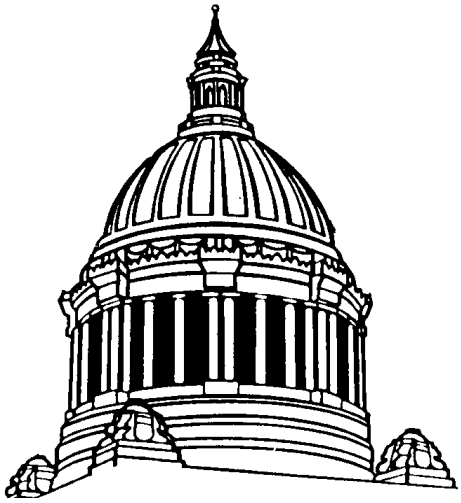

State of Washington
Joint Legislative Audit and Review Committee

Department of Transportation Ferry System Performance Audit

Report 98-6

Prepared by Booz-Allen & Hamilton, Inc. for the Joint Legislative Audit and Review Committee.

October 6, 1998

Upon request, this document is available in alternative formats for persons with disabilities.

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Established by Chapter 44.28 RCW, the Joint Legislative Audit and Review Committee (formerly the Legislative Budget Committee) provides oversight of state funded programs and activities. As a joint, bipartisan legislative committee, membership consists of eight senators and eight representatives equally divided between the two major political parties.

Under the direction of the Legislative Auditor, committee staff conduct performance audits, program evaluations, sunset reviews, and other types of policy and fiscal studies. Study reports typically focus on the efficiency and effectiveness of agency operations, impact of state programs, and compliance with legislative intent. As appropriate, recommendations to correct identified problem areas are included. The Legislative Auditor also has responsibility for facilitating implementation of effective performance measurement throughout state government.

The JLARC generally meets on a monthly basis during the interim between legislative sessions. It adopts study reports, recommends action to the legislature and the executive branch, sponsors legislation, and reviews the status of implementing recommendations.

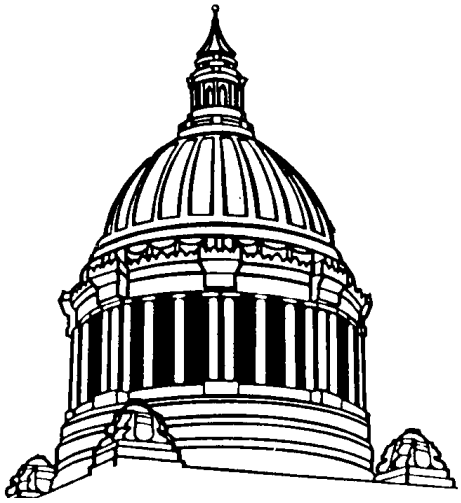

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TABLE OF CONTENTS

WASHINGTON STATE FERRY SYSTEM PERFORMANCE AUDIT

Summary

In legislation passed during the 1997 Session, the Washington State Legislature directed the Joint Legislative Audit and Review Committee (JLARC) to conduct performance audits of various functions within the Washington State Department of Transportation (WSDOT). In September 1997, JLARC retained a team lead by Booz·Allen & Hamilton to undertake an audit of the activities and operations of the Washington State Ferry (WSF) system. The time frame considered in the audit was the six-year period since 1991, which was the year that Booz·Allen reviewed the ferry refurbishment program for the Legislative Transportation Committee (LTC).

The purpose of the audit was to evaluate the historical and current performance of WSF and identify activities and programs that should be strengthened, abandoned, redirected, or replaced. The audit included a comprehensive review of WSF's overall operation, management, costs, and infrastructure, in addition to addressing 20 specific issues defined by JLARC in its Request for Proposal (RFP). Findings and conclusions developed during the audit were based on extensive interviews with WSF employees, stakeholders, and other ferry systems; facility and ferry inspections; review of internal and external documentation/reports; and team analysis.

The remainder of this executive summary highlights the key findings and conclusions resulting from the audit.

1. PASSENGER AND VEHICLE ACTIVITY AT WSF HAS INCREASED AT A FASTER RATE THAN OPERATING COSTS OVER THE PAST SIX YEARS.

Over the past six-year period, the number of passengers carried by the ferries has increased from 23.0 million to 24.9 million, or 1.6 percent annually, and vehicles increased from 9.7 million to 10.9 million, or 2.4 percent annually.

Over the same period, total annual operating costs, expressed in 1997 dollars, increased from $112.1 million to $123.2 million, or 1.9 percent annually. More importantly, WSF's cost-per-unit of service, or production, as expressed by dividing

operating cost by various activity levels, has held constant or increased slightly over the past six years. Exhibit 1, illustrates the operating cost performance of WSF over the most recent six fiscal years.

EXHIBIT 1
WSF Operating Cost Performance
(In 1997 Dollars)

Performance Indicator	Unit Costs Per Year					
	1992	1993	1994	1995	1996	1997
Cost Per Passenger	$4.88	$5.14	$5.04	$4.90	$4.87	$4.95
Cost Per Passenger Mile	$0.71	$0.74	$0.72	$0.74	$0.70	$0.72
Cost Per Vehicle	$11.55	$11.86	$11.51	$11.06	$11.15	$11.29
Cost Per Vessel Mile	$124.48	$129.49	$130.49	$127.12	$128.76	$131.45
Cost Per Trip	$795.42	$835.89	$828.46	$794.27	$805.20	$822.73

Source: WSF BEARS Report and Booz-Allen analysis.

Annual growth against each cost performance indicator, ranging from -0.5 percent to 1.1 percent annually, was found to be below that of activity growth rates. This indicates that operating costs have been appropriately balanced with activity growth.

2. WSF IS COMPARABLE TO OTHER NORTH AMERICAN FERRY SYSTEMS IN TERMS OF PRODUCTIVITY AND COST FACTORS.

The audit developed various benchmarks in order to compare WSF's performance to that of other ferry systems. It was found that no North American ferry system was directly comparable to WSF in customer characteristics, route length and structure, governance and ownership structure, organization, and pricing and subsidy policies. WSF is more commuter-oriented and supports a higher volume of annual passengers and vehicles than other systems.

Comparisons to a number of large ferry systems is useful to assess current and relative performance. Exhibit 2 compares the cost performance of WSF to four large ferry systems.

EXHIBIT 2
Comparison of Unit Costs on
Five North American Ferry Systems in 1996

Benchmark	WSF	BC Ferries	North Carolina	Staten Island	Steamship Authority*
Cost per Passenger	$4.95	$11.37	$18.30	$1.90	$14.80
Cost per Vehicle	$11.29	$14.83	$19.50	$88.60	$70.00
Cost per Employee	$72,780	$76,248	$55,132	$60,821	$55,068

Source: WSF data and other ferry operator input.
Note (*): Woods Hole, Martha's Vineyard and Nantucket Steamship Authority.

The exhibit demonstrates that, with a few exceptions, WSF's cost performance against each benchmark is lower than each of the other ferry systems with which they were compared. This performance is due, in part, to the economies of scale associated with the higher traffic volumes on the Washington system.

3. THE FERRIES OF THE WSF FLEET ARE AMONG THE OLDEST IN NORTH AMERICA AND REQUIRE A MORE RIGOROUS AND FORMAL MAINTENANCE PROGRAM THAN A MORE MODERN FLEET.

The WSF fleet consist of 25 vessels, with an average age of 31 years. WSF's oldest vessels are the Steel Electric ferries (four total), which are 71 years old. These vessels are between 22 and 38 years older than the oldest ferry identified in the four other ferry systems identified on the previous page. WSF's next oldest vessel is the *M/V Rhododendron* which is 51 years old.

Due to the scope of the audit, engineering or technical surveys of the fleet were not conducted, but walk-through inspections found the fleet to be in generally good condition, particularly in the machinery spaces. However, a formal Steel Maintenance Program recommended in an earlier study has not been fully implemented. More importantly, WSF currently does not have a formal, systematic, and standardized Maintenance Management System (MMS). Recent efforts over the past four years to implement an MMS have been unsuccessful. WSF has a significant and immediate need to implement an MMS.

Routine and emergency vessel and terminal maintenance is primarily executed by WSF's Eagle Harbor Repair Facility and is an essential element of WSF's maintenance program. However, numerous improvements in Eagle Harbor's facilities and management are needed to enhance its current and future value to WSF.

WSF has historically employed major refurbishment on older vessels to extend their useful life by as much as 25 years. In 1991, Booz·Allen conducted a study of WSF's refurbishment program which resulted in 22 recommendations. Only three of these recommendations, including the Steel Maintenance Program mentioned above, have not been implemented. Current procurement and contracting procedures have improved WSF performance since the 1991 study. WSF is also taking steps to insure new vessel procurement practices utilize fair risk-sharing through a procurement partnership with contractors.

Nevertheless, vessels renovated in recent years have returned costs of approximately 75 percent of new construction, without providing a similar amount of capability and technology. WSF is currently proposing the implementation of a potentially less costly vessel preservation program in lieu of major refurbishment. Before a final commitment is made to implement the preservation program, the appropriate management tools, including the development of life- cycle-cost-models for terminals and vessels, should be fully installed. The benefits of the preservation program might include more cost-effective and targeted investments in vessel systems, passenger spaces, and hull, and lower project expenditures. If implemented, the preservation strategy could extend vessel life by 10 to 15 years, use available capital more prudently, and permit more timely replacement of older vessels with new construction; provided that WSF is able to manage steel maintenance costs, and recognizing that vessel replacement needs may be accelerated in the 20-year plan.

Finally, while there are no audit findings to suggest that WSF ferries are unsafe (see section 4, below), this audit recommends that the single compartment vessels (i.e., Steel Electric class and M/V Rhododendron)–and perhaps those over 40 years old–receive independent surveys. Such surveys would be an added precaution to ensure the safety of these vessels and allay public concerns. Surveys should be conducted in concert with each vessel's next scheduled dry-docking.

4. WSF OPERATES THE SYSTEM WITH SAFETY AS A HIGHEST PRIORITY, WITH THE OVERALL FLEET PERFORMING RELIABLY AND WITH CUSTOMERS VIEWING THE SYSTEM FAVORABLY.

Over the past two years, the ferry system has achieved a voyage completion rate in excess of 99 percent. Additionally, its on-time departure performance ranged between 87 percent and 95 percent, placing it above the airline industries' national average (85 percent) and below that of major transit systems (90 to 98 percent).

A recent ferry system customer survey conducted by Elway Research Inc. concluded that 82 percent of ferry riders consider the system good or excellent in four of seven service attributes. Only one attribute, parking, received lower than a 60 percent good or excellent rating. Additionally, the survey found that 72 percent of the ferry system customers believe the boats are safe to ride. No major mode of passenger travel had a lower fatality rating than WSF, and only the airline industry had a lower incident rate.[1]

The U.S. Coast Guard (USCG) is ultimately responsible for marine safety in the United States, including setting design and construction standards, conducting periodic inspections, issuing compliance Certificate of Inspections (COI), and citing vessel owner/operators with safety and non-compliance violations (known as Form 835 deficiencies). All WSF ferries were found to have current USCG COIs. Exhibit 3 shows unweighted Form 835 deficiencies issued to six US ferry systems over the six-year sample period.

EXHIBIT 3
Summary of USCG Form 835 Deficiencies of Six Auto-Passenger Ferry Systems (Calendar Year 1992 to 1997)

Ferry System	No. of Auto-Passenger Ferries *	Total No. Of 835 Reports Over Six Year Period	Average No. of 835 Reports Per Vessel Per Year
Washington State Ferry	21	805	6.4
Alaska Marine Highway System	8	426	8.9
Staten Island	7	752	17.9
Cape May-Lewes	1	58	9.7
Anderson Island	1	59	9.8
Black Ball (Private Operator)	1	4	≤,1.0

Source: USCG Port Safety Information Exchange (PSIX) and Booz·Allen analysis.
Note(*): Only includes number of 835 Reports and corresponding number of auto-passenger ferries included in the PSIX system.

The exhibit shows that WSF had a lower number of deficiencies per vessel than four other ferry systems but more than the single-ship Black Ball ferry system. The audit also compared the number of Form 835 deficiencies issued to each WSF vessel over the six-year sample and between vessel classes. The comparison showed no distinct patterns or abnormalities over time or between vessel classes.

[1] Five transportation modes includes: airlines, automobiles, bus, commuter rail, and heavy passenger rail.

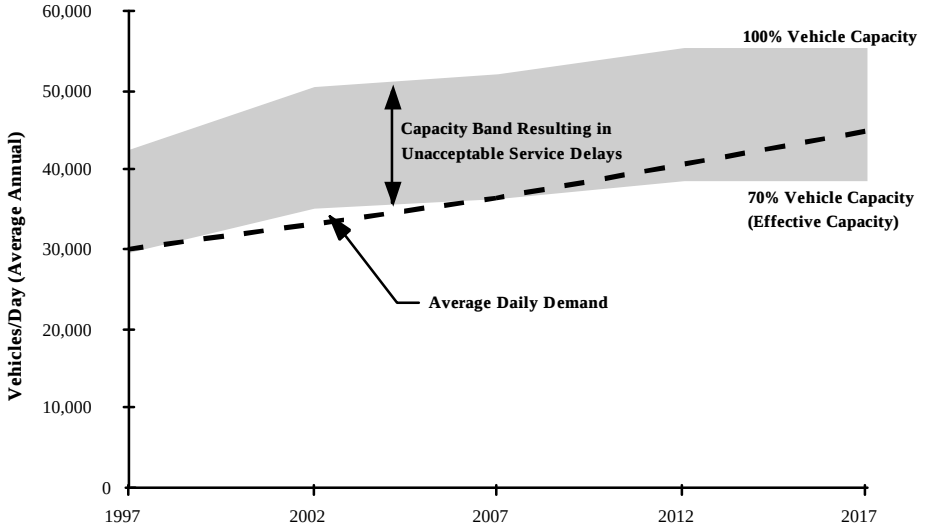
5. CURRENT FLEET AND TERMINAL CAPACITY IS NOT CAPABLE OF MEETING VEHICLE DEMAND OVER THE NEXT 20 YEARS. HOWEVER, THE FLEET DOES MAINTAIN ADEQUATE PASSENGER CAPACITY TO SUPPORT ITS 20-YEAR FORECAST ON EXISTING ROUTES.

Recent forecasts developed for passenger and vehicle activity indicate continued growth and use of the ferry system, with annual growth for passengers of 2.6 percent and 2.0 percent for automobiles expected.

While capacity utilization of the WSF system peaks during commuting hours and during summer months, when tourism and vacation travel are the greatest, average annual passenger utilization in 1997 was 15 percent. The WSF fleet maintains adequate passenger capacity to support its 20-year forecast on existing routes. However, the 20-year plan includes new routes and more frequent service on existing routes which, if implemented, would require additional ferries in the fleet.

In contrast, vehicle capacity, both onboard vessels and in terminal holding (or staging) areas is inadequate. For utilization levels above 70 percent, the ferry system begins to experience service deterioration, long waits, and delayed departures. During 1997, vehicle capacity utilization on the vessels averaged 71 percent for the year, and on many routes exceeded 100 percent utilization during peak hours. Inadequate fleet capacity is even more evident during the summer season when ferries are taken out of service for repairs and service must be reduced due to the lack of spare vessel capacity. The availability of the new Jumbo Mark II class will relieve service degradation over the short run. However, as shown in Exhibit 4, utilization levels will again exceed the 70 percent threshold by 2007.

EXHIBIT 4
Comparison of the Vehicle Capacity of the Current WSF Fleet With Projected Demand Over the Next 20 Years



Source: WSF 20-Year Plan and Booz·Allen analysis.
Note: Increase vehicle capacity resulting from addition of two Mark II Jumbo ferries and higher service.

The WSF 20-Year Plan proposes the addition of three Steel Electric type ferries and a fourth Jumbo Mark II ferry. Implementing this plan will provide adequate vehicle capacity to maintain current service standards over the 20-year period; unless otherwise determined by a thorough assessment of the preservation initiative and the effectiveness of the steel maintenance program. The plan also proposes to add six passenger-only ferries (POF) to the fleet.

Long-term success in meeting service standards is dependent, not only on adequate vessel passenger and vehicle capacity, but also on adequate terminal capacity. Most of WSF's terminal infrastructure was constructed in the 1940s and 1950s and generally does not provide the characteristics of world-class ferry terminals. Most notable, vehicle staging capacity at 14 of WSF's 19 domestic terminals currently falls short of acceptable service standards by 1,842 vehicles. Only five terminals were found to have surplus capacity.

The terminal situation is expected only to deteriorate with passenger and vehicle growth. Exhibit 5 (page viii) summarizes, in graphic form, planned terminal improvements against peak vehicle demand for a sample route.

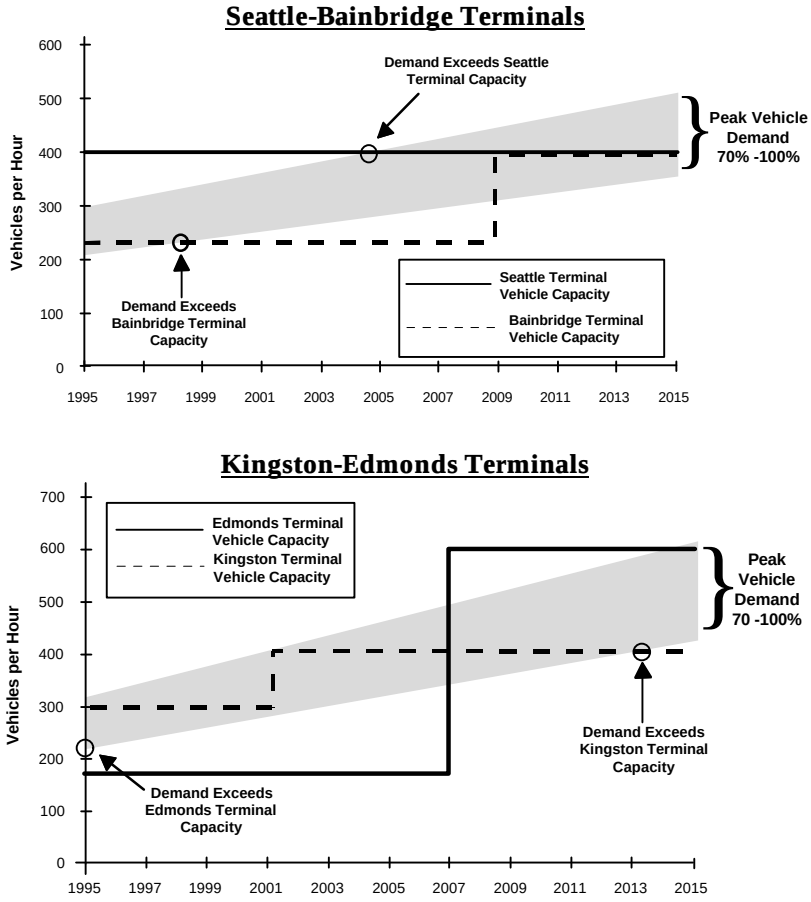
The exhibit shows the hourly vehicle capacity of the Seattle-Bainbridge terminals (in the upper graph) and the Kingston-Edmonds terminals (below), expressed as a step function. The gray curve represents a peak-hour-vehicle-demand projection for each route. The top of the gray curve represents the actual projection (referred to as the 100 percent point). The bottom of the gray curve represents 70 percent of the

demand projection and is the point when congestion becomes apparent. The exhibit shows that the service deterioration point has already been exceeded at Edmonds and Bainbridge Island, and should be reached in Seattle by 2005 and at an expanded Kingston terminal by 2013. The findings at other terminals were similar.

Current funding of $504 million is available in the Current Law Budget for terminal improvements over the 20-year period ending in 2015. This is $635 million below the $1.1 billion which WSF believes will be required to maintain current service levels through that point in time. The situation with the fleet is not as acute with current funding of $707 million available in the Budget for fleet preservation and replacement. This is $366 million below the $1.07 billion detailed in the 20-year plan.

The audit team believes the WSF estimate better represents future funding requirements. However, WSF builds from current fleet, terminal, route, and operating paradigms to develop long-range plans and define future fleet requirements which may not optimize operating and capital costs. As a strategic imperative, WSF should conduct a "clean slate" analysis to define the optimal system (e.g., vessel types and size, terminal locations and structure, routes, etc.) that WSF and the legislature might pursue to meet performance objectives without the constraints of the current infrastructure. This analysis will aid WSF and the legislature in understanding the cost implications of continuing the status quo versus reinventing the system.

I. EXHIBIT 5
Comparison of Terminal Vehicle Capacity to Forecast Vehicle Demand (1997 - 2017)



Source: WSF 20-Year Plan and Booz·Allen analysis.

6. PUBLIC/PRIVATE PARTNERSHIPS MAY OFFER OPPORTUNITIES TO REDUCE OPERATING COSTS, BUT REQUIRES PROACTIVE PLANNING. IF SUCH OPPORTUNTIES ARE TO BE PURSUED, THE LEGISLATURE SHOULD CONSIDER AMENDING CURRENT LEGISLATION TO ELIMINATE BARRIERS TO PRIVATE FERRY OPERATIONS IN PUGET SOUND.

The audit evaluated the potential for public/private partnerships for WSF's international and POF services. WSF, at the direction of the Transportation Commission, is currently initiating steps to privatize its international service. Opportunities to reduce operating costs in both services, primarily labor, exist. Savings in labor costs assume the use of non-union labor, more flexible work rules, and lower pay scales. An evaluation was also made of capitalized expenditures for vessels and terminals. Due to the potential number of ownership and operator alternatives, the audit did not reach any final conclusion. However, it was

determined that the use of WSF terminal facilities by private operators could be advantageous.

The audit identified a number of regulatory barriers to the use of private operations and the joint use of WSF terminals. Specifically, current regulations discourage the mixing of union and non-union operations and require that comparable wages be paid. Changes to these regulations will be necessary if some privatization is pursued (including subsidization of private operations) and joint use of terminal assets is required to achieve desired savings. Due to the number of variables and assumptions, WSF and the legislature should engage the private sector and affected communities in planning for public/private partnerships, and leverage the innovation of the private sector and affected communities to propose operations alternatives to provide international or POF service, while correspondingly meeting the service and tariff goals and objectives established by WSF and the legislature.

7. ORGANIZATION STRUCTURE AND CULTURE HAS IMPEDED THE WSF'S ABILITY TO RETAIN MANAGEMENT, CONDUCT NEEDED TRAINING, AND MANAGE LABOR AND COLLECTIVE BARGAINING EFFECTIVELY.

WSF is an integral element of the region's cross-sound transportation system and, as such, has a large and diverse constituency which includes over 20 stakeholder organizations overseeing or influencing its management and operations. The heterogeneous nature of these stakeholders makes it difficult to forge consensus on mission, priority, budgets, and programs. Further, a dual reporting relationship to the Transportation Commission and the LTC inhibits clear and decisive policies, programs, and management actions. This is further exacerbated by statewide funding mechanisms (e.g.; motor vehicle excise tax and gas tax) supporting a ferry system primarily serving the Puget Sound region.

This situation has contributed to inefficiencies and inequities in several areas, including:

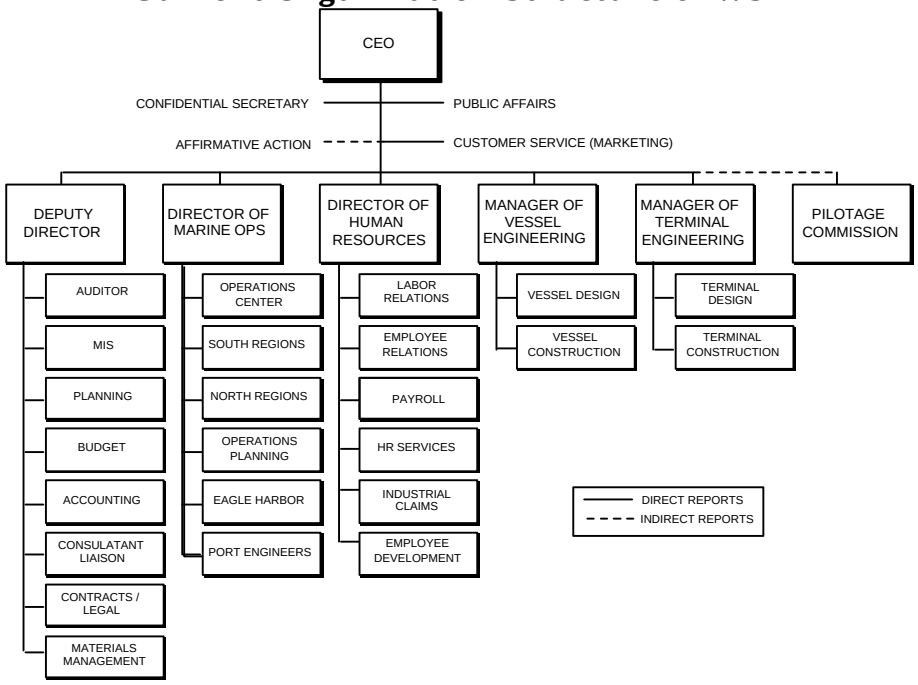
- Ineffective communication and coordination;
- Instability and turnover of top management;
- An informal Human Resource and Training and Development Program;
- A largely ineffective labor relations and conflict resolution process.

Each of these is elaborated upon below.

7.1 The current organization structure of WSF de-emphasizes certain critical functions and results in ineffective communications and coordination.

The existing organization structure of WSF is presented in Exhibit 6.

EXHIBIT 6
Current Organization Structure of WSF



Source: WSF.

The exhibit identifies five major organization units reporting to the CEO. An inspection of the exhibit and an understanding of how it functions led to the identification of several potential problems:

- First, maintenance has no visible role nor senior positioning. Its functions are dispersed under the Deputy Director (Materials Management), and the Director of Marine Operations (Port Engineers, Eagle Harbor, and Operations Planning);
- Second, at a time when Information Systems development is critical, the function's position is a step removed from the CEO and is a service provided primarily by WSDOT;
- Third, Vessel and Terminal Engineering and maintenance functions are organizationally separate;
- Finally, the Pilotage Commission position, which has no direct relationship with WSF, is prominently positioned in the organization.

WSF's current organization structure has created, in part, a number of vertical organization "silos" which facilitate intradepartmental communication and coordination, but has resulted in ineffective or poor interdepartmental communication and coordination. This is supported by the findings in Conrex's *Stainless Steel Report.* This is further compounded by the lack of a complete and comprehensive set of documentation defining roles, responsibilities, procedures, and policy across the organization. WSF has recently developed policies to address maintenance and engineering roles and responsibilities and an alternative organization that upgrades and unifies maintenance. Booz·Allen has created an alternative organization structure that expands upon that proposed by WSF.

7.2 WSF management is characterized by high turnover in key positions impacting operational continuity, management oversight, and succession planning.

An inordinate amount of turnover within the senior levels of WSF management was identified during the audit. Twenty-two different employees have held the seven most senior administrative and technical positions at WSF since 1990. Two reasons contribute to this.

- A compensation system where senior managers are compensated up to 50 percent less than comparable positions in the region;
- The inability of management to effect timely change in a highly-routinized, politically-charged, and predominately unionized organization.

Constant change in upper management extends the learning curve, interrupts the continuity of decision making, inhibits succession and career planning, and reduces management's ability to affect meaningful and long-term change.

In contrast, compensation of field operations staff (i.e., vessel and terminal) and lower-level administrative and support staff are generally comparable to or higher than wages of similar industry and state employees. Additionally, turnover is low and tenure of employment is much higher than that of management.

7.3 WSF lacks a formal performance measurement system and comprehensive training and development programs.

In recent years, implementation of a formal employee performance evaluation system has been mixed. One reason for this is the lack of a corporate-wide performance measurement system which defines performance measures and

establishes clear goals for managers. Without a performance measurement system for the organization, it is difficult to implement an employee evaluation system. Over the last year there has been improvement, as the CEO has initiated a system of development and performance plans for each of his direct reports.

Concerning training and development, all required training addressing safety and environment is developed and deployed to all applicable personnel. However, employee development and leadership training is not adequately deployed. Correspondingly, a majority of management and supervisory personnel are not prepared to deal with issues related to disciplinary situations, employee disputes, discrimination complaints, or performance issues.

7.4 The current collective bargaining and dispute resolution processes impact the day-to-day operations and management of WSF and its ability to operate efficiently and effectively.

WSF employees are highly organized. In total, 13 labor organizations, accounting for 92 percent of total WSF employees, are represented by 7 collective bargaining agreements. Each agreement is two years in length. Consequently, all agreements are effectively being negotiated and implemented in unison. The audit found that the two-year agreements are unusual when compared to the staggered three-year agreements of other collective bargaining agreements, both in the public and private sectors, and result in a never-ending process of collective bargaining. Additionally, current legislation and Marine Employees Commission (MEC) precedents guarantee WSF employees minimum cost of living adjustments, which further compromises the collective bargaining process.

The MEC was reestablished in 1983, after a two-year period where WSF employees were part of the state Civil Service System. Its principal purpose is to address and resolve disputes between the collective bargaining units and WSF. Only one collective bargaining unit utilizes MEC for this purpose, as the MEC more often receives and addresses unfair labor practices (ULPs). More ULPs are filed against the WSF than any other state agency. Since 1990, a total of 89 ULP charges were filed against WSF by labor organizations, with 20 ULPs being filed between January 1997 and September 1997. In comparison, fewer than 20 ULPs were filed with the Washington State Personnel Resources Board by over 22 labor organizations representing the vast majority of state employees.

The audit determined that substantial improvement will be required in all areas of organization design, employee retention, compensation, training and development, performance management systems, policy and procedure documentation, and labor

relations. Additionally, greater use of automation is needed to support and optimize the operation and management of WSF.

8. THE AUDIT MADE 28 RECOMMENDATIONS WHICH WILL IMPROVE WSF MANAGEMENT AND OPERATIONS, AND GENERATE $4.9 MILLION IN ANNUAL SAVINGS.

Twenty-eight recommendations were made to improve the overall management, operations, and performance of WSF. For those recommendations where savings were quantified, potential annual cost reductions are estimated at $3.8 million. For those recommendations where costs were identified, probable one time expenditures were estimated at $2.1 million.

II. AGENCY RESPONSE

Agency responses are included in Appendix B of this report.

III. ACKNOWLEDGEMENTS

Numerous agencies and individuals supported the completion of this performance audit. We appreciate the extensive and courteous cooperation of the management and staff of the Washington State Ferry System and Washington State Department of Transportation. We also appreciate the many helpful comments and views expressed by the Technical Review Advisory Committee, private citizens, and stakeholders during the course of the audit.

IV. AUDIT STANDARDS

This performance audit was conducted in conformance with generally accepted government auditing standards.

On October 6, 1998, the Joint Legislative Audit and Review Committee approved a motion to adopt and distribute this report.

The committee also adopted an Addendum to the report, in which the committee takes no position on Recommendation 25 through 28 (see page xxv, following the Summary of Recommendations).

Representative Cathy McMorris
Chair

WASHINGTON STATE FERRY SYSTEM PERFORMANCE AUDIT

Summary of Recommendations❖

Recommendation 1

Evaluate the current management structure system and identify options to reduce decision cycle time, clarify accountability and responsibility, eliminate conflict, and facilitate access to capital.

Legislation Required:	Yes
Fiscal Impact:	None
Completion Date:	2000

Recommendation 2

Develop an Employee Training and Development System.

Legislation Required:	No
Fiscal Impact:	Moderate cost to develop and implement
Completion Date:	1999 for planning; 2001 for implementation

Recommendation 3

Conduct a comprehensive job classification and compensation study prior to the next biennium to support collective bargaining negotiations.

Legislation Required:	No
Fiscal Impact:	Moderate cost depending on scope and comprehensiveness of study
Completion Date:	1999

❖ **Note: The Joint Legislative Audit and Review Committee approved an Addendum (please see page xxv) regarding recommendations 25 through 28.**

Recommendation 4

Implement recommended organization structure to right the span-of-control situation, create succession planning opportunities, direct focus on "key" strategic areas, and alleviate communication and departmental gaps within the organization.

Legislation Required:	No
Fiscal Impact:	None
Completion Date:	2000

Recommendation 5

Align WSF employee overtime policy to that of state employees, where basic overtime rates will be no greater that 150 percent of base wage.

Legislation Required:	WAC 356-05231
Fiscal Impact:	$1.1 million annual savings
Completion Date:	Next bargaining cycle

Recommendation 6

Remove mandatory cost of living adjustment for WSF employees resulting from legislative action, and assign responsibility to WSF and WSDOT management to achieve legislative limits on appropriations.

Legislation Required:	Modify Appropriations Act Language
Fiscal Impact:	Up to $1.5 million annual savings
Completion Date:	1999

Recommendation 7

Evaluate the benefits of improving current MEC services or placing WSF employees and labor organizations under the jurisdiction of the Public Employee Relations Commission (PERC) or a similar organization.

Legislation Required:	WSF
Fiscal Impact:	None to annual savings up to $170,000
Completion Date:	1999

Recommendation 8

Develop an Information Technology Plan that leverages current system initiatives, identifies future information and data requirements, leverages
technology to achieve operational and organizational efficiencies, and supports management decision making and operational monitoring.

Legislation Required:	No
Fiscal Impact:	Moderate cost to development and implement; Potential savings high
Completion Date:	2000 or sooner

Recommendation 9

Analyze vessel deployment strategies to reduce or eliminate the frequency of non-revenue generating boat moves and refueling operations.

Legislation Required:	No
Fiscal Impact:	Up to $500,000 annual savings
Completion Date:	2001

Recommendation 10

Extend the International Safety Management (ISM) effort to include WSF domestic routes and terminal operations, including the development of documentation defining policies, procedures, and responsibility across the WSF organization.

Legislation Required:	No
Fiscal Impact:	Moderate costs to implement
Completion Date:	1998 for International Route 2000 for Domestic Service

Recommendation 11

Develop emergency response and contingency plans for WSF, vessels, and terminals. Documents should address field operations, management and support, and communications.

Legislation Required:	No
Fiscal Impact:	None
Completion Date:	2000

Recommendation 12

Accelerate implementation of Maintenance Management System (MMS) and redirect current MMS efforts to validate system functionality requirements with users and identify additional development costs.

Legislation Required:	No
Fiscal Impact:	$2.0 million annual savings; $1.5 million investment
Completion Date:	2000

Recommendation 13

Restructure the Eagle Harbor Repair Facility (EHRF) operation addressing facilities, staffing levels, workload management, and job cost-estimating processes.

Legislation Required:	No
Fiscal Impact:	Up to $1.1 million annual savings; Investment unknown
Completion Date:	1999

Recommendation 14

Implement a more systematic and formal Steel Maintenance Program and, as part of this program, the older single-compartment ferries should be subject to an independent survey.

Legislation Required:	No
Fiscal Impact:	Unknown
Completion Date:	High priority for FY 1999

Recommendation 15

Continue implementation of other recommendations made by the 1991 Booz·Allen report that have not been fulfilled.

Legislation Required:	No
Fiscal Impact:	Unknown
Completion Date:	2000

Recommendation 16

Modify legislation controlling ferry firm, fixed-price contracting practices to allow WSF more discretion and flexibility in its procurement/contracting policy.

Legislation Required:	Yes
Fiscal Impact:	Unknown
Completion Date:	1999

Recommendation 17

Assign a Contract Administrator from the Contracts/Legal Department to new construction, renovation and preservation contracts over $10 million.

Legislation Required:	No
Fiscal Impact:	Potential capital savings
Completion Date:	1998

Recommendation 18

Modify the standard contract language on Contract Problem Reports (CPRs) to require timely submission of proposals to accomplish Indefinite Quantity Work (IQW).

Legislation Required:	No
Fiscal Impact:	Potential capital savings
Completion Date:	1999

Recommendation 19

Increase the length of time between contract award and ferry shipyard arrival.

Legislation Required:	No
Fiscal Impact:	Potential capital savings
Completion Date:	1999

Recommendation 20

Reduce the amount of preplanned Indefinite Quantity Work (IQW) included in the contract award to no more than 10 percent of the base work package.

Legislation Required:	No
Fiscal Impact:	Potential capital savings
Completion Date:	1999

Recommendation 21

Build from WSF's corporate strategy to develop a strategic plan detailing corporate goals/objectives, actions and implementation steps, timing of actions, department and individual responsibilities, costs/benefits, and broader service standards.

Legislation Required:	No
Fiscal Impact:	None
Completion Date:	2000

Recommendation 22

Validate the current Travel Forecast Model (TFM) forecast with a new O/D study, and augment the current supply side analysis with demand elasticity and fleet optimization analyses.

Legislation Required:	No
Fiscal Impact:	$625,000 expenditure
Completion Date:	1999

Recommendation 23

Conduct a "clean slate" fleet and service optimization study to identify and evaluate benefits-costs of an unconstrained fleet and compare to the current 20-year plan.

Legislation Required:	No
Fiscal Impact:	Potential operational and capital savings
Completion Date:	2000

Recommendation 24

Develop a Life-Cycle-Cost Model for terminals.

Legislation Required:	No
Fiscal Impact:	Minimal
Completion Date:	2000

Recommendation 25❖

If public/private partnerships are to be pursued, the legislature should consider amending current legislation to eliminate barriers to private ferry operations in Puget Sound.

Legislation Required:	Yes
Fiscal Impact:	None
Completion Date:	1999

Recommendation 26❖

Conduct a preliminary Request for Qualifications (RFQ) or Request for Proposals (RFP) process to assess current interest and/or ability of the private sector to be a partner in POF and/or international service.

Legislation Required:	No
Fiscal Impact:	None
Completion Date:	2000

❖ **Note: The Joint Legislative Audit and Review Committee approved an Addendum regarding this recommendation. Please see page xxv.**

Recommendation 27❖

Establish definitive goals for public/private partnership for the international service.

Legislation Required:	No
Fiscal Impact:	None
Completion Date:	1999

Recommendation 28❖

Evaluate feasibility and merits of a summer season international service.

Legislation Required:	No
Fiscal Impact:	Study can be done within existing resources; Potential for future savings
Completion Date:	2001

❖ **Note: The Joint Legislative Audit and Review Committee approved an Addendum regarding this recommendation. Please see page xxv.**

ADDENDUM

Statement of the Joint Legislative Audit and Review Commitee

This states the position adopted by the Joint Legislative Audit and Review Committee on October 6, 1998.

The Joint Legislative Audit and Review Committee has considered the findings and recommendations of the final report of the Department of Transportation Ferry System Performance Audit. The committee has voted to adopt the following addendum to be included in the final report.

> *JLARC adopts the final report and authorizes its distribution but takes no position on Recommendations 25, 26, 27, and 28. Issues surrounding those recommendations shall be addressed in Phase II of the Ferry System Performance Audit.*

INTRODUCTION

Chapter One

In legislation passed during the 1997 Session, the Washington State Legislature directed the Joint Legislative Audit Review Committee (JLARC) to conduct performance audits of various functions within the Washington State Department of Transportation (WSDOT). Among the functions designated for audit was the state's ferry system.

In September 1997, JLARC retained Booz·Allen & Hamilton, Inc. to conduct an independent and comprehensive audit of the overall operations of the Washington State Ferry (WSF) System, including its operating and capital improvement program performance. Six years earlier, in April 1991, Booz·Allen had conducted a review of the *Management of Vessel Refurbishment Programs* for the Washington State Legislative Transportation Committee (LTC).

1. OBJECTIVE AND SCOPE OF THE AUDIT.

Unlike the 1991 study, which was specific to the WSF vessel refurbishment and contracting practices, the 1997 performance audit covered all system practices, including marine operations, terminal and landside interfaces, construction programs, vessel refurbishment and preservation, maintenance, planning, organization, administrative functions, and financial management. Both day-to-day operations and the longer-term capital program were considered.

The objective of the audit was to evaluate how efficiently, effectively, and economically WSF is operated. The scope was defined by JLARC in "Washington State Ferry System Performance Audit Overview of Scope." That document directed Booz·Allen to "use judgment, experience and creativity" to identify WSF activities and programs that should be strengthened, abandoned, redirected, or replaced. The overview posed approximately 50 general and specific questions addressing 20 issues. It also provided eight general performance audit issues identified by the state legislature, and directed Booz·Allen to address the issues, as appropriate, while conducting the audit. They were:

A. For each function, activity, or program, identify associated costs and full-time equivalent staff;

B. Determine the extent to which the particular activity or function is specifically authorized in statute or is consistent with statutory direction and intent;

C. Consider whether the purpose for which the program was created is still valid based on the circumstances under which the program was created;

D. Determine whether the function, activity, or program is achieving the results for which it was established;

E. Identify any duplication of services with other government programs or private enterprises or gaps in service;

F. In the event of inadequate performance by the program, identify the potential for a workable, affordable plan to improve performance;

G. Identify, to the extent possible, the causes of any program's failure to achieve the desired results and identify alternatives for reducing costs or improving service delivery, including transferring functions to other public or private sector organizations;

H. Develop recommendations relating to statutes that inhibit or do not contribute to the agency's ability to perform its functions effectively and efficiently, and whether specific statutes, activities, or programs should be continued, abandoned, or restructured.

A copy of the complete "Study Scope and Objectives" provided by JLARC is attached as Appendix A to this report. Additionally, a matrix that cross-references the questions posed by JLARC to the sections of this report in which we address them is provided in Appendix C. Appendix B presents WSF comments responding to findings and recommendations presented in this report.

2. APPROACH TO CONDUCTING THE AUDIT.

To achieve the audit's objective and address its scope in the designated performance period, Booz·Allen began by identifying the skills and knowledge required to meet JLARC's expectations and then assembling an audit team with the requisite level of expertise. From October 1997 until January 1998, the team worked together to:

- Assess WSF's performance against past audit recommendations;
- Review current departmental functions, organization, and core processes;

- Compare performance based on internal and external performance measures;
- Evaluate current and future requirements for equipment and technology;
- Determine potential benefits of outsourcing, including privatization;
- Identify process re-engineering opportunities.

As directed, the audit team used judgment, experience, and creativity to identify activities and programs that should be strengthened, those that should be abandoned, and those that need to be redirected or have other alternatives explored. The findings and conclusions developed during the audit were based on a comprehensive understanding of WSF business and the environment in which it operates. To develop this understanding, the audit team conducted more than 100 interviews with WSF employees (including management, operations, fleet, and terminal staff); toured WSF's repair facility at Eagle Harbor, WSF vessels and terminals, and ship repair facilities in the Puget Sound region; and interviewed WSF stakeholders, as well as other North American ferry systems. Our understanding was also augmented by the outcome of a public outreach program facilitated by JLARC.

The audit was performed in accordance with government auditing standards and generally accepted auditing standards, as described in the United States General Accounting Office document, *Government Auditing Standards, 1994 Revision.*

3. THE STUDY TEAM.

Booz·Allen assembled an experienced and diversified team to conduct the audit. Its members included:

- *Booz·Allen & Hamilton, Inc.* - As the lead consultant, Booz·Allen was responsible for overall project management and for the organization, management, planning, finance, and operational elements of the audit. The firm came to the project with direct experience, having performed a review of the WSF ferry refurbishment program in 1991;
- *M. Rosenblatt & Son, Inc.* - Also a member of the 1991 audit team, Rosenblatt was responsible for the engineering, construction, and technical elements of the 1997 audit;
- *Matt & Associates* - Matt addressed the human resource, compensation, and labor relations aspects of the audit;
- *Fox & Associates* - Fox was responsible for the terminals and for other aspects of the project.

4. THE TECHNICAL REVIEW ADVISORY COMMITTEE.

During the course of the audit, the Booz·Allen team relied on the input and expertise of a Technical Review Advisory Committee (TRAC), which Booz·Allen established at the direction of JLARC in its Request for Proposal (RFP). Composed of a diverse group of marine and technical experts – all of them key stakeholders in WSF – the TRAC provided insight concerning matters related to data and assumptions used in WSF operational and capital planning as well as advice and feedback concerning Booz·Allen's use of data and assumptions during the performance review.

The TRAC met twice during the audit period. The first meeting took place on December 10, 1997, at the Port of Seattle. The second was held in the board room of the Puget Sound Regional Council on January 13, 1998. This report, which details audit findings and recommendations, however, was developed independent of TRAC review and endorsement.

The members of the TRAC are:

- Mr. Michael Martin, Special Projects Director of British Columbia (BC) Ferries;
- Mr. Ches King, Seattle Station Manager of Det Norske Veritas, the Norwegian Ship Classification Society;
- Mr. Roland Webb, President and COO of Todd Pacific Shipyards;
- Mr. David Freiboth, President of the Inland Boatmen's Union of the Pacific;
- Mr. Maynard Willms, Vice President-Engineering of Crowley's Vessel Management Services Inc.;
- Mr. Don Eklund, the King County Auditor;
- Ms. Mary McCumber, Executive Director, and Mr. King Cushman of the Puget Sound Regional Council;
- Mr. Ed Hagemann, naval architect and independent maritime consultant.

5. ORGANIZATION OF THIS REPORT.

In addition to this introduction and Chapter 2, which provides an overview of WSF, the report consists of seven chapters. Each of these chapters focuses on an area of system operations or planning. The chapters are broken into sections, each of which concentrates on a specific topic.

The remaining chapters of this report are as follows:

- Chapter 2, "System and Service Overview." Opening with a brief history recounting the origins of WSF, this chapter provides an overview of the WSF system as it exists today;
- Chapter 3, "Activity Levels, Revenues, and Costs Review and Comparison." This chapter presents the historical performance of WSF activity levels, revenues, and costs and a comparison of WSF with other North American ferry systems;
- Chapter 4, "Organization Structure and Human Resources." Booz·Allen closely examined WSF's organization structure and its human resources capabilities. This chapter presents our findings in regard to organization and management issues. Specific topics include governance, organization structure, staff turnover, compensation, training, labor relations, and general administration;
- Chapter 5, "Operations Review." This chapter presents our findings and recommendations in regard to several key components of WSF operations. Specific topics include the Operations Center, documentation of practices and procedures, emergency planning , communications, and information technology;
- Chapter 6, "Maintenance and Safety of the Fleet and Other Assets." This chapter reviews the current maintenance practices of WSF and presents a number of indicators and findings regarding the condition and safety of the WSF fleet and system;
- Chapter 7, "Construction, Refurbishment, and Preservation Programs." The focus of this chapter is on service, safety, and cost issues associated with refurbished vessels. It also explores preservation partnerships, cost controls, engineering staff levels, and other issues key to fleet modernization;
- Chapter 8, "Long-Range Planning." Addressed in this chapter are WSF's long-term planning process, the state of current fleet and terminals as they relate to long-term needs, and future asset requirements;
- Chapter 9, "Public/Private Partnerships." In the final chapter, we explore the prospects of partnering with private enterprise on selected WSF services. In particular, the focus is on passenger-only and international services.

SYSTEM AND SERVICE OVERVIEW

Chapter Two

It has been 47 years since the formation of the WSF system. In that time, the population of Puget Sound has nearly tripled, and ferry ridership has grown at twice that pace. In keeping with growing demand, WSF has increased its capability and its capacity over the years, gradually building a faster, more modern fleet, with service tailored to meet the needs of its customer base.

Presented in this chapter is an overview of the WSF system and service as they exist today. Preceding the overview is a short history of WSF, which traces the system back to its roots in private enterprise.

1. THE STATE OF WASHINGTON HAS OPERATED THE FERRY SYSTEM SINCE 1951.

In the first half of this century, the ferry operations of Puget Sound were exclusively a private enterprise. Using mostly steam-driven, wood-hulled passenger/cargo ships of varying size and type, several small companies competed for the business of transporting people and vehicles across Puget Sound and from point to point within its boundaries. In the late 1930s, as the growing population and increasing road traffic in the region made the need for larger vessels apparent, the Puget Sound Navigation Company (PSNC) seized an opportunity brought about by the end of the auto-passenger ferry business in San Francisco Bay. In 1940, PSNC purchased six steel-hulled, double-ended, diesel-electric powered vessels from the Bay Area operation. Already the largest of the Puget Sound ferry operators, this purchase made PSNC the dominant force in Puget Sound ferry operations.

By the late 1940s, however, owner-labor relations were taking a toll on PSNC. Facing demands for increased wages and benefits, ferry owners sought state approval for a 30 percent tariff increase, but were granted only a 10 percent increase. Union appeals failed to convince the state to reconsider its decision, and relations between the state, the ferry owners, and the unions deteriorated. In early 1948, PSNC halted service within Puget Sound, and the bulk of cross-sound traffic ceased.

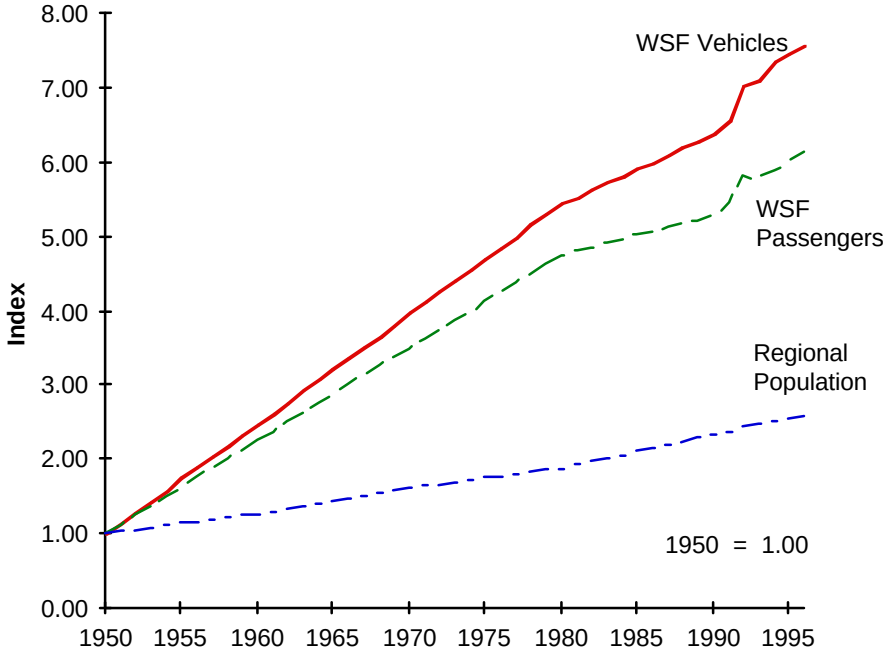
In 1949 the state began a series of steps that culminated in the purchase of PSNC's

assets and operation for $5 million and the creation of WSF on June 1, 1951. WSF assumed ownership of, and responsibility for, 16 vessels and 20 terminals and immediately resumed cross-sound ferry operations on the routes previously operated by PSNC.

2. OVER ITS 47 YEARS OF OPERATION, WSF HAS BECOME AN INCREASINGLY IMPORTANT AND CRITICAL PART OF THE PUGET SOUND TRANSPORTATION SYSTEM.

Nearly 50 years have passed since the creation of WSF, and in that time it has become integral to the transportation system supporting the Puget Sound region. During this period, the population of the seven counties adjacent to Puget Sound has grown slightly more than 2.1 percent per year, from 1.2 to 3.2 million, with ferry ridership increasing nearly twice that rate. Annual growth of ferry passengers has averaged 4.0 percent, rising from 4 million per year at the inception of WSF to 24.6 million in 1996. Even more dramatic has been the growth in the number of vehicles transported. From 1950 to 1996 the number of vehicles transiting Puget Sound via WSF grew from 1.4 million to 10.7 million. This represents an annual growth rate of 4.5 percent. Exhibit 2-1 highlights the relative growth of the Puget Sound population, the ferry traffic, and the WSF fleet, indexing all data to 1950.

EXHIBIT 2-1
Comparison of Growth in WSF Ridership and Vehicles to Puget Sound Regional Population (1950 - 1996)



Source: *WSF, U.S. Department of Commerce, Bureau of the Census, and Booz·Allen analysis.*
Note (*): *Regional population figures are for Island, King, Kitsap, Pierce, San Juan, Skagit, and Snohomish Counties.*

3. WSF DEPLOYS A FLEET OF 25 VESSELS TODAY AND WILL TAKE DELIVERY OF AT LEAST THREE MORE BY 1999.

In order to keep pace with regional growth, WSF has increased system capability and capacity. The fleet purchased by the state in 1951 consisted of a combination of diesel, diesel-electric, and steam powered vessels of both wood-hull and steel-hull construction. Since then, WSF has replaced several of the older vessels with faster, higher-capacity, and more modern vessels. Additionally, several older vessels have been renovated and upgraded to modernize equipment and increase capacity.

As of January 1, 1998, the WSF fleet consisted of a total of 25 vessels. Of these, 22 ferries transport both vehicles and passengers, and the remainder are passenger-only ferries (POF). In addition, plans are in place to expand fleet capacity. In 1998, WSF will take delivery of its second Jumbo Mark II vessel, and a third Jumbo Mark II is scheduled for delivery in 1999. Two POFs will be added to the fleet, one in 1998 and one in 1999, bringing the total inventory of POFs to five. Another four may be added in the future.

Exhibit 2-2 identifies each vessel in operation as of January 1, 1998, by name, class, route, age, and capacity.

EXHIBIT 2-2
Washington State Ferry System Fleet Overview (1997)

Vessel Class	Name	Route	Capacity		Age	Ferry Type
			Passenger	Vehicles		
Jumbo II	Tacoma	Seattle-Bainbridge	2,500	218	1	Auto-Pax
Jumbo	Spokane	Seattle-Bainbridge	2,000	206	26	Auto -Pax
	Walla Walla	Seattle-Bainbridge	2,000	206	26	
Super	Hyak	Edmonds-Kingston	2,500	160	31	Auto -Pax
	Kaleetan	Anacortes-San Juans	2,500	160	31	
	Yakima	Edmonds-Kingston	2,500	160	31	
	Elwha	Anacortes-San Juans	2,500	160	31	
Issaquah	Chelan	Anacortes-San Juans	1,200	100	17	Auto -Pax
	Sealth	Seattle-Bremerton	1,200	100	16	
	Issaquah	Fauntleroy-Vashon/South	1,200	130	19	
	Kitsap	Seattle-Bremerton	1,200	130	18	
	Kittitas	Mukilteo-Clinton	1,200	130	18	
	Cathlamet	Mukilteo-Clinton	1,200	130	17	
Evergreen State	Evergreen State	Anacortes-San Juans	1,000	100	44	Auto -Pax
	Klahowya	Fauntleroy-Vashon/South	1,200	100	40	
	Tillikum	Fauntleroy-Vashon/South	1,200	100	39	
Rhododendron	Rhododendron	Pt. Defiance-Tehlequah	546	65	51	Auto -Pax
Steel Electric	Quinault	Port Townsend-Keystone	616	75	71	Auto -Pax
	Illahee	Fauntleroy-Vashon/South	616	75	71	
	Nisqually	Anacortes-San Juans	616	75	71	
	Klickitat	Port Townsend-Keystone	616	75	71	
Hiyu	Hiyu	Anacortes-San Juans	200	40	31	Auto -Pax
Skagit	Skagit	Seattle-Bremerton	250	0	9	POF
	Kalama	Seattle-Vashon	250	0	9	
Tyee	Tyee	Seattle-Bremerton	317	0	14	POF

Source: WSF.

4. THE WSF FLEET SERVES TEN ROUTES AND 20 TERMINALS, CONNECTING THE WEST SOUND TO THE EAST SOUND.

WSF provides needed connectivity for passengers and vehicles between the West Sound and East Sound regions of the Puget Sound. Currently, WSF provides service on ten routes via 20 terminals. Exhibit 2-3 illustrates WSF's current route structure.

EXHIBIT 2-3
Washington State Ferry System Routes

Source: WSF.

WSF operations primarily provide east-west service. Interestingly, no private ferry service in the State of Washington, vehicle or passenger, directly competes with WSF on any of these routes. However, private ferry operators do provide limited ferry service in the region, including north-south services connecting the mainland and Vancouver Island and POF services to/from the San Juan Islands.

From time to time, WSF augments its regular routes with additional service to meet special needs. For example, in 1979, severe weather destroyed the Hood Canal Floating Bridge. WSF provided barge service between Lofall and South Point until the bridge was returned to service in 1983, in addition to a conventional ferry service for one year in 1982. Also, the Point Gamble-Shine and Edmonds-Port Townsend routes were reconstituted for one year after the bridge was destroyed. In 1989, WSF supplemented auto-passenger service between Seattle and Bremerton with the permanent addition of POF service. In the same year, a new route was opened between Seattle and Vashon Island, offering POF service only.

The level of service on each route varies and is defined by daily trips (including arrivals and departures), hours of operation, and average waiting time. Exhibit 2-4 compares the level of service, including both summer and winter seasons, across each of WSF's ten routes and corresponding 20 terminals. Where differences exist between summer and winter service, the exhibit details summer service levels in brackets.

EXHIBIT 2-4
1997 WSF Service Statistics by Route [1]

Route	Type of Service	Daily Trips (Departures)	Hours of Operation (Daily Hours)	Avg. Boat Waits for Vehicles
Anacortes-Sidney	Auto-Pax	2 (4)	7 (13)	1 (1-2)
Anacortes-San Juans [2, 3]	Auto-Pax	28 (36)	16 (23)	1-2 (1-3)
Keystone-Port Townsend	Auto-Pax	20 (40)	9 (16)	1 (2)
Mukilteo-Clinton	Auto-Pax	72 (82)	21 (22)	1 (2)
Edmonds-Kingston	Auto-Pax	52	20	1 (2)
Seattle-Bainbridge	Auto-Pax	72	21	1 (2)
Seattle-Bremerton	Auto-Pax	28	20	1 (2)
	Pax Only	11	21	1
Seattle-Vashon	Pax Only	17	16	1 (3)
Fauntleroy-Southworth/Vashon[3]	Auto-Pax	42	22	1-2 (1-3)
Pt. Defiance-Tahlequah	Auto-Pax	40	20	1
Total		**384 (424)**	**7-22 (13-23)**	**1-2 (1-3)**

Source: *WSF Service Schedule and Booz·Allen analysis.*
Note (1): *Numbers indicate service provided during winter season. Where numbers are provided in parentheses, these indicate the level of service provided during the summer season.*
Note (2): *San Juan service includes Orcas, Shaw, Lopez, and Friday Harbor.*
Note (3): *Daily trips indicate arrivals and departures to Anacortes or Fauntleroy destinations only.*

As Exhibit 2-4 indicates, the most frequent service and the longest hours of operation are provided on WSF's core commuter routes, which are Mukilteo-Clinton, Edmonds-Kingston, Seattle-Bainbridge, Seattle-Bremerton, and Fauntleroy-Southworth/Vashon. The exhibit also highlights the variance in service levels across the year, with increased capacity being provided on some routes during WSF's peak summer season for both passengers and vehicles. In many cases, this increase in capacity is insufficient to support peak summer demand for vehicles, resulting in an increase in average boat waits. A "boat wait" is a service indicator of how long vehicles will have to wait prior to transiting Puget Sound (e.g., a customer will have to arrive while a boat is loading to board the next vessel to arrive [one "boat wait"], or the second vessel to arrive [two "boat waits"], and so on). Similar increases in delays for walk-on passengers have not occurred.

Although fleet size and capacity have increased over the years to support increasing demand and frequency of service on many routes, corresponding terminal improvements and investments have not maintained a similar pace. In fact, little change in terminal capacity and infrastructure has occurred to support demand and service change over the 47-year existence of WSF. Vehicle holding capacities have been increased at some terminals, but many lack sufficient capacity or designs to support current and future vehicle demand. The lack of adequate terminal capacity and the need for general improvements are becoming strategic issues that will affect the system's future performance and growth, and is addressed in detail in Chapter 8.

5. WSF'S 1997 CUSTOMER BASE INCLUDED 24.8 MILLION PASSENGERS AND 10.9 MILLION VEHICLES. TWO-THIRDS WERE COMMUTERS ON HIGH-VOLUME ROUTES.

The primary customer market served by WSF is commuters. In 1997, some 66 percent of all passengers and vehicles originated from commuter traffic. The remaining 34 percent included tourists, business travelers, and infrequent users.

Exhibit 2-5, which presents WSF's activity level and customer mix for 1997, highlights the commuter focus of WSF. The exhibit demonstrates that demand for commuter service on the three routes connecting with the Seattle terminal is higher than commuter demand on all other routes. Commuter traffic on these routes accounts for 65 percent to 88 percent of total traffic. In fact, a significant percentage of all 1997 traffic originated from or was destined to the Seattle terminal (nearly 39 percent of total passengers and 28 percent of total vehicles handled by WSF). Additionally, total activity on WSF's five primary commuter routes accounted for nearly 85 percent of all passenger and vehicle traffic in 1997. This concentration of market and customer base is further compounded by daily peak/non-peak demand and seasonal trends across all routes.

EXHIBIT 2-5
1997 Activity and Customer Mix by Service Route

Route	Activity (in Millions)		Customer Mix	
	Pax	Vehicles	Commuter	Other
Seattle-Bainbridge*	6,739	2,246	70%	30%
Mukilteo-Clinton*	4,296	2,334	60%	40%
Edmonds-Kingston*	4,132	2,067	50%	50%
Fauntleroy-Southworth/Vashon*	3,168	1,857	50%	50%
Seattle-Bremerton*	2,642	732	65%	35%
Anacortes-San Juans	1,758	782	10%	90%
Keystone-Pt. Townsend	846	381	15%	85%
Pt. Defiance-Tehlequah	800	460	53%	47%
Seattle-Vashon	267	n/a	88%	12%
Anacortes-Sidney	185	53	12%	88%
Total	**24,833**	**10,912**	**66%**	**34%**

Source: WSF Traffic Statistic System, WSF Origin-Destination Survey, and Booz·Allen analysis.
Note(*): Primary commuter services as defined by annual passenger and vehicle volumes.

Looking more broadly at the 1990s, annual traffic volumes have averaged more than 23 million passengers and 10 million vehicles. Exhibit 2-6 illustrates the scope of annual and daily operations completed by WSF in 1997, when passenger service topped 24 million. The exhibit highlights WSF volumes achieved in terms of customers served, trip totals, and vessel mileage.

EXHIBIT 2-6
1997 WSF Operating Statistics

Statistic	1997	Average per Day
Passengers	24,833,000	68,036
Vehicles	10,912,000	29,896
Revenue Trips	178,000	485
Vessel Mileage	1,310,000	3,600

Source: WSF Traffic Statistic System and Booz·Allen analysis.

By all accounts, the magnitude of WSF's activity is large. In fact, as the data presented in the next chapter demonstrates, WSF's annual and daily level of customer and operational activity is one of the largest in North America.

ACTIVITY LEVELS, REVENUES, AND COSTS REVIEW AND COMPARISON

Chapter Three

Any organization concerned with how efficient or effective its product or service offering is has a number of ways to measure results. The approaches used most frequently include the following:

- Comparison of a period's performance with its plan or budget;
- Solicitation of user or customer responses or inputs;
- Comparison with historical performance or experience; and
- Comparison with other firms or organizations in the same or similar business.

None of the above is an ideal choice. In fact, an independent review might reject the first alternative as providing nothing more than assurance that results achieve a self-fulfilling prophesy because budget objectives are established by the organization. With this approach eliminated, an audit approach might focus on the three remaining alternatives.

In this chapter, Booz·Allen presents findings resulting from a review of WSF activity levels, revenues, and costs using a combination of the third and fourth approaches: comparisons of WSF's current performance with its own historical performance and with the performance of other ferry organizations. During the audit, Booz·Allen also applied the second approach, evaluating customer attitudes and opinions. The results of that approach are treated in Chapter 6.

Our review of WSF's historical performance covers the last three bienniums, or the six-year period that includes Fiscal Year (FY) 1992 through FY 1997. This period covers the time that has elapsed since Booz·Allen conducted a study of WSF vessel refurbishment programs in 1991. This time series is reasonable on its face in light of the refurbishment audit. However, it is also supported by a very practical consideration, i.e., that WSF's Financial Information Reporting System (FIRS) can only access information after 1991. Consequently, such data have only been collected and reported in a consistent fashion over the time period covered in this review.

In our comparison of WSF with other ferry systems, the audit compared specific attributes or characteristics of WSF with other systems or peer organizations. This is sometimes referred to as "benchmarking." The audit did not compare the system with, or against, best practices, as the required data to define or determine best practices was either not available or inadequate to make a "best practices" determination for the ferry industry. Accordingly, comparisons were made with a number of ferry systems without determining how efficient these other systems, or benchmarks, may be. The evaluations were made at three levels:

- First, comparisons with several ferry systems without distinguishing the type of system;
- Second, a finer level of comparison with auto-passenger ferry operations;
- Third, more specific comparisons with the ferry system deemed to be most similar to WSF.

The objective of each level of comparison was to determine how the WSF compares with its peers in the category being evaluated. Comparisons where the WSF was at the head or in the middle of the sample resulted in a conclusion that the WSF performance is effective or reasonable. Areas where the WSF lagged behind other operations warranted special attention or emphasis.

1. OVER THE PAST SIX YEARS, GROWTH IN SERVICE LEVELS HAS EXCEEDED INCREASES IN OPERATING COSTS.

Activity levels at WSF have grown in each of the six years covered in the historical performance review. At the same time, the costs of operating the system have been contained.

1.1 Depending on the measure used, WSF activity levels have grown from 0.8 percent to 2.4 percent each year since 1991.

As noted in Chapter 2, "System and Service Overview," the demands on WSF have been sustained during the 1990s. As indicated in Exhibit 3-I, which depicts system demand over each of the last six years, this holds true in terms of passenger and vehicle ridership, trips made, and vessel mileage.

V. EXHIBIT 3-1
WSF Activity Trends 1992–1997
(Passengers and Vehicles in Millions, Trips and Miles in Thousands)

Activity	Fiscal Year						Annual
	1992	1993	1994	1995	1996	1997	Growth *
Passenger Ridership	23.0	22.8	23.7	23.9	24.6	24.9	1.6%
Vehicles Transited	9.7	9.9	10.4	10.6	10.7	10.9	2.4%
Trips**	141	140	144	148	149	150	1.2%
Vessel Miles**	900	906	914	922	930	937	0.8%

Source: *WSF Traffic Statistic System and Booz·Allen analysis.*
Note (*): *Compounded Annual Growth Rate.*
Note (**): *1994 and 1996 trips and vessel miles estimated.*

As the exhibit shows, the number of trips and miles traveled increased about 1 percent each year over the six-year period. The number of passengers and vehicles transported increased by 1.6 percent and 2.4 percent respectively, each year.

1.2 After adjusting for inflation, system operating costs per unit of production have either leveled off or modestly declined over the period, indicating that productivity has been maintained or increased.

An overall performance indicator is the cost required to produce a unit of product or service. To determine this cost for WSF, Booz·Allen analyzed WSF system activity levels, operating revenue, and operating costs. Exhibit 3-2, on page 4, presents operating revenue and expense for the period FY 1992 through FY 1997. For a history of activity covering the same period, refer back to Exhibit 3-1.

Exhibit 3-2, which is presented in 1997 dollars, shows that operating revenues have grown from $79.0 million in 1992 to $81.6 million in 1997, or less than 1 percent each year. Over the same period, total operating expenses grew from $112.1 million to $123.2 million, or nearly 2 percent (in 1997 dollars) each year. The result has been an operating income deficit that has increased nearly 5 percent per year.

The exhibit also includes a provision for depreciation and an estimate for net income. After depreciation, net income and farebox recovery are declining even faster than operating income. This deterioration in performance is more the result of a lack of growth in revenues than of cost escalation. WSF, however, does not have direct control over fare policy, and it lacks the ability to diversify the revenue base. Therefore, a better measure of productivity can be found in the relationship between cost levels or growth and the units of production, i.e., the volume of vehicles and passengers carried. This is presented in Exhibit 3-3 (page 5).

EXHIBIT 3-2
WSF Financial Trends
(In Millions of 1997 Dollars)

WSF Financial Trends	1992	1993	1994	1995	1996	1997	Annual Growth
Revenues:							
– Fares	77.1	75.0	72.5	81.5	79.8	79.7	0.7%
– Miscellaneous	1.9	0.7	4.6	2.0	2.0	1.9	0.0%
Subtotal	*79.0*	*75.7*	*77.1*	*83.5*	*81.9*	*81.6*	*0.6%*
Expenses:							
Vessel:							
– Labor	51.8	54.5	54.2	52.3	53.6	53.7	0.7%
– Fuel	10.9	12.4	10.8	10.2	11.5	11.3	0.7%
– Other	8.2	8.3	7.7	8.0	6.2	6.5	-4.5%
Subtotal	*70.9*	*75.1*	*72.7*	*70.6*	*71.3*	*71.4*	*0.1%*
Terminal:							
– Labor	11.2	11.8	13.4	13.1	13.7	13.6	4.0%
– Other	3.2	3.5	3.7	4.0	3.0	3.2	0.0%
Subtotal	*14.4*	*15.4*	*17.1*	*17.0*	*16.7*	*16.8*	*3.1%*
Maintenance:							
– Labor	9.0	8.5	9.1	9.0	10.0	9.3	0.7%
– Vessel	6.0	5.9	7.3	6.3	5.8	7.3	4.0%
– Terminal	1.9	1.9	2.5	2.7	2.8	3.2	11.0%
– Other	0.2	0.2	0.1	0.2	0.1	0.0	-100.0%
Subtotal	*17.1*	*16.5*	*19.0*	*18.2*	*18.7*	*19.8*	*3.0%*
Management & Support:							
– Labor	4.5	5.6	5.4	5.3	5.6	5.8	5.2%
– Other	5.2	4.7	5.0	6.1	7.4	9.5	12.8%
Subtotal	*9.7*	*10.3*	*10.4*	*11.4*	*13.0*	*15.2*	*9.4%*
Total Expenses	*112.1*	*117.3*	*119.3*	*117.2*	*119.7*	*123.2*	*1.9%*
Operating Income	-33.1	-41.7	-42.2	-33.7	-37.8	-41.8	4.7%
Farebox Recovery (Operating Cost)	70%	64%	65%	71%	68%	66%	-1.3%
Annual Depreciation*	32.5	30.0	32.2	35.7	39.4	44.2	6.3%
Net Income (With Depreciation)	-65.6	-71.6	-74.4	-69.4	-77.2	-85.8	5.6%
Full Farebox Recovery (Operating Costs and Depreciation)**	55%	51%	51%	55%	51%	49%	-2.3%

Source: WSF BEARS Report, WSF Budget Office, and Booz·Allen analysis.

Note(*): Annual depreciation represents the value of WSF capital assets (including vessels, terminals, office equipment, Eagle Harbor facility, etc.) utilized by its employees in providing and maintaining service over the fiscal year. Annual depreciation is estimated assuming straight line depreciation over a 25-year period of annual capital expenditures from 1967 to date.

Note(**): WSF currently defines "farebox recovery" as the percent of annual operating cost recovered by collected farebox revenues. Full farebox recovery is equal to the percent of total annual operating costs plus depreciation recovered by collected farebox revenues and is more indicative of WSF's recovery of total operating costs.

EXHIBIT 3-3
WSF Operating Cost Performance and Annual Growth Rate
(In 1997 Dollars)

Performance Indicator	Unit Costs Per Year					
	1992	1993	1994	1995	1996	1997
Cost Per Passenger	4.88	5.14	5.04	4.90	4.87	4.95
Cost Per Passenger Mile	.71	.74	.72	.74	.70	.72
Cost Per Vehicle	11.55	11.86	11.51	11.06	11.15	11.29
Cost Per Vessel Mile	124.48	129.49	130.49	127.12	128.76	131.45
Cost Per Trip	795.42	835.89	828.46	794.27	805.20	822.73

Performance Indicator	Annual Percentage Change (Year to Year)					
	1992	1993	1994	1995	1996	1997
Cost Per Passenger	n/a	5.3%	-1.9%	-2.8%	-0.6%	1.6%
Cost Per Passenger Mile	n/a	4.2%	-2.7%	2.7%	-5.4%	2.8%
Cost Per Vehicle	n/a	2.7%	-3.0%	-3.9%	0.8%	1.3%
Cost Per Vessel Mile	n/a	4.0%	0.8%	-2.6%	1.3%	2.1%
Cost Per Trip	n/a	5.1%	-0.9%	-4.1%	1.4%	-2.2%

Source: WSF BEARS Report and Booz·Allen analysis.

The costs displayed in this exhibit, which are based on traffic and cost data from Exhibits 3-1 and 3-2, indicate that costs per unit of service, or production, have been held constant or have declined slightly. Therefore, productivity levels have been maintained or have slightly increased over the six-year period analyzed.

Because employee or labor costs represent 67 percent of the total system operating cost, it is useful to test the conclusion just developed by analyzing staffing levels and utilization. Booz·Allen performed that analysis, and the results are presented in the next section.

2. STAFF UTILIZATION LEVELS AND PRODUCTIVITY HAVE IMPROVED OVER THE LAST SIX YEARS.

The demand for passenger ferry services has grown 2.5 percent since 1991, and the demand for vehicle ferry services has grown 4.0 percent in the same time period. Operating costs have grown as well, but at a lesser rate. Staff levels and operating costs are examined in considerably more detail below.

2.1 Staff levels have increased by 9 percent since 1991, or about 2 percent per year.

Staff levels have increased in all operations categories and in most categories of management and support over the six-year period evaluated during the performance audit. Exhibit 3-4 presents the total staff levels at WSF for each of the three bienniums.

EXHIBIT 3-4
WSF Biennium Staff Levels 1991– 1997

Category	Biennium 91/93	93/95	95/97	Growth Annual	4-Year
Operations:					
- Vessel	964	945	995	0.8%	3.2%
- Terminal	322	331	372	3.7%	15.5%
- Maintenance	100	110	111	2.6%	11.0%
Subtotal Operations	*1,386*	*1,386*	*1,478*	*1.6%*	*6.6%*
Management & Support:					
- Mgrs., Admin. & Support	104	109	121	3.9%	16.3%
- Vessel Engineering	31	38	47	11.0%	51.6%
- Terminal Engineering	34	41	47	8.4%	38.2%
Subtotal Mgmt. & Support	*169*	*188*	*215*	*6.2%*	*27.2%*
Total	1,555	1,574	1,693	2.1%	8.9%

Source: WSF and Booz·Allen analysis.

As Exhibit 3-4 indicates, the total WSF staff has increased by 8.9 percent over the four-year period between the 1991/1993 and the 1995/1997 bienniums. In total, operations staff increased by 92 positions, and management and support staff grew by 46 positions. Growth in operations staff as a percent of total was less than management and support, totaling 6.6 percent. This growth was the result of recent staffing increases to address service changes (i.e., extended operating hours and additional vessel runs) and increasing traffic congestion at some terminals. Growth in management and support was 27.2 percent between the 1991/1993 and 1995/1997 bienniums. The vessel engineering and terminal engineering departments accounted for the majority of management and support growth, averaging 51.6 percent and 38.2 percent, respectively, since 1991/1992. Growth in these departments is correlated with or explained by recent expansion of WSF vessel and terminal design and construction programs.

As shown in Exhibit 3-5, the growth in staff has not been accompanied by a corresponding per unit growth in operating expenses. The exhibit compares key cost elements per appropriate staff over the past six years.

EXHIBIT 3-5
WSF Staff-Related Costs 1991-1997
(In 1997 Dollars)

Performance Measure	Biennium 91/93	93/95	95/97
Total Vessel Cost/Vessel Employee	$77,993	$74,662	$71,775
Total Terminal Cost/Terminal Employee	$47,672	$51,385	$45,183
Total Maintenance Cost/ Maintenance Employee	$165,017	$165,842	$177,989
Total Administration Cost/ Administration Employee	$99,342	$104,752	$125,919
Total Costs/ Total Employees	$75,441	$74,476	$72,780

Source: WSF Two-Year Operations Reports, WSF Dept. of Human Resources, and Booz·Allen analysis.

Exhibit 3-5 shows that, with the exception of administrative costs per staff member, costs per employee have either declined over time or not changed significantly, depending upon employee category. This suggests that costs have been managed over the sample period. An additional measure of staff utilization is the number of passengers and vehicles transmitted per full-time employee, and these data also support the finding that staffing and costs are under control and have been held close to inflation and system growth. The ratio of passengers to total employees has increased slightly from 14,662 passengers per employee in 1991/1993 to 14,708 passengers per employee in 1995/1997. Similarly, the number of vehicles per employee increased from 6,367 to 6,438 per employee over the same period.

3. WSF IS COMPARABLE TO OTHER FERRY SYSTEMS IN TERMS OF COST PER PASSENGER AND VEHICLE BECAUSE OF THE VERY HIGH VOLUMES AND DENSITY THAT CHARACTERIZE THE SYSTEM.

Because no best practices standards exist, no absolute conclusion may be drawn regarding the effectiveness of the WSF system from the results of the historical performance analysis described above. However, the analysis indicates probable improvement over time in terms of both operating cost control and staff utilization. The results of Booz·Allen's benchmark analysis, i.e., comparisons of WSF with other ferry systems, generally supports this synopsis.

3.1 WSF is generally comparable to other passenger and auto-passenger ferry systems in the U.S.

A comparison of WSF with other large U.S. ferry systems in terms of cost per passenger-mile shows that WSF is generally comparable. Exhibit 3-6 identifies the ten large ferry systems in the United States receiving federal assistance, comparing them in terms of total passenger-miles and operating costs per passenger-mile.

EXHIBIT 3-6
Passenger Volumes and Operating Costs per Passenger-Mile of the Ten Large U.S. Ferry Systems

Ferry System	Annual Passenger-Miles (In Thousands)	Operating Costs per Passenger-Mile *
WSF	110,360	$1.03
Staten Island	90,121	$0.34
San Francisco - Golden Gate	14,429	$0.77
San Francisco - Vallejo	6,461	$0.30
Boston Water Shuttle	6,458	$0.73
Port Authority (PATH - NY, NY)	4,065	$1.17
San Francisco - Alameda	2,761	$0.70
Portland - CBL	2,537	$0.77
New Orleans - Crescent City	1,072	$1.93
San Juan Port Authority	1,575	$3.90
Average	23,826	$1.16

Source: 1995 National Transit Summaries and Trends, U.S. DOT, and FTA.
Note(*):If San Juan Port Authority were dropped from the list, WSF's cost would be above average.

The exhibit shows that WSF passenger-mile volumes are more than 20 percent higher than the next largest system and over five times the average volume of the ten largest systems. It also shows that, at an operating cost of $1.03 per passenger-mile, WSF is below the average and slightly above the median in terms of cost. However, if the highest per-passenger cost system (San Juan Port Authority) were removed from the exhibit, WSF would be above the average.

It should be noted that the above systems vary significantly in terms of type of service (e.g., many do not carry vehicles), type of ownership (e.g., four are privately owned), vessel types, route length, and route complexity. Consequently, no major conclusions should be drawn from Exhibit 3-6. A more meaningful comparison may be made of systems that accommodate both passengers and vehicles.

Four other systems in North America serve relatively large-scale passenger and vehicle markets. These are:

- BC Ferries;
- North Carolina State Ferry System;
- The Staten Island Ferry System;
- The Woods Hole, Martha's Vineyard and Nantucket Steamship Authority.

Exhibit 3-7 identifies the governance structure and describes the top-level system elements of these four systems as well as WSF.

EXHIBIT 3-7
Governance and System Descriptions of Five Auto-Passenger Ferry Systems

Category	WSF	BC Ferries	North Carolina	Staten Island	Steamship Authority
Ownership and Governance Structure	Public State Agency (WSDOT)	Public Crown Corporation	Public State Agency (DOT)	Public City Agency	Public Independent Authority
Number of Routes	10	24	7	1	3*
Fleet Size	25	40	23	7	7
Number of Ferry Classes	10	26	3	3	7
Number of Terminals	20	42	13	2	5
Number of Employees	1,693	3,320	393	536	609

Source: Survey of five ferry systems and Booz·Allen analysis.
Note (*): Includes service between seven origin-destination points over three primary routes.

WSF and the North Carolina systems are both part of the Department of Transportation of the state, and the Staten Island system is an agency of the city of New York. The Steamship Authority system is an autonomous authority, and BC Ferries is a Canadian Crown corporation.

In terms of assets and employee levels, WSF and the BC Ferries are considerably larger than the other three systems and thus, most comparable. However, BC Ferries is considerably larger than WSF when considering just the above parameters.

3.2 Traffic levels and route densities are considerably more intensive in the Washington State system.

As illustrated in Exhibit 3-8, WSF traffic levels and route densities are more intensive than those of the other large systems to which it was compared. The exhibit compares the activity levels of the five systems during 1996.

EXHIBIT 3-8
Comparison of 1997 Operating Statistics of Five Auto-Passenger Ferry Systems

Activity Statistic	WSF	BC Ferries	North Carolina*	Staten Island	Steamship Authority
Passengers (Millions)	24.9	22.3	1.1	16.9	2.6
Vehicles (Millions)	10.9	8.2	1.0	0.4	0.6
No. of Voyages (Thousands)	150	346	74	n/a	19
Vessel Miles (Thousands)	937	1,447	405	161	n/a
Percent Commuters **	63%	33%	44%	n/a	n/a

Source: Survey of five ferry systems and Booz·Allen analysis.
Note(*): Volume increased to adjust for impact of hurricanes.
Note(**): Represents commuters as a percent of total passengers.

An inspection of the exhibit leads to several conclusions concerning similarity or differences among the five systems. First, the WSF, BC Ferries, and Staten Island systems have high passenger densities. The two remaining systems are not comparable in passenger traffic. Secondly, the Washington and British Columbia systems carry a comparable number of vehicles (WSF is the highest), while the other three have much lower vehicle volumes. WSF is second to BC Ferries in terms of annual voyages and miles traveled. Finally, the WSF system transports a much higher percentage of commuters than any of the other systems for which this figure is known with the probable exception of Staten Island. This difference, more than any other, sets the WSF system apart.

3.3 The cost per unit of service is lower on WSF than on the other auto-passenger systems, while costs per employee are higher.

A comparison of WSF with the same four systems reveals that WSF compares favorably with other auto-passenger systems in terms of total cost per passenger, per vehicle, and per mile.[1] However, only one other system has a higher cost per employee. Exhibit 3-9 presents the operating costs of the five systems in terms of these service delivery characteristics.

[1] Of the five ferry systems compared, only WSF and BC Ferries operate passenger-only ferries. However, in both cases, the majority of total costs and annual activity is generated by auto-passenger ferry activity.

EXHIBIT 3-9
Comparison of 1997 Total System Operating Costs on Five North American Ferry Systems

Benchmark	WSF	BC Ferries*	North Carolina	Staten Island	Steamship Authority
Cost per Passenger	$4.95	$11.37	$18.30	$1.90	$14.80
Cost per Vehicle	$11.29	$14.83	$19.50	$88.60	$70.00
Cost per Vessel-Mile	$131.45	$174.94	$50.00	$389.00	n/a
Cost per Employee	$72,780	$76,248	$55,132	$60,821	$55,068

Source: *WSF data and other ferry operator input.*
Note (*): *Canadian dollars converted at a rate of $1.35 CD = $1.00 USD.*

In terms of operating cost per passenger and vehicle, WSF is the lowest of the five systems evaluated. WSF also maintains the second lowest cost per vessel- mile due to its relatively high annual vessel-miles. Correspondingly, cost per employee at WSF is higher than three of the other four systems, indicating that each employee absorbs more of the total operating costs of the system. While the above comparison is limited and disregards differences in the structure and size of each operation, it indicates WSF's relatively favorable cost position and productivity of its staff, in light of higher wage levels of maritime employees in Washington and British Columbia.

4. WSF IS GENERALLY COMPARABLE TO THE BRITISH COLUMBIA FERRY SYSTEM IN BOTH STAFFING AND OVERALL SYSTEM ECONOMICS.

It is apparent from the preceding exhibits that only one other system in North America is reasonably comparable to WSF, and that is the BC Ferries system. In this section, a comparison of the two systems is made at a greater level of detail. Particular emphasis is placed on relative staffing levels and underlying system economics.

4.1 The staff size of the British Columbia system is comparable to that of the WSF, after consideration of the number of vessels and terminals in their respective operations.

The British Columbia system employs more people than WSF in almost every labor category, and in total, its staff outnumbers that of WSF more than two to one. Exhibit 3-10 compares the staffing levels of the Washington and British Columbia ferry systems.

EXHIBIT 3-10
Employment on the WSF and BC Ferry Systems

Employee Category	WSF		BC Ferries	
	No.	% of Total	No.	% of Total
Fleet Staff	995	59%	1,453	31%
Terminal Staff	372	22%	790	17%
Maintenance	111	7%	210	5%
Technical Staff/Engineers	94	6%	60	1%
Management & Support	121*	7%	585	13%
Subtotal Ferry Operation	*1,693*	*100%*	*3,098*	*67%*
Other Staff	0	0%	1,532**	33%
Total	1,693	100%	4,630	100%

Source: WSF Dept. of Human Resources, BC Ferries, and Booz·Allen analysis.
Note(*): Includes MIS department of 22 employees including contract staff from WSDOT.
Note (**): Includes Catamaran Ferries International staff and vessel catering staff.

VI.

At a comparable level, the Washington system employs 1,693, while the British Columbia system employs nearly twice that, or 3,098, and a higher percentage of the WSF (59 percent vs. 31 percent) serves onboard the fleet. While the Washington system employs a higher percentage of technical and engineering staff, the British Columbia system has a correspondingly higher proportion of management and support personnel.

In total, the British Columbia system employs nearly twice as many people as WSF to transport roughly the same number of passengers and vehicles. In Victoria, some 1,310 additional employees are assigned to the catering functions, while this concession function is outsourced at WSF, and therefore not included in the WSF head count. The concession employees of either system are not included in any subsequent analysis and comparisons.

The above comparison, however, does not consider the difference in system infrastructure maintained and operated by each respective ferry system's staff. To compensate for these differences, a comparison of WSF and BC Ferries was completed against a number of staffing performance measures. Exhibit 3-11 highlights the results of this analysis.

EXHIBIT 3-11
Comparison of Staffing Performance Measures Between the WSF and BC Ferry Systems

Staffing Performance Measure	WSF	BC Ferries
Fleet Staff per Vessel	39.8	36.3
Terminal Staff per Terminal	18.6	18.8
Maintenance Staff per Vessels and Terminals	2.5	2.5
Total Employees per Management & Support Sta	13.91	7.91

Source: WSF Dept. of Human Resources, BC Ferries, and Booz·Allen analysis.

The exhibit indicates that WSF and BC Ferries are generally comparable regarding operating staff per vessel and/or terminal, with variances being explained by differences in fleet, terminal, and operating practices between the two systems. In contrast, the exhibit also demonstrates that WSF is more prudent or efficient in the use of its administrative staff, where the number of employees per management and support staff is greater than that found at BC Ferries. This is primarily due to the significantly higher number of clerical and administrative staff at BC Ferries.

4.2 WSF generates lower revenue levels, but also incurs lower costs than the British Columbia system.

British Columbia garners higher per-unit and total passenger revenues than WSF. Consequently, it enjoys higher farebox recoveries and a relatively lower deficit (requiring less subsidy) in percentage terms. However, because fares (and subsequently revenues) represent a political or policy issue that is beyond the control of WSF management, very little can be drawn from these revenue comparisons in terms of the efficiency and effectiveness of either system.

Costs are a different matter. In nearly all categories, unit costs in the Washington system are lower than those in British Columbia. Margins, though, are higher in British Columbia both before and after a provision for depreciation. This suggests more of a relationship between revenues and expenses in the British Columbia system than in Washington. Exhibit 3-12 compares the key economic characteristics of the two systems.

EXHIBIT 3-12
Comparison of the System Economics Between the WSF and BC Ferry Systems

Revenue/Cost Category	WSF	BC Ferries
Revenue/Passenger	$3.28	$9.74
Revenue/Passenger-Mile	$0.47	$0.51
Revenue/Employee	$48,209	$65,352
Vehicle Utilization	71%	53%
Passenger Utilization	13%	31%
Cost/Passenger	$4.95	$11.37
Cost/Passenger-Mile	$0.72	$0.59
Cost/Vehicle	$11.29	$14.83
Cost/Vessel-Mile	$131.45	$174.94
Cost/Employee	$72,780	$76,248
Farebox Recovery	66%	86%
Farebox Recovery w/Depreciation	49%	78%

Source: WSF, BC Ferries and Booz·Allen analysis.

As noted in the exhibit, WSF lags behind BC Ferries in generation of total and per-unit revenues. BC Ferries also maintains higher passenger capacity utilization of fleet capacity, but WSF maintains higher utilization of its vehicle capacity. WSF's lower utilization of passenger capacity (15 percent as opposed to 31 percent for BC Ferries) and higher utilization of vehicle capacity (71 percent as opposed to 53 percent for BC Ferries) is reflective of each system's fleet, customer mix, and service frequency.

Cost per passenger-mile, in conjunction with cost per vessel-mile, are the truest indicators of overall cost performance for a ferry system. The exhibit demonstrates that WSF compares favorably in all cost categories except cost per passenger-mile, and here WSF's costs are 22 percent higher than BC Ferries. This cost advantage to BC Ferries reflects the lower passenger utilization of the WSF system. In contrast, WSF's cost per vessel-mile are 25 percent lower than BC Ferries, indicating favorable overall costs performance of the WSF fleet when disregarding utilization.

Finally, and importantly, WSF fares poorly in farebox recovery rate comparisons. The discrepancy in actual farebox recovery rates (66 percent for WSF versus 86 percent for BC Ferries) and farebox recovery rates including annual depreciation (49 percent for WSF versus 78 percent for BC Ferries) can be explained to a large degree by WSF's lack of control over established fares and by system operating cost-recovery objectives. Interestingly, the audit found that tariff increases of 30 percent would be required to achieve BC Ferries' current farebox recovery of 86 percent.

5. CONCLUSION.

In this chapter, the operating performance of WSF was compared historically over a six-year time period. It was also compared to other ferry systems with respect to system infrastructure, activity levels, management and organization, governance environment, and financial performance, among others. Because there is no universal definition of efficiency within the ferry industry against these parameters, no definitive conclusions may be drawn concerning how efficiently the system has historically or is currently operated. However, the information presented in this chapter indicates that there has been improvement over time in terms of employee productivity and costs per employee. In addition, based on a high-level analysis of other ferry systems, the WSF system is generally comparable to, or performs better, than other ferry systems in terms of key operating parameters. The development of more specific conclusions would require additional research and analysis which could not be completed in the scope of the performance audit.

ORGANIZATION STRUCTURE AND HUMAN RESOURCES

Chapter Four

Key to the success of any organization is the structure on which it is built and the human resources system that rests at its core. As part of this performance audit, Booz·Allen closely examined the organization structure of the WSF system and its human resources capabilities. In this chapter, we present our findings in these areas. They are based on more than 100 staff interviews; interviews with staffs of other public agencies in the state, the county, and the city of Seattle; and reviews of salary surveys and policy, procedures, training manuals, and other documentation.

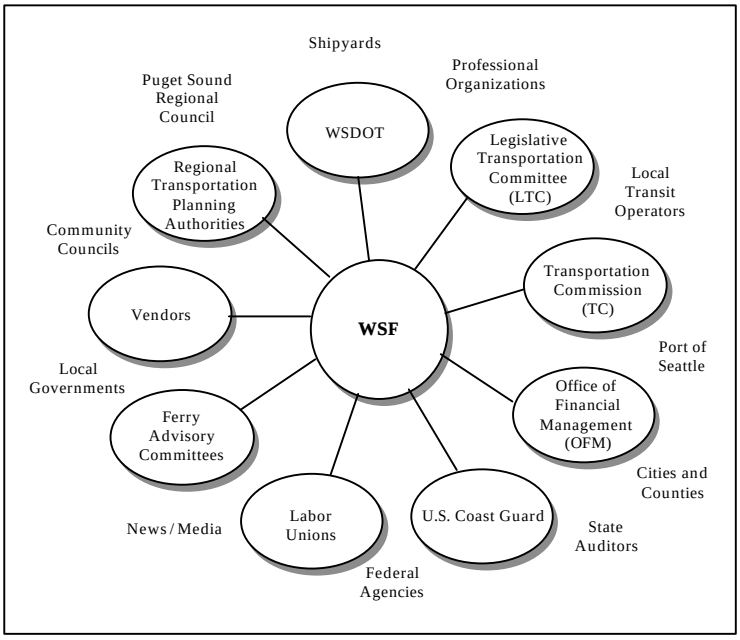
On the following pages, both organization and management issues are identified and evaluated. More specifically, the chapter addresses governance, organization structure, staff turnover, compensation, training, labor relations, and general administration.

1. WSF'S DIVERSITY OF STAKEHOLDER INTERESTS IMPEDES ITS ABILITY TO MANAGE AND OPERATE IN THE MOST EFFECTIVE AND EFFICIENT MANNER.

As shown in Exhibit 4-1 on page 2, more than 20 organizations have control or influence over the WSF system. In the conduct of its day-to-day business, WSF is responsible to each of them.

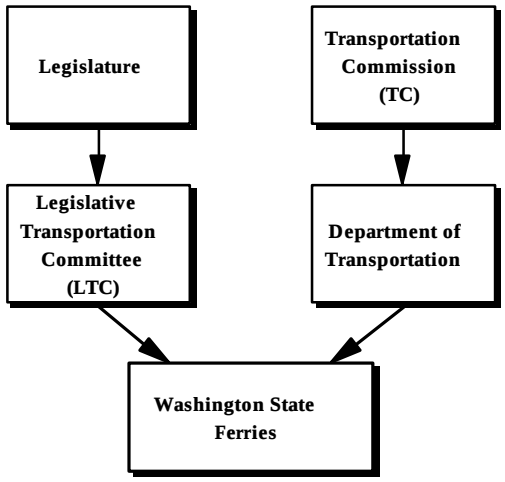
These groups may be placed into one of two stakeholder categories: governance bodies or business constituencies. The interests of these groups vary widely and often are in conflict, and WSF spends a great deal of time reconciling differences between groups and developing compromise. Even the governance structure that makes policy and oversees ferry operations is not unified, as shown in Exhibit 4-2.

EXHIBIT 4-1
WSF Stakeholders



Source: Booz·Allen analysis.

EXHIBIT 4-2
Existing Governance Structure of Washington State Ferry



Source: Booz·Allen analysis.
Note: TC appointed by Governor's Office.

The exhibit shows that both the legislature and the administration have oversight of WSF. The legislature exercises its oversight through the Legislative Transportation Committee (LTC) while the administration supervises through the Transportation Commission (TC) and WSDOT.

The Booz·Allen audit found that the needs, demands, and expectations of each WSF constituency vary. The audit also found a high level of review and scrutiny of WSF, resulting in the continual diversion of management and staff resources to address current issues. This results in WSF, at times, fostering a more reactive than proactive organization and culture.

2. THE CURRENT WSF ORGANIZATION STRUCTURE IS INVERTED, WITH SENIOR MANAGEMENT HAVING NUMEROUS DIRECT REPORTS AND LOWER MANAGEMENT HAVING FEW.

Critical to the effectiveness and efficiency of any business is its organization structure and management team. This section evaluates WSF's current organization and management team.

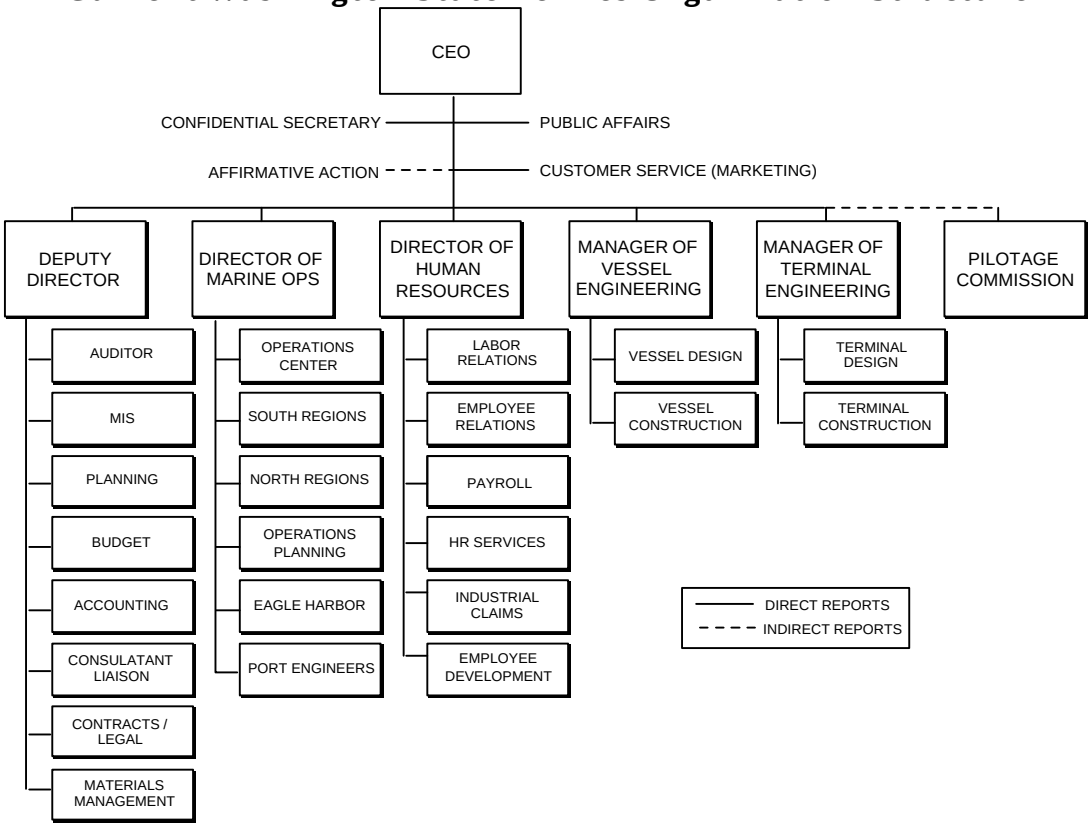
During this review, we conducted interviews with WSF managers and supervisors and with representatives of other ferry operations. We also reviewed organization and job descriptions for all staff and solicited input and advice from the Technical Review Advisory Committee (TRAC) and Booz·Allen organization experts.

To develop the understanding of WSF's organization that we needed in order to evaluate its adequacy, we completed a review of past, current, and planned organizational structure. Exhibit 4-3, on the following page, illustrates the WSF organization structure that has been in place since 1995.

A review of earlier organization charts revealed that organizational changes recommended in the 1991 Booz·Allen refurbishment study report have either been implemented, or that their intent has been met.[1] Additionally, a review of organization charts existing prior to 1995 indicates a Finance & Administrative Division that combine today's Deputy Director (who oversees current non-human resource finance and administrative functions within WSF) and Director of Human Resource positions. Organizational experts and TRAC indicate that the separation of finance and administration from human resources in the new organization is appropriate and consistent with that found in most organizations.

[1] The 1991 Booz·Allen audit recommended a number of organization changes, including: reduce management layers between the CEO and those directly responsible for engineering design and construction; create a senior level position solely responsible for new construction and refurbishment; hire senior management with relevant experience in shipyards and/or vessel maintenance; and enhance internal vessel construction and design capabilities.

EXHIBIT 4-3
Current Washington State Ferries Organization Structure

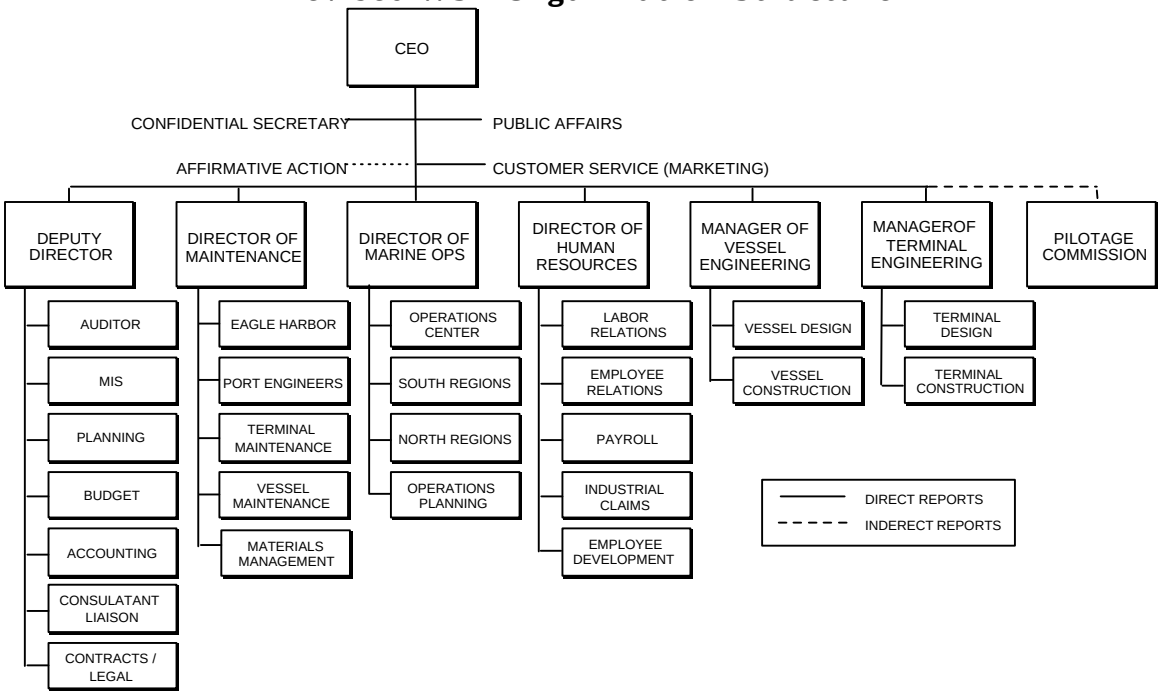


Source: WSF.

Overall, the analysis highlighted an organization whose culture is deep seated and operations oriented. A turf mentality exists within some WSF departments and functions, contributing to poor communications and coordination on projects affecting multiple departments within WSF. Additionally, we identified few management performance measures and defined goals that provide WSF managers with direction, objectives, or basis for performance measurement.

On July 1, 1997, WSF proposed and received approval of a revised organization scheme. This organization plan has not been implemented to date. The new scheme prioritizes maintenance functions and procurement into a new maintenance division that directly reports to the Chief Executive Officer (CEO). A summary of the WSF revised organizational structure is provided in Exhibit 4-4, on the following page.

EXHIBIT 4-4
Revised WSF Organization Structure



Source: WSF.

WSF's current organization structure has created, in part, a number of vertical organization "silos" which facilitate communication in the vertical direction, but have resulted in ineffective or poor communication horizontally. This is supported by the findings stated in Conrex's *Stainless Steel Report*. The revised organization structure only partially addresses silo and communication issues. Further, both the current organization structure and the proposed structure reflect a high number of positions that report directly to the CEO. However, as will be shown in the next two exhibits, as one proceeds down the different levels of the organization, management span-of-control is the inverse of standard industry practice.

Exhibit 4-5, on the next page, identifies each WSF employee by organization or management level.

EXHIBIT 4-5
Breakdown of WSF Staff by Management Level

Management Level	Management & Admin.	Shipboard	Terminal	Eagle Harbor	Total
I	1	0	0	0	1
II	11	0	0	0	11
III	36	28	2	1	67
IV	73	210	24	3	310
V	90	244	339	9	682
VI	0	528	0	94	622

Source: Booz·Allen analysis and WSF Department of Human Resources.
Note : Total may not reflect actual head count due to position vacancies.

The management levels identified in the left column of the exhibit relate to the different levels of the organization shown in the Exhibits 4-3 and 4-4, but are expanded to reflect the full table of organization of the ferry system. Exhibit 4-6 presents the data from Exhibit 4-5 in terms of management span-of-control and compares the resulting span-of-control with industry practice. The data in the exhibit reflects the results achieved from dividing the number of employees at any level by the number of supervisors at the level above it.

EXHIBIT 4-6
Comparison of Ferry System Management Span-of-Control With Industry Practice

Management Level	Industry Practice*	Washington State Ferries			
		Management & Admin.	Shipboard	Terminal	Eagle Harbor
I	4-5 : 1	11.0 : 1	0	0	0
II	4-5 : 1	3.3 : 1	0	0	0
III	6-8 : 1	2.0 : 1	7.5 : 1	12.0 : 1	3.0 : 1
IV	8-10 : 1	1.2 : 1	1.2 : 1	14.1 : 1	3.0 : 1
V	10-15 : 1	0	2.2 : 1	0	10.4 : 1

Source: Booz·Allen analysis.
Note (*): Port of Oakland Organization Study, 1994.

The data in the exhibit isolates certain production functions (e.g., Eagle Harbor) and shipboard functions, which tend to be relatively flat hierarchies, so as not to distort the management and administrative levels. The resulting spans are the reverse of what one would expect to see in industry practice as identified in the 1994 *Port of Oakland Organization Study*. The Chief Executive (Level I) has an 11:1 span, while a Level IV manager has a 1.2:1 span. Industry practice is to increase span-of-control at the lower levels, where tasks are more routine, and

reduce span-of-control at higher levels, where a small group is more effective in setting policy and achieving desired outcomes.

3. THE MANAGEMENT OF WSF IS CHARACTERIZED BY HIGH TURNOVER IN KEY POSITIONS. THIS AFFECTS OPERATIONAL CONTINUITY AND SUCCESSION PLANNING.

There has been an inordinate amount of turnover within senior levels of WSF management. As indicated in Exhibit 4-7, 22 different people have held the top seven administrative and technical positions since 1990, averaging 3.1 senior managers per position. This is an unusually high level of turnover. In comparison, the next 31 management positions have had an average of 1.6 occupants since 1990, which may also be considered high in some industries.

EXHIBIT 4-7
Summary of WSF
Management Turnover

Position	No. of Employees Since 1990
CEO	3
Deputy Director	1
Marine Operations Director	3
Human Resources Director	4
Vessel Engineering Manager	3
Terminal Engineering Manager	5
Director of Administration	3
Average of Next 31 Manager Positions	1.6

Source: WSF and Booz·Allen analysis.

One reason for this unusually high turnover is the level of compensation for senior management.

3.1 Compensation levels of the ferry system's top management are below that of comparable positions in the region.

Exhibit 4-8 compares the compensation range of six WSF management positions with that at ports in Seattle and Tacoma (i.e., two public maritime agencies) as well as the city of Seattle and King County.

EXHIBIT 4-8
Comparison of 1997 Regional Public Salary Scales
(Thousands of Dollars per Year)

Management Employee Level	WSF	Ports of Seattle and Tacoma	City of Seattle	King County
Deputy Director	$54 - $69	$109 - $143	$81 - $93	$85 - $108
Marine Ops. Director	$65 - $85	$72 - $97	$72 - $84	n/a
HR Director	$50 - $63	$70 - $90	$81 - $94	$75 - $95
Vessel Engr. Director	$67 - $85	$77 - $87	$78 - $91	n/a
Terminal Engr. Director	$60 - $74	$77 - $87	$78 - $91	n/a
Director of Admintration	$52 - $66	n/a - $92	$75 - $95	$75 - $95

Source: Washington State Ferry and 1997 AAPA Annual Salary Survey.

The exhibit underscores the compensation disparity between WSF and comparable positions in the public sector elsewhere in Puget Sound. Of particular note is the nearly 50 percent disparity between the mid-point compensation of the Deputy Director, Human Resources Director, and the Director of Administration at the WSF in comparison to other agencies. Were WSF compared only with the other public maritime agencies in Puget Sound, the disparity would even be greater.

3.2 Compensation of maritime and lower-level administrative support staff is above comparable positions in the region and state.

Turnover is not a problem at the lower, operational levels. A possible reason for this is the relatively high compensation levels for these positions when compared to peers. To illustrate, Exhibit 4-9 compares the hourly compensation of WSF maritime, terminal, and lower-level administrative support positions with benchmarks provided by the Marine Employees Commission (MEC) and the state of Washington.

EXHIBIT 4-9
Comparison of WSF Hourly Wages to Comparable Maritime and State Employees

Position	WSF Hourly Salary	MEC Industry Hourly Salary	WA State Hourly Salary
Vessel:			
- Master	32.75	35.56 - 40.84	n/a
- Mate	25.08	29.11 - 33.12	19.00 - 20.97
- Ordinary Seaman	16.09	15.87 - 19.57	9.78 - 10.72
- Chief Engineer	31.30	29.58 - 37.18	16.37 - 20.97
- Assistant Engineer	22.43	24.46 - 32.28	17.00 - 19.00
- Oiler	18.94	17.09 - 20.91	10.97 - 12.03
- Able-Bodied Seaman	18.08	16.94 - 20.91	10.97 - 12.03
Terminal:			
- Agents	20.03	29.56	13.82 - 17.64
- Ticket Seller	18.30	13.80 - 20.17	n/a
- Traffic Attendant	15.13	19.11	9.78 - 12.30
Administration:			
- Receptionist	10.53 - 13.33	n/a	8.92 - 11.22
- Office Assistant	11.57 - 14.65	n/a	9.55 - 12.03
- Accounting	12.12 - 15.35	n/a	10.47 - 13.20
- Staff Aid	12.69 - 16.11	n/a	12.30 - 15.59
- Accountant	14.65 - 18.59	n/a	12.60 - 15.98

Source: 1997 MEC Survey and Matt & Associates.

A review of the exhibit leads to several conclusions:

- First, the maritime ratings receive comparable hourly wages to other maritime employees surveyed by the MEC and considerably higher hourly compensation than other maritime employees of the state of Washington. The exhibit does not include fringe benefits. Were fringes to be added, the WSF maritime employees' compensation would be considerably higher than both peer groups shown in the exhibit;
- Second, WSF terminal employees' hourly wages are similar to or somewhat below comparable employees surveyed by the MEC but considerably higher than comparable state employees;
- Finally, administration wage ranges are substantially above comparable state positions.

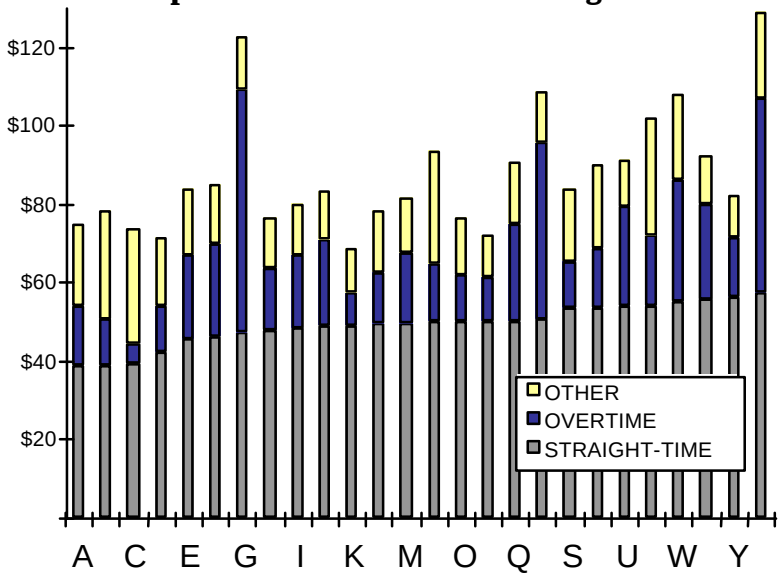
In addition to the above, the audit compared overtime rates of WSF and state employees. Pursuant to WAC 356-05-231, the audit found that overtime rates for state employees are limited to 150 percent of base wage. A review of the collective bargaining agreements of WSF employees identified four unions that maintain overtime rates in excess of limits for the majority of state employees. These four unions have labor agreements which provide for basic

overtime at 200 percent of base wage and 300 percent of base wage in certain, but limited, circumstances.

3.3 Within certain job classifications, there are wide variations in compensation levels.

We also evaluated compensation by job class. As part of this analysis, annual compensation for straight-time, overtime, and "other" time in FY 1997 was distributed among individuals who were employed for at least one year. "Other" compensation includes compensatory time, annual leave, travel time, sick leave, and penalty pay, among others. We expected compensation to be similar between members of the same job class. However, there were significant variances in overtime and other compensation. Between job classes, this variation may be due, in part, to differences in labor agreements and the nature of the work. Some variances are also driven by the participation of individuals in special projects outside their job description or department (e.g., International Safety Management (ISM) documentation development, Maintenance Management System (MMS) technical management). Moreover, employees within the same job class and with more tenure tended to receive higher compensation than members less tenured. As an illustration, Exhibit 4-10 compares the 1997 compensation, including straight-time, overtime, and other time, for all WSF staff working within the employee classification of Staff Chief Engineer.

EXHIBIT 4-10
Comparison of Staff Chief Wages *



Source: WSF Information Management Systems.
Note(*): The alpha designations A through Z designate the 26 Staff Chiefs within WSF who only worked in the Staff Chief job classification.

The exhibit illustrates that within job categories, significant differences in Staff Chief Engineer compensation exist, with total compensation levels of four individuals at nearly double the base salary. Additionally, overtime and other time vary significantly among employees, while straight-time (or base salary) is relatively consistent. Similar findings were identified within many job categories, but they were not as extreme as the above example.

Conclusions from the analysis indicate a need for tighter management controls, oversight, and potential work control analysis comparing the number of employees, workloads, and FTE budget constraints. In other maritime companies, similar issues are addressed by the creation of temporary shore or special project assignments, where fleet and operations staff work full-time at normal straight-time compensation levels. WSF currently does not use this management or organizational tool and indicates that changing from current practices would require changes to current collective bargaining contracts.

4. THE COLLECTIVE BARGAINING AND DISPUTE RESOLUTION PROCESS IMPACTS THE DAY-TO-DAY OPERATIONS AND MANAGEMENT OF WSF AND ITS ABILITY TO OPERATE EFFICIENTLY AND EFFECTIVELY.

We evaluated the collective bargaining, the salary setting process, and the dispute resolution process based on:

- A historical review of collective bargaining at WSF;
- A review of the role and functions of the Marine Employees Commission (MEC);
- An evaluation of collective bargaining regulations, policies, and practices relating to salary setting.

An evaluation of the dispute resolution process for collective bargaining and salary setting indicates that the relationship between WSF and its labor organizations has a long history which precedes the creation of WSF. Except for a brief period between 1981 and 1983 when the legislature folded WSF employees into Washington State's Civil Service System, WSF and its bargaining units, unlike other state employees, have been free to negotiate wages, hours, and working conditions. In 1983, the legislature rescinded the 1981 civil service legislation and reinstated, with some restrictions, the right and obligation of WSF and its labor organizations to negotiate wages, hours, and working conditions. Strikes or other work stoppages were prohibited, and MEC was reestablished to oversee labor relations, and WSDOT was required to ensure that negotiated labor agreements did not exceed total budget authorizations.

Seven collective bargaining agreements involving 13 labor organizations cover 92 percent of WSF staff. Labor agreements are limited to two years in duration. No single agreement can be implemented until all labor agreements are negotiated. The two-year labor agreements are unusual when compared to the staggered three-year agreements of other employers, public and private, and the result is a never-ending cycle of collective bargaining. As one two-year cycle ends, the next cycle of negotiations begins. This process does not allow for long-term stability in labor relations, and it impedes WSF's ability to bargain for a more flexible working environment.[2] WSF is the only employer in the state known to have a two-year limit on labor agreements.

The enactment of RCW 47.64, which imposes the two-year limitation, was intended to ensure continuous commuter service, promote sound labor relations and dispute resolution, prohibit strikes and other work stoppages, protect the right of employees to collectively bargain, and ensure legislative budget authorizations were not exceeded as a result of collective bargaining.[3] However, the net result has been that labor organizations benefit from all of the advantages of collective bargaining with little of the risk associated with traditional bargaining. Moreover, restrictions placed on the WSF bargaining process, when combined with inadequate WSF staffing resources (e.g., one FTE Labor Relations Manager versus 13 union representatives) and minimum wage adjustments guaranteed by the legislature to WSF's represented employees, minimize true collective bargaining within WSF.

Past and current legislation and precedents guarantee WSF employees minimum wage adjustments, which compromise the WSF collective bargaining process. Prior to 1997, wage adjustments authorized by the legislature were not implemented until negotiations were completed, and by practice of the parties, accepted as a ceiling on wage adjustments for general hourly wage adjustments. However, this practice was effectively eliminated in 1997, when the MEC declared that the legislature's intent was to provide ferry system workers a wage adjustment on July 1, 1997, the same as for all other state employees. The MEC directed WSF to implement the general 1997 wage adjustments authorized by the legislature, essentially creating a wage adjustment floor for subsequent WSF negotiations. Consequently, WSF's ability to bargain and update work rules and practices in exchange for wage increases is severely compromised, if not effectively eliminated.

[2] MEC agrees that staggered three-year contracts may offer more stability in labor/management relations.

[3] Chapter 47.64 RCW declares that it is the public policy of Washington State that sound labor relations are essential to the development of a ferry system which will best serve the interests of the people of the state. WAC 316.02 declares that the State's policy is to promote peace in labor relations in the state ferry system, and that the rules adopted by the Commission shall be liberally construed to effect the purpose of the statute administered by the Commission.

4.1 Services provided by the MEC are not fully utilized by WSF management and labor unions.

The MEC was reestablished in 1983 because it was believed that a commission familiar with marine issues would help maintain labor peace at WSF. It was further hoped that the commission would be able to provide a consistent basis for speedy resolution of disputes and assist in the salary setting process. The commission would be responsible for addressing all disputes unless the parties negotiated other grievance dispute processes. As a result of the negotiations process, only one WSF labor organization (i.e., MEBA) utilizes the MEC for dispute resolution purposes. The majority of MEC activity is directed at charges of unfair labor practice (ULP) brought forward against the WSF by labor organizations or by individual employees against the WSF and/or labor organizations.

The Public Employees Relations Commission (PERC), an organization whose purpose is similar to the MEC, but whose jurisdiction covers public employees within the state of Washington and some state employees, has established long-standing case histories and precedent and uniform rules to determine the appropriate status of ULP charges.[4] On the contrary, the MEC has none. On the record, the MEC has admonished WSF for not settling grievances and disputes submitted to the MEC before the facts of the case are known to the MEC. The tendency on the part of labor organizations to file numerous ULPs and MEC's acceptance of all charges tends to confirm WSF assertions of bias.

Additionally, the MEC is charged with conducting a biennial salary survey to assist WSF and its labor organization in the collective bargaining process. The survey report is for information purposes only and is not binding on the parties.[5] The MEC has chosen to interpret the RCW narrowly with regard to the scope of the survey. For all intents and purposes, the salary survey is limited in scope and does not provide adequate information to assist WSF management and labor to justify current pay scales and benefits (e.g., does not consider double and triple overtime rates, does not include all employee classifications represented by labor, survey excludes comparison to similar state employees).

[4] PERC was created to consolidate administration of six separate state collective bargaining laws, under a charter to be "uniform … impartial … efficient and expert". RCW 41,58.005(1)

[5] RCW 47.64.220 directs the MEC to conduct a survey that compares the "wages, hours, employee benefits, and conditions of employment of involved ferry workers with those of public and private sector employees in states along the West Coast of the U.S., including Alaska and British Columbia" indirectly comparable, but not necessarily identical positions.

4.2 Grievances and ULP charges are disproportionately high at WSF.

WSF received in excess of 200 grievances in 1995 and 1996. On the average, for the two-year period there was a formal grievance filed for every 6.75 employees. The Inland Boatmen's Union filed the vast majority of grievances. Additionally, since 1990 a total of 89 ULP charges were filed against WSF by the labor organizations. Of this total, the Inland Boatmen's Union filed 54. From January 1997 through September 1997, 20 ULPs were filed with the MEC. By contrast, for the entire calendar year 1997, fewer than 20 ULPs were filed with the Washington State Personnel Resources Board by more than 22 labor organizations representing the majority of all state employees.

The PERC has a very detailed process outlined in Washington Administrative Code (WAC) to determine whether a ULP charge has sufficient status to qualify as a ULP. The MEC has no such detailed process. The MEC has not proactively addressed the dispute resolution process at WSF, and it has not applied a uniform and neutral approach to dispute resolution as evidenced by the extremely high number of charges filed and accepted by the MEC. Neither the MEC nor WSF can provide accurate and detailed records or summaries for dispute activities over the years regardless of ULP dispositions.

5. RECENT ACTIONS BY THE CEO SHOULD ADDRESS GAPS IN PERFORMANCE MEASUREMENT PROGRAMS.

Performance evaluation policies and procedures for merit system employees and those covered by the Washington Management Services are governed by the state Department of Personnel. In recent years, implementation of performance evaluation systems within WSF has been mixed. Although the WSF Human Resources Department notifies the several departments of the requirements on an annual basis, some organizations fail to perform such evaluations. Human Resources has not followed up to ensure compliance.

In 1997, the CEO initiated a system of Manager Development and Performance Plans (MDPP) for each of his direct reports. These plans are tied to the goals and objectives set forth in WSF's Strategic Plan. For 1998, Human Resources, at the request of the CEO, is coordinating efforts to ensure that each director prepares MDPPs for all subordinate managers during the first half of the year.

Ultimately, the performance evaluation program will apply to all WSF exempt, Washington Management Service, Merit System, and Office & Professional Employees International Union (OPEIU) staff. This should address what has been an imperfect record of ferry-wide performance evaluations.

6. THE WSF TRAINING PROGRAM MEETS MANDATORY REGULATORY REQUIREMENTS REGARDING SAFETY, BUT DOES NOT INCLUDE MORE BROADLY BASED PROGRAMS SUCH AS MANAGEMENT DEVELOPMENT.

New employees at WSF generally possess the core skills necessary to perform the jobs for which they have been hired. In large measure, this is due to the fact that many of WSF's jobs require certification or licensing from an outside regulatory agency, such as the U.S. Coast Guard. WSF provides regulatory or mandatory training such as Industrial First Aid, Vessel Emergency and Preparedness Training, Diversity, and Sexual Harassment Prevention. Additionally, training in Quality Management concepts advocated by WSDOT were provided to WSF employees until about a year ago, when training was suspended for lack of funds. Notwithstanding funding constraints, WSF's 1997 and 1998 training summary includes an impressive array of regulatory compliance, safety, and personal productivity classes coordinated or provided by WSF's training unit.

6.1 Required safety-based training programs are effectively developed and delivered, but adequate employee development and leadership training are not provided.

The training emphasis at WSF is on safety and is based on regulatory, mandatory, or policy requirements. Employee development and leadership training are not adequately deployed. As a consequence, a majority of supervisory/management personnel in administration, operations, and the fleet are not prepared to deal with issues related to disciplinary situations, employee disputes, discrimination complaints, or performance issues.

A review of training records for the past three years indicates that all mandatory training, whether by law or policy, is successfully developed and provided to all applicable personnel. In this limited but important area, the safety-based training and development program at WSF is good.

6.2 Training programs are underfunded, understaffed, and not centrally coordinated.

WSF's training section does not have adequate staffing. The section consists of a full-time manager, a temporary training assistant, and project personnel who are assigned from other departments. Most in-house training programs are coordinated by designated trainers, of which there are 25. The training budget appears low, as shown in Exhibit 4-11, which compares training data for WSF with the entire WSDOT.

EXHIBIT 4-11
Comparison of WSF and
WSDOT Training Program Characteristics

Training Element	WSDOT	WSF
Budget	$1,854 Thousand	$140 Thousand
Percent of Total DOT Head Count	75%	25%
No. of Full-Time Trainers	10	1
No. of Part-Time Trainers	274	25

Source: WSDOT and Matt & Associates.

The exhibit shows that WSF has 25 percent of the total WSDOT staff, but just 7 percent of its training budget.

In addition, funding for training within WSF is not centralized. Some WSF units have independent or discretionary sources of funding from vessel lay-up or new capital projects. These are used to support independent training efforts within such groups as engineering or Eagle Harbor. This funding is not available to support the agencywide training effort. Based on interviews with WSF's Training Manager, we understand that requests for additional resources to support the agency's strategic plan through comprehensive training in areas such as customer service, conflict resolution, team building, problem solving, quality, and leadership have been rejected by the LTC. Additional requests to authorize an increase of one full-time equivalent Training Assistant, in lieu of having used temporary employees over the past six years, have also been rejected in each of the last two bienniums at the legislative level.

7. COST-SAVINGS OPPORTUNITIES AND RECOMMENDATIONS.

In the final section of this chapter, Booz·Allen presents recommendations representing opportunities to improve current processes and conserve costs in the areas of organization structure and human resources.

Report Recommendations 1 through 7 follow:

1. Evaluate the current management structure system and identify options to reduce decision cycle time, clarify accountability and responsibility, eliminate conflict, and facilitate access to capital.

The governance and mission of WSF lends itself to significant levels of oversight and scrutiny from a diverse audience of stakeholders. During the audit, numerous governance systems were identified. These systems included various combinations of state and private sector ownership and operation. One option to consider would be an autonomous agency, similar to the Port of

Seattle, with a single oversight committee (or Board of Directors) to provide guidance and direction. Benefits of an alternative structure may include reduced decision and policy cycle time, provide more directed accountability and oversight, and facilitate access to capital or investment. WSF and WSDOT, in conjunction with the legislature, should identify and evaluate alternative models to its governance and the corresponding benefits and risks.

2. Develop an Employee Training and Development System.

WSF currently provides appropriate mandatory training. However, to implement WSF's mission and strategic plan (see Chapter 8 for detail), additional training is needed. WSF should develop an Employee Training and Development System plan. A key element of this plan will be a thorough training and employee development needs assessment. The plan should be comprehensive and multi-year, and it should focus on essential training necessary for WSF to achieve its strategic initiatives, goals, and objectives. The development plan should also identify internal funding alternatives to the current budget allocation process, i.e., per-capita funding by work unit, charge-back, etc. Required staff and budget resources to develop and execute this plan should be provided.

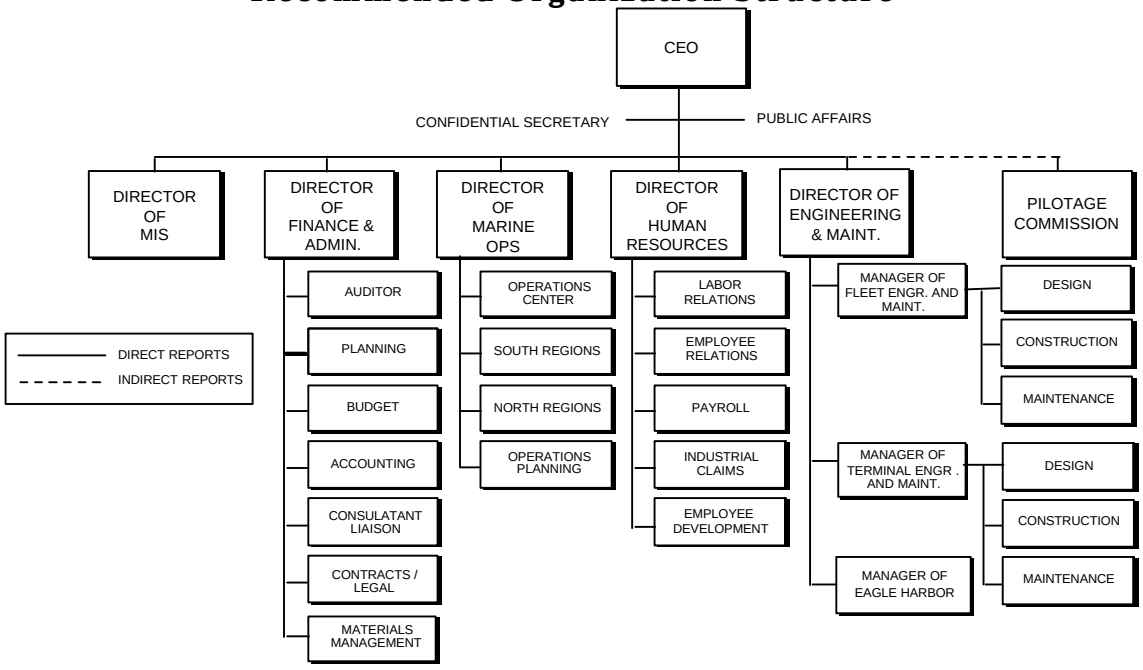
3. Conduct a comprehensive job classification and compensation study prior to the next biennium to support collective bargaining negotiations.

The audit identified disparity in current compensation levels throughout WSF when compared to those in the private and public sectors and comparable state positions. Current compensation levels impact WSF's ability to attract and retain critical management, operations, and technical skills. Additionally, in some areas, our review implies that expenditures for compensation, including benefits, may exceed prevailing wages, resulting in unnecessary expenditures. Lastly, the MEC salary survey is not comprehensive and does not address all positions within WSF. Completion of a salary survey will assist WSF and the legislature in identifying opportunities for cost savings and addressing employee retention issues. A key element to completing the salary survey will be to develop a comprehensive job classification manual that identifies comparable skills, training, and responsibilities with positions in the private and public sectors including, but not limited to, the maritime industry. This manual will be critical to quantifying appropriate prevailing wages. Completion of this recommendation may be facilitated by MEC, in conjunction with WSF management and labor, or through an alternative independent organization.

4. Implement recommended organization structure (see Exhibit 6-12) to right the span-of-control situation, create succession planning opportunities, direct focus on "key" strategic areas, and alleviate communication and departmental gaps within the organization.

The current WSF organization structure is ineffective and restricts WSF's ability to effect change. Implementation of a new organization structure will assist to right span-of-control, create succession planning opportunities, direct focus on "key" strategic areas needing focus, and alleviate communication and departmental gaps and responsibilities throughout the organization. We find WSF's "revised" organization (see Exhibit 4-4) to be a transitional organization structure appropriate only for near-term objectives. A recommended organization structure that Booz·Allen proposes is presented in Exhibit 4-12, on the following page.

EXHIBIT 4-12
Recommended Organization Structure



Source: Booz·Allen analysis.

The recommended organization structure places focus on the core elements of WSF business and management: finance and administration, marine operations, human resources, and engineering and maintenance. Additionally, we recommend a temporary MIS position at the director level to address near-term automation, technology, and communication issues. A discussion of information system issues are included in Chapter 5. In the long term, this position should be moved under the Director of Finance and Administration. Implementation of this recommendation should follow completion of Recommendation 3.

5. Align WSF employee overtime policy to that of state employees, where basic overtime rates will be no greater than 150 percent of base wage.

Pursuant to WAC 356-05-231 (Statutory Authority 41.06) overtime rates for state employees are limited to 150 percent of base wage. Four WSF unions were identified which have collective bargaining agreements which provide for basic overtime at 200 percent or higher of base wage. Even under PERC jurisdiction, a majority of public employers provide for basic overtime at 150 percent of base wage with 200 percent as a maximum under certain conditions. The legislature and WSF should evaluate WSF's ability to implement maximum overtime rates and develop a plan to address this inconsistency in state policy. Cost savings associated with the successful implementation of this recommendation are approximately $1.1 million annually.

6. Remove mandatory cost of living adjustment for WSF employees resulting from legislative action, and assign responsibility to WSF and WSDOT management to achieve legislative limits on appropriations.

The ability of WSF management to bargain effectively is primary to effecting substantive change in the organization's culture and accountability. A key element of the collective bargaining process is the negotiation of wages and compensation in concert with work rules to promote efficiency and effectiveness. The legislature should not identify specific wage adjustments for WSF employees in future appropriations and should allow collective bargaining to establish wage rates in the context of overall needs of the ferry system to provide cost-efficient and cost-effective labor services to the public. Accountability for achieving legislated limits on appropriations should be assigned to WSF and WSDOT management.

7. Evaluate the benefits of improving current MEC services or placing WSF employees and labor organizations under the jurisdiction of the Public Employee Relations Commission (PERC) or a similar organization.

ULPs and other labor disputes raised by public employers within Washington State and certain Washington State employees (Washington State Patrol officers, community college faculty, and certain bargaining units within higher education) are overseen by PERC. The audit found PERC to be effective and responsible in executing its mission. In contrast, the audit found the MEC, which addresses similar issues to PERC for WSF employees, to be less professional and effective. Only one WSF labor organization

currently uses the MEC for its grievance dispute process. Its biennial salary survey is not comprehensive, it maintains poor records and case histories, and uniform policies and procedures have not been successfully developed. Due to MEC's redundancy and ineffectiveness, the legislature should consider placing WSF employees and labor organizations under the jurisdiction of PERC which has established and maintained a better and more comprehensive dispute resolution process. Prior to implementing this alternative, the legislature should evaluate the relative benefits of re-engineering the MEC to improve its services and utility to WSF labor and management. In conjunction with this, PERC may offer advisory services to MEC to identify areas of opportunity for improvement and appropriate implementation steps, operating practices, and policies. Cost savings associated with this recommendation are estimated at $170,000 annually should MEC responsibilities be transferred to PERC.[6]

[6] The biennial budget for MEC is approximately $340,000 annually. Assuming the transfer of some costs and staff, annual savings are estimated at one-half of current expenditures.

OPERATIONS REVIEW

Chapter Five

"Operations" can be defined as the activities an organization undertakes in order to transform inputs into a final product or service and to achieve its mission. These activities may be routine, but often they are not. An effective organization anticipates the irregular.

There is no single operations formula that works universally. Organizations vary by mission, by size, by management style, and they need to tailor their operational procedures to meet their own needs. However, some similarities usually exist among organizations within an industry. Vessel and terminal operations are the core business of WSF, and the organization has much in common with other large transportation companies. Such companies often use procedures and practices developed in-house to manage their operations. These procedures are often constructed around industry best practices. Typically, marine transportation companies have shoreside and shipboard operating manuals that document procedures in most areas of activity, and the prudent ones also use management operating manuals. However, these companies also rely on the inherent skills and knowledge of the operations personnel to manage operations effectively.

During the audit, we evaluated the operations and administrative practices and procedures of the WSF system. In doing so, we identified some shortfalls. For instance, adequate vessel and terminal operating procedures reside in the institutional memories of WSF's experienced work force, but WSF needs to document these procedures more comprehensively. In addition, adequate standard operating performance measures are required if internal operations are to be evaluated consistently. In many cases, WSF has already begun to correct these shortfalls.

This chapter presents findings and recommendations in regard to several key components of WSF operations. Section 1 focuses on the WSF Operations Center. In Section 2, we explore the need for documentation of WSF's practices and procedures, and review progress in this area to date. Emergency plans are reviewed in Section 3, and communications systems in Section 4. Section 5 focuses on the use and applications of information technology within WSF.

In the final section of the chapter, we present recommendations pertaining to WSF operations.

1. THE OPERATIONS CENTER DRIVES WSF'S ABILITY TO OPTIMIZE OPERATIONS, CONTROL COSTS, AND INTERACT WITH CUSTOMERS.

Large transportation companies such as railroads, airlines, and ship operators often have operations centers, whose function is to support and control operating activities. WSF established an Operations Center (OC) in 1995 in order to increase its ability to manage its day-to-day operations more effectively. The OC acts as a central communication link in the WSF system. Its mission is to ensure smooth, continuous running of the system in both normal and emergency (irregular) situations.

It is the OC's primary responsibility to ensure continuous service on every route. Key to meeting that responsibility is the day-to-day scheduling of vessel trips, a task that OC staff handle. The schedules are based on WSF-developed service plans, which are, in turn, based on budgeted funding allocated by the Washington State Legislature via "decision packages." The service plans are detailed accounts of all trips on all routes, and all assigned vessels are specifically identified. Service plan schedules are integrated with vessel maintenance requirements (e.g., drydocking, planned maintenance periods, etc.).

OC Watch Supervisors and Dispatch Agents also play key roles in fulfilling the OC's primary responsibility. Watch Supervisors maintain a radio communications suite that is operational 24 hours per day. Their primary task is to act as WSF's communications liaison, and in the event of a vessel or terminal failure or emergency, they determine the proper response, e.g., deployment of a repair team or a replacement vessel. Dispatch Agents act as focal points for information on the location and condition of the vessels, terminals, and the crews staffing them. They dispatch the relief crews required to maintain service, using telephones and a hand-generated list of available "relief" or "on-call" staff. In addition, they are responsible for coordinating refueling operations with the captains and chief engineers of each vessel.

Information Agents help the OC meet its secondary responsibility, i.e., effective interaction with the public. Their primary mediums for communication include telephones, print notices posted at terminals and on vessels, and a site on the World Wide Web. They provide the public with both regular service schedule changes and directions to the terminals. They also handle reservations for priority vehicle boarding in the San Juan Islands. Information agents also respond to customer inquiries or complaints. The information agents also maintain customer service reports that are prepared for the CEO.

During the audit we found gaps in staffing plans and potential opportunities for savings in regard to non-revenue vessel trips. These are explored below.

1.1 Systematic and documented procedures are needed to ensure continuous service and appropriate relief staffing.

It is the Watch Supervisor's job to maintain continuous service by responding properly to vessel or terminal failures and other emergencies. However, the audit found no documented procedures or contingency plans with regard to schedule realignments in the case of vessel failure.

Similarly, we found no systematic or standardized procedures or records in place for dispatching relief staff when scheduled crew cannot make or complete a shift. The Dispatch Agent has a responsibility to fill each position with relief or on-call personnel of at least equal capability or training as quickly as possible so that a vessel can sail with the required crew complement. Dispatch agents handle these assignments by telephone, using hand-generated lists of available personnel.

Checks or balances that are in place to ensure that relief staff have the qualifications to fill the open billet are poor due to a paper-intensive processes. Although assignments are seniority- and certification-based, on occasion relief crews without required skill certifications are dispatched, only to be replaced later by qualified staff. As a result, WSF incurs the costs of duplicate travel and labor time.

Relief staff are guaranteed a minimum of 80 hours of work per pay period, and Dispatch Agents spend a major portion of their time ensuring that the relief staff are assigned positions to fill their 80 hours. Still, problems arise. Available data to evaluate WSF's performance in insuring relief staff work 80 hours per pay period was unavailable. In 1996 WSF settled an out-of-court class action suit brought by relief staff who believed they were improperly passed over for assignments and not provided sufficient time off.[1] The agreement stipulated that WSF would develop a system for eliminating these problems. WSF is currently developing an Automated Operations Support System (AOSS) which will address this requirement.

[1] *Moran case: Action was brought forward by IBU. It was settled in mid-1997 after two years for a $300,000 settlement. MM&P and IBU got a settlement agreement that guaranteed WSF on-call and relief employees would be assigned by seniority and get days off between duty periods.*

1.2 WSF incurs expense and reduced vessel availability resulting from non-revenue trips that might be avoided.

The service plans generated by the OC account for both scheduled revenue-generating trips and non-revenue (maintenance) trips taken. A part of the day-to-day scheduling involves refueling.

Since 1996, the OC has collected daily operational statistics on all trips scheduled and completed. All trips are accounted for, including revenue trips or non-revenue trips. Included in the non-revenue trips are refueling operations and boat moves. An example of a boat move is the moving of a vessel to start the day on an eastbound trip after being tied up at pier on the east side of the sound at the end of its scheduled service the night before. Performance measures that are not included in the report are fuel consumption and on-time departure and arrival statistics.

The performance audit included reviews of WSF operations practices regarding fueling, water, hazardous materials, and sewage. We were left with questions regarding the efficacy of WSF's refueling practices.

Ships operating in the Northern and Southern region are refueled by tank trucks that are driven aboard the vessels while they are tied up at night. In the Central Sound region (around Seattle), vessels are moved to Pier 90, where they tie up at a refueling dock. Current Seattle Fire Marshal Regulations prevent refueling operations from occurring on the Seattle waterfront between Piers 46 and 70. In 1997, more than 840 refueling boat moves were completed. At an average operating cost per trip of $822, the indirect cost of refueling as a result of vessel shifting is estimated at $690,000 per year. More than a year ago, WSF explored the possibility of vendor-provided lightering barges to bring the fuel to the boats, but concluded that the technical problems associated with the barge-ferry connections were too expensive to warrant further investigation. This issue needs to be reexamined and alternatives to refueling boat moves explored.

We also found that fuel is typically not topped off, i.e., filled to 100 percent capacity. Consequently, the number of non-revenue trips increased as well as indirect fueling costs. While not topping off fuel tanks is a common practice in the maritime industry, it is unclear if any advantages in fuel consumption or vessel speed result from this practice.

In addition to refueling boat moves, more than 2,360 re-positioning boat moves occurred in 1997 as vessels were positioned to begin service the following day. Although this represents less than 2 percent of the total revenue trips in the year, the opportunity to reduce the daily number of non-revenue moves should be examined. Assuming the previous cost of $822 per

trip stated above, these non-revenue moves accounted for $1.9 million in annual operating costs.

2. THE LACK OF DOCUMENTED OPERATING PRACTICES AND PROCEDURES INHIBITS THE SHARING OF STANDARDS AND POTENTIALLY IMPEDES PERFORMANCE.

The audit team evaluated WSF's current and planned vessel and terminal operating procedures. We anticipated finding procedures that identified standardized shipboard practices, e.g., policies and objectives for deck and engine operations. Typical operating manuals used by shipping companies to detail the role and responsibilities of each shipboard position. They also present marine operating procedures that clearly assist the organization's primary staff in accomplishing its goals, including the safe operation of its ships and shipboard systems, and they implement policies that satisfy existing regulatory requirements imposed by state, federal, and international regulatory bodies.

The OC has a number of manuals in place, and plans are under way for more documentation. However, we identified the need for manuals that are more comprehensive, that provide step-by-step guidelines where appropriate, and that are in line with management practices and procedures.

2.1 Existing operating manuals are neither comprehensive nor kept in a timely manner.

WSF maintains operating manuals for areas such as personnel orientation and vessel operations, which are maintained in handbooks developed by the Human Resources and Vessel Operations Department: the *Vessel Operating Procedure Handbook*, the *Vessel Orientation Handbook and Supplement,* and the *Terminal Orientation Handbook*. These handbooks cover topics such as seamanship, chain of command, identification of muster lists, duties, and passenger and vehicle loading operations. However, details of safety and environmental protection, shipboard maintenance, and coordination with the operations center are either insufficient or not included. Furthermore, ship and terminal specifications are inadequate to support ongoing operations.

In general, we concluded from our review of the manuals that they are adequate as orientation documents, but that they need to be more instructive; that is, they would be more useful if they provided step-by-step directions for carrying out processes. In addition, we concluded the lack of procedures for reporting to the OC indicate that the handbooks are not current.

The lack of documentation underscores the need for standardized reporting requirements, which WSF may be able to address as it brings its

international routes into International Safety Management (ISM) compliance (see subsection 2.3).

2.2 The existing operating manuals do not coincide with management practices or procedures.

Operating procedures concerning shipboard and terminal policy are developed by WSF managers, but currently, no management procedures exist for Port Captains or Terminal Managers. WSF recently finalized a policy addressing roles, responsibilities, and authority of its Port Engineering and Vessel Engineering departments. However, in all cases, there is no clear linkage between management goals (where defined) and current operating procedures and policies.

2.3 ISM procedures are required for international compliance and for safety and should result in improvements in documentation, analysis capabilities, and performance.

WSF must bring its international route into compliance with ISM standards by July 1, 1998, and is working toward that goal. Compliance requires development of a series of manuals, including a shipboard operations manual for each ship used on international routes (WSF utilizes two vessels on this route, the *M/V Elwha* and the *M/V Evergreen State*). An ISM implementation team has nearly completed development of the manuals, which, in addition to shipboard operations, includes:

- Safety and environmental protection policy;
- Management systems procedures;
- Deck operations;
- Emergency preparedness;
- Engineering and maintenance;
- Human resources and training;
- Operations Center; and
- Terminal operations.

These new manuals will identify standardized reports that the OC will use for analysis purposes, and the procedures establish a designated person to take charge of documentation, certification, and control.

Although ISM standards are mandatory only in regard to WSF's international operations, which will be monitored for compliance by the U.S. Coast Guard, the goal of WSF is to utilize the new standards and practices systemwide. The documents under development are much more comprehensive than any of existing handbooks in use at WSF and fulfill the need to document many operational policies and procedures.

The new standards have the potential to improve performance; in addition, systemwide application means that the entire system will benefit from the investment made to bring WSF into ISM compliance.

3. DOCUMENTED EMERGENCY PLANS ARE REQUIRED TO PREVENT DELAYED OR IMPROPER RESPONSE TO A CRISIS.

WSF is developing an emergency preparedness manual as part of its effort to bring WSF into compliance with ISM. However, our OC review revealed little else in the way of documented plans for emergency situations.

3.1 WSF does not maintain adequate emergency response documentation to meet situational needs.

Although experienced WSF personnel use their institutional knowledge to guide them through emergency situations, the audit revealed a lack of written documentation of emergency procedures or contingency plans for emergency situations. WSF can take advantage of the knowledge and skills of its experienced staff to educate others by transferring their institutional knowledge to paper. Access to written procedures for dealing with emergency situations will provide all personnel, at all experience levels ,with an opportunity to respond appropriately and highlight training needs as discussed in Chapter IV. Probable outcomes for WSF will include increased safety and lowered risk of reduced service resulting from injury or incapacitation.

3.2 WSF's documentation to support ship-specific emergency response is needed.

Currently, only one vessel in the WSF fleet, the *M/V Tacoma*, is equipped with ship-specific emergency documentation. Documentation for the *M/V Tacoma* is comprehensive, offering step-by-step procedures for responding quickly and safely to a variety of situations, including bomb threats and evacuation commands.

The crews and passengers of the remaining vessels in the WSF fleet would benefit from similar documentation, and the *M/V Tacoma's* emergency documentation could serve as a model.

4. WSF'S ABILITY TO PERFORM EFFECTIVELY DEPENDS ON CLEAR AND TIMELY COMMUNICATIONS BOTH WITHIN WSF AND WITH ITS CUSTOMERS.

Communications is an important function at WSF. WSF vessel and terminal crews use several radio systems to communicate on the vessel, between vessels, and with the OC and WSF management. In addition, WSF communicates with the public through placard bulletins in the terminals, radio and television announcements, a WSF internet homepage, and an enhanced telephone system.

4.1 WSF employs redundant and modern systems to communicate vessel location and condition.

WSF vessels are well equipped with modern, redundant communications systems. The systems include ship-to-ship, ship-to-shore, and internal radio communication systems. In addition, radar sets onboard the vessels give the masters the ability to know the position of other vessels in the vicinity and their location in Puget Sound. The deck crews use hand-held radio sets during loading and unloading procedures to communicate with their counterparts onshore at the terminals.

In addition to the U.S. Coast Guard vessel tracking system, the WSF is also currently testing a vessel tracking system for use in identifying and locating the whereabouts of the entire fleet on a continuous basis. Repeaters are installed on board four ferries to broadcast location, direction, and speed both to the OC and to the local U.S. Coast Guard station. With this system operational and implemented across the fleet, the OC will have quick access to each vessels' location and situation.

As a fail-safe system, all vessels are equipped with cellular telephones for use in the event other systems fail. These phones may be underutilized. For example, although the vessels are equipped with onboard computers, there is no system in place for effective, reliable ship-to-shore data transmission. The cellular phones represent potential pathways for computer data transmission between the ships and the shore.

4.2 The OC Information Agents use a modern, sophisticated telephone system to communicate with the public.

Information Agents in the OC are the primary conduits of public information, and they have an arsenal of modern, communications devices for public information at their disposal, including public radio alerts, schedule bulletins, an internet Web page, and a sophisticated telephone system. Updated in 1997, the telephone system can accommodate several thousand calls per day. The new system controls long-distance costs by preventing

receipt of calls at individual terminals. In addition, the system conducts analysis on the number of calls and response time. Reports are developed from the system which details the productivity of each information agent, in addition to WSF's overall customer responsiveness.

The WSF Web site contains scheduling information, including temporary cancellations or changes. Individuals around the world can request information, make reservations for priority boarding in the San Juans, and submit comments.

Future plans include installation of variable display signs along the roadways leading to terminals to dispense information to drivers headed to the terminals.

5. THE WSF INFORMATION TECHNOLOGY PROGRAM HAS ONLY BEEN PARTIALLY SUCCESSFUL. THE ADDITION OF IMPROVED INFORMATION TECHNOLOGY SHOULD RAISE THE EFFICIENCY AND LOWER COSTS OF THE WSF OPERATIONS.

Aware of the need to refine procedures and record-keeping processes, WSF has initiated a plan to develop technology for improving the efficiency and accuracy of its system's operations. At the core of its effort is *Information Technology Contributions Towards Momentum*, a WSDOT publication that identifies and prioritizes the information technology investments and projects needed to assist WSF achieve its mission. The plan is limited to those computer systems and investments developed or supported specifically for WSF use. It excludes departmentwide budgeting, accounting, inventory and other systems supported by WSDOT and state central computer services. The plan is good in that it thoroughly identifies WSF's current systems infrastructure, but it is incomplete in outlining a comprehensive information technology strategy, defining needs/objectives, solutions, costs, and timing. WSF's need for additional investment in technology is also discussed in the most recent report of the State Auditor.[2]

5.1 Recent WSF computer system development initiatives have had mixed success.

WSF recently developed and implemented one new information management tool, and two more are in development now. The results have been mixed. The WSF Point of Sales System (POS) is already in use. Based on packaged software customized to meet WSF's needs, the system is effective and has been well received. The other two systems, which are partially operational at this time, are a Maintenance Management System (MMS) and an Automated Operations Support System (AOSS).

[2] *Washington State Auditor's Office, Audit Report No. 5875, February 9, 1998.*

MMS, which is described in more detail in Chapter VI, was intended to provide a tool for scheduling and monitoring maintenance onboard WSF vessels. This system has been in development for four years and has experienced significant delays, in part due to vendor selection, functionality standards not developed early in the project, and customization/development problems.

AOSS is progressing more steadily. AOSS will automate many procedures currently being completed in less efficient ways. AOSS will include vessel and crew dispatching, terminal personnel dispatching, short-term vessel maintenance and crew scheduling, time keeping (see State Auditor report), personnel seniority and qualification verification. The system will also help develop and track performance measurements such as vessel on-time departure and arrival statistics.

5.2 WSF does not fully utilize technology internally or externally to achieve operational savings and support management decision making.

WSF has recently initiated efforts to standardize computer systems and software throughout the organization. Over the long term this practice should result in system management efficiencies. However, WSF's current software and system development efforts have been limited. MIS best practices in most industries typically involve the collection and centralizing of key finance, organization, and operations information into a database for use in management report and statistics generation, in addition to automating labor-intensive and less-efficient processes.

WSF technology efforts in recent years have been limited to the three systems mentioned earlier. A review of WSF overall computer support systems identified a complex amalgamation of state and custom applications. Collection of similar data from different systems frequently resulted in two sets of data. While the difference between data sets was typically minor, the fact that different and conflicting information exists and is being utilized throughout the organization is problematic (e.g.; FTE information between WSDOT *Financial Report* and FIRS system do not coincide, revenues detailed in WSDOT RATS and WSF *Revenue Recap Report* are not equal, etc.).

While inspecting the terminals, Eagle Harbor, and vessels, we also attempted to identify the use of new technologies. Few were identified. WSF is contemplating the development of a global "farecard" that could be used for public transit throughout the Puget Sound area. An integrated farecard system is an excellent use of technology to improve customer convenience and achieve operational efficiencies. Other opportunities, such as the use of automated ticket takers, turnstiles, or token machines, should also be considered.

6. RECOMMENDATIONS AND OPPORTUNITIES FOR COST SAVINGS.

In the last section of this chapter, we present our recommendations regarding opportunities for WSF to improve current processes and reduce costs in the area of operations.

Report Recommendations 8 through 11 follow:

8. Develop an Information Technology Plan that leverages current system initiatives, identifies future information and data requirements, leverages technology to achieve operational and organizational efficiencies, and supports management decision making and operational monitoring.

The audit found that considerable data is collected and processed on paper or in non-centralized and isolated computer databases within WSF. We also identified inconsistencies in similar data between databases and limited historical data to support trend analysis. We also observed that much information which was readily accessible was due to financial and management reporting requirements to the state and not for management monitoring and decision making. The recent *Operations Statistics Report* and *Route Statements* were two of few management reports found useful. WSF should augment their recent *Information Technology Contributions Towards Momentum* report with the development of an Information Technology (or MIS) Plan. This plan should identify data requirements needed to support financial, performance, organizational, and operations monitoring and decision making; statistical analysis; and operational efficiencies. Development of the plan must be based on a thorough functionality and needs assessment, including the development of performance measures (addressing service and management standards, safety, financial performance, organizational efficiency, etc.) and decision reports. The plan should detail objectives, timelines, required resources, and implementation steps. In addition, the plan should outline opportunities to automate and streamline current administrative processes, report generation, and field operations (such as ticket processing). Completion of this recommendation

should be done in conjuction with other recommendations which will support or be facilitated by the use of information technology.

9. Analyze vessel deployment strategies to reduce or eliminate the frequency of non-revenue generating boat moves and refueling operations.

Morning commuters crossing Puget Sound from west to east make up a significant portion of total WSF traffic. This pattern is reversed in the evening, especially Friday evenings, when weekend travelers join the commuters. Thousands of boat moves take place each year to position vessels to accommodate anticipated traffic, and these are in addition to other non-revenue trips made for fueling or maintenance. Additional plans to expand the auto-passenger and POF fleet will only compound non-revenue trips. The development of improved vessel scheduling and mooring of vessels on the west side of Puget Sound during the night, instead of at Coleman Dock, Edmonds, Fauntleroy, Mukilteo, etc., should provide an opportunity to reduce the costs. WSF should evaluate opportunities and schedule planning to minimize non-revenue boat moves, including a review of current repositioning and fueling practices. Assuming WSF can reduce non-revenue moves from current levels by 20 percent, annual operational savings of approximately $500,000 may be achieved. This level of savings is not based on a well defined deployment plan or rigorous study, but is consistent with fleet deployment savings identified in other Booz·Allen studies for private maritime clients.

10. Extend the ISM effort to include WSF domestic routes and terminal operations, including the development of documentation defining policies, procedures, and responsibility across the WSF organization.

WSF currently lacks detailed operating, administrative, and management documentation. Achieving ISM certification is an excellent means to document policies, procedures, and responsibilities. More importantly, the continuous monitoring required of the ISM certification provides an excellent vehicle for continuous improvement. WSF will be completing its ISM certification for its international service in early summer. In achieving this certification, WSF will make significant inroads in developing needed documentation throughout the fleet. While it is not necessary that WSF incur the cost of achieving ISM certification for its entire fleet, WSF should apply the ISM principles and requirements across its organization_including terminals, administrative and support functions, and Eagle Harbor_to capitalize on this investment in safety. Some level of implementation and annual recurring cost will be necessary in addressing this recommendation.

11. Develop emergency response and contingency plans for WSF, vessels, and terminals. Documents should address field operations, management and support, and communications.

The Operations Center makes emergency management decisions based on experience and the current deployment situation. The audit found that there were no documented contingency plans developed for the numerous situations that could potentially occur to the ferry system, such as a vessel or terminal fire, a collision, passenger evacuation, the collapse of a pier into the water, etc. Beyond broader plans for WSF as a whole, specific plans are needed for orientation, training, and guidance for the WSF personnel. The documentation used on the *M/V Tacoma* provides one plan model which could be utilized for the development of shipboard plans. Additionally, as a means to ensure developed emergency and contingency plans are understood and current, WSF should conduct periodic "desk drills" and/or training exercises by shoreside and field (e.g., vessels, terminals, and Eagle Harbor) staff. Development of emergency response and contingency plans and emergency drills may be developed in conjunction with and should consider ISM efforts detailed in the previous recommendation.

MAINTENANCE AND SAFETY OF THE FLEET AND OTHER ASSETS

Chapter Six

Maintenance is a cornerstone in the successful operation of a ferry system. Properly planned and executed, preventive maintenance can ensure service is infrequently disrupted. More importantly, proper maintenance ensures equipment reliability and operational safety. In this chapter, we review the current maintenance practices of WSF and present a number of indicators and findings regarding the condition and safety of its fleet and system.

The audit identified a number of operational and safety metrics which can be used to review performance. Walk-through tours conducted by the audit team resulted in positive impressions of the WSF fleet and terminals, considering their age and operations schedule. In light of the system's condition, the audit also identified maintenance practices and systems that are not standardized, systematic, and integrated across the fleet.

1. NON-TECHNICAL WALK-THROUGH INSPECTIONS AND A REVIEW OF WSF OPERATIONAL PERFORMANCE REFLECT A FLEET THAT IS GENERALLY IN GOOD CONDITION, GIVEN ITS AGE AND OPERATING SCHEDULE.

During the audit, Booz·Allen conducted non-technical walk-through inspections of vessels and terminals, and conducted interviews with shipboard officers and terminal management. The purposes of these inspections and interviews were to develop an understanding of the underlying infrastructure that constitutes the WSF system and to assess (by visual inspection only) the general physical condition of these assets. Additionally, a number of performance measures were evaluated to validate initial impressions from the inspection.

1.1 Visual inspection of the WSF vessels showed a high level of operating maintenance; the audit identified capital maintenance issues in Chapter Seven.

Walk-through inspections of the WSF fleet were conducted by former merchant marine and naval deck and engineering officers. In total, 11 vessel inspections were conducted, including at least one vessel from each class. During the inspection, the audit team observed general machinery and vessel structure condition; type, quantity, and location of machinery and equipment; and general passenger and crew space cleanliness. Additionally, a review of current deck and engine room logs was completed.

In general, the vessel inspection indicated that the fleet is well maintained and in good condition given the relative age of many of the ferries. The audit identified that, in general, the engine and machinery spaces of older vessels were in better physical condition than above-deck spaces. This dichotomy is explained by examining the operations and manning schedule of the vessels, which is addressed in the maintenance section of this chapter.

The walk through inspection did not include a detailed technical or engineering evaluation of each vessel's machinery systems or superstructure which might be necessary to fully ascertain the safety condition of some vessels. Technical or engineering inspections typically require the opening and inspection of machinery and void spaces, in addition to non-destructive and ultrasonic (UT) inspection of the hull (e.g., superstructure). Currently the Washington State Department of Transportation is in the process of selecting a contractor to conduct an assessment of the safety of Washington State Ferries. This assessment is due for completion by November 1998. If this assessment does not include technical or engineering inspections, the legislature may wish to consider sponsoring such inspections as a follow-up to this audit.

1.2 WSF terminal inspections showed older facilities that are adequate, but with uncertain piling conditions.

The audit team inspected 16 terminals and, as part of the inspections, interviewed ticket agents and terminal agents. The audit team observed general building and machinery condition; type, quantity, and location of passenger and vehicle staging and loading areas; general cleanliness; and ferry docking, loading, and unloading practices. The inspection did not address the mechanical or structural condition of each terminal.

The audit identified significant variance in the size, layout, and services provided at each terminal, reflecting the unique geography, location, and activity level supported by each terminal. More interestingly, the audit

identified a terminal infrastructure that in most cases was approximately 50 years old, with little recent enhancement or improvement. In general, the audit found the terminals to be in good condition. However, recent findings of severe piling deterioration from wood-boring insects (e.g., marine borer worms) at Seattle's Coleman Dock suggest that more detailed and technical inspections may be necessary to ensure current conditions. This is addressed in greater detail later in the chapter.

1.3 WSF system condition is reliable in terms of scheduled voyages completed. WSF also maintains on-time schedule performance in line with other public transportation modes.

For audit purposes, we identified two performance measures (percent of scheduled trips completed and on-time performance) as indicators of the condition of WSF's infrastructure. In regard to the first measure, WSF fares well. Currently, WSF schedules approximately 180,000 sailings a year. As shown in Exhibit VI-1, the system completed more than 99 percent of its annual scheduled trips in 1996 and 1997.

EXHIBIT 6-1
Comparison of Completed and Scheduled Trips in 1996 and 1997

Trip Statistics	1996		1997	
	No.	% Total	No.	% Total
Scheduled Trips	179,122	100.0%	178,818	100.0%
Canceled Trips	1,016	0.6%	1,767*	1.0%
Replaced Trips	0	0.0%	375	0.2%
Net Completed Trips	178,106	99.4 %	177,426	99.2%

Source: WSF Operation Statistics Report.
Note (*): M/V Klickitat accounts for canceled 777 trips due to delayed repairs on one propulsion system.

The above exhibit was developed using WSF's *Operations Statistics Report*, which details the number of scheduled and completed revenue trips for each fiscal year. The report also details the number of trip cancellations and presents statistics as to reasons for cancellation. The exhibit shows a 99.4 percent completion rate in 1996 and a 99.2 percent completion rate in 1997. Of the 1,767 canceled trips in 1997, 777 were due to a single propulsion casualty on the *Klickitat*. If those cancellations were removed from the data, the 1997 completion rate would have been 99.6 percent. The Technical Review Advisory Committee (TRAC) considered this measure a favorable indicator of WSF's system condition.

The audit found that other ferry systems do not maintain similar schedule/completion statistics; thus no comparison could be made. Similarly, most ferry systems, including WSF, do not record departure schedule

adherence. However, on-time performance is a good measure of system condition and operational capability. To evaluate on-time performance for the WSF, the audit team developed WSF's on-time performance for 1997 from a random sample of three months of data. Similar data was only available from one other ferry system, the Staten Island Ferries, which is simpler in terms of route configuration. Because of limited comparisons, comparable on-time statistics were developed for other modes of transportation to assess WSF current performance. Exhibit 6-2 compares schedule performance of WSF with Staten Island Ferries and other transportation modes.

EXHIBIT 6-2
Comparison of On-Time Performance of Major Passenger Transport Modes

Transportation System	On-Time Performance (From Scheduled Departure)	Percent of On-Time Departures
Commercial Airlines	= 15 minutes	85.0%
Transit Rail Systems:		
- Pittsburgh	= 3 minutes	90.0%
- Washington, D.C.	= 3 minutes	98.3%
- Los Angeles	= 5 minutes	97.0%
Ferry Systems:		
- Staten Island	= 3 minutes	98.0%
- WSF	= 5 minutes	87.5%
- WSF	= 10 minutes	94.2%

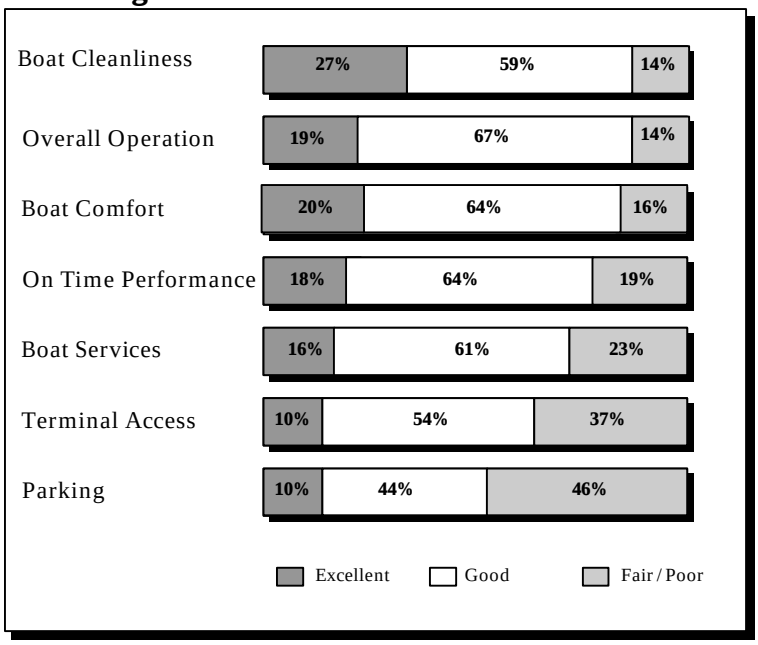
Source : Various transportation agencies.

The exhibit indicates that the WSF does not maintain schedules as rigidly as the Staten Island Ferries or select transit rail systems, but performs better than commercial airlines. Conclusions from this comparison are limited, however, due to differences in operating environments, infrastructure, and level of service for each transportation system.

1.4 Ferry customers are highly satisfied with the condition and attributes of the WSF system.

A review of the daily press in the Puget Sound area might lead one to believe that a high level of dissatisfaction with the WSF's current service exists. However, the evidence does not support such a conclusion. A survey of 338 WSF users released by Elway Research Inc. in September 1997 indicates a high level of satisfaction among ferry customers. Exhibit 6-3 is taken from that report.

EXHIBIT 6-3
Results of a Ferry Customer Survey
Against Seven Service Attributes



Source: Elway Research Inc., June 1997.

The results indicate that a high percentage of the respondents are pleased with the system and most of its attributes, including boat cleanliness, operation, comfort, and on-time performance. Only the terminal components elicited a high percentage of negative reaction, primarily due to poor terminal access and inadequate parking. Most importantly, the survey indicated that 72 percent of customers felt very safe while riding the ferries.

2. A UNWEIGHTED COMPARISON OF THE NUMBER OF COAST GUARD SAFETY DEFICIENCIES ISSUED TO THE SIX U.S. FERRY OPERATORS IN OUR COMPARISON GROUP SHOWED THAT WSF WAS CITED LESS FREQUENTLY THAN FOUR OF THE FIVE OTHER OPERATORS.

Safety is a relative concept and may be defined in the context of a system, emergency plans, training, asset condition, and operations, among other things. In this section, we evaluate the safety of the WSF fleet from the perspective of asset condition and operations. Our evaluation consisted of a review of WSF accident reports, U.S. Coast Guard (USCG) interviews and regulatory compliance statistics, U.S. Department of Transportation accident studies, and a review of vessel logs.

2.1 The USCG establishes and enforces safety regulations for maritime companies operating in U.S. waters.

The audit identified the USCG as the agency of the U.S. Department of Transportation with ultimate responsibility for marine safety in the United States. The federal government has provided the Coast Guard with specific powers to enforce marine-related laws and regulations under a broad marine safety program. Its primary mission is to prevent marine casualties through appropriate legislation and regulations, and through enforcement of these laws and regulations in the field. The USCG has divided the United States into districts. Enforcement within districts is conducted through Marine Safety Offices (MSOs). The 13th District MSO oversees the WSF system.

Among other agencies, the USCG writes the regulations that apply to shipping and shipbuilding within the United States. These regulations are set forth in the Code of Federal Regulations (CFR). The CFR presents the requirements applicable to design, construction, and operation of U.S. flag ships. The regulations are promulgated under different "Titles" coinciding with the laws they implement, and each addresses a particular discipline. Title 46 specifically addresses shipping and is the most frequently referenced set of federal regulations for commercial vessel operators. The U.S. is also a party to international treaties invoking the regulations of the International Maritime Organization (IMO.) The result is a comprehensive and complex set of overlapping regulations.

2.2 All WSF vessels have Coast Guard Certificates of Inspection.

The MSO is responsible for verifying that a vessel remains in compliance with applicable requirements and CFRs for operations and any subsequent modifications during the vessel's lifetime. The MSO issues a Certificate Of Inspection (COI) on a periodic basis as validation that a vessel is in

compliance with all federal laws, regulations, and requirements the USCG enforces.

WSF vessels are inspected by the USCG four times per year and at every drydocking. For vessels in domestic service, drydocking inspections are conducted twice in five years (no interval over three years).[1] For vessels on international runs (*M/V Elwha* and *M/V Evergreen State*), drydocking inspections are conducted once a year. The audit revealed that all 25 WSF vessels meet USCG requirements and maintain current COIs.

In addition to the USCG COIs, two WSF vessels are assigned to the international route between Anacortes, Washington and Sidney, British Columbia, and must also be certified to Safety of Life at Sea (SOLAS) requirements and receive a Passenger Ship Safety Certificate. The audit also found that Passenger Ship Safety Certificates for these two vessels were current.

2.3 The WSF fleet currently maintains no U.S. Coast Guard operating waivers. However, single compartment issues present a long-term safety concern.

Occasionally, the USCG issues a waiver permitting a non-compliance vessel to continue operations for a set period of time. The audit did not identify any current operating waivers of CFR requirements for the WSF fleet. However, the two international vessels have been granted waivers from specified SOLAS requirements. The SOLAS requirement waivers are the same for both vessels and have been allowed because, while on the international run, the vessels voyage solely on protected (including inland) waters and are not more than three nautical miles from the nearest land.

In addition to reviewing current waivers, the audit team reviewed safety concerns raised by stakeholders regarding single compartment vessels.[2] WSF Steel Electric class of vessels and the *M/V Rhododendron* are built to a "one-compartment" standard. At the time that these vessels were built, a one-compartment standard was acceptable. The one-compartment standard on these vessels has been "grandfathered" by the USCG, and they are certified

[1] Drydock examination means hauling out a vessel or placing a vessel in a drydock or slipway for an examination of all accessible parts of the vessel's underwater body and all through-hull fittings.

[2] Compartmentation is the subdividing of a vessel's hull by transverse watertight bulkheads so that the vessel will remain afloat under certain assumed conditions of flooding (i.e., the waterline will not rise beyond the margin line). By the number and location of the transverse watertight bulkheads in a vessel, that vessel can be made to be a one-, two-, three-, etc. compartment vessel. A vessel defined as a "one-compartment" vessel means that any one compartment in the vessel's hull may be flooded without the vessel sinking below its margin line. If, however, two compartments are flooded, the vessel will sink beyond its margin line.

to continue to operate.[3] The audit found that if any of the Steel Electric class vessels and the *M/V Rhododendron* were to allow their USCG COI to lapse, they could not be recertified under the present USCG regulations. The audit did not make a determination of the safety of one-compartment vessels and their adequacy to continue operations. However, numerous TRAC members indicated that the replacement of these vessels should be a priority and that an independent technical or engineering inspection of these vessels to arrest any concern regarding their condition and seaworthiness would be prudent. The Steel Electric vessels are currently scheduled to be reassigned or retired by 2010.

2.4 The Washington ferries are cited for safety infractions less often than other ferry systems, with little difference between classes.

The USCG uses a Form 835 to record regulation deficiencies identified during all inspection visits. The issuance of a Form 835 against a vessel is the most objective measure of a vessel's safety status which is available for comparison purposes. The status of Form 835 deficiencies for each U.S. registered vessel is contained in a USCG maintained database, the Port State Information Exchange (PSIX) System. The PSIX System contains specific information derived from the USCG's Marine Safety Information System (MSIS). The PSIX System contains data from 1992 to the present.

To assess the comparable safety status of WSF's fleet, a comparison to other auto-ferry operators was completed. Exhibit 6-4, on the following page, provides a summary of 835's issued to WSF and five other auto-passenger ferry systems during the six-year period since the 1991 audit.

[3] Older vessels that do not meet today's USCG safety requirements, are allowed to have vessel configurations that do not meet today's safety requirements, i.e., "grandfathered." This means that a vessel configuration that was in place prior to a new regulation requiring a different configuration may remain as-is and still meet USCG certification requirements.

EXHIBIT 6-4
Summary of U.S. Coast Guard Form 835 Deficiencies Issued to Six Auto-Passenger Ferry Systems (Calendar Year 1992 to 1997)

Ferry System	No. of Auto-Passenger Ferries *	Total No. of 835 Reports Over Six Year Period	Average No. of 835 Reports Per Vessel Per Year
Washington State Ferry	21	805	6.4
Alaska Marine Highway System	8	426	8.9
Staten Island	7	752	17.9
Cape May-Lewes	1	58	9.7
Anderson Island	1	59	9.8
Black Ball (Private Operator)	1	4	<1.0

Source: U.S. Coast Guard Port Safety Information Exchange (PSIX) and Booz·Allen analysis.

Note(*): Only includes number of 835 Reports and corresponding number of auto-passenger ferries included in the PSIX system and in operation over the six-year period.

As the exhibit indicates, a conclusion can be drawn from this objective USCG database that WSF has a statistically better record of safety compliance, based on the average number of USCG Form 835 deficiencies per vessel per year, than any of the other public ferry systems analyzed. However, all public ferry systems have more deficiencies than the privately-owned ferry system, Black Ball Transport. The analysis did not evaluate and weight the relative seriousness of each 835 infraction and its potential impact to fleet safety within or across the ferry systems evaluated. Additionally, BC Ferries was not considered in the comparison because safety oversight and compliance of its vessels is provided by the Canadian Coast Guard.

The audit also compared the number of Form 835 deficiencies issued to each WSF vessel over the six-year sample and between vessel classes. The comparison showed no distinct patterns or abnormalities over time or between vessel classes. Additionally, the audit found that WSF does not currently maintain a formal database of current and past Form 835 deficiencies for review and analysis purposes.

2.5 WSF safety performance statistics compare favorably to various ground modes of transportation.

A good indicator of fleet and operational safety is the comparison of shipboard incidents and fatalities as a fraction of total activity level, not only among ferry systems but also in comparison to other modes of transportation.

Incident and fatality statistics were not available for other ferry systems during the audit. Exhibit 6-5 is taken from a report prepared by the U.S. Department of Transportation. It reports on incidents and fatalities experienced by the several modes. The exhibit compares experience with these other transportation modes over a three-year period during the 1990s.

EXHIBIT 6-5
Comparison of WSF Safety Performance
With Other Transport Modes Over a Three-Year Period

Mode of Transportation	Incidents Per Million Vehicle Miles *	Fatalities Per Billion Vehicle Miles *
Airlines	**0.0004**	17
WSF	0.9	**0**
Highway-Automobile	1.5	26
Highway-Bus	5.6	16
Commuter Rail	12.4	421
Heavy Rail	29.4	164

Source : U.S. Department of Transportation and Safety Management Information Statistics.
Note(*): Lowest incident or fatalities number illustrated in bold.

For purposes of the Department of Transportation report, an incident with a ferry would include a collision, an allission, or grounding. An incident with a surface transport vehicle would be an accident where damage has been reported in excess of $1,000 or involving fires. The exhibit indicates WSF's positive performance in comparison to these other modes of transportation, with only airlines exhibiting better incident performance.

Additionally, a review of WSF's accident reports indicates that over the past five years, seven accidents have occurred, resulting in six groundings and one collision. The U.S. Coast Guard concluded that the collision occurred due to the fault of the non-WSF vessel. Human error was identified as the cause of all but one accident, where mechanical failure was the stated cause. Lastly, the evacuation of passengers for safety of life reasons was not required during any accident.

2.6 The WSF fleet includes vessels that are significantly older than other ferry systems.

During the audit, numerous stakeholders raised concerns regarding the age of some vessels within the fleet and their relative safety. We conducted interviews with numerous ferry systems to assess what they consider the useful life of a ferry to be. In addition, we reviewed the age of vessels in each system's fleet to assess the oldest vessel currently in operation. Exhibit 6-6 presents our findings from this analysis

EXHIBIT 6-6
Comparison of Oldest Vessels in Fleet of North American Ferry Operations

Fleet	Stated Useful Life of a Ferry	Oldest Ferry (Year Built)	Oldest Ferry (Present Age)	Difference From Oldest WSF Ferry
WSF	40 yrs.*	1927	71	n/a
British Columbia	40 yrs.	1949	49	-22
Black Ball	60+ yrs.	1958	40	-31
Alaska Marine Hw System	60 yrs.	1963	35	-36
Staten Island	30 yr. (min.)	1965	33	-38

Source: Booz·Allen analysis.
Note(*): WSF assumes preservation of vessels at 25-year life. Black Ball Transport useful life estimate assumes no major investment. BC Ferries assumes preservation of vessels as required. The audit did not conclude any advantage for the level or type of capital investment for other systems.

The exhibit shows that WSF operates the oldest ferries of the sample. Older ferries currently in operation were identified in the Great Lakes and Lake Champlain (in Vermont), both fresh-water environments. However, the oldest ferries being operated in a salt-water environment in North America were found to be WSF ferries. The exhibit shows no consistency in policy among the ferry systems regarding a standard useful life. Most importantly, the audit found that the service life of a vessel is not determined solely by age factors; the quality of the maintenance and refurbishment/preservation provided is also a consideration. The age factor that is relevant appears to be regulatory obsolescence where regulatory compliance to modern standards cannot be satisfied without expensive modernization.

3. OVERSIGHT AND TRACKING OF WSF FLEET AND TERMINAL MAINTENANCE PRACTICES VARY AND ARE DECENTRALIZED.

Fleet and terminal maintenance practices significantly affect the condition, performance, and safety of the ferry system. Maintenance typically performed in a ferry system can be categorized as emergency, preventive, or scheduled. In all cases, work may be performed by a WSF vessel crew, by WSF's Eagle Harbor Repair Facility (EHRF), or by local and regional contractors and shipyards. This section focuses on WSF maintenance management practices and responsibilities, in addition to the effectiveness of the EHRF facility.

3.1 Variance exists between vessel and terminal maintenance management, with greater oversight, ownership, and resources dedicated to WSF's fleet.

Maintenance responsibility and execution extends across three departments: Port Engineers, Terminal Maintenance (subset of Operations Planning), and the EHRF. Port Engineers are responsible for the planning, scheduling, and coordination of all vessel maintenance. One Port Engineer is assigned as a liaison with Eagle Harbor, which is a dedicated repair facility providing maintenance to WSF fleet and terminals. Similarly, Terminal Maintenance coordinates maintenance and repair activities for WSF's terminals. As indicated in Chapter IV, all three departments are located in Operations. Also noted earlier is a plan to shift these three departments into an independent Maintenance Management Division.

The audit identified strong ownership and advocacy of the fleet by WSF's Port Engineers. This, in conjunction with dedicated engineering crews on each vessel and Staff Chief Engineers, who are administratively responsible for maintenance on their vessels, is reflected in the positive condition of the fleet indicated above. Staff Chiefs have responsibility for oversight and maintenance of both vessel machinery and topside spaces. Including over 20 Staff Chief Engineers and three Port Captains, fleet maintenance has adequate accountability and oversight.

In contrast, one Terminal Maintenance Manager, in conjunction with two Terminal Managers, currently oversee the operation and maintenance of all 20 terminals. Terminal Engineering assists with the coordination and conduct of period inspections. Terminal agents, who are the day-to-day on-site representatives of WSF, coordinate maintenance and repairs with Terminal Maintenance. In comparison to vessel maintenance, however, the audit found less ownership and advocacy for many of the terminals visited. This is, in part, due to the fragmented responsibilities for the day-to-day operations, periodic inspections, maintenance, and project planning between the WSF organization (i.e., Terminal Engineering, Terminal Maintenance, Terminal Managers, and Terminal Agents), WSDOT, and service contractors. To some extent, the Port Engineers fulfill all of these roles for the WSF fleet.

Lastly, the audit team expected to find an integrated, standardized, and systematic Maintenance Management System (MMS) to ensure that all appropriate maintenance is being conducted in a timely manner; that maintenance completed is documented (i.e., when, where, by whom, and how long); and ownership/system costs are tracked over time. The use of an MMS reflects best practices in operation and capital intensive-businesses such as WSF. Such a system was not in place for terminal maintenance.

3.2 Comprehensive maintenance and inspection records are not centralized or easily accessible for the fleet and terminals.

Emergency repairs and scheduled maintenance may be conducted by ship staff, Eagle Harbor, or contractors, depending on available resources, location, time, and other matters. Preventive maintenance is typically completed by shipboard staff for vessels and by Eagle Harbor for terminals. Additionally, preventive maintenance and repairs of special machinery and systems (such as elevators, escalators, fire suppression systems, etc.) are completed under service contracts with regional vendors. This division of work and responsibility is consistent with what the audit team expected; however, maintenance controls and oversight were not.

A key element to machinery monitoring and maintenance is appropriate oversight of the process, including quality assurance. The audit found that sufficient maintenance oversight by the EHRF Shop Foreman, Chief Engineers, and Port Engineers was provided to ensure that the appropriate maintenance was completed, that it was done to WSF's satisfaction, and that a record is maintained on the vessel. The level of detail and data retained in machinery logs across the fleet varied, as did computerized machinery records. This disparity is a result of the lack of a systematic and standard MMS used across the fleet.

Unlike the maintenance performed on the vessels, there is no indication that a system for monitoring or review of routine preventive maintenance and inspections of terminals exists. Due to the specialization of the equipment, several outside contractors perform much of the systems maintenance on terminals (e.g., cable sheaves, water sprinklers, elevators, etc.). The WSDOT Bridges and Structures Office monitors and inspects each terminal's piers and trestles. Data on maintenance is dispersed among all the participants of terminal maintenance. During the audit, the team requested inspection and maintenance reports for various systems/equipment at the terminals. We expected that Terminal Engineering or Terminal Maintenance would retain a complete copy of all inspection and maintenance reports. The audit found that this information is not well managed and is retained among various vendors and departments responsible for inspection and maintenance of the terminals.

4. EAGLE HARBOR PLAYS A KEY ROLE IN WSF'S ABILITY TO EFFECT TIMELY REPAIRS, BUT OPERATES WITH ANTIQUATED FACILITIES AND REQUIRES BETTER MANAGEMENT AND CONTROLS.

Eagle Harbor is a key element in WSF's maintenance program. It supports annual vessel lay-up periods, emergency vessel and terminal repairs, preventive maintenance, and other maintenance needs. In FY 1997, EHRF accounted for more than 55 percent of total maintenance expenditures. Remaining maintenance was completed by contractors, outsourced labor, and, to a lesser extent, WSF engineering staff.

In this section, we evaluate the feasibility and cost performance of EHRF over recent years. In conducting our evaluation, we considered facilities, labor, skills, cost, outsourcing, and management.

4.1 EHRF facilities are antiquated and poorly laid out.

EHRF is located on Bainbridge Island. The facility is housed in one main building and three auxiliary buildings containing warehouse/storage and shop areas. Additionally, there is docking space to support simultaneous work on six auto-passenger ferries and one passenger-only ferry. The main building is of wood construction; it predates the 1940s, and is partially situated on wood pilings in the water. The building contains no comprehensive fire suppression system, and asbestos shielding coats the underside of the steel flooring of the building. To reduce the hazard of fire, the weld shop is located in a smaller building near the main building.

EHRF's main building is poorly laid out, with non-contiguous shop areas making the movement of heavy items between work stations difficult. Each shop has a small office containing paper records of the work performed in the yard for the last several years. The General Foreman's office is located in a separate building away from the shops and the yard's administrative and management offices. The electrical shop is located on the second floor, requiring the lifting of equipment up to that level in order to work on the equipment. Collectively, this results in less than optimal operations.

4.2 EHRF's cost of labor is comparable to private shipyards and facilities.

An alternative to completing work at EHRF is to use regional shipyards and repair facilities. This is done periodically depending on the complexity of the job and the availability of WSF resources. Historically, major repairs, overhauls, and refurbishments were conducted outside of EHRF. The audit

identified more than ten Puget Sound-based ship repair facilities with varying capabilities to support WSF repair and maintenance needs.[4]

A comparison of regional labor rates including salary, benefits, overhead, and facility allocations was completed to assess the cost competitiveness of EHRF. EHRF's fully burdened rate is $48.41 per hour and is slightly higher than the $42.00 average for private yards in the region. However, the audit found that, when considering only variable costs and overhead in developing EHRF's rate, it is reduced to $39.19 and becomes competitive to private-sector services in the region. This is a better measure of competitive position, assuming EHRF remains in existence. This finding suggests that, assuming similar labor productivity and capability, completing maintenance and repair work at EHRF has a slight advantage over using regional shipyards and repair facilities.

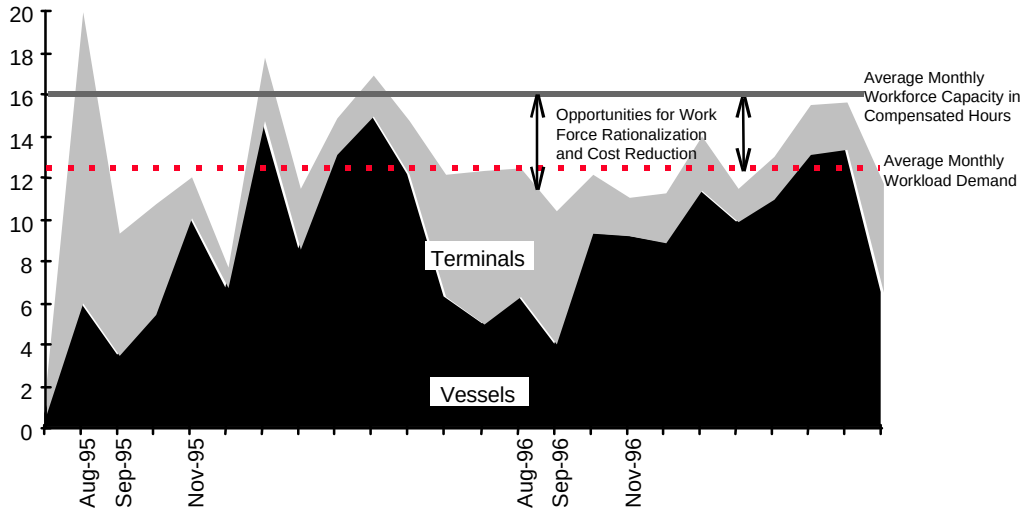
4.3 EHRF's workload is seasonal, and current staffing is not aligned with current workload.

The audit identified similar trade skills at EHRF to those found in other regional shipyards and repair facilities. The number of staff working at EHRF at any one time varies with the current workload. EHRF currently maintains a staff of 110 and supplements this staff with temporary workers when workloads exceed base capacity. Temporary staff are paid the same rates as full-time WSF employees, and the use of temporary labor appears to be an effective means of maintaining lower permanent staff levels. Eagle Harbor indicated that it has not had any difficulty in hiring temps when needed. Additionally, specialized maintenance skills are contracted out (e.g., transfer span cable repairs and greasing, hydraulics, pier replacement, main engine overhauls, etc.).

In evaluating EHRF effectiveness, we compared the actual workload of Eagle Harbor with current staff capacity. Monthly workload was provided by Eagle Harbor. Current staff capacity expressed in monthly available hours to complete work (e.g., compensated hours) was obtained from the Marine Labor System. The analysis was completed over the past two fiscal years by month. A graphic of the analysis is provided in Exhibit 6-7, on the next page.

[4] The ten shipyards include: Todd Pacific Shipbuilding, Dakota Creek, Lake Union, Foss Maritime, Maritime Contractors, Duwamish, Fisherman's, Marco, Marine Industries, and Martinac. Each facility maintains different capabilities, services, and drydock facilities.

EXHIBIT 6-7
Average Monthly Workload at Eagle Harbor Repair Facility
(FY 1996 and FY 1997)



Source: *WSF Marine Labor System, Eagle Harbor Repair Facility, and Booz·Allen analysis.*

Note (*): *WSF states that a major portion of the 7/ 95 and 12/95 data were incorrectly entered in 8/95 and 1/96 respectively, creating an unusually high variation in hours.*

The exhibit illustrates actual hours worked on vessels and terminals in the two shaded areas. The vessel area clearly illustrates that maintenance completed on the vessels is concentrated in the non-summer months, when ferry availability is greater. Similarly, terminal maintenance is concentrated in the summer months when EHRF's labor pool has the greater availability. The two horizontal lines represent actual labor capacity (solid line) and average monthly workload (dashed line).

More interestingly, the exhibit suggests potential opportunities to realign EHRF's work force to better meet base demand, with the potential of increasing the use of temporary labor or outsourcing work to regional yards during peak months. A financial evaluation of the prospect of reducing EHRF's labor force against FY 1997 demand and using temporary or contractor labor during peak months indicates that potential savings of $1.1 million annually are possible. This analysis did not evaluate staffing levels and workload by trade, nor did it account for the potential increase in average monthly workload resulting from the addition of the new Jumbo Mark II ferries into WSF's fleet.

4.4 Eagle Harbor does not have the capability to estimate projected costs for comparison with private-sector bids.

Effective management of a ship repair facility should include the capability to develop accurate and timely estimates (or bids) for completing standard jobs. The ability to develop job estimates reflects an understanding of labor cost, productivity, and materials costs. To assess EHRF's ability to do this and compare its cost position to regional ship repair facilities, six job package descriptions were developed and provided to EHRF and five regional shipyards for cost estimates. A comparison of the job quotes was developed after receiving quotes from each facility. The analysis was inconclusive because EHRF was unable to develop detailed cost estimates. While some estimates for labor were in line with the average quote from industry on some jobs, in all cases the quotes were significantly under the industry average. One reason for the difference in quotes is that EHRF does not have a system that enables it to estimate materials and machinery parts costs. Implicit in EHRF's inability to estimate project costs is a generally poor understanding of WSF's cost of ownership.

5. WSF HAS BEEN UNSUCCESSFUL IN IMPLEMENTING A MAINTENANCE MANAGEMENT SYSTEM TO STANDARDIZE DOCUMENTATION AND MAINTENANCE PROCESSES.

An operations-oriented organization must recognize the need for a system that not only provides the proper tools for planning and scheduling maintenance, but also ensures sufficient scrutiny and analysis at a very early preventive maintenance stage. The maritime industry, with its constantly shifting and widely distributed machinery base, has the additional need of a centralized system to provide a level of uniformity and control that otherwise might be impossible. Implementation and integration of an MMS is considered industry best practice.

The audit found that WSF is in its fourth year of developing an MMS. In the fall of 1997, the basic MMS development was completed. Users of the system were to include fleet engineers, terminal managers, EHRF, and materials management (i.e., procurement). However, fleet engineers and materials management are not using the system, listing functionality, lack of ship-to-shore communications, and unproven database access and integrity as some of many issues that need to be resolved. The audit reviewed the development process to identify mistakes and lessons learned from this effort. Findings from this review are detailed in Exhibit 6-8,on the following page.

EXHIBIT 6-8
Lessons Learned From MMS

Finding	Result
System users and functionality were not clearly defined at beginning of process, prior to selecting software.	MMS tool is not being utilized by primary user group (i.e., fleet) at end of development.
Program management and leadership changed hands numerous times between Operations and MIS departments.	Project direction and focus changed, resulting in schedule delays.
Make/buy decision of software package was determined by procurement convenience, not business rationale.	Highest value decision may not have been made.

Source: WSF and Booz×Allen analysis.

A comparison of WSF's expended cost for MMS development to cost estimates provided by two established MMS software providers, Marine Management Systems and Nautical Technology Corporation, was completed. The comparison indicated that WSF expended from $320,000 to $460,000 dollars more than was necessary; additionally, had WFS worked with an established software vendor, it could have a proven and operational system in hand with the appropriate functionality required. The benefits of developing an MMS and implementing it into daily operations and management practices are great. The audit identified one large North American ferry system who estimates annual savings in excess of $2.0 million (1997 dollars) after recovering initial investment costs. Benefits typically achieved by marine operators who implement these systems include:

- Assist maintenance staff to plan more effectively and efficiently;
- Reduce costs of spare parts;
- Decentralize responsibility and centralize understanding and analysis of the maintenance function;
- Improve service standards and equipment reliability;
- Assist in managing and understanding costs;
- Provide tools for repair/replace decisions of fleet assets;
- Improve/standardize maintenance process and documentation; and
- Centralize information for improved asset management.

6. RECOMMENDATIONS AND OPPORTUNITIES FOR COST SAVINGS.

The results of our performance audit indicate that opportunities exist to improve the maintenance practices of the WSF system and enhance operational integrity

and safety. In the last section of this chapter, we present our recommendations for WSF to improve current processes and conserve costs.

Report Recommendations 12 and 13 follow:

12. Accelerate implementation of MMS and redirect current MMS efforts to validate system functionality requirements with users and identify additional development costs.

Key to ensuring the operational integrity of WSF's fleet and terminals is its maintenance program. The audit found that while the fleet is maintained well, it does not maintain a systematic and standardized maintenance system. The development and implementation of a comprehensive MMS will enable WSF to better understand its ownership and maintenance costs, ensure rigorous documentation and machinery history records, ensure consistency of maintenance practices across the fleet and in terminals, and address public scrutiny regarding vessel condition and safety. WSF should accelerate its effort to implement an MMS and, as part of this effort, it should consider the purchase of a proven, readily available, and industry-focused product in lieu of custom development. Additional one-time cost of implementation is estimated conservatively at $1 million with additional expenditures of $500,000 estimated by WSF for Department of Information Services (DOI) oversight. Benefits resulting from implementation of an MMS are difficult to quantify, but for similar ferry systems, are estimated at $2 million annually.

13. Restructure EHRF operation addressing facilities, staffing levels, workload management, and job cost-estimating processes.

EHRF provides specialized technical skills, fleet knowledge, and convenient access for repairs which is essential to WSF maintaining its fleet. The audit identified several areas where improvements are needed to ensure its continued operation and cost-effectiveness. Immediate needs of EHRF are both facilities and operational. Principal to these improvements is the development of a long-term facilities plan to replace old and inefficient facilities. However, more immediate operational improvements regarding staffing levels, workforce and workload management, and skills development (e.g., job cost estimating) are needed. To address these needs, WSF should develop and execute an EHRF organization and operations management plan to address the above issues. Potential savings resulting from better management of staffing levels and workloads could equal up to $1.1 million annually.

VESSEL CONSTRUCTION AND REFURBISHMENT PROGRAM

Chapter Seven

The Vessel Construction and Refurbishment Program at WSF has been active in the 1990s. Four major renovations have taken place, and an equal number of new buildings have recently been completed or are underway. A new POF vessel (the *M/V Chinook*) should be in service early this year. Projects for the next six years include as many as four new POFs, the preservation of three Super class vessels, and six major vessel/systems modifications.

As part of the 1997 performance review, Booz·Allen evaluated the vessel construction and refurbishment practices of WSF, along with the practices and procedures of WSF's vessel construction and design teams. Booz·Allen had visited at least some of these issues earlier in the decade. In 1991, recognizing the need for an efficient, cost-effective program to guide the refurbishment projects ahead, WSF retained Booz·Allen to review WSF's management of vessel refurbishment programs. The primary focus of the review included contracting practices and vessel engineering processes as they relate to vessel refurbishment and new construction.

At the end of the 1991 study, Booz·Allen made 22 recommendations for improvements to the WSF Vessel Refurbishment Program, and during the 1997 study we assessed the level of WSF's compliance with those recommendations. We also evaluated the impact of the recommendations that were implemented. In this chapter, we report on the outcomes of that assessment and on other findings in the areas of vessel construction and refurbishment. Specific topics discussed include operating costs and vessel availability as they relate to refurbishment, WSF's new preservation program, and current procurement and contracting procedures.

In the final section of the chapter, we present our recommendations and opportunities for cost savings.

1. WSF HAS IMPLEMENTED MOST OF THE 1991 BOOZ·ALLEN STUDY RECOMMENDATIONS ADDRESSING VESSEL REFURBISHMENT.

In 1991, Booz·Allen completed a study of the WSF vessel refurbishment programs. At the conclusion of that study, we presented 22 specific recommendations for change within the WSF operation and management. A copy of those recommendations is attached as Appendix D. As part of the audit that is the subject of this report, we reviewed WSF's progress and compliance in implementing the 1991 study recommendations. We found that 16 of the recommendations have been implemented, with positive results. Many of the implemented recommendations pertain to contracting procedures and practices, and the WSF organization has responded to them well.

Of the 22 recommendations made, 16 were fully complied with or the intent met, three have been partially implemented, and the remaining three have not been implemented. Those recommendations not fully complied with are addressed below.

1.1 WSF is in partial compliance with three recommendations.

Recommendation 9: Standardize the Work Scoping Process. Finding that no standardized Work Scoping Process existed, the 1991 study recommended the development of a process that identifies all types and sources of information needed for work definition. As conceived, it would include all data from the earlier concept design and strategic planning phases; a vessel maintenance history; input from maintenance, masters and deck officers, operating engineers, and regulatory bodies; lessons learned; a pre-refurbishment inspection report; asbestos and toxic paint surveys; and other data as appropriate.

To date, no Work Scoping Process has been documented. Nevertheless, WSF complied in part with the intent of the recommendation by establishing formal steering committees (Work Scoping Committees) for the refurbishment of Super and Issaquah class vessels. WSF, however, has not established formal Work Scoping Committees for all major renovations (e.g., *M/V Evergreen State*).

Recommendation 10: Develop a procedure for estimated planned growth. The 1991 study's intent in making this recommendation was that WSF have a methodology for estimating growth for those areas and systems that cannot be adequately inspected before issuing the work package. Data from three sources would be utilized: a pre-refurbishment inspection; a ship maintenance history; and a change order database for previous refurbishments. WSF has established the change order database, but it is utilized only on an adhoc or informal basis. WSF has not complied with the procedural requirements.

Recommendation 19: Formalize the current Asbestos Abatement Program. The intent of this recommendation was to expand WSF's asbestos removal policy to include a formal abatement program. Program development would entail a fleetwide survey to locate remaining asbestos; establishment of a plan for removal of asbestos as part of scheduled fleet maintenance and refurbishment programs; and the tracking of asbestos until the fleet is asbestos-free. WSF has complied with the recommendation to develop a plan for removal by making removal a part of the established preservation program; however, there is no scheduled date for all WSF vessels to be asbestos-free. In addition, there is no evidence that a fleetwide survey has taken place since 1991, although inspections of six vessels (two Jumbo Mark I class ferries, three Super class ferries, and a working barge) are documented.

1.2 WSF is not compliant with three of the 1991 study recommendations, including implementation of a formal Steel Maintenance Program.

Recommendation 2: The position descriptions of the two vacant senior management positions should include a prerequisite for previous shipyard and/or vessel management experience. To date, WSF has not revised either of the position descriptions as recommended, and neither position has been filled by a manager with previous shipyard and/or vessel management experience. However, we believe that the necessity for revision has been mitigated, at least in the case of the Director/Chief Executive Officer (CEO) (Assistant Secretary for Marine Transportation at the time of the 1991 study) by numerous reorganizations and the hiring of personnel in subordinate positions with the appropriate experience.

Recommendation 7: Establish a Steel Maintenance Program. Responding to the fact that numerous WSF vessels refurbished prior to the 1991 study incurred significant cost increases over original contract values, Booz·Allen recommended that WSF establish a new Steel Maintenance Program. An existing program was presented to the audit team, but it did not meet the requirements of what Booz·Allen considered to be a comprehensive, systematic, and workable plan. As conceived in the recommendation, an adequate steel maintenance program would provide for scheduled inspections and condition monitoring; condition reports on all steel by location using standard forms; trend analysis of the condition reports to refine the inspection schedule; nondestructive testing as a regularly scheduled part of condition monitoring; evaluation of reports to determine the most effective coatings, routine maintenance schedules, work scope identification, and deterioration estimates for hidden or inaccessible steel; and evaluation of the benefits/costs of classifying all vessels under American Bureau of Shipping (ABS).

After the 1991 study, 13 of the system's 25 steel vessels were subjected to ultrasonic testing (UT) to ascertain the condition of the steel, but an adequate steel maintenance program was never developed. In 1992, WSF considered a proposal from QED, a marine management consulting firm, to develop the program, but the project was not launched. Vessel Operations and Vessel Design were separate entities by the time the proposal was received, and a lack of coordination between the two prohibited implementation.

Recommendation 8: Establish a formal pre-refurbishment inspection procedure. Noting that it found no formal pre-refurbishment inspection procedure in place during the 1991 study, and that a "lack of adequate inspection procedures . . . led to 'hidden surprises' later in the refurbishment program," Booz·Allen recommended that WSF establish a formal procedure. As conceived by the firm, the procedure would provide for coordination with vessel operating, maintenance, and routine drydocking schedules; identify areas of concern through vessel maintenance history reviews, interviews with operations personnel, and reviews of change order data from previous refurbishments; completion of all systems and space inspections using forms developed for each system and space; identification of locations and quantification of hidden or inaccessible items; and a standardized approach to nondestructive testing for steel deterioration.

WSF has not developed a pre-refurbishment inspection procedure, and "hidden surprises" continue to surface. A major surprise came during the renovation of the *M/V Klahowya* in 1994 and 1995. Lacking any formal procedures, WSF overlooked (or failed to use) an existing detailed inspection report on the *M/V Klahowya* to estimate the steel replacement required. While the report was available in the Vessel Engineering Library, WSF relied instead on estimates for an earlier renovation of the *M/V Tillikum*. The rationale for this decision was logical. Both ships were constructed in the late 1950s, and both are Evergreen State class vessels with identical customer capacity. Nevertheless, the estimate was low, and WSF incurred $1 million in unanticipated steel replacement costs and potential shipyard delay and disruption fees. In addition, the vessel was out of service 39 days longer than planned.

The development and judicious use of a comprehensive formal pre-refurbishment inspection procedure can help WSF avoid future unanticipated costs and delays.

2. THE WSF REFURBISHMENT PROGRAM REDUCES MAINTENANCE COSTS AND IMPROVES SERVICE RELIABILITY MODERATELY.

WSF has been a major ferry operation for nearly 50 years now, and as such it owns a fleet that consists of many vessels that have been in service for decades. To assure its customers of continuous service at affordable rates, the system is making significant investments in major vessel renovations. Four renovations have already been completed in this decade, and several preservations are planned over the next six years. As part of our performance review, we assessed the performance of these refurbished vessels, comparing them to other vessels in the fleet in terms of maintenance costs incurred, overall operations costs, and service reliability (i.e., availability). We compared the refurbished vessels both to newer vessels and to older, non-refurbished vessels. Comparisons were made across the fleet and within vessel classes.

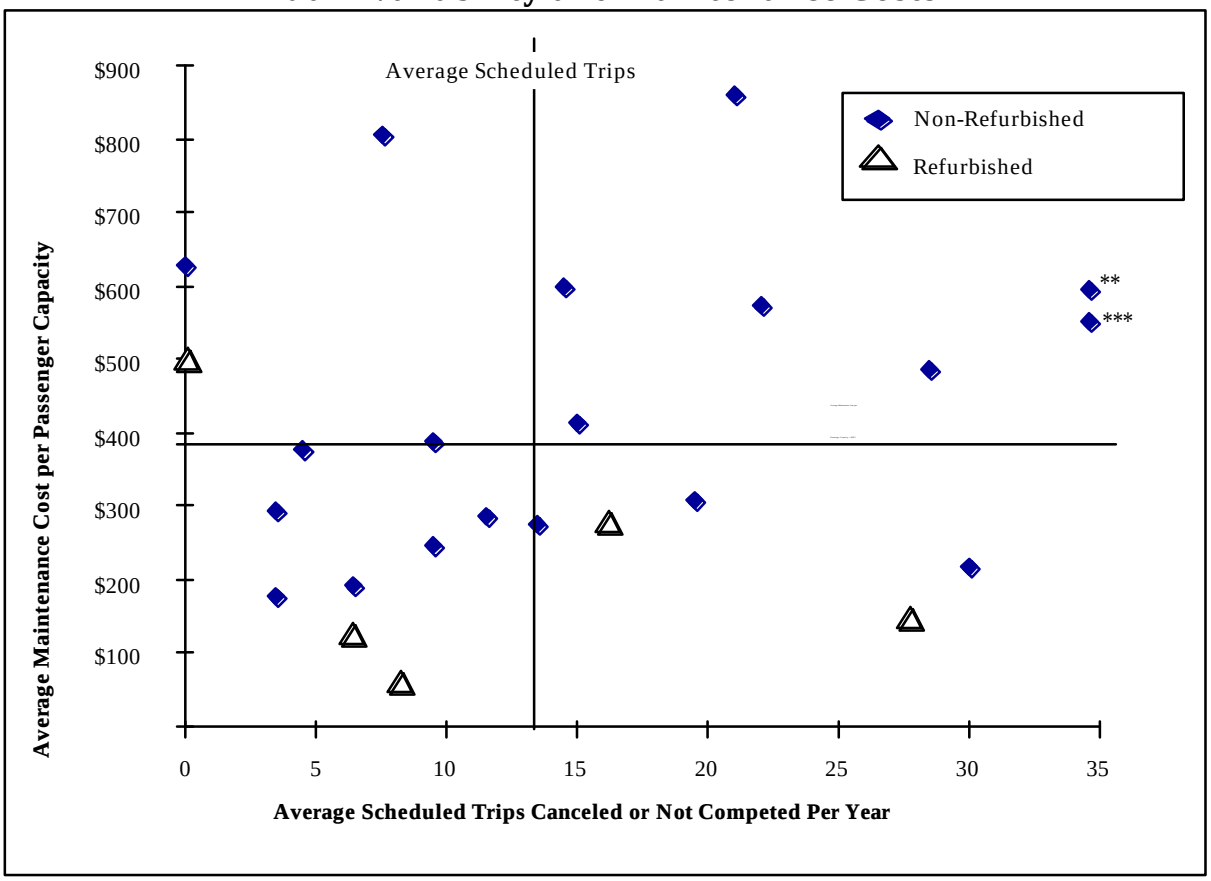
The refurbished vessels compared favorably in terms of maintenance costs and service reliability. To a lesser extent, operating costs were also smaller. It must be noted that the true impact of refurbishment in terms of savings achieved will only be known ten to 20 years from now, when the data exists for long-term comparisons. Reliability and cost data at the time of the audit dated back only two and eight years, respectively.

2.1 Refurbishment programs appear to be effective in reducing maintenance costs and, to a lesser degree, in increasing service reliability.

Our review of the major refurbishment program appears to indicate that the program is achieving a reduction in maintenance costs for post-refurbishment vessels and in a modest increase in vessel reliability.

To make the determination with regard to maintenance costs, we compared total maintenance costs dating back to 1989 for refurbished and non-refurbished vessels. We viewed the costs in terms of average cost per passenger “capacity” to normalize costs across the fleet. We chose to apply the number of scheduled runs missed as our indicator of service reliability. Data was available for 1996 and 1997. The non-refurbished vessels used in the comparison include both older and newer vessels (“newer” being less than 12 years in service). The results are illustrated in Exhibit 7-1.

EXHIBIT 7-1
Comparison of Refurbished and Non-Refurbished Ferry Annual Availability and Maintenance Costs



Source: *WSF and Booz·Allen analysis.*
Note (*): *Average number of trips lost does not include the Klickitat and the Nisqually.*
Note (**): *The Nisqually had 207 lost trips in 1996 and 1997.*
Note (***): *The Klickitat had 777 lost trips in 1996.*

As the exhibit shows, the average maintenance cost-per-passenger capacity for all vessels compared is just under $400. Of the five refurbished vessels included in the comparison, four were below the average ($300 or less). The one refurbished vessel exceeding the average had a maintenance cost of slightly more than $600. Of the 18 vessels that have not been refurbished at any time, ten were at or above the average, with two at $800 or more. The lowest documented per-passenger-cost for a non-refurbished vessel was just under $200. Three of the six refurbished vessels were under this mark, with one recording a per-passenger- cost of less than $100.

There is a caveat in regard to these maintenance results, i.e., it is expected that newly renovated vessels will enjoy reduced maintenance costs in the near term. As stated above, a truer picture of the cost benefits of renovation will be available several years from now, when the renovations have been complete for a longer period of time and more data is available.

As noted above, we measured availability by counting the number of scheduled runs missed per year due to a vessel problem. The exhibit shows that the renovated vessels have a small advantage here. The average number of cancellations per vessel included in the comparison was about 13. Four of the six refurbished vessels had fewer than thirteen cancellations (and one of these had none). Of the 18 non-refurbished vessels, exactly half were at or below the average.

The performance of refurbished ferries results in net operating savings to the ferry system when compared within a given class of ferry. A comparison of average yearly maintenance costs between July 1993 and July 1997 for the refurbished Super class vessel *M/V Elwha* against the three non-refurbished vessels in the same class indicates relative savings from the *M/V Elwha*'s refurbishment. The average annual maintenance costs of the *M/V Elwha* were slightly less in two cases and significantly less than the third vessel in the comparison. The average annual maintenance costs for the non-refurbished vessels was $538,792, or $200,000 more per year than the maintenance costs for the *M/V Elwha*. However, capital investments of over $27 million were invested to achieve these relatively minor annual savings in maintenance costs–and cannot justify renovation alone. Service reliability and total operating cost savings should also be considered.

A service reliability comparison of refurbished vessels to newer vessels (12 years or less) showed that refurbished vessels experience more missed runs on average than newer vessels. Exhibit 7-2 displays the results of comparisons fleetwide and within specific vessel classes.

EXHIBIT 7-2
Comparison of the Operational Availability of Refurbished Vessels and Newer Vessels

WSF Fleet	Missed Runs FY 1996	Missed Runs FY 1997	Average No. of Missed Runs
All Refurbished Vessels[1]	14.70	13.30	14.00
All Newer Vessels [2]	6.50	4.30	5.40
Class Specific:			
Super Class[3]			
– Refurbished	7.00	6.00	6.50
– Non-Refurbished	10.70	7.30	9.00
Evergreen State Class[4]			
– Refurbished	18.50	17.00	17.75
– Non-Refurbished	50.00	7.00	28.50

Source: WSF Operating Statistics Report and Booz·Allen analysis based on missed scheduled runs due to mechanical or safety equipment problems.
Note (1): Includes following vessels: Elwha, Tillikum, and Klahowya.
Note (2): Includes following vessels: Issaquah, Kittitas, Kitsap, Chelan, Cathlamet, and Sealth.
Note (3): Refurbished: Elwha; unrefurbished vessels include: Hyak, Kaleetan, and Yakima.
Note (4): Refurbished vessels include: Tillikum, Klahowya; unrefurbished: Evergreen State.

The exhibit compares three ferries refurbished since 1991 with the three newest auto ferries (i.e., the last three *Issaquah* class ferries built). The exhibit demonstrates that the newer vessels provide much better operational availability than the older, refurbished vessels. This indicates that new vessel construction provides higher service reliability/availability than refurbishment.

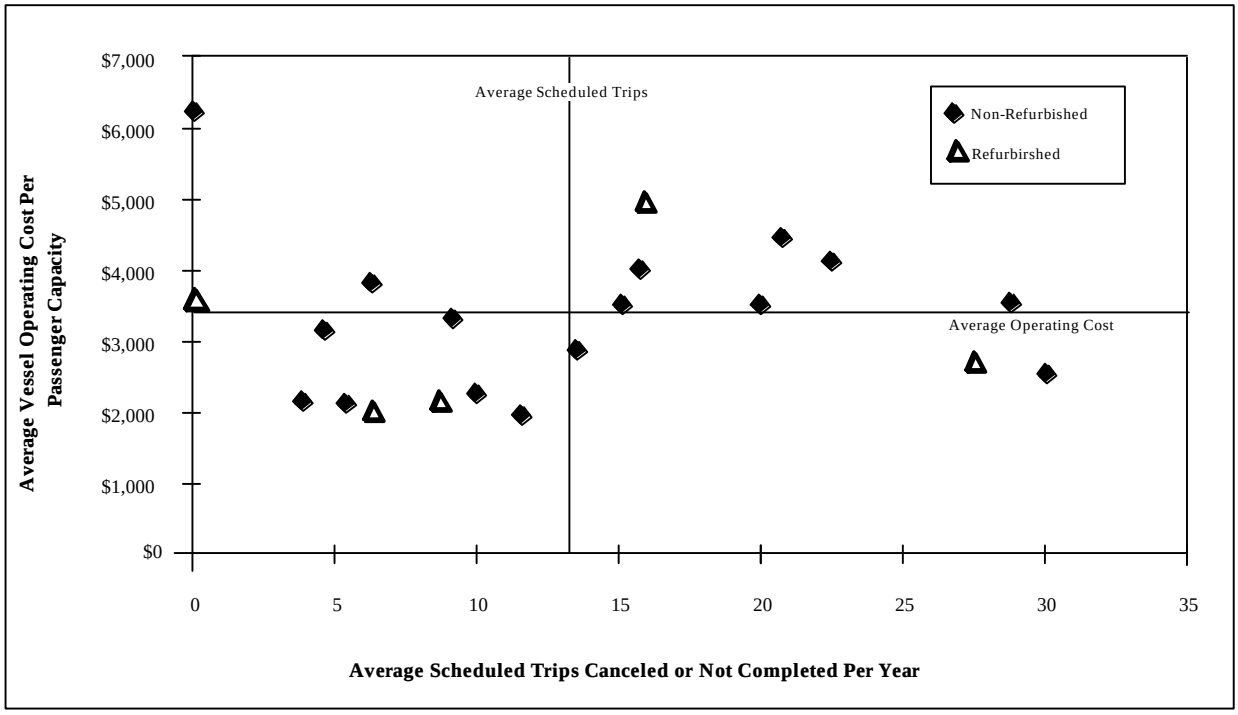
Our same-class comparison (again, the refurbished *M/V Elwha* compared to the three other non-refurbished vessels in the Super class) shows that the refurbished vessel has marginally better operational availability than the average of the other three. The *M/V Tillikum* and *M/V Klahowya* have significantly better operational availability than the other vessel in the class, the *M/V Evergreen State.*

Overall, newer vessels have better operational availability than the recently refurbished vessels. However, the refurbished vessel has better operational availability than the non-refurbished vessels in the same class (though not to the extent that the newer vessels have over the refurbished vessels). It must be noted, however, that these comparisons have limited relevance because of the small number of vessels included and the limited amount of data available.

2.2 Refurbishment programs appear to result in only minor savings in overall operations costs.

When considered separately, it appears that vessel refurbishments led to savings in maintenance costs. When these costs are combined with all other operating costs, however, the savings are less significant. Using data collected since 1989, the audit team compared the average total operating costs of 5 refurbished vessels against those of 15 non-refurbished vessels. Again, the dollar amounts were based on average cost-per-passenger capacity. The outcome of the comparison is displayed in Exhibit 7-3 below.

EXHIBIT 7-3
Comparison of Annual Operations Costs and Cancellations for Refurbished and Non-Refurbished Ferries



Source: WSF and Booz·Allen analysis.

As the exhibit illustrates, three of the five refurbished vessels included in the comparison had per-passenger operating costs below the overall average of approximately $3,500 per passenger. One refurbished vessel exceeded the overall average by a slight margin; the other reached approximately $5,000. Of the 15 non-refurbished vessels in the comparison, 7 were at or below average, and 8 were above the average, with 1 vessel exceeding $6,000 per passenger.

At first glance, it would appear that the refurbished vessels compared favorably to their non-refurbished counterparts. However, taking into

account the caveat expressed in subsection 2.1 above—that lower costs are to be expected in the years immediately following a renovation—and when considering the costs of the refurbishment itself and corresponding loss of service capacity over the renovation period, the benefits resulting from refurbishment are less significant and, depending on the analysis, may offer no benefits.

3. WSF HAS PLANNED AND IS IMPLEMENTING A PRESERVATION PROGRAM TO REPLACE ITS HISTORIC REFURBISHMENT PROGRAM.

As part of the audit, we conducted a comprehensive review of major renovations performed on vessels of the WSF fleet and the major maintenance approaches used to keep the vessels in working condition. We found that WSF is currently making a transition from a "major renovation" approach to a "preservation" approach. There are several advantages to the preservation approach, and we found WSF's move in this direction to be well-reasoned. However, we also found that WSF will need a well-managed Steel Maintenance Program if it is to maintain and preserve its vessels in a manner that adequately supports the WSF's service standards and financial restrictions.

3.1 The refurbishment program may not result in the greatest return on capital investment as expenditures for some refurbishments have exceeded 67 percent of new construction costs.

In the past, WSF used a "two-thirds" rule of thumb when deciding whether to renovate or build new, i.e., a renovation is only cost-effective if the total cost does not exceed two-thirds (66-2/3 percent) of what it would cost to build a comparable new vessel. As Exhibit 7-5 makes clear, in WSF's experience the concept of major renovation has proven not to be cost-effective.

EXHIBIT 7-5
Comparison of Refurbishment Costs to Cost of New Construction
(1997 Dollars in Millions)

Vessels	Cost of Refurbishment	Cost of New Construction	Refurbishment Cost as Percent of New Construction Costs
Steel Electrics*	$64.9	$73.0	89%
M/V Rhododendron	$16.5	$20.9	79%
M/V Elwha	$27.4	$53.0	52%
M/V Tillikum	$18.9	$34.7	54%
M/V Klahowya	$22.7	$32.7	69%
*M/V Klahowya***	$27.1	$32.7	83%

Source: WSF and Booz·Allen analysis.
Note(*): Three vessels: Illahee, Nisqually, and Quinault.
Note(**): If shipyard claim of $4.4m is paid.

The exhibit shows the costs of major refurbishments completed in the last 12 years. Of the eight vessels shown (Steel Electrics include three vessels), only two meet the "two-thirds" test. Therefore, assuming acceptance of the "two-thirds" rule of thumb, the conclusion can be drawn that major renovation is not cost-effective. However, the effectiveness of this rule is limited. Buy versus build decisions should only be based on a detailed life-cycle cost analysis which incorporates both operating and capital expenditures over time. Nevertheless, in four of the six cases shown in the exhibit, it appears that it would have been more prudent to construct new versus refurbish, if financial resources were available at the time of refurbishment for new construction. In these four cases, the state's money would probably have realized a greater return on investment by building new vessels.

Looking forward and recognizing that the state will most likely have limitations on public funds available for new vessel construction, but that additional capacity to support growing vehicle demand and new services (see Chapter 8), WSF will most likely have to rationalize expenditures between new construction and maintenance of the current fleet.

3.2 Preservation offers an opportunity to maintain WSF vessels in sound operating condition while controlling costs.

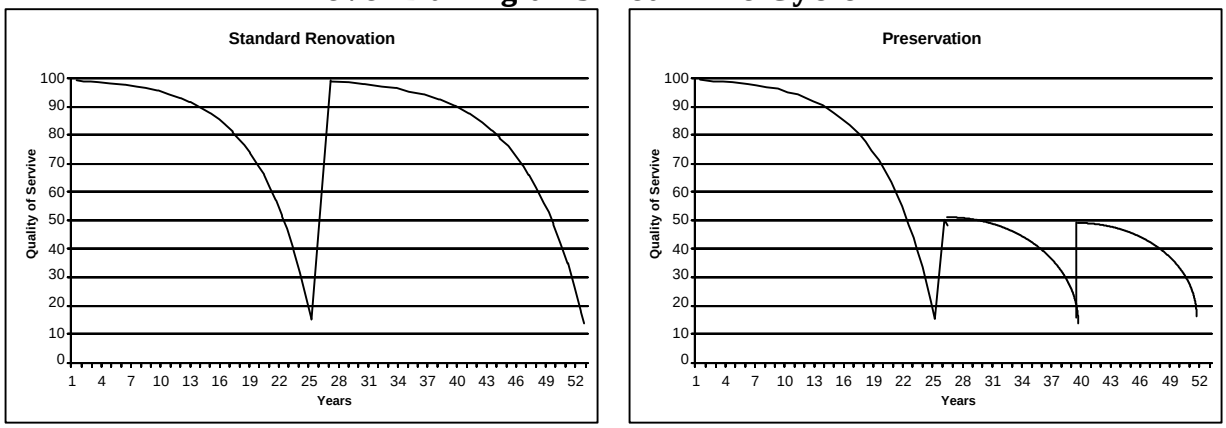
Under normal operating conditions involving mechanical equipment, the performance of a system degrades as it ages. WSF vessels are not unique. Under its "major renovation" approach, WSF assumes a 25-year initial useful life for its vessels, and the vessels are expected to deteriorate slowly (i.e., lose quality of service) over that span of time. In the past, WSF's practice has been to conduct a major renovation at the end of a vessel's 25-year initial

useful life. At this point, the expectation was that the renovation would bring the quality of service back to 100 percent (i.e., like-new condition), adding approximately 25 more years of useful life to the vessel.

Under the "preservation" approach, WSF again assumes a 25-year initial useful life for a vessel. At the end of 25 years, a major "preservation" may be conducted. The preservation effort is expected to bring the vessel back to a level of at least 50 percent of the quality of service of a new vessel and add 10 to 15 years of useful life to the vessel. In addition, or as a substitute, periodic preservation will be conducted on targeted systems over the life of a vessel to extend its useful life. Examination of peer ferry operations in North America show that a 40-year service life is common for most vessels operated in a "preservation" environment.

Exhibit 7-4 shows a representative index of the service level of a vessel during its life cycle when the two maintenance approaches are applied.

EXHIBIT 7-4
Representative Index of a WSF Vessel Service Level During a 25-Year Life Cycle



Source: WSF.

The left side of the exhibit shows a vessel in a "renovation" cycle. It experiences an increasingly degraded level of service as it ages over 25 years. Then it goes through a major renovation, including replacement of most onboard systems. At that point, the vessel is almost like new, and level of service reliability and cost efficiency are brought back to 100 percent, where the cycle starts all over again. On the right side of the exhibit is the level of service reliability and cost efficiency for the same vessel when the preservation approach is applied.

In both the case of refurbishment and preservation, depending on the level and type of work being conducted, it is probable that certain systems being modernized may not be brought up to the most current regulatory or construction standards, but only restored to original design and engineering

specifications. This is permitted by the U.S. Coast Guard under operating allowances which permit "grandfathering" of regulatory requirements and construction standards which proceeded those currently in place. In comparison, newly constructed ferries would have to meet all current regulatory and construction standards. While not completed during the audit, it may be prudent to identify and assess regulatory gaps within the WSF Fleet to current standards, and their impact of system reliability and safety.

3.3 The preservation approach offers several potential advantages over the renovation approach.

A major preservation effort will not increase a vessel's capacity (e.g., passenger or vehicle capacity), nor will it increase its capability (e.g., vessel speed, range). It also will not bring the vessel back to 100 percent performance. The main advantages of a preservation approach is that it should permit more cost-effective and targeted investments in vessel systems, passenger spaces, and hull with lower project expenditures. Additional advantages of preservation may include the following:

- Shorter periods out of service for major maintenance work;
- More schedule control and reduced delay and disruption;
- The ability to implement upgrades of spaces and equipment on a more frequent basis, precluding a gradual slide into obsolescence; and
- Less costly, less time-consuming planning effort.

Furthermore, inefficiencies caused by the high cost of the extensive removal of materials required for major renovations (estimated as high as 30 percent of total project costs) are not value-added investments and could be minimized with the preservation approach.

3.4 The preservation approach needs appropriate management tools to ensure savings are realized.

To support the implementation and management of the preservation program, the appropriate decision and monitoring tools, including the development of life-cycle cost models for vessels and terminals should be developed. In 1996, the WFS Vessel Engineering Department contracted with American Management Systems (AMS) to develop a formal Vessel Preservation Program. Under this program, AMS developed a life-cycle model of the WSF fleet. In support of the effort, WSF Port Engineers, vessel Staff Chief Engineers, and vessel engineering staff collaborated to compile data on vessel systems, equipment, and components. The data included

information to establish normal life cycles (i.e., expected useful lives of components based on fleet experience), dates of previous refurbishments/upgrades/replacements, and component preservation costs.

Ultimately, the model accounted for every vessel of the fleet. It described the current condition of each vessel, projected its future condition (based on age, etc.), and predicted the preservation requirements to maintain the vessel. Using this fleet life-cycle model, WSF's Program Development Office, Port Engineers Office, and Vessel Engineering collaborated to develop biennial, 6-year, and 20-year vessel preservation programs.

The Vessel Preservation Program has provided WSF with an excellent foundation for its new approach to maintaining the useful life of vessels. However, in our review, we detected at least one shortfall. The program does not assist in establishing the ongoing MMS, data collection, and scientific development programs needed for a formalized WSF Steel Maintenance Program. In conjunction with targeted preservation, a steel maintenance program can be effective in reducing and retarding the rate of steel deterioration of WSF vessels and extending vessel life.

If implemented, the preservation strategy could extend vessel life by 10 to 15 years, use available capital more prudently, and permit more timely replacement of older vessels with new construction. This assumes that WSF is able to manage steel maintenance costs, and recognizes that vessel replacement needs may be accelerated in the 20-year plan. As part of past "refurbishment" efforts, WSF invested significant resources toward the replacement of hull steel. The success of the "preservation" approach will depend on the ultimate effectiveness of a comprehensive steel maintenance program, which WSF has not implemented (see sub-section 1.2). Initially, the steel maintenance program may identify unknown steel repair or replacement costs which are not expected by WSF and have not been estimated in this report.

As indicated above, a "refurbished" vessel is expected to have a 25-year useful life; while a "preserved" vessel service life is extended by 10-15 years. A more detailed comparison between the "preservation" approach and the current "refurbishment" program should be conducted to determine net life-cycle costs for either strategy during the twenty-year capital planning period – taking into account that a given vessel may need two or more "preservations" over its planned service life, at which time it will be replaced with a newly constructed ferry.

4. CURRENT PROCUREMENT AND CONTRACTING PROCEDURES HAVE CONTRIBUTED TO IMPROVED WSF PERFORMANCE ON RECENT SHIPYARD PROJECTS.

Since the 1991 study, WSF has changed its procurement and contracting procedures to comply with the intent of the recommendations in the report, and it has performed several maintenance availabilities using the revised policies and procedures. During the current performance audit, Booz·Allen performed a comprehensive review of these changes and their impact on the performance of recent shipyard projects. In addition, the audit team compared WSF procurement and contracting policies with industry practice in order to determine whether additional changes should be considered to further improve performance. A detailed accounting of this review is presented in Appendix E.

As part of the review of contracting procedures, the audit team reviewed procurement and contract documentation developed since the 1991 study, including procurement data such as Invitations for Bids (IFB) and Requests for Proposals (RFP) and contracts for a propulsion system upgrade, new vessel construction, and three major renovations. In addition to reviewing procurement and contract documentation on these projects, the team examined the actual contract cost and schedule performance. The audit team also reviewed the current statutes and WSDOT regulations controlling the procurement and contracting policies of WSF. This documentation included studies performed by or for WSF since the 1991 study and information furnished by parties outside WSF who have interest in procurement and contracting issues.

Following the documentation review, the team conducted interviews with key WSF employees involved with the procurement, contracting, and execution of ferry availabilities and new construction projects. Finally, the team assessed the adequacy of WSF's in-house vessel contracting and design staff.

4.1 A review of cost performance indicates reduction in non-value added contract growth in major shipyard projects completed during the 1990s.

A review of WSF ferry-related procurement and contracting practices indicates that WSF has implemented policies and procedures that enable it to exercise greater control over new vessel construction, repair, and refurbishments. Moreover, the review indicates that the system has improved its cost-estimating (or budget-development) capabilities. Exhibit 7-6 compares the cost performance of several ship maintenance projects performed since 1991 with contract costs incurred prior to that year.

EXHIBIT 7-6
Cost Performance on Major Shipyard Projects
(In Millions of Dollars)

Major Project and Type MR = Major Renovation R = Renovation PC = Propulsion Control	Original Contract Value	Added-Value Growth ($ / %) *	Non-Value Growth ($ / %) *	Total Growth ($ / %) *	Final Contract Cost
Pre-1991 Contracts (7 Total) **	$45.0	$12.4/27.5%	$13.6/30.2%	$26.0/57.7%	$71.0
M/V Cathlemet (R, 93)	$3.7	$0.3/8.9%	none	$0.3/8.9%	$4.0
M/V Tillikum (MR, 93/94)	$15.2	$3.0/19.5%	none	$3.0/19.5%	$18.1
M/V Klahowya (MR, 94/95) ***	$16.2	$5.1/31.6%	$0.9/5.3%	$6.0/36.9%	$22.2
M/V Nisqually (PC) ****	$2.7	$0.3/11.9%	none	$0.3/11.9%	$3.0
M/V Illahee (PC)	$2.0	$0.3/13.7%	none	$0.3/13.7%	$2.3

Source: WSF and Booz·Allen analysis.
Note (*): Work growth includes authorized IQW and change orders; percentages are calculated using the base package value as the denominator.
Note (**): Data from 1991 study.
Note (***): Contractor has submitted a Request for Equitable Adjustment of $4.6 million.
Note (****): Final contract cost includes a $44,000 credit for liquidated damages.

The exhibit highlights the reduction in contract growth (or change orders), particularly in the non-value added category since the pre-1991 period. Although some of these improvements are due to more effective planning and greater diligence, a substantial amount is also due to a reinterpretation following the 1991 study of what constitutes a change order.

As an example, new business practices have led to a significant increase in Indefinite Quantity Work Orders (IQWs). These are work packages developed during the course of the shipyard period and based on previously agreed-to unit prices, but with some flexibility in the number of units required within each work package or bid lot. Within the base package, these IQWs have less visibility in the post-1991 period as they are included in the original award. Previously, they would have been classified as change orders. Now, only IQW work above the baseline is classified as a change order. The major non-value added growth cost occurred with the *M/V Klahowya*, when the estimate of the amount of steel to be replaced, was considerably low.

4.2 Current vessel procurement contracts attempt to place most all risk on the contractor. WSF's proposed Procurement Partnership Process is designed to share more risk with contractors and potentially reduce project change orders.

WSF currently uses procurement and contracting practices that place virtually all risk on the contractor. Unlike typical industry practices, which share risk through incentive and cost-reimbursable contracts with inflation protection, WSF contracts require the contractor to bear the full burden of the uncertainty associated with a complex ferry construction or renovation project. Previously, WSF shared risk through the change order process, which allowed the contractor some flexibility to recover from errors made during the bid or in execution. Although this was an inefficient risk-sharing mechanism, it provided additional revenue to contractors and helped mitigate the effects of declining shipyard workload. With no risk-sharing mechanism, contractors are in financial peril if they underestimate the scope of work or fail to implement efficiently. In the long run, WSF has the potential to suffer the consequences through reduced competition and inadequate personnel and facility resources at local shipyards.

The new practices have increased the complexity of the contract administration process. This is evident in the large numbers of Contract Problem Reports (CPRs) written on recent projects and the related issue of timely CPR resolution. For example, 294 CPRs were written on the *M/V Klahowya* renovation, and the Jumbo Mark II contract currently has a backlog of more than 190 unadjudicated CPRs on the *M/V Tacoma*. Part of the problem on the Jumbo Mark II project is that the contract has no provision requiring the contractor to respond to a Work Authorization to Follow Order with a timely IQW proposal. Although the WSF can unilaterally issue a priced Work Authorization Record and force the contractor to file a protest if it disagrees with the amount, WSF has been reluctant to use this authority because it could create an unnecessarily adversarial relationship. Large numbers of CPRs also increase the contract administration responsibilities of the project engineer, diverting his or her attention from deckplate construction/renovation issues.

The new Procurement Partnership Proposal is a step in the right direction, and the planned approach should mitigate some of the risk associated with using the IFB process for ferry construction. In the Procurement Partnership, shipyards will participate in the design process. This procedure should enable the shipyards to bid smarter because they will be thoroughly familiar with the design and will have had an opportunity to tailor the design in ways that will enhance producibility. An interview with Todd Shipyard, who is currently constructing WSF's new Jumbo Mark II ferries, is in agreement with this finding.

4.3 A review of current in-house vessel design and construction support indicates an appropriately staffed work force.

In Recommendation 3 of the 1991 report, Booz·Allen urged WSF to ". . . continue its policy of establishing an in-house design engineering capability . . ."and noted that ". . . this recommendation is unique in that it conflicts with a general trend to privatize functions historically performed in the public sector. WSF has established an in-house design engineering capability, but with significant consultant use. As presently configured, WSF Vessel Design performs lead engineering functions and contracts out approximately one-half of the design work.

All design and construction functions could be contracted to naval architectural and marine engineering firms, and engineering construction management firms. However, the continuation of these functions in-house ensures that WSF's corporate knowledge of engineering and operational issues and lessons learned is effectively embodied in contracts and designs for future construction and renovations/preservations. This is particularly true with respect to the refinement of specification language to eliminate ambiguity and prevent change orders. WSF ferry renovation work represents a small fraction of the work of local consultant design and marine management firms; therefore, corporate knowledge and continuity is not retained. The 1991 report validated the effectiveness of in-house staff and noted a reduction in the number of change orders on projects where the design was completed in-house.

As indicated in Chapter 3, Vessel Engineering staff levels have increased significantly in recent years due to current Jumbo Mark II Ferry and POF construction programs. WSF has indicated that as these construction programs conclude in the upcoming years, engineering staff levels will be lowered in conjunction with reduced department work load.

5. RECOMMENDATIONS AND OPPORTUNITIES FOR COST SAVINGS.

In the last section of this chapter, we present our recommendations regarding opportunities for WSF to improve current processes and reduce costs regarding contracting/procurement and construction/refurbishment.

Report Recommendations 14 through 20 follow:

14. Implement a more systematic and formal Steel Maintenance Program and, as part of this program, the older single-compartment ferries should be subject to an independent survey.

WSF currently plans for and conducts periodic steel maintenance. These efforts are most notable when WSF is planning for annual maintenance periods and major shipyard projects. However, as demonstrated in Exhibit 7-6 and in recent ship renovations, e.g., *M/V Klahowya*, WSF has not been successful in planning and budgeting for steel work. Further, a private ferry operator in the region spends significantly less for steel replacement due to investment in preventive maintenance (i.e., chipping and painting). It is inevitable over the next decade that WSF's fleet will become newer. As such, maintaining the condition of the WSF in the most cost-effective manner is important. WSF should implement the 1991 study recommendation to develop a systematic, comprehensive Steel Maintenance Program. As part of this program, WFS should evaluate the costs and benefits of traveling paint gangs and alternative coatings. When implementing this program, and in line with scheduled bi-annual inspection periods required by the U.S. Coast Guard, WSF should also have an independent survey conducted of its oldest, single-compartment vessels (See Chapter 6, Section 2.3). The recommendation to wait until the next scheduled drydock is based upon the need to minimize service disruptions as well as the fact that no compelling reason was identified during the audit for an immediate survey.

15. Continue implementation of other recommendations made by the 1991 Booz·Allen report that have not been fulfilled.

Of the 22 recommendations made, WSF is in compliance with 16; 3 have only partially been implemented, and the remaining 3 have not been implemented at all. Excluding the implementation of a Steel Maintenance Program and the requirement that senior management have ship or shipyard management experience, we reaffirm that the following recommendations (see Section 1) be implemented. These include:

- Standardize the Work Scoping Process;
- Develop a procedure for estimating planned growth;
- Formalize the Asbestos Abatement Program; and
- Establish a formal pre-refurbishment (preservation) inspection procedure.

16. Modify legislation controlling ferry firm, fixed-price contracting practices to allow WSF more discretion and flexibility in its procurement/contracting policy.

Current legislation allows limited use of RFPs but does not permit deviation from the firm, fixed-price contract. WSF needs the flexibility to select the procurement and contracting practices that best fit the needs of the individual project. The legislation that controls the procurement and contracting practices of WSF should be modified to permit the use of either an IFB or RFP for car ferries at the discretion of the WSF CEO. The RFP process should be broadened to ensure early participation of qualified vendors, i.e., the "Procurement Partnership" concept. As a check on the authority of the CEO, the Secretary of Transportation should have veto power over the CEO's procurement method decision.

17. Assign a Contract Administrator from the Contracts/Legal Department to new construction, renovation and preservation contracts over $10 million.

High-value contracts require professional contract administration support to oversee the CPRs, protest and claims processes, and to perform risk analyses related to contract issues. These functions are currently performed by the project engineer, who may not have the time and/or expertise to provide the level of support required on large contacts. A full- or part-time contract administrator from the Contracts/Legal Department should be assigned to new construction, renovation, and preservation contracts over $10 million. This person would directly support the project engineer, but maintain formal ties with the Contracts/Legal Department so potential contract problems/issues would be reported directly to WSF managers outside the Vessel Engineering organization.

18. Modify the standard contract language on CPRs to require timely submission of proposals to accomplish IQW.

Current standard contract language does not establish a specific time frame in which a contractor must submit a proposal for IQW initiated by a CPR. This can and has led to a backlog of unadjudicated CPRs and uncertainty regarding WSF financial exposure. The standard contract language should be modified to require the contractor to submit a proposal within two weeks of the authorization to proceed with the work. If the contractor fails to submit within the allotted time frame, WSF should issue a unilaterally priced IQW authorization which the contractor has the option of challenging using the disputes process.

19. Increase the length of time between contract award and ferry shipyard arrival.

Current procurement practices do not provide the contractor adequate time between contract award and vessel delivery to the shipyard to perform the advance planning, engineering and material procurement essential to the success of a complex renovation or preservation project. WSF, in consultation with industry, should establish a reasonable, minimum time period between contract award and vessel delivery and schedule the procurement process accordingly. If the procurement schedule slips, the vessel delivery should slip by an equivalent amount, even if the return to service date is jeopardized.

20. Reduce the amount of preplanned IQW included in the contract award to no more than 10 percent of the base work package.

Recent renovation contracts have included increasingly large amounts of preplanned IQW. Since large amounts of preplanned IQW can reduce the incentive for WSF to carefully define the base work package and can lead to schedule delays if the IQW is authorized late in the availability, preplanned IQW included in the contract award price should be limited to no more than 10 percent of the estimated base work package value. If additional, unforeseen work is identified during the availability, it should be authorized through the change order process.

LONG RANGE PLANNING

Chapter Eight

Building on an understanding of WSF, gained during the phases of the performance audit documented in preceding chapters, Booz·Allen evaluated the adequacy of the assets and capital plan of WSF to meet its mission and forecast demand over the next 20 years. During this portion of the WSF performance audit, Booz·Allen conducted site visits of all terminals and vessels of each class; reviewed WSF forecasting models, assumptions, and literature; and conducted interviews of technical and operational experts internal and external to WSF. To help in assessing the adequacy of certain assumptions and fleet conditions, we also interviewed functional experts within Booz·Allen and private industry, and we leveraged the technical expertise of the audit team.

The audit identified that, given current service standards and demand forecasts, shortfalls exist in both vessel and terminal capacity. Additionally, it was found that the capital budgeting process, which is limited to a six-year horizon, does not include adequate capital funding to support expansion and preservation of WSF's current system to meet service standards.

More specific outcomes of this evaluation are presented in Sections 1 through 5 of this chapter. Specifically addressed are WSF's long-term planning process, the state of current fleet and terminals as they relate to long-term needs, and future asset requirements. In the final section of the chapter, we present recommendations pertaining to the long-term planning process.

1. THE MISSION STATEMENT IS NOT ADEQUATELY SUPPORTED BY DETAILED STANDARDS AND PERFORMANCE MEASURES.

The purpose of a mission statement is to define the primary focus and future direction of an organization. Typically, mission statements are broad in scope, providing broad vision and definition to a business. They rarely include defined performance measures or service standards.

In May 1996, WSF published a mission statement as part of a new strategic plan that also outlined WSF's goals and strategic initiatives. The mission statement indicates that:

> *Washington State Ferries is in business to provide marine mass transportation linkages for people and goods throughout the greater Puget Sound Region and Vancouver Island.*

The WSF mission statement also set forth WSF's vision *"To be the most efficient and affordable customer-focused ferry operator in the world"* with guiding principles addressing safety, customer service, excellence, public trust, respect of others, and partnerships.

As a first step in reviewing WSF's long-term planning process, Booz·Allen reviewed the above mission statement and compared it to that of other maritime companies. Our objective was to determine whether the statement was adequate and sufficiently detailed to serve as a base for establishing appropriate service levels and performance goals. We found that the level of detail and scope found in WSF's mission statement is consistent with that found in other ferry operations and shipping companies, including British Columbia Ferries, Woods Hole Ferries, American President Lines, and Crowley. However, the audit also revealed that no specific and measurable strategic, operational, or service targets exist in WSF's mission statement, goals, or strategic plan.

1.1 Supporting service standards are proposed by WSF's Planning Department. They reflect community input, but are defined by the legislature.

Current operational and service standards are developed by WSF's Planning Department and encapsulate the influence of both public outreach and legislative approval processes. As part of the 20-year planning process, WSF has developed numerous presentations and decision packages over the past year, detailing operating and capital costs associated with meeting planned schedule and service goals.

WSF service goals are defined in terms of the number of boat waits or percent of vessels overloaded. With the exception of the San Juans, boat waits are utilized for planning purposes on all routes. "Boat waits" are defined as the maximum period of time (as determined by the number of boat departures) that a customer must wait prior to boarding a ferry. Typically boat wait service standards vary from one to three, depending upon the season and the time of day. Similarly, "percent of vessels overloaded" is defined as the percent of total boat departures in which the ferry is at capacity. Typical overload service standards vary from 60 percent to 80 percent, depending on the season.[1]

[1] Interview with WSF Planning Department.

WSF considers public input from regional Ferry Advisory Committees as it develops service plans and standards. However, the legislative review process, through which the state legislature approves or disapproves WSF's operating and capital budgets, has the greatest influence on current and future services and service standards. For example, WSF proposed a 20-year plan to the Transportation Commission in July 1997, but was directed to scale back the plan in order to conform with state financial constraints and policy. A new plan proposed on November 19, 1997, reflects WSF current 20-year plan and corresponding service standards.

1.2 WSF service goals are consistent with Alaska State Ferries.

WSF system demand varies significantly between peak loads and non-peak loads. Although we could find no data for a comparison to other systems, we did find that the commuting-time loads on the WSF commuter runs (Bainbridge, Kingston, and Clinton) and the summer peak loads on the tourist routes have an estimated three- to five-fold variance from non-peak loads. The standard used for Alaska Marine Highway System is that "a vehicle arriving at the time of departure of one ferry should not have to wait for more than one additional ferry before departing." This is compatible with the "two boat" rule adopted by WSF. With the exception of some special events and holidays (e.g., long summer weekends, Fourth of July, Labor Day), WSF generally meets this criteria. However, flexibility to increase WSF's current level of service is limited by the system's financial and vessel resources. Current and future capacity utilization is addressed in later sections of this chapter.

1.3 Operational service goals and standards should be expanded to address on-time performance, customer satisfaction, etc.

As part of an effort to develop performance measures in 1996, WSF began collecting operational service statistics (such as the numbers of scheduled and canceled trips) in a database. Reports from the database include types of cancellations (e.g., vessel, terminal, route, or type of system causing the cancellation). This data can be used to compare operation profiles from week to week, month to month, etc. The data is a good indicator of the level of service WSF provides to the region and is a good first step in developing consistent standards across the entire system.

WSF needs to develop additional performance and service standards. These standards would benefit both the WSF staff and the public. These standards would include:

- *On-time departure and arrival performance (percentage within five minutes).* On-time departure and arrival statistics will facilitate the planning and deployment of vessels to appropriate routes, and ensure that all employees are working to the best of their ability to run the ferries efficiently;
- *Route completion;*
- *Safety and physical injury performance (number). As is true with all organizations, safety should be considered as one standard of performance;*
- *Farebox recovery targets and corresponding tariffs differentiated by route and/or service;*
- *Total travel time performance (hours and/or minutes between central points in the region); and*
- *Customer satisfaction (number of complaints). Limited customer satisfaction data is already being collected by WSF.*

The audit did not identify any North American ferry system which has developed or considers all of the above service standards in managing its service. However, benchmarks presented in Chapter 2 and this chapter provide some guidance to service standards which WSF may consider.

2. THE WSF 20-YEAR PLANNING PROCESS ANTICIPATES AVERAGE ANNUAL GROWTH IN PASSENGERS OF 2.6 PERCENT AND VEHICLES OF 2.0 PERCENT OVER THE NEXT TWO DECADES, WITH EVEN HIGHER GROWTH DURING PEAK PERIODS.

WSF currently develops operating and capital budget plans according to both short- and long-term planning cycles. Short-term planning cycles, including two-year (biennium) and six-year plans, are updated every other year, and more frequent interim updates are made as required. Long-term planning, which covers a 20-year period, has historically been completed less frequently and approached less rigorously.

Recently, WSF initiated development of a comprehensive 20-year plan, which details operating and capital costs against future demand and service requirements. A key driver of the long-term plan is the demand forecast, which, in combination with service levels, drives infrastructure requirements. This section focuses on WSF's long-term planning process and, more specifically, on its demand projections.

2.1 Forecasts since 1989 have overstated the passengers and vehicles handled through 1996 by as much as 5.5 percent and understated them by as much as 4.1 percent in a given year.

As an indicator of WSF's ability to predict future activity levels, Booz·Allen compared the system's historical forecast levels over the past ten years with actual activity levels for the same period. We considered both internally-generated forecasts and those developed in conjunction with various regional planning studies. WSF forecasts, typically limited to a maximum of ten years, were developed using a simple econometric model, and did not consider shift in services, employment, and population. Externally-developed and consultant-developed forecasts tend to be longer in range, and in many cases were not developed to specifically support the planning needs of WSF.

A comparison of five forecasts to actual activity levels identified the level of accuracy typically found of these models. It ranged from 5.5 percent greater than actual passenger and vehicle levels to 4.1 percent lower than actual levels. Typically, forecasts developed earlier in the eight years since 1989 had the greatest amount of variance from actual levels.

2.2 The cornerstone of WSF's current 20-year planning process is the use of the Travel Forecasting Model for demand forecasting.

The Travel Forecasting Model (TFM) is the cornerstone of WSF's current and future long-term planning process. Developed using EMME/2, a transportation software program used by most agencies and jurisdictions in Puget Sound and by metropolitan regions across North America, the TFM brings together regional demographics and population shifts; employment densities; cost, time, and purpose of travel by mode; boarding modes; origin/destination data; and other economic variables to develop 20-year demand forecasts for current and planned WSF services by route, time, and direction of travel. The model was developed under the direction of WSF planning staff, with input from a Modeling Advisory Committee comprised of forecasting experts and staff within the region. The TFM complements the Puget Sound Regional Council's (PSRC) model and relies on the PSRC model for estimations of growth in regional travel patterns and background transportation supply.

A review of the TFM indicates that it is comprehensive and that it is based on sound economic and forecasting methodology. Where possible, inputs into the TFM are coordinated between WSF and local/regional planning organizations, and transit agencies, and with regional plans, including PSRC's Metropolitan Transportation Plan (MTP).

A review of key assumptions of the TFM identified the use of a ferry on-board origin-destination (O/D) survey conducted in 1993.[2] This survey provides WSF with the appropriate data to develop a calibration file regarding customer behavior and mode of access/egress to and from a ferry terminal. WSF's intention is to update the O/D survey and recalibrate the model in the near future, which should be updated at least every five years. Other key assumptions affecting the forecast are consistent or interlinked with other regional plans and forecasts.

2.3 Current 20-year demand projections highlight growth of 66.6 percent for passengers and 48.9 percent for vehicles in both peak and non-peak periods.

Development of the WSF demand forecast is an iterative process, and is influenced by service level assumptions. In developing the current 20-year demand forecast, WSF has introduced service constraints that correspond to future capital and operating budget direction provided by the Transportation Commission. Exhibit 8-1 presents WSF's current 20-year plan demand forecast.

EXHIBIT 8-1
Annual Passenger and Vehicle Demand Forecast
(1997-2017, Annual Activity in Millions)

Activity	1997*	2002	2007	2012	2017	Avg. Annual Growth	Total 20-Year Growth
Passengers	24.9	28.6	32.6	36.8	41.4	*2.6%*	*66.6%*
Vehicles	10.9	12.0	13.3	14.7	16.3	*2.0%*	*48.9%*

Source: WSF Planning Department and Booz·Allen analysis.
Note(*): Actual 1997 fiscal year activity levels.

As the exhibit indicates, WSF forecasts a 20-year increase in passenger and vehicle demand of 66.6 percent and 48.9 percent, respectively. More interestingly, Exhibit 8-2 illustrates a comparison of average and peak daily demand over the same period.

[2] The 1993 O/D survey provides a basis for modeling and calibrating trip purposes, method of boarding (e.g., walk-on, bicycle, vehicle, etc.), and the mode of transportation used to transit to and from the ferry system.

VII. EXHIBIT 8-2
Daily Passenger and Vehicle Demand Forecast
(1997-2017, Average and Peak Activity in Thousands)

Activity	1997	2002	2007	2012	2017	Avg. Annual Growth	Total 20-Year Growth
Passengers:							
- Daily Avg.	68.2	78.4	89.2	100.9	113.5	*2.6%*	*66.6%*
- Peak (4 Hrs.)	26.6	30.8	35.0	39.3	44.1	*2.6%*	*65.6%*
Vehicles:							
- Daily Avg.	29.9	33.0	36.4	40.4	44.5	*2.0%*	*48.9%*
- Peak (4 Hrs.)	10.7	11.9	13.1	14.5	16.0	*2.0%*	*49.1%*

Source: WSF Planning Department and Booz·Allen analysis.

The exhibit indicates that for both passengers and vehicles, forecasted growth during peak demand periods will be slightly lower than average daily system demand growth. The implications of these growth rates are substantial and, according to the *Draft Long Range System Plan* developed by WSF, will require significant capital investments in vessels and terminals over the study period.

3. CURRENT WSF FLEET CAPACITY IS ADEQUATE FOR PASSENGERS, BUT NOT FOR VEHICLES, OVER THE NEXT 20 YEARS.

The ability of WSF to meet service standards will be determined by the capacity and deployment of its infrastructure and by the efficiency and effectiveness of its management and operations. In Chapter 2, we presented an overview of the WSF fleet. In this section, we evaluate the adequacy of WSF's fleet to support demand forecast and meet service-standard objectives for the ferry system.

3.1 WSF's current fleet capacity is insufficient to support the 20-year demand for vehicles at current service standards. However, current WSF fleet passenger capacities, including both auto-passenger and POF ferries, are sufficient on a systemwide basis to support projected passenger demand over the next 20 years without service delays.

Ferry capacity utilization is defined as the actual activity level, in passengers or vehicles, divided by fleet capacity. Passenger capacity utilization for passenger-vehicle ferries in FY 1997 averaged less than 15 percent for the year, rising to 23 percent during peak operating hours. In contrast, vehicle capacity utilization for 1997 averaged nearly 71 percent for the year and on

many routes operated at 100 percent utilization consistently during peak operating hours. For both passenger and vehicle measures of capacity utilization, the system begins to experience service deterioration, long waits, later departures, etc., at rates higher than 70 percent.[3]

With this backdrop, Booz·Allen evaluated the ability of WSF to support current and future passenger demand as detailed in the 20-year plan. Exhibit 8-3 highlights expected daily average and peak capacity utilization over the 20-year period using WSF's current fleet. For purposes of the analysis, WSF's current fleet was defined as current deployed vessels plus planned additions to the fleet that are currently under construction.

EXHIBIT 8-3
Daily Vessel Passenger Capacity Utilization
for 20-year Passenger Demand Forecast (1997-2017)

Fleet Capacity Measure	1997	2002	2007	2012	2017
Passenger Capacity:					
- Daily Avg.	458	558	576	603	603
- Peak (4 Hrs.)	114	139	144	151	151
Capacity Utilization:					
- Daily Avg.	15%	14%	15%	17%	19%
- Peak (4 Hrs.)	23%	22%	24%	26%	29%

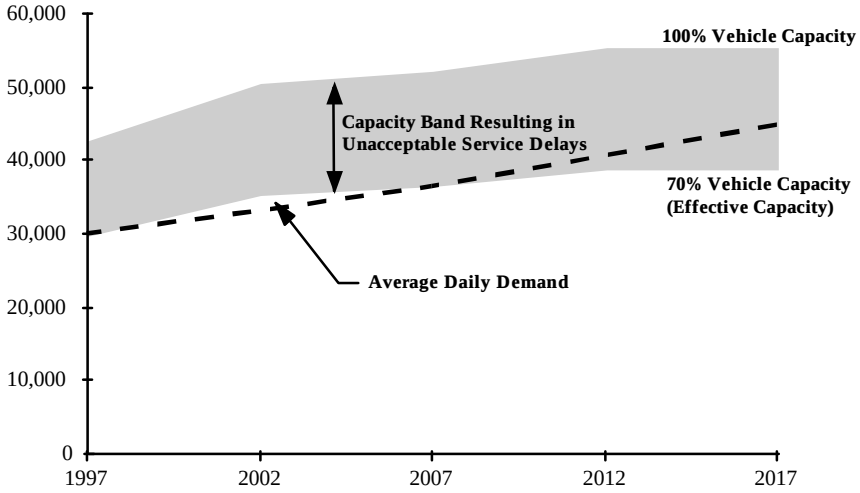
Source: WSF Planning Department and Booz·Allen analysis.

Passenger capacity was calculated by multiplying the passenger capacity of each vessel by its average daily number of sailings. Total capacity was then developed by summing passenger capacity of all vessels. Exhibit III-3 highlights the fact that current WSF fleet passenger capacities, including both auto-passenger and POF ferries, are sufficient on a systemwide basis to support projected passenger demand over the next 20 years without service delays.

Similarly, an analysis was conducted to evaluate WSF's ability to support the vehicle demand detailed in the 20-year plan. The results of this analysis are graphically presented in Exhibit 8-4 for daily average demand.

[3] Cross-Sound Analysis for the Washington State Ferries, December 1988, pg. 13.

EXHIBIT 8-4
Comparison of the Vehicle Capacity of the Current WSF Fleet with Projected Demand Over the Next 20 Years



Source: WSF 20-Year Plan and Booz·Allen analysis.
Note: Increase vehicle capacity resulting from addition of two Jumbo Mark II ferries and higher service.

The exhibit shows daily demand for vehicles increasing from current levels of 29,900 to 44,500 in 2017. We determined the vessel vehicle capacity for the same period by multiplying the number of vehicle spaces on each vessel by its average daily number of sailings, and then summing the capacity of all auto-passenger vessels. We found that, even including the three Jumbo Mark II ferries, WSF will not be able to maintain current service standards beyond 2007 without adding new vessel capacity.

3.2 The 20-year plan includes the retirement of older vessels, the addition of incremental capacity, and preservation of the current fleet.

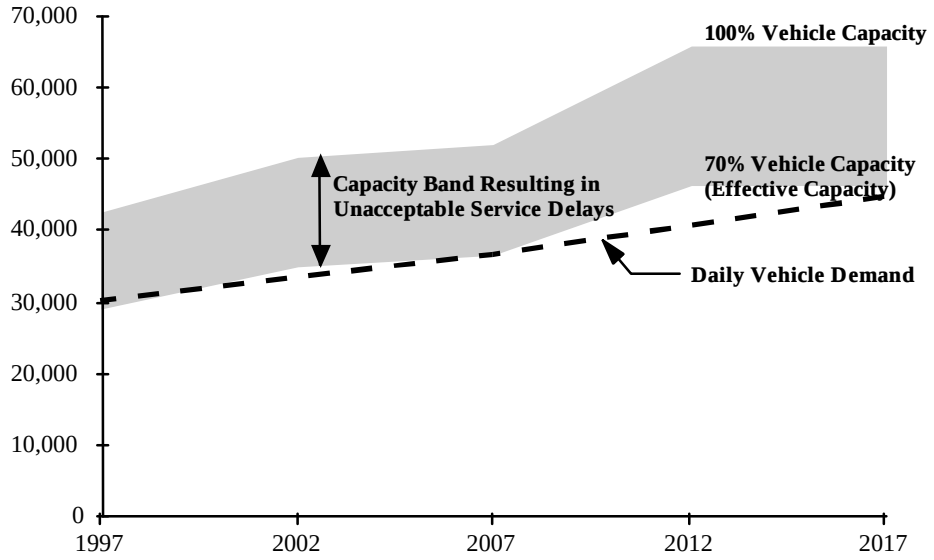
Fleet preservation, retirement of older vessels, and the addition of incremental capacity all are part of the WSF 20-Year Plan. Specific vessel additions and retirements include:

- Addition of two Jumbo Mark II ferries currently under construction (delivery in 1998 and 1999);
- Addition of two POF ferries currently under construction (delivery in 1998);
- Addition of four POF ferries (1 in 2000, 1 in 2001, 2 in 2002);
- Retirement of two monohull POF ferries (2004);

- Addition of three Steel Electric replacement ferries (2008-2010)4;
- Retirement of one Steel Electric ferry (2010); and
- Addition of one Jumbo Mark II-like ferry (2012).

In total, 12 new ferries are planned for delivery and 3 ferries are scheduled for retirement, yielding a net addition of 5 auto-passenger and 4 POF ferries, a gain of slightly more than 1 vessel every 3 years. Exhibit 8-5, on the next page, illustrates the capacity and utilization impact of adding these vessels to the fleet.

EXHIBIT 8-5
Comparison of the Vehicle Capacity of the WSF 20-Year Plan Fleet with Projected Demand Over the Next 20 Years



Source: WSF 20-Year Plan and Booz·Allen analysis.

The exhibit shows that the addition of these vessels will enable WSF to maintain overall vehicle service standards currently being provided over the planning period. However, vessel deployment and capacity will vary between each service, resulting in "status quo" service and probable continuation of current congestion and service gaps during peak periods and summer months. Additionally, congestion will be compounded by inadequate vehicle staging and holding area capacity at some terminals without expansion and/or improvements to support higher volumes, traffic density, and more frequent service.

Recently, WSF established a Vessel Preservation Program as a replacement to major renovations of vessels over the past. This is discussed in Chapter 7.

[4] Current design undetermined.

Beyond the addition of new vessels, WSF's preservation program is essential to maintaining the fleet in operational order and sustaining current service standards.

The preservation program consists of a systematic and targeted capital investment plan to protect and preserve the existing capacity of the fleet by extending its useful life. Investments are prioritized in terms of regulation (e.g., safety of life), continuity of service, and quality of service. The preservation program's objective is to meet the Transportation Commission's policy objective to "protect our investment by keeping transportation infrastructure in sound operating condition."

The cornerstone of the preservation plan is WSF's recently developed vessel life- cycle-cost-model (LCCM), which identifies capital expenditures over a 20-year period by vessel system. If properly utilized, this comprehensive tool will provide WSF with an excellent decision-making and planning tool for fleet planning, life-cycle-cost-analysis, new build/preservation trade-off analysis, and condition assessment. This system is too new and the appropriate historic data has not been populated into the LCCM for the audit to assess its ability to predict costs accurately.

3.3 WSF's fleet planning process is scenario-based and focuses on service planning by route and region. It may not optimize operating and capital costs.

Critical to meeting its service and financial goals, a complex transportation system such as WSF should strive to optimize not only the selection of vessels which comprise its fleet, but also how that fleet is deployed and utilized. Both operating and capital costs should be weighed in the planning process against service standards (e.g., boat waits, commuting hours). Best practices of shipping companies incorporate fleet and deployment optimization exercises as part of their long-term planning process, where operating and capital costs are combined into a total cost analysis, which is then weighted against customer service goals and objectives to identify the impact of various strategic and planning options.

The fleet planning process currently employed by WSF is based on scenario analysis. Additionally, the WSF planning effort considers WSF as four independent geographies: South Sound, Central Sound, North Sound, and International. In scenario analyses, alternative deployment schemes such as adding additional vessels, substituting a larger vessel for a smaller one, or changing vessel routings are considered to address growing or shifting demand. This type of analysis is appropriate for regional short-term system planning, but is limited in its ability to develop out-of-the-box thinking due to current operating, infrastructure, and service paradigms.

WSF's fleet and service planning methodology is less analytical and less detailed than its demand forecasting, but does consider existing vessel class operating costs, speed, and loading requirements. However, a review of the WSF planning process did not identify any model or analysis that evaluated service maximization and cost (operating and capital) minimization. More importantly, the 20-year planning process assumed the continued use of most vessels in the current WSF fleet, without consideration of the financial and service impacts of a new fleet and different types of vessels. WSF indicates that this is due to state and federal requirements which require fleet planning to be conducted in a financially realistic manner which considers all capital investments.

4. TERMINAL ASSETS DO NOT SUPPORT CURRENT DEMAND IN MANY LOCATIONS AND ARE INADEQUATE TO SERVE WSF'S FLEET AND CUSTOMERS OVER THE NEXT 20 YEARS.

WSF currently operates and maintains 20 ferry terminals including 19 domestic and 1 international. Each terminal has one or more vehicle loading ramps, and three have POF loading ramps. Five terminals have overhead passenger loading ramps for walk-on passengers; the remaining terminals require passengers to embark/disembark on the vehicle deck. Nearly all the terminals were built in the 1940s and 1950s, and improvements beyond preservation and maintenance since original construction are minimal.

Just as long-term success hinges on adequate vessel passenger and vehicle capacity, the ability of WSF to achieve its service objectives is, in part, dependent on its terminal infrastructure. Terminals are an indispensable part of the WSF system and are the focal points for staging, embarkation, and disembarkation for all customers. In this section, we address the adequacy of WSF terminals and their ability to support the forecasted demand and meet service standard objectives for the ferry system.

4.1 The attributes of an efficient terminal include safety, multi-modality, adequate capacity, and efficient loading/unloading capabilities.

The operation of a world-class ferry system must include facilities adequate to support current demand and future growth, and meet or exceed customer service standards. Attributes of an efficient terminal include:

- A safe environment for both passengers and vehicles;
- Multi-modality, providing access to and coordination with other landside transit and transportation systems;
- Efficient layout enabling orderly and quick processing of customers, including vehicles and passengers;

- Capacity to stage and process average-daily and most peak-period loads;
- Adequate facilities for passengers waiting or disembarking; and
- Efficient processing of traffic into/from the terminal and parking areas.

WSF terminals generally fall short in meeting one or more of the above attributes.

4.2 WSF terminals are out of date and have insufficient capacity to support current peak demand.

Given the criteria for an efficient terminal, WSF terminals generally fall short on one or more criteria. Most WSF terminals have enjoyed little in the way of modernization, upgrades, or capacity enhancement since they were constructed 40 to 50 years ago. In fact, many of them are antiquated and have trestles and pilings that are deteriorating (as demonstrated at Colman Dock and Fauntleroy most recently). In addition, some terminal facilities lack adequate overnight tie-up or mooring slips, and they are not in compliance with the Americans with Disabilities Act (ADA).

In nearly all cases, the terminals do not meet capacity standards and cannot support peak traffic demands. Terminal capacity is defined by its ability to stage vehicles within and external to the terminal for vessel loading. Terminal capacity required at each terminal is defined by WSF's current service standard on each route (defined in boat waits) times the vehicle capacity of the largest vessel serving the terminal. Exhibit 8-6, on the following page, summarizes the required and current capacity of each WSF terminal and calculates terminal vehicle holding capacity excess or shortfalls.

EXHIBIT 8-6
Current Capacity of Washington State Ferry System
(In Vehicles Unless Otherwise Noted)

Terminal	Desired Vehicle Holding Area Capacity (In Boat Loads)	Required Vehicle Holding Area Capacity	Actual Vehicle Holding Area Capacity	Terminal Vehicle Holding Capacity Excess or (Shortfall)
Lopez	2	320	75	(245)
Bremerton	2	320	110	(210)
Orcas	3	480	275	(205)
Bainbridge Island	2	412	230	(182)
Clinton	2	260	85	(175)
Fauntleroy	2	260	100	(160)
Mukilteo	2	260	110	(150)
Vashon	3	195	50	(145)
Edmonds	2	320	175	(145)
Tahlequah	2	130	5	(125)
Point Defiance	2	130	50	(80)
Keystone	2	150	100	(50)
Port Townsend	2	150	110	(40)
Kingston	2	320	290	(30)
Shaw	0	0	15	15
Friday Harbor	2	200	255	55
Southworth	1	65	150	85
Seattle	2	436	650	214
Anacortes	2	320	560	240

Source: WSF and Booz·Allen analysis.

As the exhibit shows, 14 of the 19 terminals do not have adequate vehicle holding capacity to meet current service standards and nearly one-half of all terminals have less than 50 percent of desired capacity. Where inadequate capacity exists, this typically results in significant queuing of vehicles alongside and on roadways, and this in turn results in congestion and delays in vessel loading and unloading that are exacerbated during peak hours and summer months.

4.3 WSF's terminal capacity is insufficient to support demand growth over 20 years without significant expansion.

Terminal capacity is inadequate to support even current WSF activity levels at most terminals, much less the activity projected for the future. As part of its 20-year plan, WSF has proposed to the legislature a 20-year terminal investment plan that includes:

- Expansion at Clinton, Colman Dock, and Point Defiance[5];
- POF facilities at Southworth and Kingston; and
- Intermodal facility development and/or facility relocation at Mukilteo, Bremerton (e.g., Sinclair Landing) and Edmonds (e.g., Port Edwards), and Anacortes.

Similar to the vessel capacity analysis, we also evaluated the ability of each terminal to support future vehicle staging demand as detailed in the 20-year plan. The results of our analysis for the Seattle-Bainbridge and Kingston-Edmonds terminals is illustrated in Exhibit 8-7 on the following page. Similar graphs for other WSF routes are provided in Appendix F.

For the respective terminals of each route, the exhibit compares hourly demand to terminal vehicle holding capacity. Over the 20-year period, capacity increases are indicated where terminal expansion or replacement programs are planned. Comparing vehicle holding capacity to demand for each terminal, the analysis shows that:

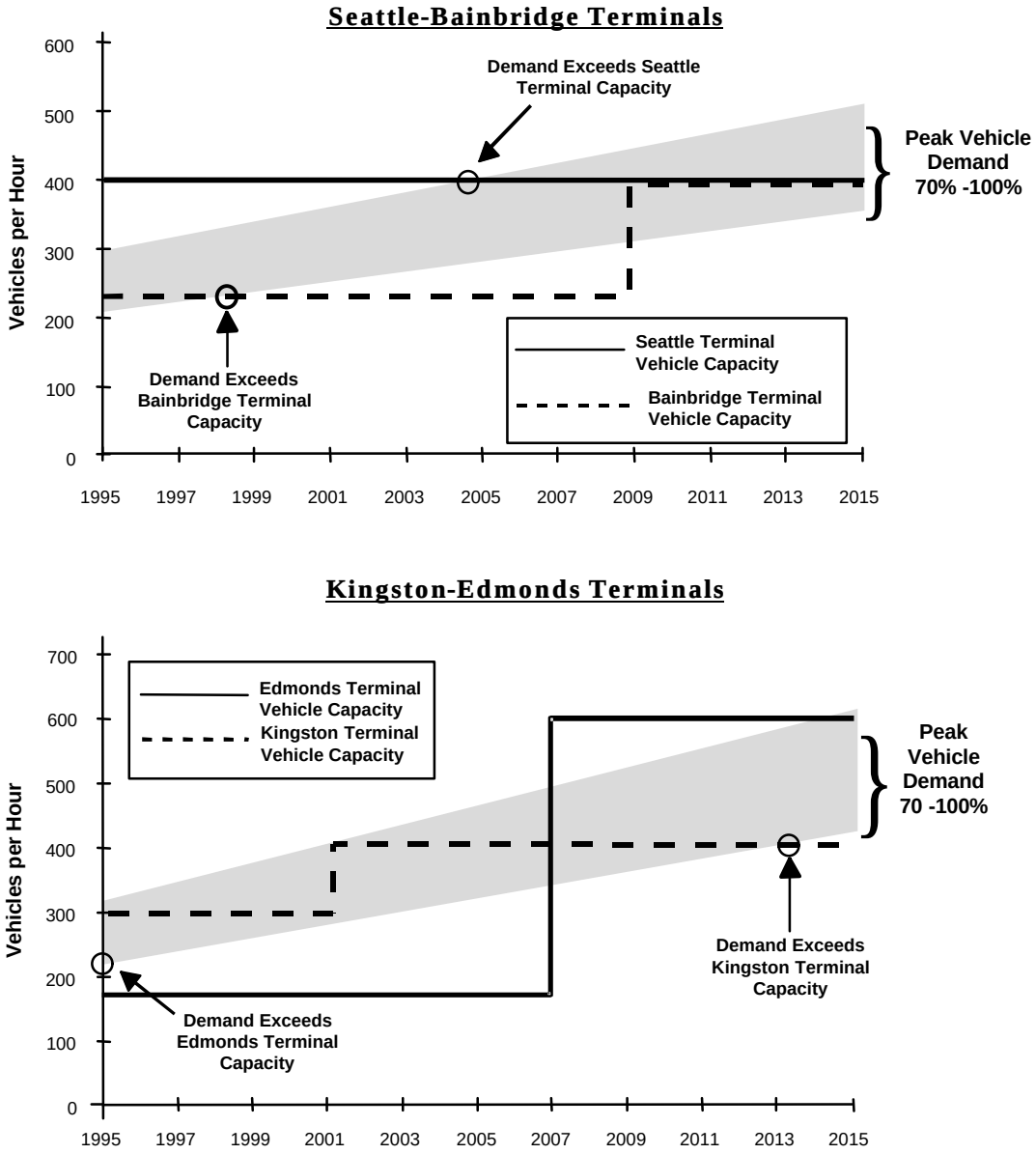
- Seattle terminal capacity serving the Bainbridge service will remain constant over time without significant impact to service;
- Bainbridge will experience increasing service disruption and congestion until terminal capacity is expanded in 2009;
- Edmonds will experience increasing service disruption and congestion until terminal capacity is expanded in 2007; and
- Kingston capacity will be adequate until 2013, when diminishing service and congestion should be expected.

The results of the analysis across all terminals is similar to those presented above, indicating that shortfalls in vehicle staging capacity will increasingly contribute to traffic congestion and delays, thus compromising service standards and objectives.

The performance audit identified four terminal renovation and/or terminal replacement projects: Edmonds, Mukilteo, Seattle (Colman Dock), and Bremerton. Each will be critical to WSF's ability to address near growth on its key cross-sound commuter routes. Accelerating terminal expansion projects in key facilities should be a priority for WSF in developing its capital plan for the next decade.

[5] Coleman Dock expansion will be part of a large waterfront development effort resulting in the creation of larger vehicle queuing areas, the addition of new POF facilities, and vehicle parking for ferry riders.

EXHIBIT 8-7
Comparison of Terminal Vehicle Capacity to Forecast Vehicle Demand (1997 - 2017)



Source: WSF 20-Year Plan and Booz·Allen analysis.

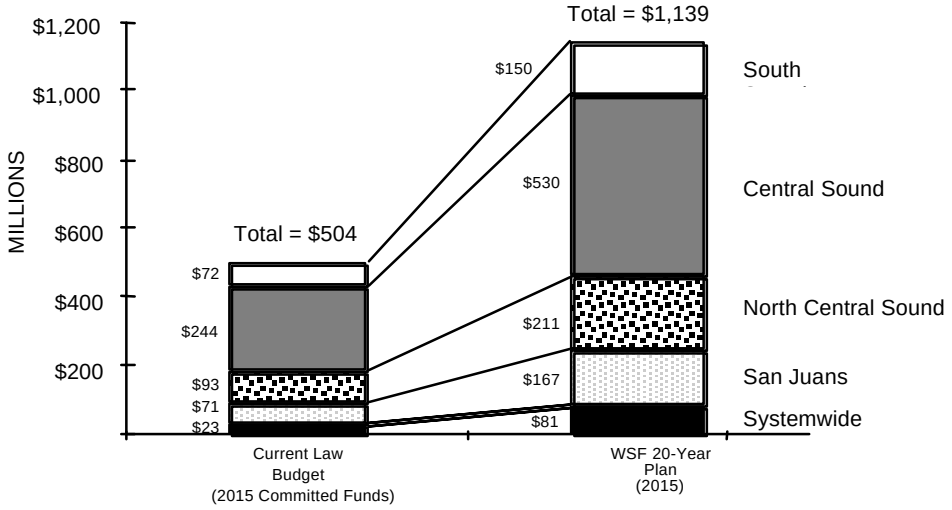
5. CAPITAL INVESTMENTS REQUIRED TO SUPPORT DEMAND AND ASSET REQUIREMENTS ARE ESTIMATED BY WSF TO EXCEED $2.2 BILLION OVER THE NEXT TWO DECADES.

In the previous sections, we addressed service standards, demand forecasting, WSF vessel and terminal infrastructure, and probable capital expenditures regarding new vessel and terminal construction, expansion, and preservation. In this section, we briefly evaluate and compare current and planned budget requirements.

5.1 Vessel and terminal capital investments for the 20-year plan are estimated at $2.2 billion, which exceeds current law budget by $1.1 billion.

Over the last several months, WSF has developed several draft long-range service plans that formulate levels of service for the system through 2017. These plans represent WSF's view of the level of funding necessary to maintain the current level of service in the Puget Sound region over the forecast period. Exhibit 8-8 illustrates the total capital funding budgeted for terminals in the Current Law Budget and in WSF's current 20-year plan.

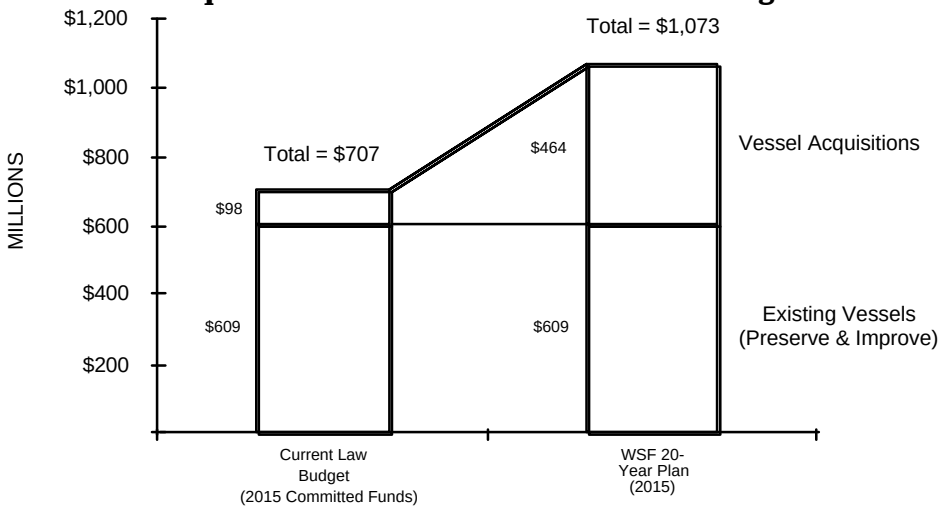
EXHIBIT 8-8
Comparison of 20-Year Terminal Capital Requirements and Current Law Budget



Source: WSF, Booz·Allen analysis.

The exhibit illustrates the significant difference in the funding level of the Current Law Budget and the funding requested by WSF in order to maintain and improve the terminals in the system. The total budget shortfall over the period is estimated at approximately $635 million. A similar shortfall in funding is also highlighted in the capital program budget for vessels. Exhibit 8-9 presents the difference in the capital funding available in the Current Law Budget and the WSF request for vessels.

EXHIBIT 8-9
Comparison of 20-Year Vessel Capital Requirements and Current Law Budget



Source: WSF, Booz·Allen analysis.

The exhibit shows that the Current Law Budget agrees with the funding levels requested by WSF for preservation and improvement of the current fleet. However, as was the case in previous long-term plans, a shortfall occurs in the funding for new vessel acquisition.

5.3 Estimating capital expenditure requirements builds from recent construction costs, the life-cycle-cost-model, and professional experience.

As part of the audit, Booz·Allen reviewed the WSF methodology for estimating future capital costs for vessels and terminals. Vessel capital expenditures include cost for preservation, improvements, and new construction. Preservation and improvement costs are developed using the vessel LCCM. New construction costs for auto-passenger ferries are estimated using current new construction costs (i.e., *M/V Tacoma*) per light-shipweight-ton multiplied by estimated light- shipweight-tons for new vessels.[6] The capital expenditures detailed above are in 1997 dollars; thus no inflation index has been used to forecast capital cost into future years. In the past, WSF has also used a shipbuilding cost index developed by the United States Maritime Administration (MARAD) to estimate replacement cost of older vessels. For long-range planning purposes (which typically does not require the rigor associated with developing more detailed and highly accurate near-term budgets), WSF's current methods for estimating vessel capital cost expenditures are appropriate. However, the WSF construction

[6] Light-tons are a standard industry measure of vessel size and approximate vessel capacity. WSF Vessel Engineering staff have stated that the cost to build the M/V *Tacoma* is approximately $19,213 per lightship- deadweight-ton.

cost benchmark is limited to one vessel and should incorporate the recent construction cost of other ferry vessels in North America.[7] Additionally, the accuracy of LCCM as an estimating tool has yet to be proven.

WSF does not have a track record for planning and completing complex and lengthy terminal construction and refurbishment projects; rather, it relies on support from professionals external to WSF. For this reason, the development of terminal capital investments is not limited to Terminal Engineering; it incorporates capital investment estimates developed by WSDOT and local contractors. For example, project estimates for Bremerton and Colman Dock were developed by private contractors. Additionally, an LCCM similar to that available for vessels has not been developed to date for planning and estimating terminal preservation. The audit found that the estimate for future terminal capital expenditures was less rigorous and less systematic than that utilized for vessels, resulting in less certainty in the capital estimates for terminal expansion and preservation.

6. RECOMMENDATIONS AND OPPORTUNITIES FOR COST SAVINGS.

In the final section of this chapter, Booz·Allen presents four recommendations representing opportunities to improve current processes and conserve costs.

Report Recommendations 21 through 24 follow:

21. Build from WSF's corporate strategy to develop a strategic plan detailing corporate goals/objectives, actions and implementation steps, timing of actions, department and individual responsibilities, costs/benefits, and broader service standards.

In 1996, WSF developed a Strategic Plan that identified a Corporate Strategy against a mission statement, general goals, and six strategic initiatives. A key element of the strategy was the development of performance measures. The audit identified only one performance measure against service (e.g., boat waits). Other performance indicators were identified against operations, but were more statistical in nature. Importantly, the audit did not identify any systematic, detailed, and quantifiable plan to implement WSF's broadly defined Strategic Plan. As such, WSF should pursue the development of a comprehensive strategic plan that quantifies goals and objectives, details action steps and an implementation plan, and ties department and employee responsibility to specific goals and objectives. The development of more comprehensive service standards against the parameters identified in Section 2 of Chapter 8 should be part of this effort.

[7] WSF is currently not aware, nor did the audit team identify any other comparable double-ended auto-passenger ferries constructed recently in the U.S.

22. Validate the current Travel Forecast Model (TFM) forecast with a new O/D study and augment the current supply side analysis with demand elasticity and fleet optimization analyses.

A critical part of WSF's long-range plan is its demand model. The audit found this model to be robust and comprehensive. Due to the TFM only recently being developed, the audit could not ascertain the accuracy of its long-range forecast. However, a key driver of the model's accuracy in predicting cross-harbor activity levels for WSF builds on the baseline year forecast. WSF's current baseline is based on an origin/destination study completed in 1993 (see Section 2). This study should be updated on a five-year cycle to ensure accuracy of the demand model and WSF's long-range plan. Preliminary cost estimates provided by WSF to update the O/D study is $625,000.

23. Conduct a "clean slate" fleet and service optimization study to identify and evaluate benefits-costs of an unconstrained fleet and compare to the current 20-year plan.

The audit indicates that WSF bases its long-range planning and selection of its future fleet builds on current WSF fleet, terminal, and operating paradigms. As a long-term and strategic planning exercise, WSF should conduct an analysis to define the optimal system (e.g., vessel types and size, terminal locations and structure) that WSF would pursue to meet its performance objectives without the constraints of its current infrastructure. A core part of this analysis will include the optimization of capital and operating cost against future demand, service standards, and tariff requirements. This analysis will aid WSF and the legislature in understanding the cost implications of continuing the status quo versus reinventing.

24. Develop a Life-Cycle-Cost Model (LCCM) for terminals.

The results of the audit indicate that WSF's vessel LCCM should provide a comprehensive planning tool for understanding future fleet preservation and improvement needs and costs. WSF should accelerate its effort to develop a similar tool for each of its 20 terminals. WSF may consider using tools already developed for other parts of Washington State, but should ensure that the adequacy of these tools, if available, fully meet WSF's planning needs in light of other LCCM alternatives.

PUBLIC/PRIVATE PARTNERSHIPS

Chapter Nine

In the 1980s and 1990s, public/private partnerships have become a common restructuring tool for government entities seeking to streamline or outsource operations, reduce costs, and/or minimize future capital investments. As noted in Chapter 8, the WSF system is exploring the possibility of privatizing its POF and international services.

As part of its performance audit, Booz·Allen evaluated the suitability of privatizing WSF's POF and international services and explored the potential impact of privatization. In general, the audit revealed that opportunities exist to reduce costs via public/private partnerships but that WSF has established no clear guidelines or objectives for achieving this end. More importantly, the audit identified the need to involve the private sector early in the evaluation and decision-making process in order to ensure that operational planning and investments are appropriate when weighed against privatization goals and objectives. In addition, the private sector's capabilities and financial interest must be understood and considered early in the privatization process.

In this chapter, we present the specific results of our evaluation and our recommendations in regard to public/private partnerships for selected WSF operations. Sections 1 and 2 focus on POF service, and Sections 3 and 4 address international services. Section 5, which contains our recommendations, concludes the chapter.

1. THE WSF 20-YEAR PLAN CALLS FOR EXPANSION OF POF SERVICE ON BOTH CURRENT AND NEW ROUTES.

WSF first ventured into POF service in 1978, when the system offered POF Jetfoil service for a six-week trial period in conjunction with Boeing. After that, the concept lay dormant until 1984, when WSF included a recommendation in its *Long-Range Plan Update 1990-2000* to provide POF service as a way of relieving traffic congestion on targeted routes. In 1987, WSF began POF service with the *M/V Tyee* on its Seattle-Bremerton route, and in 1990, two additional POFs were purchased and placed into service. At that time, POF service was extended to include a new Seattle-Vashon service.

In the new 20-year plan, WSF highlights the construction of six new POFs, in addition to the two currently authorized, to augment and eventually replace the current POF fleet. These new vessels will be deployed on WSF's current POF services and on two new services: Seattle-Southworth and Seattle-Kingston. In this section, we evaluate the performance of WSF POF services to date and privatization options which WSF and the legislature may consider.

1.1 WSF's first decade of POF service experienced mixed success.

WSF currently operates three POF vessels on two services. Two of these vessels were constructed for WSF; the other had been previously used. WSF's success in operating these vessels has been mixed. Engine problems and poor wake-wash characteristics have resulted in high maintenance costs (including an engine replacement on one vessel), and operation of the POFs at reduced speed along the Rich Passage shoreline.

The outcome of these problems is that WSF's POF service is slower and less reliable than planned. It does not offer any substantial time savings to Seattle-Bremerton passengers over the auto-passenger services on the same route. POF ridership has declined slightly over the past five years, but by reducing service, WSF has managed to increase capacity utilization. Current utilization ranges from 22 percent to 27 percent annually, but it may be as high 100 percent on the Seattle-Vashon route during peak commuting hours. In comparison, utilization of current Seattle-Bremerton auto-passenger ferries may reach 53 percent during peak operating hours, with sufficient capacity to support passenger activity of the POF service as well.

Financial performance is also mixed. Initial capital costs were substantially lower per boat than any auto-passenger ferry. Additionally, operating cost per service-hour and cost-per-mile, as indicated in Exhibit 9-1 on the next page, are lower than the WSF fleet average.

EXHIBIT 9-1
Comparison of Ferry Vessel Operational Cost

Service	Cost per Vessel-Service-Hour	Cost per Service-Mile	Cost per Passenger-Service-Mile	Cost per Passenger	Farebox Recovery
VIII. POF:					
– Seattle-Bremerton	$671	$33	$0.50	$6.70	22%
– Seattle-Vashon	$822	$40	$0.70	$6.63	13%
WSF Average	$2,191	$177	$1.13	$4.74	66%

Source: WSF, Booz·Allen analysis.

However, due to their substantially lower capacity and inefficient ship design (e.g., poor selection of components), POF costs per seat-capacity and per passenger are higher than the WSF average for auto-passenger ferries. Also, there is no differentiation of tariff policy between POF and auto-passenger ferries for similar routes, such as the Seattle-Bremerton service. This contributes, in part, to POF farebox recovery being the lowest of any service. Farebox recovery of WSF POF services in 1996 was 13 percent for Seattle-Vashon and 22 percent for Seattle-Bremerton. The audit found that POF levels of farebox recovery were below that found on all other routes, and substantially below the commuter route averages of greater than 80 percent. The audit did not determine the extent to which POF services induce additional WSF passenger volumes, but a 1993 study for the Transportation Commission indicates that incremental passenger inducement is less than 22 percent (see Section 1.3), with little impact on farebox recovery of auto-passenger services on parallel routes.

1.2 POF service in Puget Sound does not compare favorably with other West Coast systems.

To ascertain the operating metrics of WSF to other POF operations, we compared the activity level and operating costs of WSF with two other systems on the West Coast. Those systems were:

- The Golden Gate Ferries in San Francisco; and
- The Red & White Fleet, also in San Francisco.

We made a decision not to draw comparisons between WSF's POF service and private POF services in Puget Sound because those private services support primarily international and tourist businesses and therefore are not comparable to WSF's POF service, which supports commuters. Each of the above systems in San Francisco primarily supports a commuter customer base and were felt to be most comparable to WSF.

Exhibit 9-2 compares the two POF services offered by WSF with the Golden Gate and Red & White systems in San Francisco.

EXHIBIT 9-2
Comparison of WSF and Other POF Services

Benchmark	WSF Routes		Golden Gate		Red & White
	Bremerton	Vashon	Route 1	Route 2	
Annual Passengers	**280,000**	**267,000**	**526,000**	**1,100,000**	**1.570,000**
Route Length (Miles)	**13.5**	**8.5**	**6**	**12**	**6**
Travel Time	**55 min.**	**30 min.**	**30 min.**	**45 min.**	**25 min.**
Round Trip Fare	**$3.50**	**$3.50**	**$7.00**	**$4.40**	**$6.50**
Cost/Hour	**$6 71**	**$8 82**	**$4 47**	**$5 39**	**$47 4**
Cost/Hour/Passenger	**$6.71**	**$7.11**	**$4.29**	**$3.74**	**$7.54**
Cost/Hour/Passenger Capacity	**$1.89**	**$1.39**	**$1.02**	**$1.02**	**$1.53**

Source: WSF Route Statements, Regional Ferry Plan San Francisco Bay Area, and Booz·Allen analysis.

The exhibit highlights the following findings:

- The WSF (POF) system has lower passenger volumes than the other two systems;
- WSF fares are lower, which underscores the systemwide resistance to increasing or even differentiating between fare levels; and
- The cost measures presented indicate that WSF costs are considerably higher than other systems–sometimes twice as high.

A comparison of these findings with the operating benchmarks presented in Chapter 3 indicates that the operating practices of WSF's POF service is suboptimal to the industry. Perhaps practices that serve WSF well on the larger vessels and routes do not produce similar efficiencies and economies on the POF services. This suggests the potential requirement for a different business or operating paradigm for the POF service.

1.3 New technology and faster vessels are expected to enhance the service level of WSF's current POF service.

In 1993, the *Passenger-Only Ferry Program Implementation Plan* (also called the "Berk Study") detailed for the Transportation Commission the elements of a successful POF program. That study indicated that operation of a successful POF service hinges on the selection and purchase of a fleet of vessels that can meet and sustain operating characteristics regarding speed and reliability over a vessel's life. Additionally, the study indicated that frequency of service and on-time performance are critical.

In formulating its new 20-year plan and setting procurement specifications for a new POF, WSF considered both the recommendations of the Berk Study and lessons learned from current system performance. WSF indicates that the POF service of the future will serve as a demand management tool, designed to accomplish two things. First, the new service will provide attractive commuting time, which is expected to convince some cross-sound commuters to leave their automobiles in favor of passenger-only vessels. Second, over time it will increase service levels and relieve demand from existing auto-passenger ferries as demand increases. The Berk Study categorized current and future POF ridership generation into four groups: existing POF riders (17 percent), riders transferring from the auto ferries (61 percent), induced new riders (18 percent), and riders transferring from the auto commutes (4 percent).

The Booz·Allen audit did not verify the accuracy of the POF demand projections contained in the Berk Study. However, a comparison of the design selected by WSF for its new POF fleet shows that WSF has incorporated all the recommendations of the Berk Study. Importantly, WSF indicated to the audit team that it has recently completed initial sea trails of its new POF, the *M/V Chinook*. While not verified, WSF indicated that the sea trials demonstrated the vessel's ability to meet both speed and wake-wash design criteria. Due to the unique nature of POF fleet operations, the Berk Study also recommended the appointment of a separate POF Program Manager and staff to oversee operations and maintenance. The audit concurs in principal with this conclusion, but did not conduct analysis to determine the appropriate management and operations oversight required for WSF's

current and planned POF service. WSF has not designated an individual for this position to date.

2. PUBLIC/PRIVATE PARTNERSHIPS MAY OFFER OPPORTUNITIES FOR COST SAVINGS OF WSF'S POF SERVICE. THE PRIVATE SECTOR AND AFFECTED COMMUNITIES SHOULD PARTICIPATE IN THE PLANNING PROCESS.

The term "privatization" as used in this chapter, implies private sector involvement in the investment, ownership, and/or operation of an entity. However, privatization does not always imply non-government involvement or support. A public/private partnership, including the possibility of subsidizing private operations, is often necessary for "privatization" options to be feasible. Additionally, the ability to privatize government agencies or functions may also require legislative or regulatory change. In this section, we address the financial impact of, and regulatory constraints to, privatization of WSF's POF service.

2.1 Public/private partnership options for the POF service could offer opportunities for cost savings.

Bearing in mind the premise that ownership and operation of a POF service differs from ownership and operation of an auto-passenger ferry service, Booz·Allen evaluated several privatization options that could offer efficiencies to WSF. Our first step was to conduct interviews with representatives of WSF, regional private ferry operators, and POF experts to identify possible privatization options. No consensus resulted from these interviews, which implies that no single answer or business model for POF service exists. However, a significant number of restructuring options were identified assuming different models of state and private operator ownership, management, and operation.

Next, we performed a financial analysis covering a six-year period in which we compared the advantages and disadvantages of WSF's current form of ownership and operation with private ownership and operation. The analysis used as its baseline WSF's 20-Year Plan for POF services and identified three key areas affecting privatization options for the POF service: (1) vessel operations and ownership; (2) terminal operations and ownership; and (3) capital investment structure and cost. A summary of the analysis is set out in Exhibit 9-3 on page 7.

In our analysis we determined that numerous options exist for privatizing WSF POF services. Many of these options were found to be subjective and dependent on broad assumptions regarding the operator, operated vessels, terminals served, etc.

EXHIBIT 9-3
Comparison of WSF and Private Sector Provided Passenger-Only Ferry Service for Six-Year Plan
(1997 Dollars in Millions)

Cost	WSF Current Six-Year Plan	Private	Private Advantage (Disadvantage)
Revenues	15.6	15.6	n/a
Operating Expenses:			
- Vessel	-39.1	-33.4	5.7
- Terminal	-2.2	-15.0	-12.8
- Administrative	-5.0	-5.8	-0.8
Subtotal	*-46.3*	*-54.2*	
Operating Income	***-30.7***	***-38.6***	
Capital Expenses:			
- Vessel	-3.1	-20.5	-17.4
- Terminal	-15.7	-5.0	10.7
Subtotal	*-18.8*	*-25.5*	
Cash Flow	***-49.5***	***-62.5***	

Source: WSF and Booz·Allen analysis.

For purposes of the analysis, we looked at operations and ownership separately. During the audit we found that the use of private, non-union labor to operate the POF fleet offers one of the greatest opportunities for cost savings. Even though a private vessel operator would incur heavy insurance costs, the labor savings could potentially more than offset this expense. As shown in the above exhibit, WSF has the potential to save $5.7 million over the six-year period by privatizing vessel operations. In contrast, where POF services call at terminals serving auto-passenger ferries, it was found that the use of WSF's current terminal labor for both POF and non-POF services provided a more cost-effective solution. This conclusion is based on the fact that mixed-use terminals are advantageous because costs can be allocated among all operations at the terminal.

No conclusion was reached regarding vessel and terminal ownership. Generally, the cost of capital for government agencies is lower than that available for private operators, which suggests that public ownership of assets may be preferred. However, regional private ferry operators suggest that they are more flexible in the design, construction, and/or purchase of major assets such as vessels and terminals because they are not constrained by the purchasing procedures of state agencies. For example, private operators may look to explore opportunities with non-regional shipyards when seeking to purchase used vessels or have new vessels constructed. On

the terminal side, private operators suggest that the construction of less expensive, simpler facilities is possible.[1]

A review of the ownership/operations arrangements of various POF commuter services on the West Coast was inconclusive. However, state ownership and control of assets that are privately operated appears to be the most common paradigm.[2]

Full privatization of WSF's POF service would result in an operator maintaining full ownership, responsibility, and autonomy in establishing service standards, fares, frequency of service, vessel size, and performance characteristics, etc. However, the analysis indicates that it may be more advantageous and cost-effective to privatize certain aspects of WSF's POF service, i.e., enter into a partnership with a private operator. Under the auspices of a public/private partnership, WSF could establish service standards and tariffs, among other operating parameters, that are consistent with its 20-year plan. However, it is important that WSF engage the private sector in initiating a privatization plan to ensure that assumptions it may make concerning a private operator are reasonable, feasible, and implementable. As a first step, WSF should engage the private sector–potentially through a Request for Qualifications (RFQ) or Request for Proposals (RFP) process–to assess the level of interest of private operators and investors, determine the qualifications of interested parties, and identify the privatization options that are attractive to the private sector. BC Ferries and many government agencies worldwide use the RFQ and RFP process in developing dialogue, planning, and selecting privatization partners.

2.2 Current regulations, laws, and precedents will need to be addressed to permit any public/private partnership option.

Recognizing the need to identify key constraints that would have to be addressed in order to permit any privatization scenario, Booz·Allen undertook a regulatory analysis. In that analysis we identified five regulatory/issue areas that could impede privatization. These areas are summarized in Exhibit 9-4.

[1] A Seattle waterfront operator indicated expenditures of approximately $2.0 million for the development of its POF terminal. In contrast, the WSF cost estimate for the design and construction of its Pier 50 POF facility, which is similar in size to the private operator, is over $4.0 million.

[2] Based on review of ownership and operating structure of Golden Gate Ferries, Red & White Ferries, and Blue & Gold Ferries.

EXHIBIT 9-4
Overview of Regulatory Constraints/Barriers to Privatization

Issue	RCW/LAW	Comment
Vessel Labor	RCW 47.64.090	Private ferry operators must pay comparable wages and working conditions if they receive a state subsidy or operate directly on a WSF route. This is enforced by the Marine Employees Commission.
Contracting Out	'71-Cunningham vs. Community College (District 3)	According to a recent study regarding the privatization of the prison systems in Washington State, in the absence of legislative authority to do so, a state may not contract with an outside company for work traditionally performed by state employees.
Terminal Requirements	RCW 47.64.090	WSF terminals do not allow non-union private ferry operators to call their docks because of the indirect effect of RCW 47.64.090. WSF indicates current industry practice is to discourage mixing union and non-union operations.
Ten-Mile Rule	RCW 47.60.120	The Washington Utilities and Transportation Commission administers a regulation prohibiting private ferry operators from providing a service within ten miles of the WSF passenger-only service terminal. It is possible for an operator to get a waiver of this rule.
Federal Assistance	ISTEA	The Intermodal Surface Transportation Efficiency Act (ISTEA) provides federal funding for transportation projects, including WSF's passenger-only ferry (POF) construction program. These monies are typically appropriated to public agencies.

Source: Booz·Allen analysis.

The analysis concluded that legislative authority would be required to contract out services to a non-union operator and to permit non-union operations to operate in unison with WSF terminal employees. Other matters regarding changes to contracting, the ten-mile rule, and ISTEA monies would be dependent on the privatization scenario pursued.

3. THE TRANSPORTATION COMMISSION RECENTLY DIRECTED WSF TO PREPARE FOR PRIVATIZING ITS INTERNATIONAL SERVICE OVER A THREE-YEAR PERIOD.[3]

[3] This policy direction may be modified by Transportation Commission adoption of the "Washington State Ferries Systems Plan for 1998 – 2018" in December 1998. The new system plan states that in 2003 "... if the Sidney route is still operated by WSF, a 100-car Evergreen Class vessel could make two daily sailings during the summer. The Evergreen Class vessel could remain in operation until

WSF has provided international service between Anacortes, Washington, and Sidney, British Columbia, since 1951. Over the past six years, the cost structure of the international service (and consequently, its viability) has been questioned because of recently introduced international regulations and decreasing demand for services on the route. Moreover, the WSF mission statement appears to focus on providing domestic commuter service in its language "*to provide marine mass transportation.*" This statement does not appear to support the international service serving Victoria, British Columbia, which is primarily tourist traffic. However, in the case of the San Juan service, where the customer base is also primarily tourist, WSF provides essential connectivity between Washington and island roadways.

In 1997, the Transportation Commission directed the WSF to begin efforts to privatize the international service. In this section, we evaluate the performance of WSF's international service to date and the feasibility of moving ahead with privatization. Additionally, we summarize the privatization issues that WSF and the Washington State Legislature should consider, as well as regulatory and institutional barriers to implementation.

3.1 The international service is seasonal. It serves a tourist client base, and it generates insufficient revenue to meet its 100 percent farebox recovery goal. In addition, passenger and vehicle demand has declined, although local communities have recently initiated programs to increase system usage year-round.

WSF's Anacortes-Sidney route serves a customer base that is primarily tourist, and as might be expected, it is seasonal. The route generates 70 percent of its total revenues during the summer, when WSF operates two round trips daily between Anacortes-Sidney using two vessels. In the winter, only one round trip is made each day, and only one vessel is in service on that route. While the service level has remained steady, the demand for service has declined somewhat. Exhibit 9-5 illustrates the activity levels on the route since FY 1992. The Sidney ferry route is a major tourist attraction in local communities, attracting an estimated between $7 and $27 million in direct and indirect revenue to Skagit County each year.[4] This is based on a December 1997 report developed through a contract between the City of Anacortes and the Economic Development Council of Skagit County and is an estimate of total economic impact.

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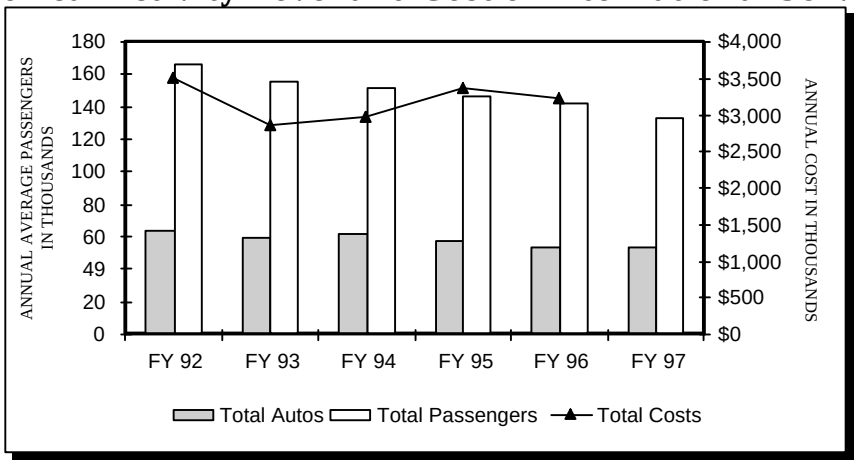
no later than 2008, when domestic needs trigger a transfer of the Sidney route to a different operator and the vessel reassigned to the Edmonds-Kingston route."

[4] Memorandum dated February 18, 1997 prepared by Don Wick, Executive Director, Economic Development Association of Skagit County entitled "Preliminary Assessment of Economic Impacts with the Anacortes-Sidney Ferry."

EXHIBIT 9-5
Historical Activity Level and Cost of International Service *



Source: WSF Route Statements.
Note(*): Route cost summaries for 1997 were not available during the audit.

As the exhibit makes apparent, passenger and vehicle activity has been on the decline since at least since FY 1992. Since this time, passenger activity has declined by 3.3 percent and vehicle activity by 2.7 percent. Correspondingly, operating costs have also declined, but at a lesser rate of 0.2 percent annually. Operating costs are expected to increase significantly in upcoming fiscal years due to investments in regulatory compliance. Additionally, preliminary activity levels for 1998 indicate a slight increase in passenger levels for the international service.

Due to the directive to privatize this service, farebox recovery targets for the international service are currently 100 percent, exceeding a farebox recovery target of 60 percent for WSF's entire system. From FY 1992 through FY 1997, 100 percent farebox recovery was not achieved. Over this time frame, farebox recovery varied between 74 percent and 90 percent, with the FY 1997 farebox recovery on the international service equaling 76 percent.

3.2 The cost of continuing international service has increased due to regulatory requirements. Compliance costs are estimated at nearly $11.8 million over six years.

WSF is currently in the process of bringing its vessels, operations, and management systems associated with international service into compliance with Safety of Life at Sea (SOLAS) and International Maritime Organization (IMO) requirements. Exhibit 9-6 provides an overview of the four specific regulations within U.S. Coast Guard, SOLAS, and IMO requirements with which WSF must comply and their corresponding six-year costs.

EXHIBIT 9-6
New Regulatory Requirements for International Service

RFSA - Retroactive Fire Safety ($7.1M)	ISM - International Safety Management ($4.0M)
• Stair tower modification for M/V Elwha • Automatic sprinklers • Smoke detection & alarm systems; heat detection for the galley • Escape routes; emergency lighting	• Safe operation of ships at sea; prevention of human injury & loss of life; avoidance of damage to the environment • Documented safety management system designs to prevent human error on board vessels and ashore

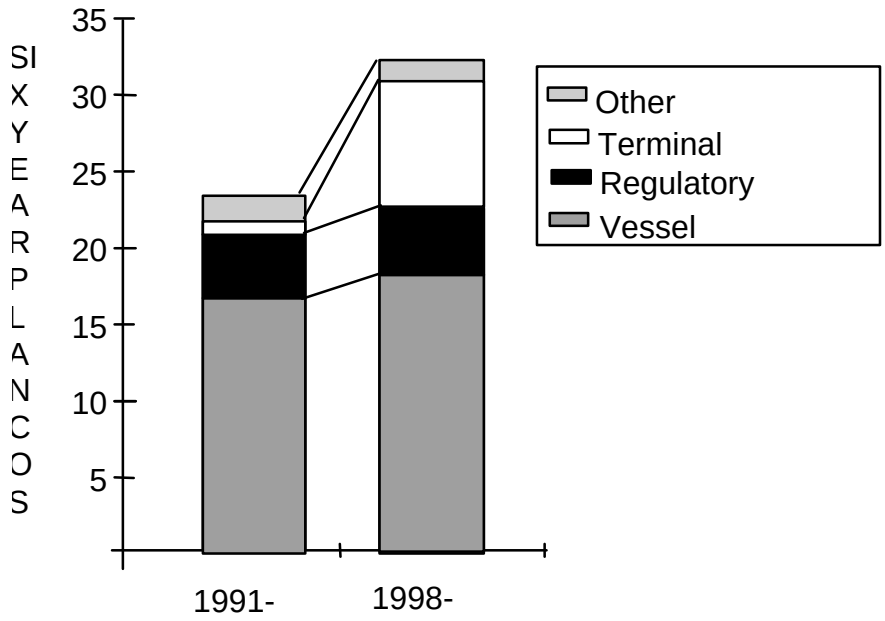
Subchapter W - Life Saving Equipment & Requirements ($0.7M)	STCW 95 - International Standards of Training, Certification, and Watchkeeping for Seafarers ($0.04M)
• Operating instructions, muster lists, and emergency instructions • Supervision/manning of survival craft • Training and drills • Lighting/reflectorizing of buoyant apparatuses	• Training for deck and engineering crew • STCW endorsements on U.S. Coast Guard-issued licenses and documents

Source: WSF.

ISM compliance is required for marine operators by July 1998. WSF is currently developing the appropriate documentation and defining required responsibilities of key management and labor positions in order to comply with the standards. SOLAS requirements, including Retroactive Fire Safety Amendments (RFSA), 46 CFR Subchapter W (Life Saving Equipment & Requirement) and International Standards of Training, Certification and Watchkeeping for Seafarers (ISTCW), account for the remainder of the regulatory compliance requirements.

WSF estimates total compliance costs associated with the international route at slightly more than $11.8 million. Approximately $4.0 million of these costs are capitalized costs that have already been expended. WSF estimates that annual recurring costs for ISM certification will reach $566,000. Exhibit 9-7 illustrates the impact of these regulatory requirements over the next six years in comparison to the past six years.

EXHIBIT 9-7
New Regulatory Requirements for International Service



Source: WSF.

ISM compliance is estimated at nearly $4.0 million over the six-year period and accounts for 34 percent of total compliance costs. SOLAS compliance accounts for the remainder, with RFSA compliance estimated at $7.1 million, or 60 percent of total compliance costs. In addition, compliance expenditures and commitments through calendar year 1997 total approximately $4.0 million, and therefore should be considered sunk costs. Any decision to restructure or privatize the international service should consider the $3.1 million remaining for planned and recurring expenditures, of which 95 percent will be distributed evenly over the next six years.

3.3 The Transportation Commission has passed a motion to implement a transition plan to privatize WSF's international service.

In March 1997, the Transportation Commission passed a motion directing WSF to continue operating the international service. The motion outlined a plan to bring the service into compliance and to develop the business in a way that would allow for privatization at the end of three years. This motion included the following directives:

- Implement a three-year transition plan to privatize operations;
- Implement a reservation system and marketing initiative to enhance the route's attractiveness;
- Implement SOLAS requirements;

- Coordinate with local communities in implementing the plan;
- Develop performance measures to assess plan progress; and
- Provide the Commission with an annual progress review.

Building from this understanding, Booz·Allen reviewed WSF's transition plan and its reports to the Transportation Commission and Legislative Transportation Committee (LTC). We found that WSF has taken steps to comply with the Commission's directives, including the installation of a reservation system, marketing the route, upgrading of vessel fire safety and crewing requirements, and the development of documentation to comply with SOLAS requirements. However, we also found that the WSF transition plan lacks clear goals (e.g., full privatization without subsidy, year-round or seasonal service, etc.) and requires additional details. Specifically, WSF needs to define the level of privatization desired, how ownership and use of vessels currently serving the trade will be utilized post-privatization, and how Friday Harbor will be served after privatization, among others things.

Remaining work to be accomplished includes development of performance measures and a complete and detailed transition plan. Performance measures that would assess the progress of the implementation plan would include such items as schedules and goals for the transfer of route ownership; definition of criteria for operator qualifications; and/or a solicitation for interested operators.

On March 24, 1998, the Transportation Commission passed Resolution No. 568 which referenced its March 1997 motion as Commission policy, and stated the goals of developing the Anacortes to Sidney service to make it attractive to a private operator, and providing Commission review of the progress toward accomplishing privatization potential.

4. A PUBLIC/PRIVATE PARTNERSHIP FOR THE INTERNATIONAL ROUTE HAS FINANCIAL IMPLICATIONS FOR BOTH WSF AND LOCAL COMMUNITIES, AND SHOULD INCLUDE PRIVATE FERRY OPERATOR AND LOCAL GOVERNMENT STAKEHOLDER PARTICIPATION IN THE PLANNING PROCESS.

Privatization implies private sector involvement in the investment, ownership, and/or operation of an entity. However, privatization does not always imply non-government involvement or support. Additionally, the ability to privatize government agencies or functions may also require legislative or regulatory change. In this section, we address the financial impact of privatization, as well as the market and regulatory constraints to privatization of WSF's international service.

4.1 Other ferry operations (both private and public) connect Vancouver Island and Washington State.

As indicated earlier in this report, the private sector does not currently compete with WSF or provide POF services within Puget Sound. However, other operations do exist in the Puget Sound Northern Corridor, providing international service. Those services are identified and compared in Exhibit 9-8.

EXHIBIT 9-8
Comparison of WSF
and Private International Service for Six-Year Plan
(Round Trip Fares Indicated in U.S. Dollars)

Ferry Service	Company	Owner-Operator	Vehicle Price*	Adult Price*	Type
From Washington State:					
– Anacortes-Sydney	WSF	State	$59.00	$8.65	Auto-Pax
– Port Angeles-Victoria	Black Ball Transport	Private	$54.50	$13.50	Auto-Pax
– Port Angeles-Victoria	Victoria Rapid Transit	Private	n/a	$20.00	POF
– Seattle-Victoria	Victoria Clipper	Private	n/a	$94.00	POF
– Seattle-Victoria	Clipper Line	Private	$85.71	$38.57	Auto-Pax
From British Columbia:					
– Tsawwassen-Swartz Bay	BC Ferries	Province	$51.43	$11.43	Auto-Pax

Source: *The Ferry Traveler.*
Note(*): *Canadian tariffs converted at exchange rate of $1.40 CD = $1.00 USD.*

As indicated in the exhibit, both auto-passenger and POF options exist for transport to Vancouver Island from Washington State or British Columbia. WSF service is currently competitive with private sector services for vehicle traffic and significantly less expensive for passenger-only fares. Current WSF vehicle and passenger capacity is adequate to support current international activity levels.

Some of the services identified in Exhibit 9-8 are seasonal and/or provide lesser service in non-summer months. BC Ferries provides the greatest level of service to Vancouver Island, with six or more sailings daily. However, this service departs from British Columbia.

Given 1997 activity levels and costs, we estimate a tariff increase of 30 percent could be required for WSF to achieve its farebox recovery target. An increase of this level would result in a round-trip fare of approximately $77 for WSF international service. It should be noted that our analysis assumed that customer demand is insensitive to large price increases. Without proper price sensitivity data, we were unable to assess the impact of a large tariff

increase. However, it is highly likely that WSF could experience a decline in its customer base given that this increase would place WSF's tariff among the highest for vehicle tariffs for service to Vancouver Island and that alternative transportation options exist.

4.2 Cost analysis indicates that a seasonal service in summer months recovers 100 percent of operating cost.

Similar to the POF service analysis, the audit team conducted interviews with WSF and private ferry operators, reviewed WSF's documentation regarding its international service, and conducted a financial analysis. The financial analysis determined WSF's projected six-year cost and compared these to estimated costs for a private operation. The baseline for the analysis was WSF's international service plan over a six-year period. A summary of the financial analysis is highlighted in Exhibit 9-9.

EXHIBIT 9-9
Comparison of WSF and
Private International Service for Six-Year Plan
(1997 Dollars in Millions)

Cost	WSF Current Six-Year Plan	Private	Private Advantage (Disadvantage)
Revenues	16.0	16.0	
Operating Expenses:			
- Vessel	-14.5	-10.2	4.3
- Terminal	-3.8	-3.4	0.4
- Administrative	-2.5	-1.6	0.9
- Regulatory Compliance	-3.0	-0.9	2.1
Subtotal	*-23.8*	*-16.1*	
Operating Income	***-7.8***	***-0.1***	
Capital Expenses:			
- Vessel	-10.0	-8.0 to - 22.0	2.0 to -12.0
- Terminal	0.0	0.0	0.0
Subtotal	*-10.0*	*-8.0 to -22.0*	
Cash Flow	***-17.8***	***-7.9 to -21.9***	

Source: WSF Route Statements and Booz·Allen analysis.

The analysis identified numerous options for privatizing WSF's international service, but many of these options were found to be subjective and dependent on broad assumptions regarding the operator, operated vessels, terminals served, etc. For purposes of the analysis, we explored operations and ownership separately.

As with POF service, we determined that the use of private, non-union labor to operate the international fleet offered one of the larger potential opportunities for cost savings. As the exhibit indicates, the potential savings from current vessel expenditures could total as much as $4.3 million over a six-year study period. The anticipated savings is derived from reduced labor costs, which more than compensate from the significant insurance expenditures a private operator can expect to incur. In contrast, it was found that the use of WSF's current terminal labor at Anacortes provided a more cost-effective option than developing a dedicated international terminal operation. This conclusion is based on the fact that terminals serving multiple routes have an advantage because terminal and overhead costs can be allocated to numerous services.

Currently, WSF allocates costs across all routes a vessel supports. In the case of vessels operating on the international route, these vessels also serve the San Juan routes in conjunction (e.g., Friday Harbor) with and in addition to (e.g., all San Juan ports) their international operations. Because the international service constitutes a small percent of total annual service-hours in which the two ferries operate on the international service, a large portion of their total annual operating costs are allocated to the San Juan service. Due to this allocation methodology, WSF currently minimizes operating and capital costs assigned to the international route. In the event that a private operator were to provide a similar service, it is likely that full vessel operating and capital costs would have to be recovered directly from the international service. While operating costs may be managed to some degree (e.g., shorter working-hours, seasonal labor, etc.), it is likely that capital, i.e., ownership, costs would have to be fully allocated to a privatized international service, resulting in a private service potentially being financially non-viable.

From the analysis, we drew several conclusions regarding privatization of the international service, including the following:

- Capital costs for a new or used ferry may be significant;
- Labor cost as applied by state regulations will remove private sector disadvantages unless non-union labor is permitted; and
- Regulatory compliance costs may or may not be a factor depending on the operator's fleet and the vessels operated.

Furthermore, from WSF's perspective, maintenance of a route with declining ridership, such as the international route, has an impact on WSF's ability to serve high-growth routes where the public might be better served and the need for additional capacity is demonstrated.

5. RECOMMENDATIONS AND OPPORTUNITIES FOR COST SAVINGS.

The results of our performance audit indicate that opportunities exist for public/private partnerships or subsidization of the passenger-only and international services provided by WSF. In the final section of this chapter, Booz·Allen presents four recommendations representing opportunities to improve current processes and conserve costs.

Report Recommendations 25 through 28 follow:

25.❖ If public/private partnerships are to be pursued, the legislature should consider amending current legislation to eliminate barriers to private ferry operations in Puget Sound.

Currently, privatization of current WSF services provides little cost advantage due to restrictive clauses in the Regulatory Code of Washington (RCW), which do not allow private operators to set their own labor cost structure or operate in conjunction with unionized operations at WSF terminals. To remove barriers (see Exhibit 9-4) and enable WSF to consider privatization of its international and POF services, the Washington State Legislature should consider altering the current language in RCW 47.64.090 to remove restrictions regarding privatization. Furthermore, the legislature should formally direct the WSF to identify and evaluate privatization opportunities to enhance current POF and international services, and lower costs.

26.❖ Conduct a preliminary Request for Qualifications (RFQ) or Request for Proposals (RFP) process to assess current interest and/or ability of the private sector be a partner in POF and/or international service.

The WSF has not involved private sector ferry operators in its privatization planning process for its international service. Likewise, the WSF has not explored privatization options for facilitating POF service on current or new routes. In essence, the WSF is reinventing its international service to make it attractive for privatization, but the structural and operational plans WSF is formulating may not be suited to the capabilities, equipment (e.g., fleet, terminals, etc.), and experience of potential private operators. Likewise, WSF privatization planning may not identify or consider all potential restructuring options. WSF should involve the private sector in the development of privatization scenarios and business plans. An RFQ or RFP process is one way to do this. A successful RFQ or RFP process could

❖ **Note: The Joint Legislative Audit and Review Committee approved an Addendum regarding this recommendation. Please see page xxii.**

potentially result in accelerating the implementation of planned new POF services and privatization of the international route.

27.❖ Establish definitive goals for public/private partnership for the international service.

WSF and the legislature does not have clearly-defined goals or objectives for public/private partnerships for its international service. Specifically, the audit identified no clear goals as to the level and/or limits of privatization that WSF should accomplish under its current Transportation Commission directive (e.g., privatized system will not be subsidized, privatized service must provide at the minimum of a summer season service, WSF will provide vessels for operation, etc.). Details regarding vessel ownership, location, and access to and operation of terminals, seasonal versus year-round services, and other issues need to be more clearly defined. Current WSF efforts to achieve 100 percent farebox recovery indicate privatization of operations only, but do not address capital cost of vessels and terminals. Impacts to the operations and financials of other WSF routes should be evaluated as part of this analysis.

28.❖ Evaluate feasibility and merits of a summer season international service.

WSF currently operates its international service on an annual basis. However, 70 percent of revenues are generated during the four-month summer season. As an option to privatization, WSF should evaluate the feasibility and merits of operating an international service during the summer season only, making additional vessel capacity available for the support of other services during non-summer months.

❖ **Note: The Joint Legislative Audit and Review Committee approved an Addendum regarding this recommendation. Please see page xxii.**

STUDY SCOPE AND OBJECTIVES

Appendix A

SCOPE OF WORK

The Firm shall objectively and systematically examine the WSF to provide an independent, comprehensive audit of operating and capital improvement program performance.

SPECIFIC AND GENERAL QUESTIONS TO BE ADDRESSED

The Firm shall use judgment, experience, and creativity in conducting this performance audit. The performance audit shall identify those activities and programs that should be strengthened, those that should be abandoned, and those that need to be redirected or have other alternatives explored.

The performance audit shall address, at a minimum, the following issues:

a. Has WSF complied with the recommendations of the 1991 Booz-Allen and Hamilton Vessel Construction and Refurbishment Study? Over the past six years, do vessels that have been modernized under the refurbishment program demonstrate significant improvements in service reliability as compared to their condition before refitting? Are vessels that have been modernized comparable in service reliability to newer vessels? Does the performance of refit ferries result in net operating savings to the ferry system; and how do each of the major renovation systems contribute to any net savings or increased costs? Are the benchmarks and standards used to calculate the performance of modernized vessels or their components appropriate?

b. Since 1991, has WSF implemented vessel procurement procedures that maximize cost-effective fleet preservation and vessel maintenance; and that ensure the lowest cost for new ferry construction? Is the ferry system modernization program appropriate given industry standard estimates for the useful life of a marine vessel? What is the ferry system's performance in controlling cost overruns and delays?

c. Is the current level of ferry system in-house design and construction support appropriate? Which design or construction functions could be performed by private engineering firms and shipyards? What procedures and procurement strategies are used by the ferry system to share the risk of project performance between the state and private shipyards in the implementation of contractual work? To what extent does the ferry system rely on contracting for marine design and capital management engineering? Do outside contracts duplicate ferry system in-house staff resources? How does the ferry system assign design work between department staff and consultants?

d. How accurate have the ferry system long-range plan recommendations for terminal and vessel investments been with current demographic trends and service demands? Has the ferry system factored the impacts of private or local government competition in planning the new Passenger Only Fast Ferry System? Has the ferry system accurately projected long-term construction and operating costs in its financial projections? What are the most critical variables and cost factors that drive the long-range planning process?

e. Based upon vessel service logs, safety records and information provided by stakeholders, is there a need for the entire Washington State ferry fleet to be systematically examined in drydock by an independent marine consultant in order to determine the safety, reliability and expected service-life of each vessel? Are major maintenance investments in older ferries reasonable and consistent with industry standards for vessels with similar size and complexity?

f. Is the administrative structure of the ferry system appropriately sized as compared to other public ferry operations? Over the last ten years, has administrative staff growth been proportionate to growth in other, direct service areas? To what extent has growth in administrative staff been justified by measurable workload growth? Is the overall level of management and support staffing appropriate?

g. Does the ferry system efficiently manage automobile traffic in its staging, loading and terminal traffic management procedures? Do terminal and dock traffic capacity limitations affect ferry schedules or the efficient use of ferry capacity? Will surface transportation and terminal facilities be adequate to support the larger new ferries? Has the ferry system adequately planned terminal and support facilities for the proposed new Passenger Only Fast Ferry System? Does the ferry system own or lease enough waterfront acreage to expand terminal and vessel support facilities as needed?

h. Based on the ferry system mission statement, and related goals and objectives, what is the appropriate service level for existing and planned routes? How much excess capacity is incorporated into the ferry system

deployment plan to meet peak, basic service demands (non-tourist peak capacity)? Does the ferry system have a clearly articulated mission statement and valid and reliable performance objectives to allow a determination of an "appropriate" service level?

i. Does the ferry system employ appropriate procedures for vessel operational support; including, but not limited to, fueling, water, sewage and hazardous materials management procedures? What is the cost impact of compliance with environmental requirements and regulations on the ferry system? Are there opportunities to provide vessel operational support services more efficiently? Do ferry system managers encourage and use suggestions and recommendations to make vessel operational support operations more efficient?

j. Has the ferry system adequately planned for life-safety or environmental emergencies?

k. Should specialized ferry services such as international route service or the passenger-only ferry programs be provided by local governments and/or the private sector instead?

l. Are the radio and electronic vessel communications and electronic tracking systems used by the ferry system adequate? What is the degree to which these technologies are or are not utilized?

m. Does the ferry system have adequate and appropriate contractual agreements for all agent services?

o. Have terminal utility costs increased faster than the rate of inflation, or disproportionately higher than for other utility customers in the same service class?

p. What strategies and facilities are in place for maintenance support of vessels and terminals? What is the long-term viability of the Eagle Harbor operations?

q. Are there capital investments in fleet and terminal equipment that could be made to enhance operational support?

r. Does the ferry system adhere to personnel system requirements and provide essential employee training, including training needed to comply with regulatory agency mandates?

s. Has the ferry system made appropriate investments in computer and information management systems?

t. Does the ferry system have a maintenance and systems development program in place to sustain the information management systems and to prevent obsolescence?

u. What is the salary setting and dispute resolution process for WSF employees, and can this process be improved to better meet identified objectives?

General Performance Audit Issues Identified by the Washington State Legislature

The original mandate for the transportation performance audits (ESSB 6061) included the following objectives. In addressing the specific audit issues referenced above, the following objectives shall also be addressed, as appropriate:

- For each function, activity or program, identify associated costs and full-time equivalent staff;
- Determine the extent to which the particular activity or function is specifically authorized in statute or is consistent with statutory direction and intent;
- Consider whether the purpose for which the program was created is still valid based on the circumstances under which the program was created versus those that exist at the time of the audit;
- Determine whether the function, activity or program is achieving the results for which it was established;
- Identify any duplication of services with other government programs or private enterprises or gaps in services;
- In the event of inadequate performance by the program, identify the potential for a workable, affordable plan to improve performance;
- Identify, to the extent possible, the causes of any program's failure to achieve the desired results and identify alternatives for reducing costs or improving service delivery, including transferring functions to other public or private sector organizations; and
- Develop recommendations relating to statutes that inhibit or do not contribute to the agency's ability to perform its functions effectively and efficiently, and whether specific statutes, activities, or programs should be continued, abandoned, or restructured.

AGENCY RESPONSES

Appendix B

- **Transportation Commission**
- **Public Employment Relations Commission**
- **Marine Employees' Commission**
- **Office of Financial Management**

To link to this appendix, click here.

CROSS INDEX OF STUDY QUESTIONS AND REPORT

Appendix C

	Audit Question	Location of Report Reference
a.	Has WSF complied with the recommendations of the 1991 Booz-Allen and Hamilton Vessel Construction and Refurbishment Study? Over the past six years, do vessels that have been modernized under the refurbishment program demonstrate significant improvements in service reliability as compared to their condition before refitting? Are vessels that have been modernized comparable in service reliability to newer vessels? Does the performance of refit ferries result in net operating savings to the ferry system; and how do each of the major renovation systems contribute to any net savings or increased costs? Are the benchmarks and standards used to calculate the performance of modernized vessels or their components appropriate?	VII (1-3) Appendix E
b.	Since 1991, has WSF implemented vessel procurement procedures that maximize cost-effective fleet preservation and vessel maintenance; and that ensure the lowest cost for new ferry construction? Is the ferry system modernization program appropriate given industry standard estimates for the useful life of a marine vessel? What is the ferry system's performance in controlling cost overruns and delays?	VI (5) VII (3-4)
c.	Is the current level of ferry system in-house design and construction support appropriate? Which design or construction functions could be performed by private engineering firms and shipyards? What procedures and procurement strategies are used by the ferry system to share the risk of project performance between the state and private shipyards in the implementation of contractual work? To what extent does the ferry system rely on contracting for marine design and capital management engineering? Do outside contracts duplicate ferry system in-house staff resources? How does the ferry system assign design work between department staff and consultants?	VI (4) VII (4) Appendix E
d.	How accurate have the ferry system long-range plan recommendations for terminal and vessel investments been with current demographic trends and service demands? Has the ferry system factored the impacts of private or local government competition in planning the new Passenger Only Fast Ferry System? Has the ferry system accurately projected long-term construction and operating costs in its financial projections? What are the most critical variables and cost factors that drive the long-range planning process?	VIII (1-4)
e.	Based upon vessel service logs, safety records and information provided by stakeholders, is there a need for the entire Washington State ferry fleet to be systematically examined in drydock by an independent marine consultant in order to determine the safety, reliability and expected service-life of each vessel? Are major maintenance investments in older ferries reasonable and consistent with industry standards for vessels with similar size and complexity?	XI (1-2)

	Audit Question	Location of Report Reference
f.	Is the administrative structure of the ferry system appropriately sized as compared to other public ferry operations? Over the last ten years, has administrative staff growth been proportionate to growth in other, direct service areas? To what extent has growth in administrative staff been justified by measurable workload growth? Is the overall level of management and support staffing appropriate?	III (1-2, 4) IX (1-2)
g.	Does the ferry system efficiently manage automobile traffic in its staging, loading and terminal traffic management procedures? Do terminal and dock traffic capacity limitations affect ferry schedules or the efficient use of ferry capacity? Will surface transportation and terminal facilities be adequate to support the larger new ferries? Has the ferry system adequately planned terminal and support facilities for the proposed new Passenger Only Fast Ferry System? Does the ferry system own or lease enough waterfront acreage to expand terminal and vessel support facilities as needed?	VIII (3-4)
h.	Based on the ferry system mission statement, and related goals and objectives, what is the appropriate service level for existing and planned routes? How much excess capacity is incorporated into the ferry system deployment plan to meet peak, basic service demands (non-tourist peak capacity)? Does the ferry system have a clearly articulated mission statement and valid and reliable performance objectives to allow a determination of an "appropriate" service level?	III (1-3)
i.	Does the ferry system employ appropriate procedures for vessel operational support; including, but not limited to, fueling, water, sewage and hazardous materials management procedures? What is the cost impact of compliance with environmental requirements and regulations on the ferry system? Are there opportunities to provide vessel operational support services more efficiently? Do ferry system managers encourage and use suggestions and recommendations to make vessel operational support operations more efficient?	V (1-5)
j.	Has the ferry system adequately planned for life-safety or environmental emergencies?	V (2-3)
k.	Should specialized ferry services such as international route service or the passenger-only ferry programs be provided by local governments and/or the private sector instead?	IX (1-4)
l.	Are the radio and electronic vessel communications and electronic tracking systems used by the ferry system adequate? What is the degree to which these technologies are or are not utilized?	V (1,4-5)
m.	Does the ferry system have adequate and appropriate contractual agreements for all agent services?	IV
o.	Have terminal utility costs increased faster than the rate of inflation, or disproportionately higher than for other utility customers in the same service class?	III
p.	What strategies and facilities are in place for maintenance support of vessels and terminals? What is the long-term viability of the Eagle Harbor operations?	VI (3-5)
q.	Are there capital investments in fleet and terminal equipment that could be made to enhance operational support?	V (1)

	Audit Question	Location of Report Reference
		VIII (1)
r.	Does the ferry system adhere to personnel system requirements and provide essential employee training, including training needed to comply with regulatory agency mandates?	IV (6)
s.	Has the ferry system made appropriate investments in computer and information management systems?	V (5)
t.	Does the ferry system have a maintenance and systems development program in place to sustain the information management systems and to prevent obsolescence?	V (5) VI (5)
u.	What is the salary setting and dispute resolution process for WSF employees, and can this process be improved to better meet identified objectives?	IV (3-5)

STATUS OF STUDY RECOMMENDATIONS FROM 1991 *MANAGEMENT OF VESSEL REFURBISHMENT* PROGRAMS STUDY

Appendix D

Recommendation	Fully Implemented or Intent Met	Partially Implemented	Not Implemented
1. Reduce the organized layers between the assistant secretary and those directly responsible for engineering design and construction management. Further, create a senior level position solely responsible for new construction and refurbishment programs reporting directly to the assistant secretary.	X		
2. The position descriptions for the two vacant senior management positions should include a prerequisite for previous shipyard and/or vessel maintenance management experience.	X		
3. The Washington State Ferry system should continue its policy of establishing an in-house design engineering capability with continuing use of outside design consultants as required.	X		
4. Assign Ships to “Single Owner”.	X		
4. The Department of Transportation and the Legislative Transportation Committee should support a policy of renewed shipyard competition and additional shipyard capacity in the region.	X		
6. Formalize refurbishment decision process.	X		

Recommendation	Fully Implemented or Intent Met	Partially Implemented	Not Implemented
7. Establish a Steel Maintenance Program.			X
8. Establish formal pre-refurbishment inspection procedure.			X
9. Standardize Work Scoping Process.		X	
10. Develop a procedure for estimating planned growth.		X	
11. Develop a standard structure for unit pricing.	X		
12. Specify bid lots for all planned growth.	X		
13. Revise standard contract language on the use of unit prices.	X		
14. Award planned growth along with base work package.	X		
15. Require the shipyard to provide additional management tools.	X		
16. Improve Change Order Management Procedures.	X		
17. Modify change approval authority.	X		
18. Establish an audit function within Washington State ferries.	X		
19. Formalize the current Asbestos Abatement Program.		X	
20. Strengthen budgetary procedure to more closely monitor budget revisions.	X		
21. Develop guidelines for project prospectus and program budget estimate compared to actuals in post program review.	X		

Recommendation	Fully Implemented or Intent Met	Partially Implemented	Not Implemented
22. Policy implications of schedule and budget adherence should be more clearly communicated to the Legislative Transportation Commission in the original budget and subsequent versions.	X		

DETAIL REVIEW OF WSF PROCUREMENT/CONTRACTING PROCEDURES

Appendix E

This appendix discusses in detail the results of the Booz·Allen performance audit regarding vessel procurement and contracting practices of the Washington State Ferries (WSF).

BACKGROUND.

The 1991 Booz·Allen study of WSF's performance on major ferry refurbishment and renovation projects resulted in a number of recommendations for improving the ferry system's method of procuring and contracting large repair, modification and modernization availabilities. These recommendations included:

- Support a pro-competitive shipyard policy;
- Establish a procedure for estimating planned growth;
- Establish a standard unit pricing structure;
- Specify bid lots for planned growth;
- Revise standard contract language on the use of unit prices;
- Award planned growth with basic work;
- Incorporate additional project-monitoring requirements;
- Improve change order management procedures; and
- Modify change approval authority.

Since the 1991 audit, WSF has made changes to its procurement and contracting policies to implement these recommendations and has performed several availabilities using the revised policies and procedures. The current performance audit has reviewed the changes and the impact of the changes on the performance of these availabilities. In addition, the current audit has compared WSF procurement and contracting policies with industry practice to determine if additional changes should be considered to further improve performance.

APPROACH.

The current audit was conducted by first performing a comprehensive review of procurement and contract documentation developed since the 1991 audit. This documentation included procurement data such as Invitations for Bids (IFB) and Requests for Proposals (RFP) and contracts for the *M/V Cathlamet* minor renovation, *M/V Tillikum* and *M/V Klahowya* major renovations, the Steel Electric class propulsion system upgrades, and Jumbo Mark II and Passenger-Only Ferry (POF) new construction. In addition to reviewing procurement and contract documentation on these availabilities and projects, the team examined the actual contract cost and schedule performance. The audit team also reviewed the current statutes and Department of Transportation regulations that control procurement and contracting policies of WSF. The team also sought out additional documentation relating to procurement and contracting policies. This documentation included studies performed by or for WSF since the 1991 audit and information furnished by parties outside WSF who have an interest in procurement and contracting issues.

Following the review of documentation, the team conducted interviews with key WSF employees involved with the procurement, contracting and execution of ferry availabilities and new construction projects. Based on the review of documentation and initial interviews, the team developed preliminary hypotheses concerning the performance of WSF in the area of ferry procurement and contracting. These preliminary hypotheses were then tested through additional focused data gathering and interviews. This step either confirmed the original hypothesis or led to modifications based on the additional information. The team then summarized the results of its audit in the form of findings, conclusions and recommendations.

FINDINGS.

The audit team's findings are organized in the following topic areas: (1) Evolution of WSF ferry procurement and contracting practices since the 1991 audit, (2) Performance on major projects since the 1991 audit, and (3) Comparison of WSF procurement and contracting practices to current industry practice.

(1) Evolution of WSF Ferry Procurement and Contracting Practices Since the 1991 Audit.

Prior to the 1991 audit, WSF was limited to using the IFB process for all ferry- related procurements. Procurements were based on an IFB package of information which included general contract provisions, contract bid and award instructions, specifications, drawings and contract administration information. The latter document contained most of the provisions under which the contact would be executed. The contract administration information contained limited procedures for change order administration

and protest adjudication and did not address authorization and control of Indefinite Quantity Work (IQW) and disputes resolution. The contracts themselves were simple two- or three-page documents which basically confirmed the award to the successful bidder and stated the award amount. Details on the execution of the contract were contained in attachments to the contract. The attachments, however, were not explicitly listed in the contract but merely referenced.

IQW was defined in the bid package as unit-priced lots for specific repair requirements, unit prices for specified hours of straight-time and overtime labor, a specified material amount plus a unit-priced percentage mark-up, and a specified subcontractor amount plus a unit-priced percentage mark-up. A unit-priced repair lot typically specified replacement of steel plate of a given area and thickness or replacement of pipe of given length, material, schedule, and diameter. The unit-priced work was considered in the bid evaluation but was not included in the award price. Unit-priced work as well as unplanned growth was authorized by change order. Change order approval authority was set at $100,000 per change order for the project engineer and $300,000 per change order for the Vessel Construction Manager. Contract administration issues were handled by the project engineer. The Contracts/Legal department prepared the bid and contract documentation and monitored the IFB process but was not involved in the project after contract award.

Following the 1991 audit, WSF implemented significant modifications to its procurement and contract documentation and practices. While still relying principally on the IFB process, the procurement package was standardized into the following five volumes:

- Contract provisions;
- Specifications;
- Drawings;
- Owner-furnished equipment information; and
- Illustrative test procedures-operational tests.

The contract provisions volume provided comprehensive bid and proposal information including: IFB/RFP schedule, bid/proposal instructions, bid/proposal requirements, bid/proposal evaluation, project legislation, financial proposal form, bond forms, and the contract. The simple two-page contract was replaced with a 70- to 90-page standardized document which contained all relevant terms and conditions. Many of the provisions appear to be modeled on U.S. Navy procurement contracts. The new contract introduced the concept of Contract Problem Reports (CPRs) which became the official method for the contractor to alert WSF of actual or potential contract problems. The new contract format also provided explicit instructions on the

process for pricing and authorizing IQW and change orders and provided a detailed process for disputes identification and resolution. Included in the disputes resolution process was a provision for non-binding arbitration. IQW was specified in the same manner as the pre-1991 bid packages but the unit-priced work was included in both the bid evaluation and award price. The contract also specified that unit labor rates would be used to price change orders as well as IQW.

The revised contract also contained provisions relating to the project management data to be provided by the contractor. Among the data specified were master construction/renovation schedules, drawing schedules, planned progress curves, and inspection schedules. The contractor was also required to update the schedules on a regular basis and participate in periodic progress review meetings.

Contracting practices were also revised to limit Vessel Construction's authority to issue change orders and IQW authorizations. Under the revised practices, the project engineer's approval authority was reduced to $25,000 per change order or IQW work authorization and the Construction Manager's to $100,000. Contract administration continued to be the responsibility of the project engineer and Contracts/Legal still ended its involvement at the time of contract award.

Although some of the revised procurement and contracting documentation and practices were implemented on the *M/V Cathlamet* minor renovation, the first real test was the major renovation of *M/V Tillikum*, an Evergreen State class ferry. Subsequently, they were used for the major renovation of *M/V Klahowya*, also an Evergreen State class ferry. With minor modifications the package was also used for the construction of the Jumbo Mark II class ferries. All of these procurements were IFBs.

In 1993, WSF identified the need for an alternative to the IFB process to use on complex system or equipment procurements where price should not be the sole or dominant selection factor. The Washington State Legislature responded with a project specific statute for the Jumbo Mark II class ferry construction program. This bill, Engrossed Substitute House Bill 2863, codified at RCW 47.60.780, permitted the use of supplemental, alternative contracting practices for the procurement of the Jumbo Mark II class propulsion system. The alternative contracting practice chosen for the Jumbo Mark II class propulsion system was the RFP process. Subsequently, WSF requested the Washington State Legislature to formally establish an RFP procurement process as an alternative to the IFB process. In 1995, the legislature passed Engrossed Substitute House Bill 1093 which provided general authorization for use of an RFP process if the Secretary of the Department of Transportation determined it was not practicable or not

advantageous to the state to use the IFB process.

WSF has used the RFP process on two ferry-related procurements, the POF construction and the Steel Electric propulsion control system replacement. In both cases, the selection of the successful bidder was made on the basis of a set of evaluation criteria tailored to address the specific requirements of the procurement. The IFB process, however, remains the principal vehicle for vessel construction, renovation, maintenance, and repair in the manner of state highway construction as specified in RCW 47.56.030. Despite the procurement flexibility provided by the limited authorization to use an RFP process, the firm, fixed-price contract is used exclusively for all ferry-related procurements. In the opinion of the WSF Contracts/Legal Manager this is the only type contract that is permitted by Washington State statutes and regulations.

Recently the Vessel Engineering organization has proposed a variation on the RFP process called "Procurement Partnership." In the Procurement Partnership process, WSF develops the conceptual design and outline specifications for a new ferry. Two or more shipyards are selected by an RFP process to work with WSF to develop competing contract designs that meet WSF requirements. The detail design and construction contract is awarded to one shipyard using the IFB process. Vessel Engineering believes this approach will encourage the shipyards to take ownership of the design, improve producibility, reduce misunderstandings about requirements, and lead to more realistic bid pricing and construction schedules.

(2) Performance on Major Projects Since the 1991 Booz·Allen Audit Study.

WSF cost and schedule performance on major projects since the 1991 audit is summarized in Exhibits E-1 and E-2 which also provide selected data on seven renovation projects completed prior to the 1991 audit.

EXHIBIT E-1
Cost Performance on Major Projects Since 1991 ($000s)

Contract	Base Package Amount	Work Growth $/% (1)	Final Contract Cost	Value-Added Growth $/% (1)	Total Value to State	Non-Value-Added Growth $/% (1)
Total of 7 pre-1991 contracts (2)	45,000	26,000 57.7%	71,000	12,400 27.5%	57,400	13,600 30.2%
M/V Cathlamet Renovation (1993)	3,673	328 8.9%	4,001	328 8.9%	4,001	0
M/V Tillikum Major Renovation (1993/94)	15,159	2,954 19.5%	18,113	2,954 19.5%	18113	0
M/V Klahowya Major Renovation (1994/95)(3)	16,167	5,980 36.9%	22,147	5,108 31.6%	21,273	874 5.3%
M/V Nisqually Propulsion Control (4)	2,675	318 11.9%	2,993	318 11.9%	2,993	0
M/V Illahee Propulsion Control	1,995	273 13.7%	2,268	273 13.7%	2,268	0
M/V Tacoma New Construction (1995/97)	65,735	2,331 3.5%	(5)	2,331 3.5%	(5)	(5)

Source: Booz×Allen analysis.
Note (1): Work growth includes authorized IQW and change orders, percentages are calculated using the base package value as the denominator.
Note (2): Data from 1991 audit.
Note (3): The contractor has submitted a Request for Equitable Adjustment in the amount of $4,617,511.
Note (4): Final contract cost includes a $44,000 credit for liquidated damages.
Note (5): The M/V Tacoma contract still remains to be settled.

EXHIBIT E-2
Schedule Performance on Major Projects Since 1991

Contracts	Original Contract Duration	Actual Contract Duration	Total Delay	Delay Attributable to WSF	Delay Attributable to Contractor
Average of 7 pre-1991 contracts (1)	263	383	120		
M/V Cathlamet Minor Renovation	139	139	0	0	0
M/V Tillikum Major Renovation	299	377	78	54	24
M/V Klahowya Major Renovation	288	478	190	112	78
M/V Nisqually Propulsion Control	106	142	36	25	11
M/V Illahee Propulsion Control	60	82	22	24	-2
M/V Tacoma New Construction	790	930	140	0 (2)	140 (2)

Source: Booz×Allen analysis.
Note (1): Data from 1991 audit.
Note (2): The M/V Tacoma contract remains to be settled.

The *M/V Cathlamet* availability was a minor renovation which included the installation of a second vehicle deck. A total of four change orders were written including two for repairs to the main reduction gears and two to correct outstanding U.S. Coast Guard (USCG) Form 835 deficiencies. The ferry was redelivered on schedule.

The *M/V Tillikum* major renovation was the first large renovation availability performed after the 1991 audit. The original contract price included approximately $2,600,000 for IQW to cover potential work growth. Only one change order was written. It covered additional mooring and pier-side services during the ferry's shakedown period when the newly installed propulsion control system was being programmed and tested. The WSF responsible schedule delay resulted from problems with the propulsion control system. The contractor responsible delay resulted from an accidental fire in the steering gear room.

The *M/V Klahowya* major renovation was considered to be a repeat of the *M/V Tillikum* job since the vessels were of the same class and the work packages were similar. It was soon discovered, however, that there was considerably more deteriorated steel on *M/V Klahowya* than was anticipated based on the surveys performed prior to the availability. In addition, portions of the superstructure were found to be coated with lead-containing paint, a hazardous material. The removal of this paint caused major disruption to other, ongoing work activities. The result of these two unanticipated growth items was significant increases in both project cost and schedule duration. Although WSF agreed to increase the contract value by over $3,000,000, the contractor is seeking an additional $4,600,000 in compensation for the delay and disruption resulting from the removal of the lead-containing paint.

The *M/V Nisqually* and the *M/V Illahee* availabilities were the first and second of a series of three availabilities planned for Steel Electric class ferries to upgrade their propulsion control systems to comply with USCG requirements. The contractor was selected using the RFP process and the award was made to a propulsion control system vendor rather than a shipyard. The cost and schedule growth on these availabilities is primarily the result of design changes identified as the project progressed and a battery bank relocation required by USCG requirements.

The Jumbo Mark II class new construction program is currently in progress with the first ferry, M/V Tacoma, delivered. The ferry, which entered service on November 17, 1997, appears to meet or exceed the expectations of WSF. At the present time, WSF believes there will be little cost growth on the contract although Todd Shipyards, the contractor, is reportedly experiencing significant cost overruns. There are over 190 CPRs on *M/V Tacoma* that

have not been adjudicated. WSF believes there are adequate, unallocated IQW funds to cover the CPRs, however, settlement could potentially increase the contract price.

Exhibit E-2 shows that all the availabilities except the *M/V Cathlamet* minor renovation have experienced significant schedule delays with responsibility shared between the contractor and WSF. The audit team attempted to determine if there are any procurement/contracting issues that could have directly or indirectly caused the schedule delays. One of the issues examined was the length of the time period between contract award and vessel delivery to the shipyard. Experience on complex U.S. Navy repair and overhaul availabilities has shown that one of the key success factors is adequate time for the contractor to perform advance planning, engineering, and material procurement. The time available for this effort is principally the time between contract award and the arrival of the vessel in the shipyard. The Navy typically allows the contractor three to six months for this effort depending on the complexity of the work package. Exhibit E-3 shows the time period between contract award and vessel delivery to the shipyard for recent ferry renovation availabilities.

EXHIBIT E-3
Time Between Contract Award and Vessel Delivery

Vessel	Contract Award Date	Vessel Delivery Date	Time Period Length
M/V Cathlamet	December 30, 1992	January 2, 1993	3 days
M/V Tillikum	April 27, 1993	June 3, 1993	37 days
M/V Klahowya	July 6, 1994	September 9, 1994	65 days

Source: Booz•Allen analysis.

Although the time period has increased on recent availabilities, it still falls well short of what the Navy would allow on availabilities of similar complexity. The time between contract award and vessel delivery is apparently driven by a number of factors including when the vessel can leave service, the expected duration of the availability, its required return-to-service date, and delays in contract award resulting from the IFB process. Delays in contract award can involve WSF delays in assembling the bid package and delays caused by shipyard bidders questions and requests for extensions. Since the delivery date is usually fixed by service requirements, delays in the IFB process have the effect of causing almost day-for-day reductions in the time between contract award and vessel delivery.

Another factor causing schedule slippage is IQW. Although, theoretically, IQW is supposed to be accomplishable within the original schedule duration, IQW is often authorized late in the availability when it can cause schedule slippage. The large amounts of IQW included in recent contracts increases

the probability some IQW will be authorized late enough to cause schedule slippage.

(3) Comparison of WSF Procurement and Contracting Practices to Current Industry Practice.

The organizations most directly comparable to the WSF in terms of procurement and contracting requirements for vessel new construction, modernization and repair are the U.S. Navy and USCG. In many respects, these organizations, although also constrained by government statutes and regulations, have more flexibility in their procurement and contracting practices than WSF. The Navy, for example, has employed at various times IFB, two-step RFP and formal source selection RFP processes for vessel new construction, modernization and repair. While awards under the IFB and two-step RFP processes are made solely on the basis of price, the RFP process allows considerable flexibility in award criteria. In recent years, the Navy has based its awards under the RFP process on an evaluation of "Best Value." This process allows the Navy to establish unique evaluation criteria for each program. The Best Value evaluation process is similar to the process WSF has employed to evaluate proposals for the POF procurement and the Steel Electric propulsion system replacement. The USCG also uses the RFP process for selection of contractors for new construction and modernization programs.

The Navy also has a great deal of flexibility in tailoring the type of contract to reflect the degree of contractor risk inherent in the project. For example, the Navy uses firm, fixed-price contracts when the work is well-defined and there is little risk. Fixed-price incentive contracts are used when there is enough uncertainty to warrant some degree of risk sharing and cost-reimbursable contracts when there is a high degree of risk. Typically, fixed-price incentive contracts and cost-reimbursable contracts are used for the lead ship in a new construction program and for initial availabilities of a ship class when the work package includes complex modernization requirements. Fixed-price incentive contracts are normally used for follow ship new construction contracts and firm, fixed-price contracts for repair and overhaul availabilities with standard, non-complex work packages. Navy new-construction contracts have never included provisions for IQW. On modernization and repair contracts, IQW is limited to a specified number of pre-priced labor hours. Navy construction contracts also include escalation provisions which protect the contractor from the inflation risk associated with long-term construction contracts. Generally speaking, Navy contracts are far more likely to share risk with the contractor than WSF contracts which are solely firm, fixed-price. USCG contracts tend to be either fixed-price incentive or firm, fixed-price.

The Vessel Engineering proposal to employ a procurement partnership on the next ferry construction program is an approach that has already been implemented by the Navy on three new ship construction programs, CVX, SC-21 and Arsenal Ship (recently canceled) and is being proposed by the USCG for its high-endurance cutter replacement program.

The CVX program office is responsible for designing and constructing the next generation aircraft carrier. An RFP was issued last November to select as many as six industry teams to participate in the design development process. The selected teams are currently serving on Navy design teams performing trade-off studies to establish key features of the design. The Navy's procurement plan includes a future down-select to two or three teams which will participate in the preliminary and contract design phases of the program and then a final down-select to the one team which will perform the detail design and construction of the lead ship. Teams will not develop competing designs but will work with the Navy to produce a set of detailed specifications and contract drawings to support the final down-select process.

The SC-21 program office is responsible for designing and constructing the next generation surface combatant. It is implementing a procurement plan that is very similar to WSF's proposed procurement partnership. The Navy program office anticipates issuing an RFP late this year to select as many as three industry teams to develop competing designs based on Navy-developed operational requirements and performance specifications. The Navy plans to remain involved in the design through a structured design review process that will ensure compliance with Navy requirements. Two teams will be selected to further develop their designs and ultimately the Navy will select one team for detail design and construction.

The Arsenal Ship program office was responsible for procuring a large fire support ship. The program office developed a very high-level performance specification (only three pages long) and selected six teams to develop competing designs. A down-select to three teams was performed using an RFP process that evaluated the designs on a number of factors including operational performance, acquisition cost, and life-cycle cost. The program office provided its input to the design development process through interim design reviews and the source selection process. An RFP had been issued for the down-select to a single team when the program was canceled for insufficient funding. Evidence suggests the use of a high-level performance specification and a competitive design process with customer (Navy) input led to innovative, technologically advanced designs that maximized performance while minimizing life-cycle cost.

CONCLUSIONS.

The audit of WSF ferry-related procurement and contracting practices shows WSF has reacted positively to the 1991 audit recommendations and has implemented policies and procedures that permit WSF to exercise far greater control over vessel new construction, repair, modification, and modernization. The findings support the fact that WSF has established a standard unit pricing structure, does specify bid lots for planned growth, has revised the standard contract language on the use of unit prices, does award planned growth with basic work, has incorporated additional project monitoring requirements, has improved change order management procedures, and has modified change order approval authority.

The findings, however, do not necessarily support the conclusion that these new practices have actually led to across the board improvements in performance. Although the performance data presented in Findings show significant improvements in cost performance from the WSF perspective, schedule performance continues to be a problem with delays resulting from both WSF and contractor actions or inactions. One problem appears to be the limited amount of time between contract award and vessel delivery to the shipyard. With insufficient time to perform advance planning and engineering, shipyards may not have an opportunity to clarify technical issues in a timely manner and are more likely to overlook critical relationships among jobs and fail to sequence and schedule work correctly. This can lead to inefficient work practices such as rework and trades interfering with each other and result in schedule slippage.

The new or revised practices have also created unintended or unforeseen consequences. For example, the new practices have led to a significant increase in IQW as shown in the Exhibit E-4. Now, however, IQW has less visibility because it is included in the award amount rather than in change orders. Less visibility means less incentive to spend only what you really need to spend and more incentive to spend all that is available.

The new practices have increased the complexity of the contract administration process. This is evident in the large numbers of CPRs written on recent projects and the related issue of timely CPR resolution. For example, 294 CPRs were written on the *M/V Klahowya* renovation and the Jumbo Mark II contract currently has a backlog of over 190 unresolved CPRs on M/V Tacoma. Part of the problem on the Jumbo Mark II project is the contract has no provision requiring the contractor to respond to a Work

EXHIBIT E-4
IQW Summary

IQW Type	*M/V Elwha (1990/1991)*	*M/V Cathlamet* (1993)	*M/V Tillikum (1993/1994)*	*M/V Klahowya* (1994/1995)
Structural Lots	9	9	9	31
Piping Lots	8	18	58	129
Insulation Lots	-	6	9	13
Blast/Paint Lots	5	12	-	-
Miscellaneous Lots	-	21	-	5
Total Unit Priced Lots	22	56	76	177
Straight-Time Manhours	12,500	1,500	20,000	15,000
Overtime Manhours	3,150	500	5,000	1,000
Material	$200,000	$1,000	$275,000	$100,000
Subcontractor	$225,000	$1,000	$715,000	$250,000
Total IQW	$1,399,895	$435,795	$2,598,817	$2,965,553
Percent of Base Package	11.4%	11.9%	17.1%	18.3%

Source: WSF and Booz×Allen analysis.

Authorization to Follow order with a timely IQW proposal. Although WSF can unilaterally issue a priced Work Authorization Record and force the contractor to file a protest if it disagrees with the amount, there has been a reluctance to use this authority because it could create an unnecessarily adversarial relationship. Large numbers of CPRs also increase the contract administration responsibilities of the project engineer and cause him/her to divert attention from deckplate construction/renovation issues.

The new procurement and contracting practices also place virtually all risk on the contractor. Unlike Navy contracts which share risk through incentive and cost-reimbursable contracts with inflation protection, WSF contracts require the contractor to bear the full burden of the uncertainty associated with a complex ferry construction or renovation project. Previously, WSF shared risk through the change order process which allowed the contractor some flexibility to recover from errors made during the bid or in execution. Although this was an inefficient risk sharing mechanism, it provided additional revenue to contractors and helped mitigate the effects of declining shipyard workload. With no risk sharing mechanism, contractors are in financial peril if they underestimate the scope of work or fail to implement efficiently. In the long run, WSF will suffer the consequences through reduced competition and inadequate personnel and facility resources at local shipyards. Already, WSF has only one option for drydocking its two largest classes of ferry. If there is ultimately only one shipyard capable of doing the work, it will not matter how tight the contract provisions are. As a public entity, WSF has an obligation to exercise its monopoly position responsibly and maintain a viable, competitive industry that will best serve its long-term needs for ferry construction, renovation and repair.

Procurement partnership is a step in the right direction and the planned approach should mitigate some of the risk associated with using the IFB process for ferry new construction. Participation in the design process should enable the shipyards to bid smarter because they will be thoroughly familiar with the design and will have had an opportunity to tailor the design in ways that will enhance producibility. Unfortunately, it will not stop shipyards from tendering unrealistically low bids because of competitive pressures.

Another alternative is to relax the restrictions on performing work outside the Puget Sound area. This alternative, however, is a risky one at best. Ferries are ill-suited for ocean voyages either under tow or their own power. A trip to/from Portland, Oregon, the location of the closest large U.S. shipyard, is probably feasible if the trip were made under ideal weather conditions but otherwise the nearest shipyards are in San Francisco and southern California, too far for a ferry to travel safely. Using a heavy lift ship to transport the ferry to/from a remote shipyard is an option but the cost would undoubtedly be prohibitive or at least non-competitive except, perhaps, in the case of new construction. Shipyards in British Columbia offer a viable alternative if Washington State is willing to have ferry work performed outside the U.S.

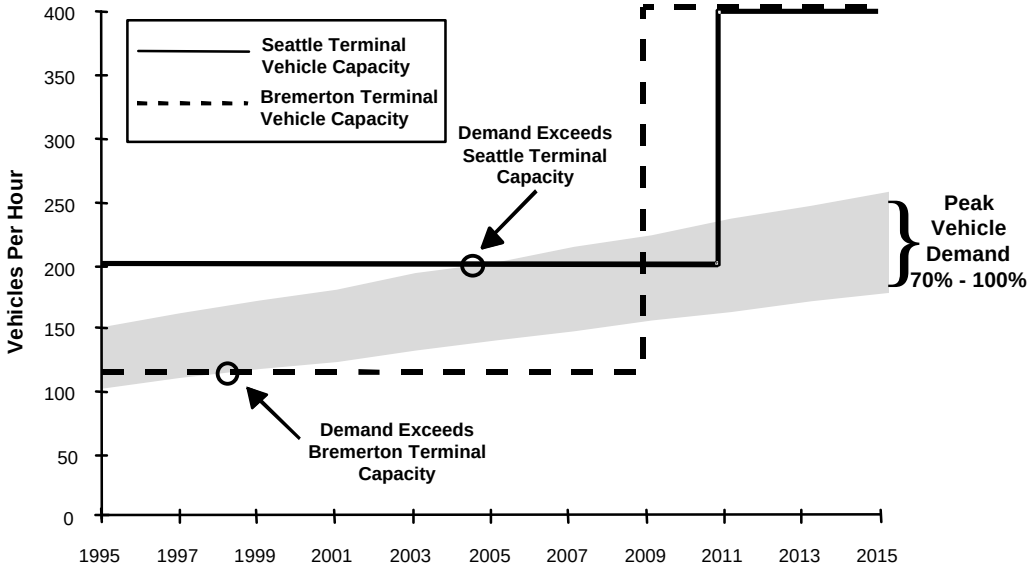
COMPARISON OF TERMINAL VEHICLE CAPACITY AND VEHICLE DEMAND FOR SIX WSF ROUTES

Appendix F

This appendix contains six exhibits presenting a comparison of terminal vehicle capacity to vehicle demand for five WSF routes between 1005 and 2015. These exhibits are provided in addition to Exhibit VIII-7 in the main body of the report which presents similar information for two additional routes.

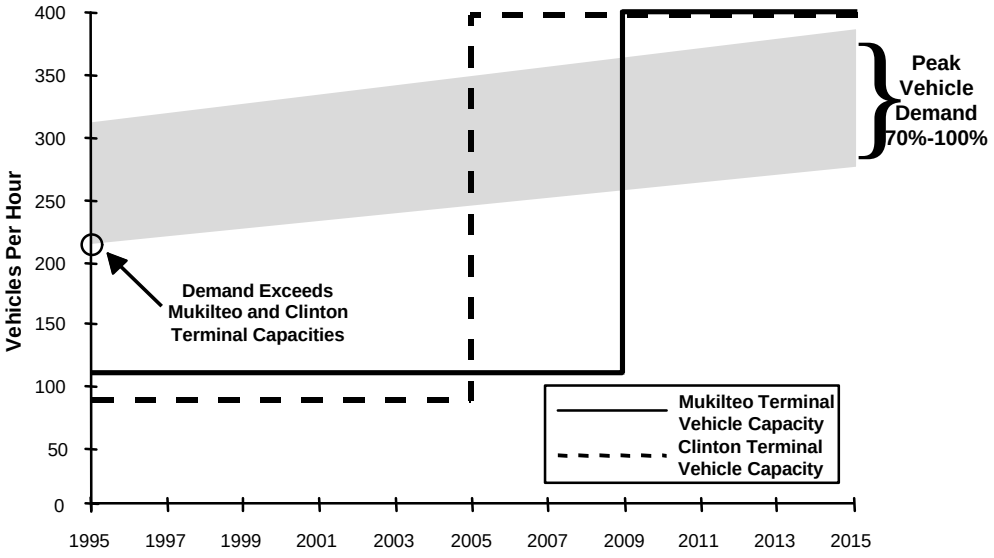
EXHIBIT F-1

Comparison of Terminal Vehicle Capacity and Forecast Vehicle Demand for the Seattle-Bremerton Route (1995-2015)



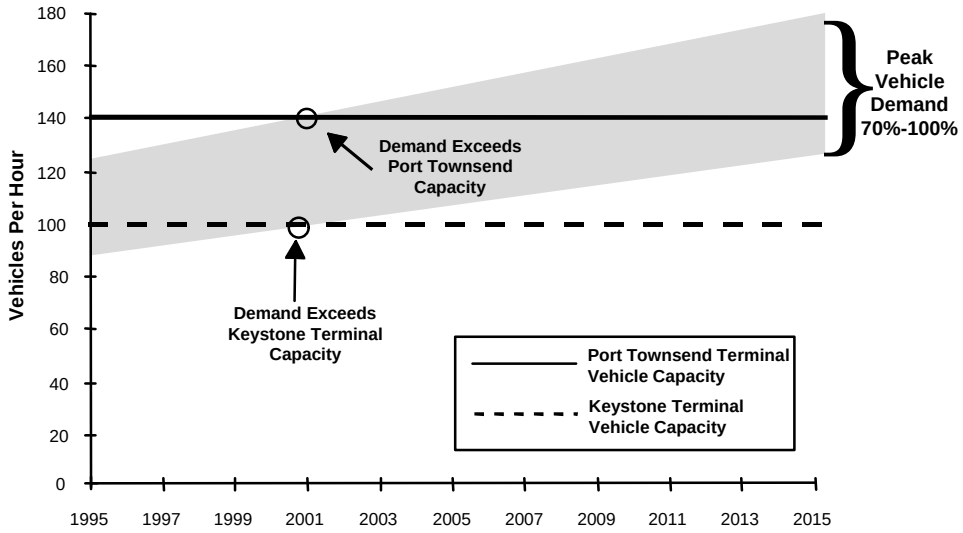
Source: WSF 20-Year Plan, Booz·Allen analysis

EXHIBIT F-2
Comparison of Terminal Vehicle Capacity and Forecast Vehicle Demand for the Mukilteo-Clinton Route (1995 - 2015)



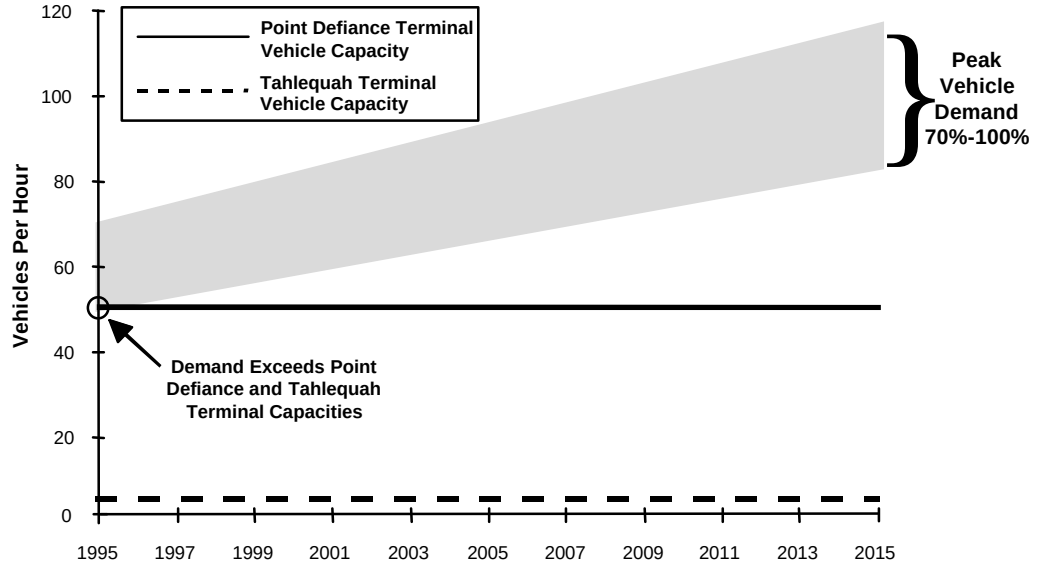
Source: WSF 20-Year Plan, Booz·Allen analysis

EXHIBIT F-3
Comparison of Terminal Vehicle Capacity and Forecast Vehicle Demand for the Port Townsend-Keystone Route (1995 - 2015)



Source: WSF 20-Year Plan, Booz·Allen analysis

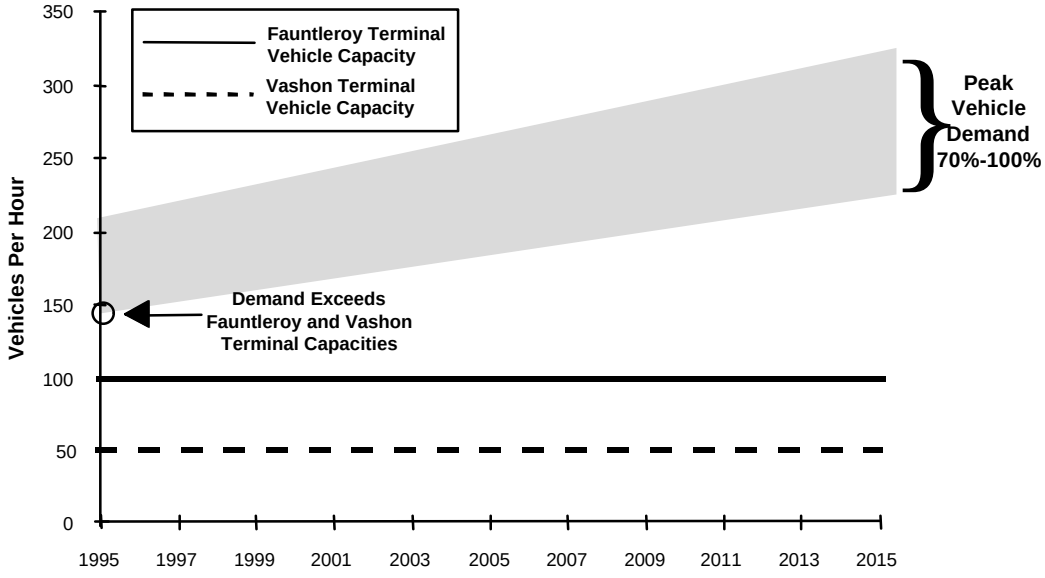
EXHIBIT F-4
Comparison of Terminal Vehicle Capacity and Forecast Vehicle Demand for the Point Defiance-Tahlequah Route (1995 - 2015)



Source: WSF 20-Year Plan, Booz·Allen analysis

EXHIBIT F-5

Comparison of Terminal Vehicle Capacity and Forecast Vehicle Demand for the Fauntleroy-Vashon Island Route (1995 - 2015)



Source: WSF 20-Year Plan, Booz·Allen analysis