fares would therefore require changes to WSF's fare structure as well as the development of an approach to satisfy needs regarding passenger headcount:

- *Fare structure:* Currently, a driver boarding a ferry at Fauntleroy pays according to a complex fare structure that incorporates the length and height of their vehicle, the number of passengers, and any discounts that may apply based on age or disability status. Existing GTG technology can adjust fares based on vehicle size, but not based on the number or uniqueness of passengers. Implementing GTG would thus require that the WSTC simplify WSF's fare structure.
- *Security headcount and vehicle screening:* The U.S. Coast Guard security protocol and Homeland Security provisions require a headcount and also vehicle screening for all sailings. Introducing GTG would require careful consideration of these provisions and perhaps adjustment to the means of implementation.^{38 39}

Alternative camera scanning technology beyond GTG's current capabilities may nevertheless be on the horizon. Incorporating such technology into a GTG-type system could conceivably generate an accurate head count (although perhaps not distinguish passenger discounts) within each vehicle, thereby allowing WSF to retain differentiated fare assignments.

There are additional challenges to Implement GTG: The system is designed to operate on vehicles moving at highway speeds, thus trials assessing technology effectiveness at lower speeds, and with vehicles moving in close proximity to one another, is an important component of planning. Earlier scoping of GTG for ferry dock use assumed that toll booths would remain in place, making it necessary to consider the tradeoffs between maintaining a toll booth as backup (for instances where GTG devices fail) and removing toll booths completely.

GTG has not been deployed at any WSF terminal to date; however, the 2012 Fare Media Study projected it as viable to come online in "Phase Two (2018 or beyond)".⁴⁰ The WSF Joint Toll Feasibility Study (2014) also found the system to be a feasible option whose implementation would require a planning stage to occur in conjunction with the upcoming end of life cycle for the ticketing and tolling customer service center.⁴¹

³⁸ Washington State Department of Transportation. (2018). Security at Washington State Ferries.

³⁹ Washington State Patrol. (2016, May 13). A Closer Look at the Washington State Patrol's Vessel and Terminal Security Division [web log comment].

⁴⁰ Cedar River Group. (2012, January). WSF Fare Media Study, Final Report.

⁴¹ Washington State Department of Transportation. (2014, January 30). Joint Toll and Ferry CSC Feasibility Study.

CRITERIA

GTG scores well on community satisfaction and ability to meet demand. In response to Cedar River’s recommendation to implement GTG on the Triangle Route, WSF voiced concerns over equity implications and the risk of decreased revenues.⁴² These concerns likely remain, particularly as a fare increase, assuming a flat fare structure, is one way to offset GTG’s implementation costs and any farebox recovery decrement.

Community Satisfaction

The efficiency gains expected from implementing GTG at Fauntleroy should benefit community satisfaction substantially. Removing the transaction at the toll booth would simplify customers’ interaction with WSF for the regular commuter’s benefit. A new fare structure, however, could be expected to generate a wide range of community responses. Satisfaction would vary based on how any change in fare might affect transportation costs for individuals as well as whole communities.

In 2012, when the Joint Transportation Committee conducted a survey to inform the Cedar River fare media study, 64% of households responded that the use of GTG on ferries was “somewhat” to “very” important to them.⁴³ Ten years have elapsed since WSDOT debuted GTG on the Tacoma Narrows Bridge, and GTG has since expanded to other state highways in the Puget Sound region. GTG served over 763,000 customers and processed over 50 million transactions in FY2017.⁴⁴ WSF customers are now undoubtedly more familiar with its technology than they were in 2012, and perceived innovation and efficiency gains would reflect positively on the organization.

Ability to Meet Demand

Implementing GTG and introducing a simpler fare structure would mitigate current processing challenges stemming from scanning difficulties and human error, allowing traffic to enter the dock and load vessels directly from the holding queue on Fauntleroy Way. As a result, the time associated with toll booth processing or scanning pre-purchased tickets would be vastly reduced.

Equity

Because current GTG technology cannot count the passengers in a vehicle precisely, WSTC would likely need to increase vehicle fares to account for lost revenue stemming from GTG’s inability to collect fares for additional passengers. The burden of a fare increase is likely to fall disproportionately on single occupancy vehicles (SOVs), particularly commuters. SOV drivers make up a greater proportion of Vashon ferry riders than the proportion in any other community in WSF’s system. A higher price signal for these drivers would provide an incentive to leave the car behind and use connections to other transit instead. But given the range of destinations to which the Vashon SOV drivers are headed,

⁴² Cedar River Group. (2012, January). WSF Fare Media Study, Final Report, p.80-81.

⁴³ Cedar River Group. (2012, January). WSF Fare Media Study, Final Report, p.5.

⁴⁴ Washington State Department of Transportation. (2017, December). Toll Division Annual Report FY2017, pp ii-iv.

this type of switch would be more feasible for some than others. Alternatively, SOVs going to and from Southworth always have the option to drive through Tacoma rather than use the Triangle Route; however, they face increasing traffic congestion and create environmental externalities when doing so.

Safety

It is unclear how GTG might affect safety at the Fauntleroy terminal. GTG would improve traffic flow during loading at the docks and in the holding lane along Fauntleroy Way, as traffic would move more consistently than when vehicles have to stop at the toll booths. It is possible that increased speed would be associated with increased safety incidents. Alternatively, reduced confusion and frustration about traffic flow may improve safety and reduce accidents.

Farebox Recovery

Long-term farebox recovery for WSF would be unchanged by implementing GTG, despite up-front technology costs, due to a revenue neutral requirement. Specifically, any modifications to the fare structure must “generate the amount of revenue required by the biennial transportation budget” (i.e. be revenue neutral) (RCW 47.60.29). Cedar River estimated up-front costs at \$3.4 million in 2012 dollars if GTG were implemented system-wide. This estimate should be revisited with a full scoping of the technology and system adapted to dock usage, such as the possibility of multiple cameras/readers given vehicle flow parameters, program development costs for building out a back-office system compatible with fare structures, and transaction fees, etc.⁴⁵ Further, ongoing maintenance costs would increase and necessitate the adjustment of fares to account for changes in terminal operating expenses.

3. Reinstitute Bypass Lane

A bypass lane allows drivers with pre-purchased tickets to avoid the holding lane on Fauntleroy Way and load onto the next departing boat. This effectively creates a third point of entry for vehicles onto the dock (the other two being the toll booths). This way of entering the terminal can only be safely utilized after disembarking vehicles have cleared the exit lanes of the dock, or if off-loading traffic were restricted to one lane, which would significantly slow unloading time. Processing bypass lane passengers requires a WSF employee to scan tickets with a mobile scanner. A bypass lane strategy was used for several years before 2008, at which point it was discontinued primarily because of safety concerns.⁴⁶

Expansion of the Fauntleroy terminal dock would render the bypass lane unnecessary as traffic flow through the toll booths is currently fast enough to process sufficient vehicles to fill a vessel between scheduled departures, assuming that the dock has adequate capacity. At present, vehicle processing becomes a bottleneck only after the dock has reached capacity.

⁴⁵ Cedar River Group. (2012, January). WSF Fare Media Study, Final Report, p.76.

⁴⁶ Washington State Ferries, personal communication, November 2018.

CRITERIA

An additional traffic lane entering the Fauntleroy dock could marginally improve vehicle flow given the dock’s current size constraints. However, it negatively impacts two performance metrics: farebox recovery and safety.

Community Satisfaction

Since the bypass lane was discontinued, Vashon riders have lobbied for its return. Reinstating the bypass lane would increase satisfaction of pre-ticketed riders, who hold multi-ride cards or have purchased their fare online at Wave2Go.

Ability to Meet Demand

A bypass lane offering a third point of entry onto the dock could increase the number of vehicles processed. Based on ridership data, roughly half of drivers traveling on the Triangle Route use multi-ride cards and could utilize a bypass lane for prepaid ticket holders. However, the time window in which this alternative could be used is short. Based upon ideal dwell times of 16 minutes, WSF allots six minutes for loading, three or four of which are allotted to load the cars presently on the dock (see Figure 13: *Ideal Dwell Time*). As a result, a bypass lane could allow 8-12 additional cars to board a ferry without impacting its departure time, assuming the vehicle processing rate is 15 seconds per car on average.

A day at Fauntleroy: Time

Loading and unloading the ferry takes time

- Dock **1 min**
- Unload **4 min**
- Security sweep **4 min**
- Load (dock) **4 min**
- Load (tollbooth) **2 min**
- Undock **1 min**

PERFECT TIME: 16 MIN

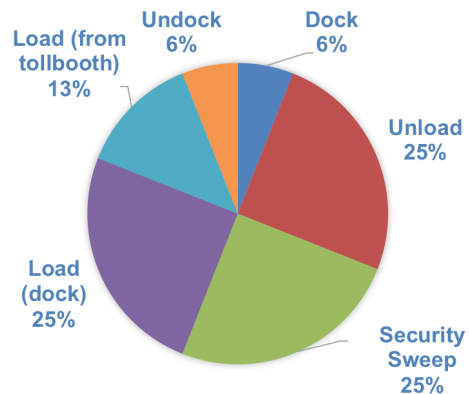


Figure 13: Ideal Dwell Time at Fauntleroy

Equity

A bypass lane only serves customers with multi-ride cards or prepaid tickets. Based on historical trends, this alternative favors Vashon riders because a greater proportion of Vashon-bound vehicles hold a multi-ride card compared to Southworth drivers (see Table

2).⁴⁷ In 2017, roughly 68% of Vashon-bound vehicles used a pre-paid ticket, in contrast with 39% of Southworth-bound vehicles.

Table 2: Proportion of Vehicles That Use Multi-ride Cards

	2013	2014	2015	2016	2017
F-V	72.4%	71.7%	70.6%	69.8%	68.3%
F-SW	44.1%	44.6%	41.9%	40.8%	39.8%
SW-V	61.0%	53.6%	51.6%	61.6%	59.9%
Weighted Average	59.2%	56.6%	54.7%	57.4%	56.0%

Safety

A third line of traffic entering the Fauntleroy terminal is a cause for safety concerns for WSF staff, especially considering the current infrastructure. This alternative requires a WSF staff member to stand beside the toll booth to scan pre-paid tickets, which poses a certain degree of risk. Reinstating a bypass lane today would also raise the risk of traffic accidents due to an increase in the number of vanpools since the former bypass lane was discontinued in 2008. (Vanpools currently employ a version of the bypass lane, entering the dock once exit lanes have cleared of off-loading traffic to stage in front of other traffic.)

Farebox Recovery

A bypass lane requires the use of mobile scanners and an additional WSF staff member. In addition to increased operating costs, a bypass lane may threaten overall revenue due to offline fare validation. This occurs when the mobile scanner is unable to detect invalid tickets because it is too far from a wireless router.⁴⁸ Revenue loss could be remedied by improving wireless connectivity on the dock or by using more advanced mobile scanners that are capable of connecting to wireless from greater distances or through cellular data plans.

4. Improve WiFi/Scanner Connectivity and Implement Upstream Mobile Transactions

This alternative would improve wireless online connectivity to provide reliable connections for mobile transactions upstream of the toll booth, either via mobile scanners or upgraded devices capable of ticket sales. WiFi boosters at the toll booths could strengthen the wireless signal and permit the long-range use of mobile devices. To optimize vehicle processing, a WSF staff member walking upstream (east) of the toll booths could validate pre-ticketed customers or possibly sell fares. To mitigate the safety risk of making mobile transaction, the WSF staff member could remain on the pedestrian sidewalk along Fauntleroy Way and conduct their transactions through vehicles' passenger side windows. Upstream mobile transactions could expedite processing vehicles at the toll

⁴⁷ Washington State Ferries (2002 - 2017). Traffic Statistics Rider Segment Report.

⁴⁸ Washington State Ferries, personal communication, July 2018.

booth at the dock's entrance and could eliminate the need for some vehicles to stop at all. At present there are mobile scanners for pre-paid ticket validation on the dock; however, issues with WiFi signal strength have compromised their usability and integrity. Mobile devices for selling tickets are not currently part of the system and would require new investments as well as planning and design.

CRITERIA

This alternative could improve community satisfaction and ability to meet demand. Impacts on safety, equity and farebox recovery are likely to be minimal.

Community Satisfaction

Because this alternative gives prepaid customers an opportunity to expedite passage through the toll booths, we expect it would improve community satisfaction relative to the Status Quo.

Ability to Meet Demand

Mobile transactions would improve the flow of traffic, because pre-validated vehicles are able to pass the toll booths without further transaction. Gains from this alternative increase the further up the line a WSF staff member is able to scan or sell tickets. At a minimum, implementing this alternative would marginally improve fare-processing times, enhancing ability to meet demand at Fauntleroy.

Equity

This alternative is likely to have a minimal impact on equity. It is difficult to determine which riders might benefit more from the decreased wait time. The mobile validation alternative rewards those who purchase pre-paid tickets, but overall traffic flow will improve marginally for all riders. The fully mobile alternative with ticket sales and validation would benefit all riders.

Safety

This alternative carries modest risk for the WSF staff member conducting mobile transactions along Fauntleroy Way. By remaining on the pedestrian sidewalk, the WSF staff member lessens the danger of walking in traffic.

Farebox Recovery

Currently, inconsistent network connection for mobile scanners runs the risk of offline validation of multi-ride tickets that have no credit left, as described in the bypass alternative. Such offline validations have contributed to substantial lost revenue in the past, as became evident when WSF experimented with a pre-ticketed lane in 2016.⁴⁹ Improved online access and/or updated mobile scanners could rectify this problem. WSF has received a grant to install high-speed connectivity at the Fauntleroy terminal, with

⁴⁹ Washington State Ferries, personal communication, 2018.

completion expected in 2019.⁵⁰ WiFi boosters and updated mobile scanners pose upfront costs which would require additional resources from the Legislature, but ongoing costs are expected to be minimal and have little impact on farebox recovery.

5. Improve Training, Management, and Retention of Triangle Route Staff

Improving staff training, management, and retention would enhance the institutional knowledge, performance, and efficiency of the dock staff and deck hands. Front-line staff and supervisors with adequate training are better equipped to manage the challenges of ticketing, loading, schedule management, and customer relations at Fauntleroy.

Conversations with WSF staff and managers indicate that training, management, and retention of staff have suffered on the route in recent years, for several reasons:

- The complexities and challenges of ticketing and loading at Fauntleroy prompt many staff to take advantage of WSF's monthly bidding process for open positions to transfer to other routes. Therefore, management at the Fauntleroy dock must frequently onboard and train new staff.
- Service is hampered by a shortage of qualified line managers. About eight years ago, WSF made a budget-related decision to stop reimbursing dock and boat crew for tuition and time spent going to school to qualify for promotion to deck officer or engineer positions.⁵¹ This decision disincentivizes junior staff from rising up the ranks. The resulting shortage of experienced and invested line managers disproportionately affects Fauntleroy because of its operational complexities and challenges, coupled with the tendency of more experienced staff to transfer away when the opportunity arises.
- In 2018, WSF was unable to hire and train new staff for the Triangle Route in advance of the summer peak – as they had done in the recent past.
- Systematic training and retraining of dock and deck crews in loading procedures only occur infrequently, when a new boat is introduced into service. This system-wide policy inhibits the accumulation of institutional knowledge and disproportionately impacts operations at the Fauntleroy dock because staff tend to cycle through quickly.

Addressing these challenges requires overcoming two issues:

1. The WSF organizational structure lacks mid-level management between the line supervisors (Chief Mates and Terminal Supervisors) and the higher tier of management at WSF headquarters (the Port Captain and the Terminal Manager). This leaves challenges related to staffing, personnel, and operations in the hands of line supervisors who are often preoccupied with immediate concerns centered around individual sailings at Fauntleroy. A symptom of this constraint is that WSF

⁵⁰ Washington State Ferries, personal communication, 2018.

⁵¹ Washington State Ferries. (2018, September). WSF 2040 Long Range Plan: Draft Plan.

sometimes struggles to communicate and implement operational decisions made at headquarters to the front-line staff on the Triangle Route.⁵²

2. Any readjustment of staff hours, pay, or education-compensation policies must be collectively bargained with the unions.

CRITERIA

Improved training, management, and retention of the Triangle Route staff would likely benefit our criteria of community satisfaction and ability to meet demand. It would have a marginal effect on safety and a negative impact on farebox recovery.

Community Satisfaction

Better trained, more experienced staff will produce more consistent loading and unloading, more appropriate and consistent responses to anomalies and emergencies, and fewer human errors. These improvements, in turn, are likely to reduce tensions and misunderstandings between riders and dock workers and improve customer satisfaction. Training focused explicitly on customer service could be particularly beneficial for community satisfaction with service at Fauntleroy, given the tensions and misunderstandings.

Ability to Meet Demand

Well-trained, experienced dock and vessel crews should be able to load the dock and the ferries somewhat more efficiently, getting a few more cars on each boat, slightly faster.

Equity

This alternative would likely have limited impact on equity across the communities on the Triangle Route or among passengers of different means.

Safety

Improving staff training, management, and retention could incrementally improve safety. Better trained staff might be more aware and better equipped to follow safety protocols for directing traffic and deescalating tense interactions with dissatisfied customers.

Farebox Recovery

This alternative would increase operational costs, in which terminal and deck crew training is included, and negatively affect the farebox recovery ratio.⁵³ Training costs money, and more experienced staff earn more than less experienced staff, on average.

6. Staff a Second Traffic Officer During Rush Hour

Currently, there is a single traffic officer at Fauntleroy Way who directs traffic and, when able, walks along the holding line to identify vehicles waiting for single destination boats

⁵² Washington State Ferries, personal communication, 2018.

⁵³ Washington State Ferries. (2017, December 15). Route Statements for Fiscal Years 2012 to 2017.

and sends them down the line to load. An additional traffic officer assigned during peak travel times could manage traffic flow at the entrance to the dock, while the other officer primarily walks up the holding lane on Fauntleroy Way to pull vehicles out of line. This alternative would require budgeting for the second officer during peak periods but otherwise could work within the current constraints. (Note: for dual destination sailings, a second officer is not necessary to expedite vehicles from the holding lane to board vessels bound for specific destinations.)

CRITERIA

The primary benefits of having a second traffic officer are that ability to meet demand and safety improve compared to the Status Quo. Loading vehicles from the holding lane on Fauntleroy Way will become more efficient with one officer walking up the line, while the other officer remains at the entrance of the dock to direct traffic. Still, this alternative would come at a cost to farebox recovery.

Community Satisfaction

An additional traffic officer would be a visible change that might further dissuade line cutters and expedite pulling single destination drivers out of line -- two changes that many customers would like to see.

Ability to Meet Demand

This alternative will result in a marginal increase in the ability to meet demand on direct routes. (It will have no bearing on dual destination routes because all vehicles can load onto any docking vessel). An officer dedicated to pulling vehicles out of line for single destination boats will be able to identify more customers waiting in the holding lane on Fauntleroy Way, allowing a few additional vehicles to load onto an earlier boat if space is available.

Equity

Because the Fauntleroy-Vashon leg has the most single destination sailings, those riders would benefit most from a second traffic officer pulling cars out of the holding line for single-destination routes. Otherwise, this alternative does not affect equity.

Safety

The presence of two officers would increase safety for ferry riders, vehicles, and neighborhood residents. A dedicated walking officer could manage safety concerns up the line in the holding lane while a stationed officer at the terminal entrance continues to direct traffic. Attention to officer safety would remain a priority.

Farebox Recovery

Adding a second traffic officer will not affect revenue. However, the officer's salary will factor into operating costs and lower the farebox recovery ratio slightly.

II. Environmental Sustainability - A Cross-cutting Criterion

This section consolidates our assessment of the environmental sustainability criterion, given its overarching nature. Under the Status Quo, there is a lot of positive recent progress to report regarding environmental sustainability. Governor Inslee's January 2018 Executive Order 18-01, *State Efficiency and Environmental Performance*, and WSF's April 2018 Fleet Advisory to captains, FA000518, *Operational Efficiencies to Reduce Fuel Consumption*, have brought about remarkable savings of both fuel and funds.^{54, 55} Specifically as a result of using 'handle 8' vessel speeds for regular operations (and 'handle 10' only to make up time when necessary), WSF saved 234,033 gallons of fuel system-wide for the period April - August 2018 relative to April - August 2017. This is a 2.9% reduction in fuel use and represents a savings of almost \$500,000, and 2270 MT of CO2 equivalent, over a five-month period during the summer peak. WSF notes:

“These savings are very substantial, particularly since ridership during this initial five months was at the highest levels seen in fifteen years... As we transition into Fall schedule with the associated reduction in ridership and reduced stress on our schedules, there is an opportunity for even greater fuel savings. “

Considering the alternatives for ticketing and loading presented above (and some alternatives not related to ticketing and loading per se), we make the following observations:

- With more efficient processing of cars, e.g., with GTG or a bypass lane, there will be less idling and less time in line, which translates to less fuel consumed and less carbon emitted.
- GTG and the bypass lane should also attract more individuals to choose to sail rather than drive around, garnering both greenhouse gas emission reductions and personal monetary savings.⁵⁶
- Improvements in staff training, management, and retention may make small differences to the time required to pass through the ticketing and loading step, but these are expected to be relatively small when compared to the environmental gains from GTG or pre-ticketing options.

Although outside of our immediate scope of ticketing and loading, we note that the following systemic changes all have the potential to decrease carbon footprint and increase fuel savings:

1. Schedule changes that improve on time performance and decrease the lines on Fauntleroy Way.

⁵⁴ Inslee, J. (2018, January 26). Executive Order 18-01: State Efficiency and Environmental Performance.

⁵⁵ Faust, G., von Ruden, M., and Cirkovich, S. (2018, April 12). WSDOT-WSF Fleet Advisory Number 000518A - Operational Efficiencies to Reduce Fuel Consumption.

⁵⁶ Washington State Department of Transportation. (2012, October). Drive or sail: comparing cost, time, and greenhouse gas emissions.

2. Electrification of the fleet, which is a transition planned and in its initial stages.
3. Incentives to ride ferries rather than drive around, including public education about the personal cost savings and greenhouse gas reductions of doing so.
4. Incentives to sail as foot passengers rather than in a vehicle, further enabled by the plan to begin service of a foot ferry from Kitsap Peninsula and improvements to public transit connectivity in general.
5. Infrastructure changes, including dock capacity improvements and foot-passenger walkways which are expected to streamline queuing and loading/unloading, but which also have implications for the ecosystems they occupy.

III. Overall Assessment on a Criterion-by-Criterion Basis

In addition to the multi-criteria assessment of operational alternatives above, we carried out a second, more focused assessment to consider each criterion individually and gauge its impact on the relative desirability of ticketing and loading alternatives. The results are outlined below. This criterion-by-criterion analysis allowed us to step away from the inherent tradeoffs between criteria. Single criterion assessment is often the best way to capture the perspective of an individual stakeholder who focuses heavily on one criterion.

Community Satisfaction

Nearly every alternative considered is likely to improve the Status Quo, reflecting current community dissatisfaction.

Ability to Meet Demand

With a focus solely on ability to meet demand, four alternatives excel – *Good To Go!* (GTG); the Bypass Lane; Improving Connectivity and Implementing Upstream Mobile Transactions; and a Second Traffic Officer.

Equity

None of the alternatives are likely to substantially improve the route's current standing relative to equity. The introduction of GTG technology could even decrease equity, unless careful attention is paid to fare structure. (To implement GTG without updated technology allowing head counts within cars would require flat fare ticketing and likely increased fares for single occupancy vehicles (SOVs), disproportionately affecting the Vashon community with its many SOVs riding ferries, although vehicles with many passengers might see reduced fares.) Improving Connectivity and Implementing Upstream Mobile Transactions could also impinge on equity for drivers unable to use a credit or debit card to purchase a ticket in the holding lane, though those drivers could pay cash at a tollbooth.

Safety

Safety is always a high priority for WSF, and several of the alternatives should increase safety over the Status Quo, especially those that lead to more smooth and orderly traffic flow and increased staff presence. These include GTG; Training, Management, and Retention; and the Second Traffic Officer. Safety would suffer with the Bypass Lane, however, unless WSF also added the Second Traffic Officer, due to the necessary weaving of cars through multiple lanes onto the dock. Even with the Second Traffic Officer, that individual would face personal safety risk.

Farebox Recovery

Farebox recovery is modest on the Triangle Route compared to other parts of the WSF system, and none of the alternatives are anticipated to improve this criterion, as they all require resources to implement. Still, with appropriate support and attention to fare structure, WSF can mitigate this concern.

Environmental Sustainability

Several of the alternatives examined should improve on the Status Quo, with reduced fossil fuel consumption as a result of less idling - these include GTG; Training, Management and Retention; and the Second Traffic Officer. A number of the system-wide considerations outlined in the following section (community understanding, performance measures, infrastructure, schedule, finance and budget, and data landscape) also have a significant impact on Environmental Sustainability and many of the other criteria as well.

IV. System-wide Considerations

Our analysis of the ticketing and loading alternatives revealed six system-wide considerations that affect the implementation and performance of the alternatives: community understanding, performance measures, infrastructure, schedule, finance and budget, and data landscape. Each of these considerations merits attention to understand the logic and the sensitivity of our recommendations to changes in them.

A. Community Understanding

The quality of community understanding influences ticketing and loading at Fauntleroy in two ways: 1) It affects how smoothly drivers and passengers purchase tickets, queue, and board sailings, and 2) it shapes passengers' and residents' satisfaction with the ticketing and loading process.

To gauge and address community understanding and satisfaction on the Triangle Route, WSF uses a number of tools:

- The Customer Service department fields thousands of emails and phone calls per week addressing both general and site-specific concerns;

- there are multiple places for riders and community members to leave comments on the WSF website;
- WSF uses a Twitter account and email or text notifications for general announcements to the public and terminal-specific alerts about service delays;
- WSF representatives travel to communities served for project-specific open houses and public forums; and
- WSF has access to the WSTC-administered Ferry Riders' Opinion Group (FROG) Survey data.

A substantial portion of the Triangle Route's ridership nevertheless feels under-informed and frustrated with WSF's policies, procedures, practices, and performance. For several reasons, the tools listed above have only a modest impact on the understanding and satisfaction of the communities the Triangle Route serves.

WSF's regular public outreach and community engagement efforts are limited to project-specific initiatives such as the development of its Long Range Plan, dock expansion, or other construction projects. WSF has few ongoing, site-specific community engagement efforts, with two exceptions: there is a Ferry Advisory Committee (FAC) in each community it serves (including each of the three Triangle Route communities), and the Triangle Improvement Task Force (TTF), which is temporary and specific to the Triangle Route.

Ferry Advisory Committees

Per WA Leg RCW 47.60.310, the appropriate county legislative authority appoints a Ferry Advisory Committee (FAC) for each of the Triangle Route communities.⁵⁷ Each community FAC includes three volunteer members. Their roles as community representatives are currently limited by several factors. First, the structure and level of engagement of individual committees varies by location and committee member. Second, interviews with FAC members indicate a lack of structured onboarding. They receive very little information about 1) the history of WSF and the communities it serves, or 2) training or strategies for how to serve as a liaison between WSF and the public. Third, because counties appoint the FAC members, WSF has limited influence over their selection and operations.

Triangle Task Force

The TTF consists of nine volunteer members - three from each of the communities served by the Triangle Route, including one member of each community's Ferry Advisory Committee (FAC). The TTF was created in Fall 2016 to work with WSF staff to generate short-term changes to improve peak hour operations at the Fauntleroy Terminal. The TTF's initial efforts resulted in a plan to 1) improve vehicle processing at the Fauntleroy toll booths, in order to get more vehicles through at peak time, and 2) a public information

⁵⁷Washington State Ferries on behalf of the Triangle Task Force. (2017, December – 2018, June).

campaign to educate drivers about steps they can take to save time while using the route.⁵⁸ The precise impacts of these changes on ticketing and loading are unclear; WSF staff and TTF members report, informally, that improvements have been, at best, marginal. The same can be said for the information campaign, which in 2018, the TTF's focus shifted from short-term fixes to consultation on the 2019 Triangle Route sailing schedule, the 2040 Long Range Plan, and the Fauntleroy Terminal Project.

The TTF has improved some members' understanding of the challenges and opportunities at the Fauntleroy dock. They express respect for the dedication of most of the WSF staff and recognize the constraints and difficulties of the dock size, the Fauntleroy Way holding lane, and recent changes in ridership patterns. At the same time, many TTF participants raised pointed concerns about the Triangle Route schedule and its proposed redesign, unexpected delays in sailings, the delayed implementation of GTG, and other operational difficulties (including the discontinuation of the Fauntleroy bypass lane) on behalf of the communities they represent. Further, many TTF members have expressed frustration, both during TTF meetings and during interviews for this study, about WSF's perceived institutional inertia.

Beyond the nine members of the TTF, the understanding and knowledge that other community residents have about the Triangle Route's operations vary considerably and are sometimes distorted by misinformation from social media or word of mouth. Significant public discussion about the Triangle Route occurs on the Vashon Ferry Riders Forum Facebook page. Per WSDOT policy, neither WSF nor WSF employees can create a WSF-specific Facebook page to proactively disseminate information, reply to comments on other Facebook pages, or view Facebook content related to WSF or its operations. This policy enables the spread of unofficial and, at times, misleading or factually incorrect information about the Triangle Route's operations and WSF's intentions and efforts, contributing to the current lack of trust between WSF and the Triangle Route communities.

Changes in community engagement and understanding could affect the performance of several of the alternatives we examined in this report. Improved community engagement and understanding could, in turn, improve the potential of our alternatives to enhance community satisfaction, the Triangle Route's ability to meet demand, and safety. Achieving improvements in community engagement and understanding is a tall order, however. The *Recommendations* section below (on pages 51-58) proposes some possible approaches.

B. Performance Measures

Per RCW 47.64.355, WSDOT is accountable to the WA Legislature for annual reporting on 17 performance measures "established to monitor progress in providing citizens with the best value for their transportation system dollars" (see Appendix E, *WSF Performance Measures*). The measures are organized into four categories: 1) Safety Performance, 2) Service Effectiveness, 3) Cost Containment, and 4) Capital Program Effectiveness. WSDOT

⁵⁸ Washington State Department of Transportation. (2017). 2017 archives: improving service on the Fauntleroy/Vashon/Southworth Route.

is required to report to the Legislature by December 31 of each year on its performance for all 17 measures for the fiscal year ending June 30 of that year.

The measures that most directly affect ticketing and loading at Fauntleroy are #16 and #17 – “on-time performance level” and “service reliability level.” These measures represent key operational priorities for WSF, and performance for these measures is tracked and published in WSDOT’s quarterly performance report, the Gray Notebook. On-time performance, counted as the percentage of trips departing within 10 minutes of the scheduled time, is the measure that seems to carry the heaviest weight amongst WSF crew, and is the most prevalent in public perception. This observation is based on dock observations, interviews with WSF staff, and observations of public comments in community meetings and online forums.

Current constraints at Fauntleroy, including insufficient dock space and the bottleneck at the toll booths, combined with the crew’s motivation to meet the on-time performance goal of 95%, result in some vessels departing Fauntleroy with space for vehicles still available.⁵⁹ Boats leaving the dock with available spaces while vehicles wait on Fauntleroy Way have increased tensions between WSF and ferry riders.

More broadly, many in WSF leadership feel that the seventeen performance measures do not allow front-line staff enough discretion to optimize service on the fly, or for the organization to provide accurate and digestible responses to customer requests for data on performance. Some of the existing measures are corollary and should not be considered independent of each other (e.g., #15, average vessel out-of-service time, and #17, service reliability). Further, WSF leadership has expressed frustration about the disconnect between required performance measures and actual service delivery, and the general public is skeptical about what data WSF collects for measurement and how it uses those data. As WSF’s Long Range Plan states, “WSF’s current performance measures do not convey the full customer experience, and measures such as queue lengths, vehicle wait times, or the number of customers who could not obtain a reservation for a given sailing might be more useful to WSF.”⁶⁰

Revising the performance measurements for which WSF is accountable could 1) affect operations at the Fauntleroy Terminal by allowing dock and boat crew to be more responsive to real-time operational challenges of ticketing and loading to improve WSF’s ability to meet demand, and 2) increase the ability of WSF administration to collect and disseminate meaningful information about available space, waiting times and other aspects of operations to the public, potentially improving trust and community satisfaction.

⁵⁹ Washington State Department of Transportation. (2017, January). FY 2016 WSDOT Ferries Division Performance Report.

⁶⁰ Washington State Ferries. (2018, June 29). 2019-2040 Long Range Plan - Status Report to Legislature, p. 5.

C. Infrastructure

As outlined in the *System Characteristics* section above, existing infrastructure at Fauntleroy – encompassing the dock size and structure, the vehicle holding lane, ferry capacities, and inadequate WiFi coverage – pose special challenges for ticketing and loading, as well as for the alternatives assessed in this report. The vehicle-holding capacity of the dock is smaller than the capacities of any of the three ferries that serve the route (which currently accommodate 90, 124, and 124 vehicles, respectively), while WSF cites “a vessel and a half” capacity as best design practice for docks.⁶¹ This mismatch precludes staging full loads of vehicles on the dock, necessitating loading from the holding lane on Fauntleroy Way once cars on the dock have loaded.

The two-lane ramp connecting ferries to the dock requires foot passengers and vehicles to load separately. Loading foot passengers and vehicles simultaneously (e.g., loading foot passengers in one lane and vehicles in the other) introduces safety concerns and limits the ability of WSF to increase efficiency. A dedicated footbridge for loading and unloading foot passengers would allow for simultaneous loading of both vehicles and walk-ons. The absence of a grade-separated walkway for foot passengers over Fauntleroy Way, moreover, adds to the demands on the traffic officer, who must not only control the convergence of off-loading traffic and through traffic, but also direct foot passengers safely across the street. Directing foot traffic can be quite time consuming on afternoons during the school year, because of the number of West Seattle students who attend school on Vashon and return to Fauntleroy in the mid-afternoon.

Currently spotty WiFi with “dead spots” on the dock completes the infrastructure-limitations picture, thwarting effective use of hand-held scanners to speed loading procedures for pre-ticketed vehicles coming from the holding lane on Fauntleroy Way.

While the current infrastructure defies short-term solutions, change is afoot: 1) the dock is slated for a rebuild beginning in 2025; 2) WSF will replace the single, 90-vehicle ferry on the route with a 124-vehicle Issaquah class ferry in 2019; and 3) earlier analyses recommended that WSF shift to *Good To Go!* ticketing.^{62, 63} These changes provide challenges and opportunities to address the mismatch between dock and ferry capacities. Wireless internet connectivity remains a vexing issue. IT personnel have assessed the dock to reduce the presence of “dead spots;” however, deck crew report that the issue persists.⁶⁴

The alternatives explored in this study are sensitive to infrastructure constraints, and indeed our assessment of several would change if the infrastructure of the dock and environs were changed. For example, improved WiFi would make handheld scanners more functional and pre-ticketing more feasible, both of which could reduce loading times and marginally improve ability to meet demand and customer satisfaction. Further, if the

⁶¹ Washington State Ferries, personal communication, June 2018.

⁶² Washington State Department of Transportation. (2014, January 30). Joint Toll and Ferry CSC Feasibility Study.

⁶³ Cedar River Group. (2012, January). WSF Fare Media Study, Final Report.

⁶⁴ Washington State Ferries, personal communication, 2018.

vehicle capacity of the dock were increased, several alternatives would add less value over the Status Quo than in our analysis above. Specifically, with a larger dock for staging vehicles, the Bypass Lane would not necessarily improve ability to meet demand because dock space would accommodate more vehicles and reduce congestion in the holding lane. Similarly, neither GTG, nor Improved Connectivity and Upstream Mobile Transactions would make an appreciable difference in loading times and hence in ability to meet demand. Conversely, the dock size constraint would no longer hamper loading as severely as it currently does if WSF implemented GTG, Improved Connectivity and Implemented Upstream Mobile Transactions, or Reinstated the Bypass Lane.

D. Schedule

The ferry schedule has a variety of latent impacts and implications for ticketing and loading at Fauntleroy. Unchanged since the era when smaller vessels served the Triangle Route, the current schedule does not allocate enough time for loading an additional 30+ vehicles to maximize the larger capacity of the Issaquah-class vessels operating today. As a result, during peak travel periods WSF must sometimes grapple with the tradeoff between filling a boat and departing on time. A delayed sailing not only puts the delayed boat behind on its own sailing schedule, but it often delays subsequent boats from docking at Fauntleroy while they wait offshore for the delayed boat to depart. Thus, one late departure can generate further delays across the Triangle Route.

As described above in the assessment of the Status Quo alternative's ability to meet demand, we analyzed the relationship between on-time departures and the associated available space counts.⁶⁵ To summarize those earlier findings, using the available dataset whose limitations are outlined on pages 48-50, we observe that for nearly every sailing in the peak travel period departures during summer of 2017, the median number of available spaces is smaller for on-time departures than for late departures. This analysis remains inconclusive regarding broader insights about WSF priorities, due to data limitations – but it represents an initial step which we explore further in the rest of this section.

Below we present analysis exploring this tradeoff and its implications for the design of the schedule. Recalling that each scheduled sailing time represents either a dual destination or single destination trip, we explore the relationship between the number of available spaces on a given sailing with single or dual destination trip status. As plotted in Figure 11 the three dual destination sailings included in the analysis (e.g., 1710, 1745 and 1835) are characterized by lower available space counts, while the single destination sailings have higher available space counts. Possible explanations for these findings include insufficient demand for the single-destination sailings given the structure of the current schedule or insufficient processing speed for these sailings, although other factors not represented in the limited available data may also apply.

Figure 14 disaggregates the data further. Each panel of this figure represents one scheduled sailing time while each point represents one observed sailing out of Fauntleroy

⁶⁵ Washington State Ferries. (2017). Fauntleroy Toll Booth Redemptions.

during the observation period (i.e., a particular date and time). Late departures appear as red dots, while on-time departures appear as gray dots. The horizontal axis of each panel represents calendar date, which runs from June 19 to October 2, 2017. The vertical axis depicts the number of available spaces on each departing vessel. These plots omit instances when the Triangle Route operated an emergency two-boat schedule. This figure suggests that late departures are not associated with higher or lower available space counts than on-time departures. Both on-time and late departures are associated with a range of available space counts; however, an in-depth, panel-by-panel analysis is not viable due to the small numbers of late departures (red dots) recorded (i.e., small sample size) and missing data.

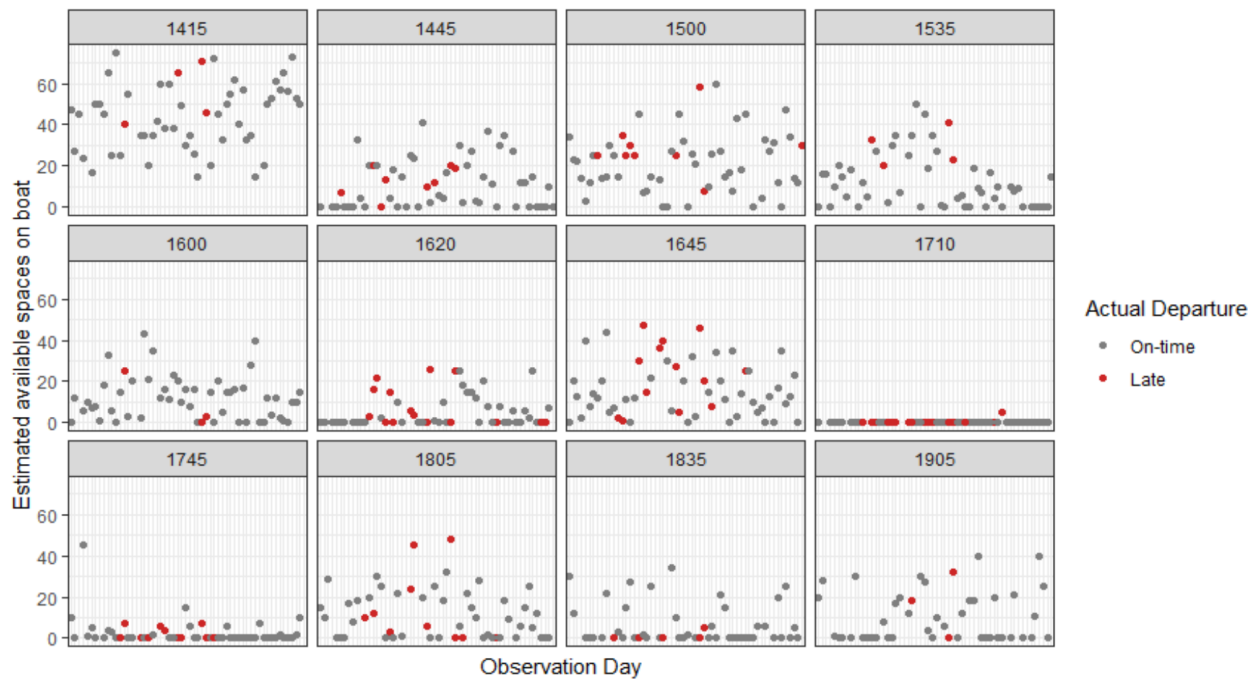


Figure 14: Observed Available Spaces Remaining on Vessels Leaving Fauntleroy

An additional analysis of available spaces is presented in Figure 15. This figure plots the frequency of on-time versus late departures, for partially full boats (left bar-cluster) and full boats (right bar-cluster) by “boat position”, i.e., whether a vessel is designated #1, #2 or #3 in the schedule. Note that vessel #2 is the 90-car vessel, while #1 and #3 are 124-car vessels. Figure 15 suggests no relationship between the carrying capacity of a vessel and whether it departs full. Specifically, the proportion of vessels leaving partially full versus full does not appear to differ according to boat size.

Exogenous challenges to maintaining the established schedule include adverse weather (e.g., heavy storms, fog affecting visibility), unanticipated vessel repairs, whales, or medical emergencies. By far the most disruptions of this kind are due to mechanical issues as well as emergency service and medical priority loadings from Vashon. Because of their geographic location on an island, Vashon residents who need serious medical attention

require ferry transportation to Seattle or Kitsap medical facilities. In such cases, WSF prioritizes loading processes and sailings to transport patients directly to their destinations, overriding the existing Triangle Route schedule.

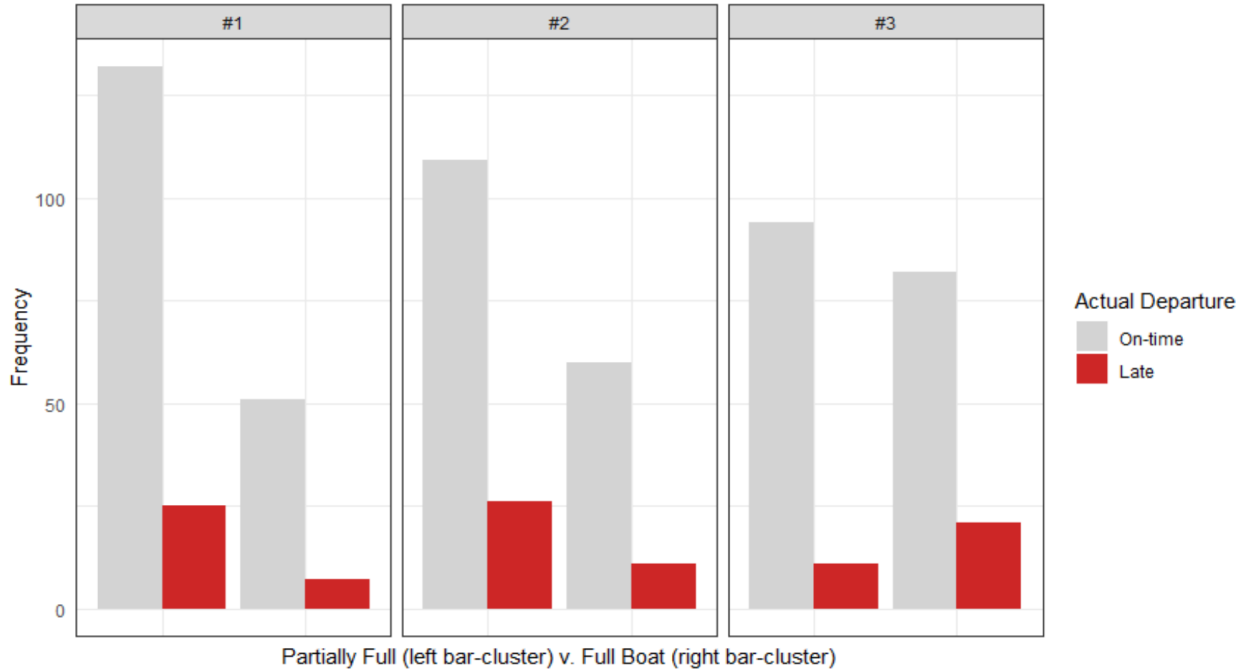


Figure 15: Fullness of Boats Departing Fauntleroy by Boat Position

Note: #1 and #3 are 124-car vessels while #2 is a 90-car vessel. Within each of the three panels, partially full departures are represented in the left bar-cluster while full departures are represented in the right bar-cluster.

Late departures and schedule delays have implications for WSF’s performance reports to the Legislature—on-time departures are one of the performance metrics on which WSF is judged. They can also affect the overall operating budget. Driven by Governor Inslee’s Executive Order 18-01 (State Efficiency and Environmental Performance), WSF issued a Fleet Advisory to its captains to reduce fuel consumption by reducing sailing speeds for greater fuel-efficiency, saving over 200,000 gallons of fuel and nearly \$500,000 in the first five months of the initiative. However, ferry captains may use discretion and increase speeds in order to make up lost time following delayed departures, thereby detracting from these cost savings and environmental gains. When delayed departures lead captains to increase boat speed, fuel consumption increases as well.

WSF has proposed changes to the schedule beginning in 2019 to accommodate longer dwell times, with the aim of improving the Triangle Route’s capacity to meet demand while adhering to the schedule. As we wrote this report, WSF was actively seeking public comments on its proposed schedule changes. A few community groups have proposed alternative schedule changes, the most elaborate and well-developed of which is a

“pendulum” schedule, in which every boat sailing between Fauntleroy and Southworth stops at Vashon. WSF staff report that they have analyzed these alternative proposals but found that none of them meets all their criteria to serve the route’s needs.

According to WSF, ensuring adequate dwell times given existing technology and infrastructure is one of the most significant challenges in designing a new schedule. Increased dwell times in a new schedule should improve the route’s on-time performance even without changes to ticketing and loading procedures at Fauntleroy, thereby increasing community satisfaction. Many of the alternatives analyzed above that are anticipated to boost efficiency in processing at the toll booth may marginally reduce the need to expand dwell time to fill vessels, while improving the prospects for maintaining on-time departures.

Schedule changes would of course carry implications for the vehicle allotments currently in place for some dual destination sailings on the Triangle Route. Allotments are generally used to address equity concerns and affect WSF’s ability to meet demand in an efficient and streamlined manner. Any specific allotments, numbers or adaptation processes would depend on the ultimate design of the Triangle Route schedule.

E. Finance and Budget

Finance and budget allocation play a prominent role in every decision WSF management makes, whether related to capital projects or operations. Several factors have left statewide transportation agencies, including WSF, severely short of funds. These include: 1) the elimination of the state Motor Vehicle Excise Tax (MVET) in 1999, 2) declining fuel tax revenue, 3) reduced purchasing power of fees and charges that are not indexed to inflation or adjusted annually, and 4) the negative effects of the 2008 recession on sales-tax revenues. Additionally, thirteen WSF vessels are scheduled to reach or be near the end of their lifespan by 2040, putting severe stress on WSF’s finances and ability to provide reliable service.

Compared to the looming financial realities of large capital projects in the near future, ticketing and loading improvements at the Fauntleroy Ferry Terminal entail relatively small upfront or ongoing costs. Investing in these processes can improve efficiency and increase the Triangle Route’s farebox recovery. That said, during formal interviews, WSF upper management questioned the logic of investing substantially in short-term fixes when dock upgrades would change their constraints and render some alternatives obsolete. Because WSF’s current resources are fully allocated, any trials or improvements at Fauntleroy require additional funding from the Legislature.

Of the alternatives analyzed in this report, some would need to be implemented system-wide, while others are location specific. The scope of each alternative will dramatically affect the cost. The Triangle Route already has a below-average farebox recovery rate -- an important consideration when analyzing alternatives that affect revenue.⁶⁶

⁶⁶ Washington State Ferries. (2017, December 15). Route Statements for FY 2012 – FY2017.

The 2017-2019 WSDOT Enacted Budget allocates \$486 million (27% of the overall \$1.8 billion) for operating costs to ferries. The operations budget maintains current ferry service levels through the continued transfer of funds from other transportation accounts. Of the system's ten routes, the Triangle Route has the highest allocation for deck crew in the biennial budget at \$20,099,057, which is 15.2% of the total.⁶⁷

WSDOT allocates \$351 million (9.6% of the overall \$3.9 billion) for WSF capital programs. The capital budget is dedicated to preserving and improving existing ferry terminals, vessels, and building new terminals and vessels. Ferry improvements are based on WSF's Long Range Plan and seek to increase the capacity of the ferry system; provide ferry riders with connections to alternative modes of travel; address customer needs and service delivery requirements; and generate revenue and cost savings. \$254 million is earmarked for terminal investments.⁶⁸ While the majority of that amount is dedicated to terminal projects at Mukilteo and Seattle and to completing the fourth 144-car ferry, trestle and transfer span replacement at the Fauntleroy Terminal is on the list of capital projects.

F. Data Landscape and Needs for Additional Data Collection

In order to advance evidence-based decision making for the Triangle Route, and in particular for ticketing and loading at Fauntleroy, we have identified a set of data limitations and gaps. In this section we first present several critical data inconsistencies and limitations that we encountered during our analysis. Next, we identify existing data needs and make suggestions for addressing them in support of future analysis -- such as assessing the impact of operational changes on WSF's ability to meet demand or on revenue and farebox recovery. These suggestions represent a starting point and seek to inspire further data collection and analysis efforts.

Data Inconsistencies and Limitations

To ascribe cause for unmet demand in the afternoon rush hour, we analyzed observation data provided by WSF, as described in the *Ability to Meet Demand* section of the Status Quo operational alternative on pages 23-26 and in the *Schedule* section on pages 44-47.⁶⁹ However, these data, collected during the rush-hour period on weekdays during the summer of 2017, were subject to considerable human error. Terminal staff were directed to record their observations by hand on a form that asked whether departing boats were full and for estimates of the number of available spaces on them. Throughout the observation period, different terminal staff documented their observations, in some cases adding notes about true departure times and in other instances keeping incomplete or inconsistent records. For instance, of the original 716 observations, 68 offered no numerical data points and another 11 had conflicting information about the boat's fullness as compared to available spaces on the vessel. While the data on available spaces spanned

⁶⁷ Washington State Ferries. (2017, October). 2017-19 Operating Program Budget.

⁶⁸ Washington State Department of Transportation. (2017, December). 2017-2019 WSDOT Enacted Budget, p.62.

⁶⁹ Washington State Ferries. (2017). Fauntleroy Toll Booth Redemptions.

June 19, 2017 to October 2, 2017, sailings on all weekends and on 16 weekdays were absent, including two federal holidays (Independence Day and Labor Day). Despite these shortcomings, the available space count observations were the most illustrative and comprehensive at our disposal.

The research team also examined WSF sales data for sailings on the Triangle Route; however, these were also incomplete. The sales records contained data for only a single week in three different seasons for 2017 and 2018. In isolation, they were insufficient to ascertain trends or inefficiencies in ticketing and loading.

Finally, an important limitation in the current information base relates to the Origin and Destination survey. This survey is carried out on a 7-year cycle with the next release slated for 2020; the most recent survey dataset (2013) is already out of date. Having more up-to-date survey data would inform the development of responsive transit connections, thus promoting walk-on passengers and other alternative modes of transportation.

Data Needs

A more complete, accurate, and standardized information base is necessary to provide further insight into the dynamics of unmet demand and late departures. Specifically, we identify the following issues and opportunities related to improving WSF's data collection and analysis:

- *Data Need:* Improved accuracy of data regarding on-time and delayed departures.
Purpose: These data would address the limitations discussed above, under data inconsistencies, and could inform revisions to schedules or loading policies.
- *Data Need:* Track the number of vehicles and the length of the holding lane, as well as the distribution of waiting times, for each destination, by sailing.
Purpose: These data would provide an accurate measure of demand in excess of current capacity and allow assessment of trends over time; however, WSF's decisions about dual vs. single destination scheduling may mitigate this data need (unknown as this report goes to press). In addition, wait-time data would support consideration of changes to performance measures and development of a smartphone app that would provide real-time information about waits and trip duration.
- *Data Need:* A robust empirical or modeled time comparison for passage through the toll booths of directly loaded vehicles (e.g., pre-ticketed and GTG) versus vehicles ticketed at the toll booths. We have seen a sample analysis which concludes 540 seconds for 40 cars through toll booth, assuming a mixture of onsite and pre-ticketing vehicles, but we have not seen the underlying dataset or model.⁷⁰ A model assuming solely direct loading vehicles would complete this comparison.

⁷⁰ Washington State Ferries, University of Washington classroom presentation, May 2018.

Purpose: These data would enable analysis of the marginal impact of direct loading on toll booth speed and inform the potential time savings of a direct loading lane.

- *Data Need:* Revenue sensitivity analysis for potential alternatives for ticketing and loading (including changing fare structures, altering passenger-toll booth interaction, and others).

Purpose: This information would enable assessment of impacts on revenues and farebox recovery, as well as the upcoming review of fare structures.

- *Data Need:* Accurate cost data for potential infrastructure and staffing changes (including purchase and maintenance of mobile scanners, GTG equipment and software, wireless infrastructure, and labor).

Purpose: Information about these costs could inform decisions about the impact of each alternative on farebox recovery.

RECOMMENDATIONS

Based on the foregoing analysis and discussion, this section presents two broad sets of recommendations. All recommendations aim to improve ticketing and loading at Fauntleroy, though each entails its own timeline, budget and implementation strategy.

The first set of recommendations presents two courses of action that directly change **ticketing and loading procedures**: a permanent solution once the Fauntleroy dock is rebuilt, and packaged short-run changes that “fast track” loading more incrementally:

1. Long Run: Directly load vehicles by implementing *Good To Go!* system
2. Short Run: “Fast track” via enhanced technology, connectivity, and staff

Given the short-run challenges of ticketing and loading at Fauntleroy, we urge WSF to pilot trials and data collection on our short-run recommendations as soon as feasible. The subsections below elaborate on these in light of our analysis above.

The second set of recommendations includes four **cross-cutting actions** that will generate incremental gains, regardless of which changes to ticketing and loading are implemented:

- A. Improve staff training, management, and retention for the Triangle Route
- B. Revise WSF’s performance measures
- C. Improve data collection and analysis
- D. Refine community engagement

These recommendations dovetail with the emphases in WSF’s Long Range Plan on upgrading technology (including implementing *Good To Go!*), improving staff training and qualifications, revising performance measures, expanding data collection and analysis, and increasing public understanding and engagement. Any recommendations that WSF pursues -- whether on a pilot or permanent basis -- will require careful planning and implementation, as well as additional funding from the Legislature given WSF’s current financial circumstances.

I. Ticketing and Loading Recommendations

1. Long Run: Directly Load Vehicles via *Good To Go!*

Nothing offers more potential to reduce the current congestion at the Fauntleroy terminal than direct loading. It allows traffic to continuously flow from the holding lane onto the dock for staging and immediate loading. GTG is the alternative that most closely conforms to direct loading. With GTG in place, cars can continue straight onto the boat as directed by WSF staff for dual destination sailings. For single destination sailings, cars bound for that boat’s destination can load directly onto the boat, while staff can direct all other vehicles to

queue on the dock, thereby relieving the bottleneck of the holding lane on Fauntleroy Way. An alternative that we considered but did not fully analyze was removing tolling entirely from Fauntleroy; however, this approach is complicated substantially by the current lack of fare collection capability and dock staging capacity on Vashon.

To implement GTG, WSF would need to adopt the technology, adjust fare structures, and accommodate passenger security requirements. Realizing that a dock replacement planning process and rebuild are on the horizon we additionally recommend that a design which incorporates GTG technology be included in the set of alternatives assembled for evaluation.

2. Short Run: “Fast Tracking”

Given the constraints of the existing dock and the related dock rebuild on the horizon, short-run solutions to the challenges of ticketing and loading at Fauntleroy are elusive. Nevertheless, WSF may realize incremental gains with bundled “fast track” packages involving additional staffing and technology upgrades drawn from the alternatives we examined above.

A basic fast track package could be structured with mobile validation of pre-ticketed vehicles upstream of the tollbooth. This would allow pre-ticketed vehicles to avoid a transaction at the dock entrance and modestly expedite the holding lane. Alternatively, a more ambitious fast track package could be structured to include fully mobile ticket sales and validation in the holding lane. This latter package would allow a contiguous line of waiting vehicles to be ticketed and validated in advance of reaching the toll booth, so that they could drive directly onto a loading vessel as a group following the staged vehicles on the dock. Both of these fast track packages would be infeasible without advances to technology and increased staffing as outlined below.

We recommend that the Legislature provide funding for WSF to run trials to estimate gains associated with fast tracking, in order to inform decisions moving forward. Possible fast track configurations to explore include the following three iterations:

1. *Upstream validation of pre-ticketed cars.* WSF could create a new staff position -- in this case a roving “scanner” who would walk up the sidewalk along Fauntleroy Way and validate pre-purchased tickets with a mobile hand scanner through the vehicle’s passenger side window. This staff member could indicate a vehicle’s validation with a receipt or visual cue, enabling it to pass directly onto the dock without stopping at the toll booth. Vehicles validated upstream would still have to wait in line behind cars needing to make tollbooth transactions, thus time savings would be only marginal and incremental. This configuration would require:
 - strong, consistent WiFi connectivity via either WiFi boosters or coverage related to a data plan extending north on Fauntleroy Way,
 - upgraded mobile scanners, and

- a roving staff member authorized to walk up the pedestrian sidewalk and carry out transactions through the passenger side window of vehicles.
2. *Upstream validation with expedited passage to dock.* This fast track configuration follows the process outlined directly above and also incorporates expedited passage to the toll booth after upstream validation. This would entail WSF hiring an additional traffic officer during peak travel times to trail the roving scanner and pull vehicles out of the holding lane after validation, directing them down to the toll booths once the staged cars on the dock begin loading. (If WSF's new schedule for the Triangle Route makes all sailings dual destination during peak travel times, sorting cars in the holding lane based on destination would be unnecessary, thus freeing up a traffic officer.) In this scenario, the officer at the dock entrance and the officer walking the holding lane could coordinate timing via walkie-talkie such that each validated vehicle pulled from the holding lane can safely enter the terminal without blocking traffic. The overall result would be to expedite the passage of upstream validated vehicles onto the dock, rather than leaving them to wait behind cars still needing to purchase tickets at the tollbooth. This innovation would further increase loading gains and thus fill available spaces on vessels even more efficiently than the previous configuration. This package would require:
- strong consistent WiFi connectivity via either WiFi boosters or coverage related to a data plan extending north on Fautleroy Way,
 - upgraded mobile scanners,
 - a roving staff member authorized to walk up the pedestrian sidewalk and carry out transactions through the passenger side window of vehicles, and
 - an additional traffic officer.
3. *Upstream ticketing and validation.* In this final refinement to fast tracking, the roving staff member would carry a mobile ticketing device that could execute both mobile ticket sales and validation, thus acting as a mobile tollbooth when the dock is full of staged cars precluding toll booth passage. This alternative opens up the possibility of a contiguous line of cars driving directly from the holding lane on Fautleroy Way onto the dock and onto the ferry filling available spaces on the docked vessel (i.e., with no stops at the tollbooth for transactions), once the staged cars have been loaded. Because ticket purchase transactions take longer than a quick scan to validate a pre-purchased ticket, the time tradeoff between transaction time costs and fast track loading time savings would need to be explored to estimate the net impact of this approach. This package requires:
- strong consistent WiFi connectivity via either WiFi boosters or coverage related to a data plan extending north on Fautleroy Way,
 - mobile ticketing devices with capabilities beyond the current hand scanners,
 - a roving staff member authorized to walk up the pedestrian sidewalk and carry out transactions through the passenger side window of vehicles.

WSF dock crew and management should collect data or carry out simulations for each configuration during pre-set trial periods, relating to 1) vehicle wait time savings, 2) ticketing and loading time costs and savings, 3) reductions in available spaces on vessels, and 4) bottlenecks in traffic lanes or dock lanes.

II. Cross-cutting Recommendations

The following cross-cutting recommendations can be implemented separately or in any combination and would support the introduction of changes to ticketing and loading. They may also produce incremental improvements in the Status Quo, particularly in light of the changes WSF is proposing to the Triangle Route schedule.

1. Improve Staff Training, Management, and Retention

- WSF should complete hiring of new staff several months *before* the summer to ensure they are trained and prepared for the increase in passengers and vehicles during peak travel season.
- Given the challenges and complexities at Fauntleroy dock, staff training should include customer service and conflict de-escalation techniques in addition to operational procedures and efficiency.
- As long as Triangle Route staffing continues to suffer rapid turnover, the Terminal Manager and Port Captain should make regular visits and coaching efforts to improve the front-line supervision and morale of the deck and dock crews.
- The Terminal Manager and Port Captain should explore ways to retain front-line staff and supervisors on the Triangle Route. Ideas could include efforts to increase intrinsic crew motivation and cohesion by offering opportunities for informal leadership or mentoring.
- The Operations Department should increase efforts to address the shortage of qualified crew members by finding creative ways to support and promote junior staff in making the transition to managerial positions.

2. Revise Performance Measures

Revising WSF performance measures could 1) allow terminal and vessel crews to be more responsive to real-time operational challenges of ticketing and loading, and 2) increase WSF's ability to collect and disseminate meaningful information to the public, increasing trust and improving community satisfaction. Performance measures that better reflect service delivery will increase WSF's ability to report on positive or negative outcomes. For example:

- Prioritizing a performance measure related to "people and vehicles transported" -- rather than "on-time departures" -- would allow staff and managers to focus on meeting demand as a top priority and likely correlate with revenue collected.

- Adding a measure focused on “vehicle wait times” would demonstrate an explicit concern for a crucial aspect of customer satisfaction. Moreover, it would provide data that WSF could make publicly available in real time via a smartphone app, to enable drivers to anticipate how long the ferry portion of their travel is likely to take (see *Refine Community Engagement* section below).

3. Expand Data Collection and Analysis

An expansion of data collection and analysis would help discern the potential impact of changes in ticketing and loading. Expanding the information base through trials of sufficient length to gauge gains is likely to be particularly valuable to inform the design and potential “Fast Tracking” strategies, because their impacts would be more marginal than the gains from *Good To Go*.

Based on the discussion in the *Data Landscape* section above, we recommend the collection and analysis of the following types of data at the Fauntleroy dock:

- More accurate observations regarding on-time and delayed departures;
- Number of vehicles and length of the holding line along Fauntleroy Way, as well as the distribution of waiting times for each destination, by sailing;
- A robust empirical or modeled time comparison for passage through the toll booth of pre-ticketed, pre-validated, and GTG vehicles, versus those ticketed or validated at the toll booths;
- Revenue sensitivity analysis for potential alternatives for ticketing and loading (including changing fare structures, altering passenger-toll booth interaction, and others);
- Accurate cost data for potential infrastructure and staffing changes (including purchase and maintenance of mobile scanners, GTG equipment and software, wireless infrastructure, labor for an additional traffic officer and increased staff training).

4. Refine Community Engagement

Improved community understanding of the Triangle Route’s operations is critically important for the legitimacy and credibility of WSF but would require augmenting WSF’s current community engagement policies and practices. We recommend WSF consider the following possibilities:

A. Customize community engagement to individual communities:

Specific constraints and operational nuances exist from one ferry terminal community to the next throughout the Puget Sound. For this reason, site-specific community engagement on the Triangle Route could improve both operations and trust between WSF and the communities the route serves. We recommend allocating funds in WSF’s biennial budget to

enable staff to attend community events and conduct location-specific surveys regarding the Triangle Route.

B. Constitute a cross-community consultative body that extends the TTF's work:

Our interviews with community residents and with WSF management suggest the desire for a richer cross-community dialogue to improve each community's understanding of the others' needs and priorities. WSF might use two related approaches to establish and maintain such a dialogue: working with the Legislature to revise the legislation authorizing the FACs and convening cross-site dialogues among the three communities the Triangle Route serves.

1. Despite efforts to maintain frequent and accurate communication between WSF and the FACs on the Triangle Route, there are discrepancies between and within the FACs in the three Triangle Route communities regarding institutional knowledge, WSF's history and purpose, and effective community engagement. The community-specific membership of the FACs further reinforces differences of perspectives and interests across the communities that WSF serves, rather than focusing the FACs on the challenges and needs of entire ferry routes. WSF's authority to improve the understanding and functioning of the FACs is limited by the legislation authorizing the FACs, which gives counties the authority to appoint FAC members. Changes to the composition, functioning, and roles of the FACs nevertheless could improve the two-way flow of accurate information between riders and WSF staff. Improved information flows, in turn, could improve community members' understanding of WSF's efforts and constraints in operating the Triangle Route. To reconstitute and revise the work of the FACs, therefore, we recommend that the Legislature work with WSF to revise the legislation authorizing the FACs, with input from the FACs themselves. The revisions should:
 - Give WSF the authority to appoint the FACs, to ensure a balance of perspectives and expertise;
 - Change the structure of the FACs so that each one represents a single ferry route (such as the Triangle Route), rather than an individual community that WSF serves;
 - Budget for WSF to staff and train the FACs;
 - Provide funds for WSF to work with a consultant and existing FAC members to develop an FAC "Toolkit" that contains comprehensive information on WSF's institutional knowledge, and broader purpose, while offering customizable best practices for community engagement (e.g. structure of community meetings, interactions with local news media, etc.); and
 - Create a FAC charter to be signed by new FAC members upon appointment by the applicable Legislative or municipal official.
2. While the Fautleroy terminal-redesign process will include a cross-community, three-site dialogue, we recommend that WSF begin such a dialogue right away. To

build understanding and trust among the three Triangle Route communities and WSF, the Legislature should allocate funding for WSF to convene a series of broad-based discussions facilitated by a neutral party. While the TTF has brought together community representatives to propose and review ideas for short-run changes at Fauntleroy, our interviews documented persistent mistrust across the three Triangle Route communities and between some community members and WSF. To address this mistrust and improve community understanding as WSF implements the recommendations listed above, a neutral facilitator could convene discussions among stakeholders. The discussions could include joint fact finding, developing a common information base, exploring issues and interests, and developing a common understanding of problems and issues. The participants would then be equipped to co-design the ground rules for the Triangle Route FACs, the community engagement process for the Fauntleroy terminal redesign, or a new TTF-type entity.

C. Expand WSF's social media presence:

In 2018 social media play the role of tabloid, credible primary news source, and public forum all at once. Consistent with WSDOT policy, WSF currently lacks its own unique social media presence on Facebook, where several Triangle Route communities have pages dedicated explicitly to discussing ferry service and advocating for improvements. WSF would benefit greatly if WSDOT permitted its staff to monitor, proactively post to, and respond to comments on social media platforms, including Facebook. A more proactive WSF presence on social media could reduce the tension and increase dialogue and trust between WSF and its constituents, or at the very least limit the spread of misinformation.

D. Increase public information and outreach on Triangle Route vessels and terminals:

One person we interviewed suggested that WSF think about the ferries as a community meeting place -- like a park -- in addition to a mode of transport. WSF might consider instituting regular customer outreach and engagement by regularly assigning customer service or outreach staff to ride Triangle Route sailings and talk with passengers about their experiences. Another possibility might be to work with local schools to create active-learning opportunities for students, to help children from the Triangle Route communities learn about the ferry system, the challenges and complexities of the Fauntleroy dock, and the ways in which the Triangle Route serves the three communities. Currently, all three boats on the Triangle Route have screens that display pre-recorded videos about safety protocol. WSF could integrate information about upcoming events, planned route changes and community meetings into these video loops. Signs and posters at the Triangle Route terminals could provide similar information.

E. Develop a smart-phone app with real-time estimates of wait times:

We recommend that WSF develop and make available an app that enables drivers to anticipate how long the ferry portion of their travel -- including wait time -- is likely to take on any given day. This recommendation builds on the recommendations above that WSF add a performance measure and collect data related to vehicle wait times and is consistent with WSF's intentions in its Long Range Plan. Riders are currently able to sign up for text or

email notifications from WSF that estimate wait times when there are schedule interruptions. These estimates are often inaccurate, however, and are not customized based on destination. A location-driven smart-phone app, by contrast, could estimate wait times before a rider leaves her house, while she is en route to a ferry terminal, and once she is in the holding lane. The app could be built to integrate with Google Maps and other travel-planning apps, enabling ferry riders to plan their entire trips using a single app. Riders using such an app would likely feel less confusion and frustration than they currently do; widespread use of the app could therefore reduce some of the tensions that Triangle Route riders currently feel toward WSF.

CONCLUSION

Commissioned by the 2018 Washington State Legislature, this report offers an independent examination of the complex operations at the Fauntleroy Ferry Terminal and potential solutions to current ticketing and loading challenges, along with suggestions to improve community engagement related to the Triangle Route. The analysis is informed by available empirical and observational data, and by the collection of primary data on the perceptions, preferences, and perspectives of stakeholders. Our approach gauges potential gains associated with ticketing and loading changes against a consistent set of criteria, while recognizing existing infrastructure and technology constraints. All of the recommended changes would require support and resources to fully scope and implement.

Summary of Findings

- WSF staff are working hard amidst financial scarcity and outdated technology. Easy fixes to the ticketing and loading challenges at Fauntleroy are elusive. Community engagement faces serious challenges, but we identify opportunities for change.
- We recommend new legislative investments to support improvements in WSF's technology, training, public engagement, and data collection and analysis to streamline ticketing and loading at Fauntleroy.
 - In the short run, additional staff, upgrades to connectivity, and mobile ticket sales and validation have potential.
 - In the long run, building a new, larger dock with WSDOT's *Good To Go!* technology holds the most potential to streamline ticketing and loading.
- To enable these changes, we recommend cross-cutting changes, including:
 - improving staff training, management, and retention at Fauntleroy;
 - expanding data collection and analysis to measure the impact of changes to ticketing and loading;
 - engaging the served communities more consistently and effectively.
- We also recommend that the Legislature work with WSF to revise WSF performance measures to better reflect service delivery realities and considerations.

Despite differences of perspectives and opinions between stakeholders, everyone we spoke with is dedicated to improving operations at Fauntleroy, as well as the Triangle Route more generally. We hope that these overall shared aims, in combination with our findings and recommendations, can help unify the Triangle Route's stakeholders to support WSF staff and the Legislature in developing sustainable solutions to the challenges of ticketing and loading at Fauntleroy.

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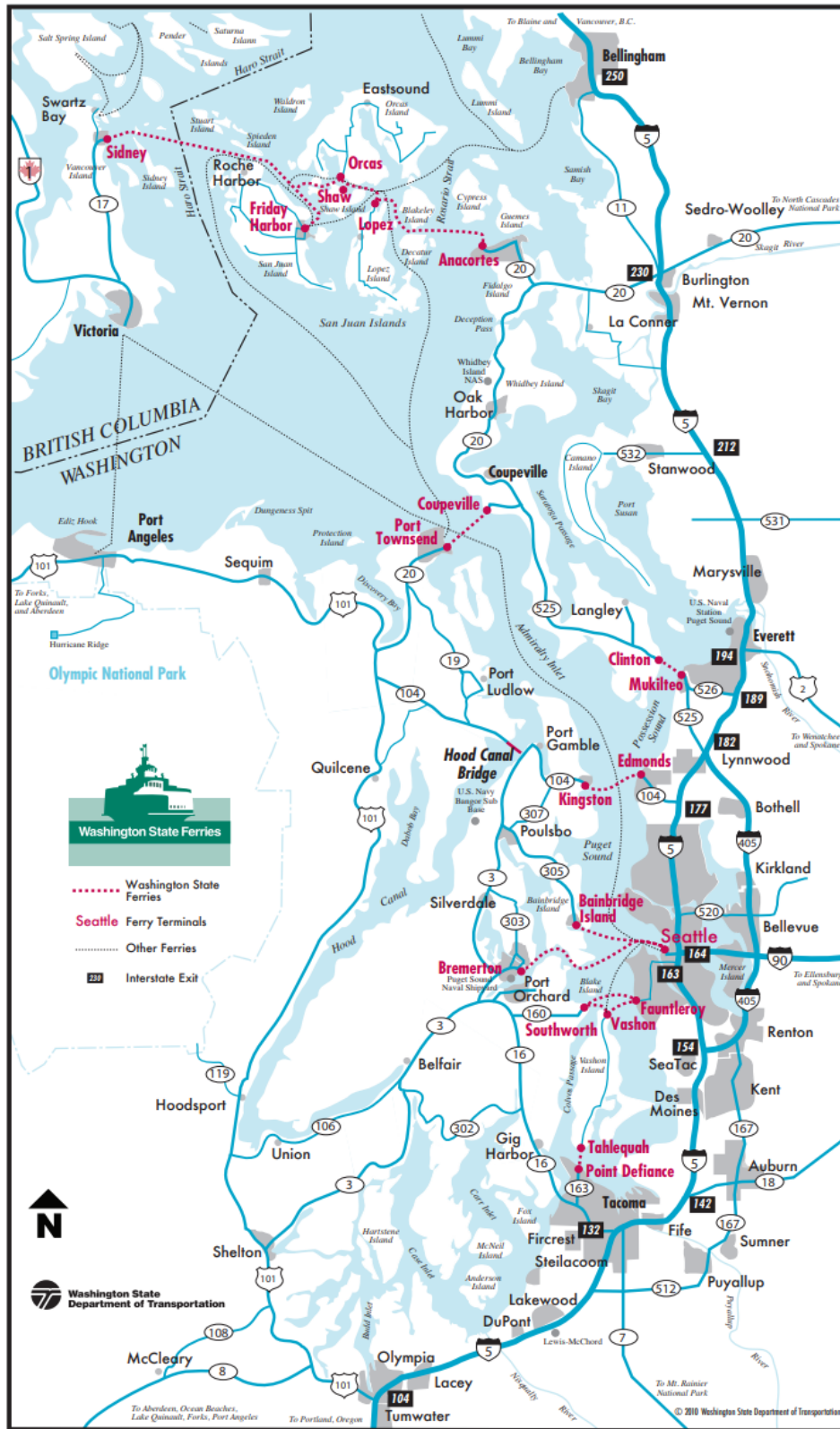
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Appendix A: WSF Route Map



Appendix B: Dock Diagram Table

Position (Location on Dock Diagram)	Duties
Terminal Supervisor (A)	The terminal supervisor coordinates communication between the Ferry Captain and the Terminal Director, relaying information such as how much longer the Captain will dwell for loading.
Ferry Captain (B)	The Ferry Captain communicates with other Captains on the route to make sure they stay on schedule. The Captain has a birds-eye view of the dock and ultimately decides when to depart. The Captain communicates with all boat staff via radio.
Able-bodied Seamen (B)	A team of ABS direct vehicles and walk-ons through the ferry side of unloading and loading procedures. They communicate with each other and the Captain via radio. They communicate with the staging employees regarding how many more vehicles are expected and, on dual destination sailings, how many are destined for Vashon or Southworth.
Staging Employees (C)	These employees direct vehicles and walk-ons through the dock side of unloading and loading procedures. Staging employees direct vehicles to the correct holding lane after vehicles drive through the toll booth. On dual destination sailings, this is particularly important as the boat must be loaded Vashon first. They communicate with the ABS team to make sure the boat is loaded as efficiently and full as possible. During peak hours, there is an additional employee assisting loading and scanning of motorcycles.
Toll Booth Operators (E)	Toll booth operators sell and scan tickets.
Terminal Director (E)	The Terminal Director watches the dock from the west of the toll booths. From this vantage point, they communicate with the Terminal Manager, Traffic Splitters, and Traffic Officer. The Terminal Director makes decisions regarding dock staging and when to stop sending vehicles through the toll booths before a departure. During peak hours the director is

	<p>assisted by an additional employee who scans and directs vanpool traffic.</p>
<p>Traffic Splitters (F)</p>	<p>The Traffic Splitters direct vehicles from the holding area along Fauntleroy Way to one of the toll booths. There are significant safety risks for this position as the Splitters stand very near oncoming traffic; they wear bright vests as a safety precaution. The Traffic Splitters communicate and closely work with the Traffic Officer to keep traffic and the holding line moving smoothly.</p>
<p>Traffic Officer (G-H)</p>	<p>The Traffic Officer alternates between directing traffic when vehicles unload and walking the line on Fauntleroy Way to direct vehicles to move ahead in line as dictated by each vehicles' destination and the space on the dock. There are significant safety risks for the officer as the officer either stands in the middle of an intersection or walks up the side of the road next to oncoming traffic. The traffic officer is paid through WSF and, currently, partially through the Legislature.</p>

Appendix C: Information Assembly

Direct Site Observations at Fautleroy Ferry Terminal

June 20, 2018	Observation of toll booth operation and work by splitter and police officer at Fautleroy during afternoon rush hour.
June 21, 2018	Introduction to terminal staff and general observation of Fautleroy during rush hour.
June 28, 2018	Observation of boat loading process and dock operations at Fautleroy during afternoon rush hour.
July 5, 2018	Tour of the full Triangle Route, including introduction to terminal and boat crew, observations from the wheelhouse, and observation of boat operation and dock operations at Southworth and Vashon.

Triangle Task Force Meetings, LRP Open Houses and Schedule Update Meetings

June 21, 2018	TTF Meeting: Evans Research Team introductions and presentation of scope of work, observed TTF discussion of new schedule options
July 19, 2018	TTF Meeting: Observed presentation and discussion of new schedule options. Evans team led group break-out sessions to present and discuss full list of “criteria” and “alternatives” for ticketing and loading at Fautleroy
August 15, 2018	TTF Meeting: Observed presentation of new schedule options
Sept. 12, 2018	Observation of WSF led Long Range Plan Open House at Vashon High School
Sept. 13, 2018	Observation of WSF led Long Range Plan Open House at Harper Evangelical Church, Southworth
Oct. 23, 2018	Observation of WSF led Schedule Change Open House at Fautleroy Church
Oct. 24, 2018	Observation of WSF led Schedule Change Open House at Vashon High School
Oct. 25, 2018	Observation of WSF led Schedule Change Open House at Harper Evangelical Church, Southworth.

Key Informant Interviews

Name	Affiliation	Date	Type
Charles Sawyer	FAC-Fauntleroy	9-Aug-18	phone
Frank Immel	FAC-Fauntleroy	14-Aug-18	phone
Andrew Hamilton	FAC-Southworth	25-Jul-18	in-person
Eric Beckman	FAC-Vashon	1-Aug-18	in-person
Justin Hirsch	FAC-Vashon	14-Aug-18	phone
Greg Beardsley	FAC-Vashon chair	1-Aug-18	in-person
Gary Dawson	TTF/FAC-Fauntleroy	17-Jul-18	in-person
Tim O'Mahony	TTF/FAC-Southworth	16-Jul-18	in-person
Kari Ulatoski	TTF/FAC-Vashon	11-Jul-18	phone
Kathleen Stephanick	TTF-Fauntleroy	10-Jul-18	in-person
Margaret Clements	TTF-Fauntleroy	10-Jul-18	in-person
Kym Shepherd	TTF-Southworth	16-Jul-18	in-person
Rich Singer	TTF-Vashon	16-Jul-18	phone
Steven Merkel	TTF-Vashon	17-Jul-18	phone
Amy Scarton	WSF-Assistant Secretary	15-Aug-18	in-person
Stephanie Cirkovich	WSF-Director of Community Services and Planning	31-Jul-18	in-person
Hadley Rodero	WSF-Strategic Communications Manager	15-Aug-18	in-person
Trevor Sharp	WSF-Central Sound Terminal Manager	14-Aug-18	in-person
Greg Faust	WSF-Director of Operations	24-Sept-18	in-person
Ray Deardorf	WSF-Senior Planning Manager	24-Sept-18	in-person
Steve Stockett/Rick Wallace	Vashon Residents	17-Oct-18	in-person
Carl Winge	Vashon Resident	17-Oct-18	phone

Consultations with WSF Administrative Staff

Colin McCann	WSF - Legislative Analyst
John Vezina	WSF - Director of Government Relations
Justin Resnick	WSF - Service Planning Manager
Kevin Burchett	WSF - Fautleroy Terminal Director
Genevieve Rucki	WSF - Design Engineering Manager

Appendix D: Interview Protocol

(Interview questions were adapted for members of different organizations)

Interview Questions: (for members of the Triangle Task Force)

1. Acknowledging that each of the communities on the triangle route is unique in demographics and in geography, how does the ferry system service affect your specific community? How does that differ from how it affecting each of the other communities?
2. As a representative of ____ community, what actions or decisions made by Washington State Ferries, specifically related to the Triangle route have shaped your community's attitude toward ferry system most strongly (positively or negatively)?
3. What suggestions would you offer ferries to improve communication within your community? (What are the most/least effective ways to disseminate information in your community? How do you see individual residents communicating with each other and how do see outside groups communicating with residents? How could outside groups better communicate with your community?)
4. What is your experience with or understanding of how ferries receives and handles complaints if and when they are made?
5. We've learned a lot about the triangle route ferry service and have heard of many different ways to judge success. What is the most important to you about ferry operations and service, in other words, what criterion would you use to gauge successful operation: i) frequency of boats, ii) on time performance, iii) reasonable fares, iv) minimizing wait time in line, v) other.
6. What do you see as the biggest challenges related to ferry operations on the Triangle routes?
Follow up: To what extent do you think other parties, such as community members not involved in the task force, news media, and ferries staff understand those challenges?
7. What do think are some possibilities for improvements to addressing the challenges you just mentioned?
Follow-up: Do you see any potential constraints or barriers to implementing those improvements?
8. What do you think are some of the strengths and limitations of problem-solving efforts to-date?
9. What questions or suggestions do you have for our research team?
10. Who else should we talk to?

Appendix E: 2016 WSF Performance Measures

FY 2016 Washington State Ferries

PERFORMANCE MEASURES		FY 2015	FY 2016	Goal	Goal met?	Comments
PRESERVATION						
1	Percent of terminal projects completed on time ¹	50%	100%	90%	✓	2 of 2 terminal projects were completed on time.
2	Percent of terminal projects completed on budget ¹	100%	100%	90%	✓	2 of 2 terminal projects were completed at or below budget.
3a	Percent of contracts completed on time:					
	• Existing Vessels ²	50%	100%	75%	✓	All five contracts completed were on time. No new vessels scheduled for completion during this reporting period.
3b	• New Vessels	0%	N/A	100%	NA	
4a	Percent of contracts completed on budget:					
	• Existing Vessels ^{2,3}	75%	60%	75%	-	3 of 5 contracts were within budget. No new vessels scheduled for completion.
4b	• New Vessels	100%	N/A	100%	NA	
14	Preliminary engineering costs:					
	• As a percent of terminal capital project costs	12%	8%	11.5%	✓	Terminal projects met the goal.
	• As a percent of vessel capital project costs	7%	12%	17%	✓	Vessel projects met the goal.
15	Average vessel out of service time	9.4 weeks	9.5 weeks	8 weeks	-	Missed the goal due to vessel breakdowns.
SAFETY						
5	Passenger injuries per million passengers	0.93	0.42	Less than 1.00	✓	Passenger injury rate was well below the goal of less than one in a million.
6	OSHA recordable crew injuries per 10,000 revenue service hours	6.2	5.6	Less than 8.0	✓	The crew injury rate was below the industry standard and met the goal.
MOBILITY						
10	Annual operating cost estimate per passenger mile compared to budgeted cost	-4.45%	-0.48%	Within 5% of budget	✓	Met goal, within 1% of budget.
11	Annual operating cost estimate per revenue service mile compared to budgeted cost	0.6%	1.0%	Within 5% of budget	✓	Met goal, within 1% of budget.
12	Overtime hours as a percentage of straight time hours compared to budgeted overtime hours	+0.45%	+0.75%	Within 1% of budget	✓	Met goal, within 1% of budget.
13	Gallons of fuel consumed per revenue service mile compared to budgeted fuel consumption	-4.08%	-2.28%	Within 5% of budget	✓	Met goal.
STEWARDSHIP						
7	Passenger satisfaction with WSF Staff customer service	94%	95%	90%	✓	Exceeded the goal.
8	Passenger satisfaction with cleanliness and comfort of WSF terminals, facilities and vessels	89%	89%	90%	-	Dissatisfaction with the cleanliness of terminal bathrooms caused the goal to be missed.
9	Passenger satisfaction with service requests made via telephone or WSF website	92%	91%	90%	✓	Exceeded the goal.
16	On-time performance level (percent of trips departing at scheduled time).	94.5%	93.9%	95%	-	Missed on time performance goal.
17	Service reliability level (percent of scheduled trips completed).	99.4%	99.5%	99%	✓	Met service reliability level goal.

1. Includes completed preservation and improvement projects. 2. Includes completed preservation and improvement projects with the exception of new vessels. 3. Budget goal is expenditures at the vessel PIN level based on last approved legislative budget.

Appendix F: Criteria Presented at TTF Meeting 7/18/18

Candidate Criteria to Gauge Value of Each Alternative

- Ability to Meet Demand
- Time Spent getting through Tollbooth
- Impact on WSF Revenue
- Cost
- On-time Performance
- Unused Capacity (available spaces on boats)
- Customer Satisfaction
- Customer Understanding of Process
- Technical and/or Technological Feasibility
- Equity in Service by Community
- Equity in Wait Times
- Safety for Passengers
- Safety for WSF Staff
- Safety of Traffic Officer(s)
- Relationship between WSF & communities
- Ecosystem Health
- Other Environmental Impacts

Appendix G: Alternatives Presented at TTF Meeting 7/18/18

Ticketing/Loading/Queuing Alternatives

- Increase Fauntleroy terminal staffing during rush hour
- Revisit space allocation for SW dual destination boats
- Change loading layout for dual destination boats
- Unload cars before foot traffic
- Institute pre-ticketing dedicated lane
- Implement wireless access on dock and along Fauntleroy Way
- Bicycle or other for traffic officer
- Re-institute bypass lane
- Redefine peak time as 1 - 7 pm
- Vehicle mobile ticket sales on dock
- On-vessel vehicle ticket sales
- Implement vehicle reservations
- Implement Good To Go! system
- Expand integration with ORCA system
- Update handheld scanners

Fares/Operations/Communication Alternatives

- Coordinate w/transit connections
- Re-route some V/SW ferries to downtown Seattle
- Incent oversize vehicle trip timing
- Increase vehicle fares to incent walk-ons
- Flat rate for car and driver only
- Preferential fares for dual destination riders
- Reduce or eliminate walk on fares
- Optimize schedule (per WSF schedule planner)
- Charge eastbound
- Educate drivers re queuing and navigating tollbooth
- Communicate wait time to F vehicles in real time
- Educate riders re transit connections
- Educate riders re pre-ticketing
- Reconsider/prioritize performance metrics
- Train & Retain Triangle Route staff

Appendix H: Summary Statistics

Table 3: Summary Statistics - Observed Available Spaces on Vessels for On-time Departures, Late Departures, and All Departures while operating on the regular schedule between **1415** and **1905** (June 17, 2017 to October 2, 2017)⁷¹

Departure	n	mean	median	std. deviation	max	min
On-time	528	13	7	15.81	75	15
Late	101	13.6	6	16.82	71	0
All Departures	629	13.11	7	15.96	75	0

Table 4: Summary Statistics - Observed Available Spaces on Vessels for On-time Departures, Late Departures, and All Departures while operating on the regular schedule between **1600** and **1905 ONLY** (June 17, 2017 to October 2, 2017)⁷²

Note: The underlying data for this table are a subset of those presented in Table 3.

Departure	n	mean	median	std. deviation	max	min
On-time	337	7.99	2	10.63	45	0
Late	76	8.93	0.5	13.58	48	0
All Departures	413	8.17	2	11.22	48	0

These data were collected between Monday, June 19 - Monday, October 2 by WSF. There were 716 observations in the raw data set transmitted in response to our data request. Observations were only taken during the weekdays and over the afternoon hours (~2-7pm). Our understanding based on questions to WSF is that dates missing in the dataset represent gaps in the record. Weekdays not accounted for in the data transmitted include:

- Friday, June 23
- Tuesday, July 4 (Independence Day)
- Thursday, July 27
- Wednesday, August 9
- Wednesday, August 23
- Friday, August 25
- Friday, September 1
- Monday, September 4 (Labor Day)
- Wednesday, September 6
- Thursday, September 7
- Entire week of September 11-15
- Monday, September 25

Further, a number of observations recorded non-numeric data points for the estimated # of available spaces leftover, such as "n/a," or "no line," or "no traffic." These observations were removed because they could not be interpreted quantitatively.

⁷¹ Washington State Ferries. (2017). *Fauntleroy Toll Booth Redemptions*

⁷² Washington State Ferries. (2017). *Fauntleroy Toll Booth Redemptions*