

Vessel Maintenance, Preservation, and Improvement Plan

Vessel Life Cycle Cost Model Update 2010



Washington State Department of Transportation/Ferries Division



Washington State
Department of Transportation



WSDOT FERRIES DIVISION

Vessel Program Update

SUMMARY REPORT

During the 2009 Legislative Session, the Legislature took on several ferries-related issues that came out of the work accomplished in response to 2007's ESHB 2358 (the "ferry bill"). Many of the issues that garnered significant attention were associated with ensuring that the current and future WSF fleet will be adequate to maintain existing service levels. These issues were discussed and analyzed in both the 2009 WSF Long-Range Plan and the Joint Transportation Committee's (JTC) Vessel Sizing and Timing Report.

While much of the discussion during the Session was focused on the approach to replacing vessels that are due to be retired (type of vessel and timing of acquisition), there were a number of other important findings and recommendations associated with ongoing maintenance and preservation of the existing fleet. These findings, as they relate to the vessel preservation program, can be grouped into three general categories:

1. **Cost of preservation needs.** In recent years, WSF has not fully spent the funding appropriated for vessel preservation
2. **Programming of projects.** The current projection of preservation investment needs as shown by the Life Cycle Cost Model (LCCM) does not adequately reflect the constraints that limit the constructability of executing the work such as unplanned emergency work, drydock availability constraints, and meeting the service delivery demands of the system.
3. **Reduction of vessel maintenance time.** WSF's current approach to vessel maintenance results in an average of seven weeks of out-of-service time per vessel per year, which is a significant factor given the size of the fleet. Reducing the average to six weeks per vessel would eliminate the need for one vessel and allow WSF to reduce its fleet size.

Based on these findings, the Legislature directed WSF to prepare a Vessel Maintenance Preservation and Improvement plan (VMPI) and to review and update the vessel life cycle cost model (LCCM). The provisos included the following specific language:

VMPI – *"The department shall develop a proposed ferry vessel maintenance, preservation, and improvement program ... (that) must:*

- A. *Improve the basis for budgeting vessel maintenance, preservation, and improvement costs and for projecting those costs into a sixteen-year financial plan;*
- B. *Limit the amount of planned out-of-service time to the greatest extent possible, including options associated with department staff as well as commercial shipyards. At a minimum, the department shall consider the following:*
 - (i) *The costs compared to benefits of Eagle Harbor repair and maintenance facility operations options to include staffing costs and benefits in terms of reduced out-of-service time;*
 - (ii) *The maintenance requirements for on-vessel staff, including the benefits of a systemwide standard;*

- (iii) *The costs compared to benefits of staff performing preservation or maintenance work, or both, while the vessel is underway, tied up between sailings, or not deployed;*
- (iv) *A review of the department's vessel maintenance, preservation, and improvement program contracting process and contractual requirements;*
- (v) *The costs compared to benefits of allowing for increased costs associated with expedited delivery;*
- (vi) *A method for comparing the anticipated out-of-service time of proposed projects and other projects planned during the same construction period;*
- (vii) *Coordination with required United States coast guard drydockings;*
- (viii) *A method for comparing how proposed projects relate to the service requirements of the route on which the vessel normally operates; and*
- (ix) *A method for evaluating the ongoing maintenance and preservation costs associated with proposed improvement projects; and*

C. *Be based on the service plan in the capital plan, recognizing that vessel preservation and improvement needs may vary by route.*

LCCM – *Washington state ferries (is) to review and update its vessel life cycle cost model and ... evaluate the impact of the planned out-of-service periods scheduled for each vessel on the ability of the overall system to deliver uninterrupted service and will assess the risk of service disruption from unscheduled maintenance or longer than planned maintenance periods.*

In response to this legislative direction, WSF organized an internal working team comprised of senior vessel maintenance and preservation engineering staff to develop a scope of work that would address these topics and other related issues previously identified in the JTC's Vessel Sizing and Timing Report (April 2009). The scope of work focused on two principal efforts: (1) developing a Vessel Maintenance Preservation and Improvement Plan (VMPI) and (2) conducting a thorough review and update of the vessel life cycle cost model (LCCM). To augment the internal working team, WSF contracted with two outside consulting firms with deep expertise in these areas. The work elements addressed the following items:

- **Vessel Maintenance Preservation and Improvement Plan.** The VMPI focused on two major areas of investigation: (1) strategies to reduce vessel out-of-service time; and (2) strategies and practices to enhance the efficiency and effectiveness of WSF's maintenance, preservation and improvement activities.
- **Vessel LCCM Updates.** The LCCM review and updates included a complete review of the life cycle model, the development of a risk analysis framework to evaluate the impacts of potential system failures, an assessment of preservation project constructability issues, and a review of budget implications of the 16-year work plans. The LCCM model review included detailed assessments of life cycle intervals, review of deferred or extended preservation items, and analysis of cost model factors as compared to budgeted scope items.

The purpose of this report is to provide an overview of important general findings that emerged from these studies and to present a focused summary of the key findings and recommendations addressing the specific legislative provisos. The detailed documentation of both the VMPI and LCCM updates are included in full as attachments to this report.

GENERAL FINDINGS

The specific efforts undertaken in response to the budget proviso are consistent with broader efforts that have been underway for several years to prioritize organizational focus on the vessel programs, including both new construction and preservation and maintenance. The fleet is the backbone of reliable service provision and WSF faces particular challenges that arise from having an aging fleet and an operation that must maintain high levels of reliability with minimal backup vessel capacity. During development of these specific vessel program studies, several key findings emerged relating to these broader issues which are worth calling out.

Current approach is achieving excellent results. WSF is achieving excellent service reliability in large measure due to its strong vessel maintenance and preservation efforts. Exhibit 1 presents reliability data for the past six quarters, which show that only 26% of missed departures are due to a vessel mechanical issue. Further, the overall rate of lost departures is very low, as WSF has missed only 1.32 departures per 1,000 scheduled trips. This level of reliability is particularly impressive given the average age of the fleet. It is worth noting that in some ways this level of performance is a requirement of the system, since WSF does not have the luxury of some ferry operators to deploy multiple backup vessels when mechanical issues arise in the operating fleet.

Exhibit 1
Vessel Reliability Performance

| | Scheduled Departures | Missed Trips | Share Due to Vessel Issue | Missed Trips Due to Vessel Issue | Missed Trips per 1,000 Scheduled Departures |
|-----------------|----------------------|--------------|---------------------------|----------------------------------|---|
| 2011 Q1 | 42,253 | 138 | 44% | 61 | 1.44 |
| 2010 Q4 | 40,638 | 200 | 16% | 32 | 0.79 |
| 2010 Q3 | 39,077 | 122 | 24% | 29 | 0.74 |
| 2010 Q2 | 40,902 | 334 | 28% | 94 | 2.3 |
| 2010 Q1 | 42,720 | 313 | 29% | 91 | 1.62 |
| 2009 Q4 | 40,572 | 134 | 13% | 17 | 0.42 |
| 6-Quarter Total | 246,162 | 1,241 | 26% | 324 | 1.32 |

Source: WSDOT Ferries Division

Internal processes. While recent reliability performance has been noteworthy, WSF needs to continue to improve its internal processes to ensure that this level of fleet reliability can be maintained into the future. The current approach is often too dependent on the skill and experience of WSF staff with deep knowledge of the fleet and systems. This has led to processes that are reliant on “ad hoc” systems which have proven to be effective but do not provide a basis for organizational consistency and continuity. The VMPI offers a number of specific strategies and opportunities to improve these internal processes.

Maintenance and Preservation programs. While WSF does have several proactive maintenance and preservation systems in place (LCCM and the Computerized Maintenance Management System which plans and assigns regular preventative maintenance work), there is a need to continue to emphasize a proactive approach to the vessel program. Perhaps the most significant area where WSF can improve in this regard is through a systematized process for reviewing system conditions on a biennial basis. This level of inspection would improve both the regular maintenance efforts and keep the LCCM up to date so longer-term budget needs can be appropriately monitored and refined.

LCCM and budgets. State law requires that the preservation program be based on the LCCM. It is important to note that while the 16-year legislative financial plan is based on the LCCM, there are a number of modifications that are made to the LCCM outputs to construct the 16-year funding needs. The most significant types of adjustments include: (1) adding systems to the future funding needs which have not yet been acquired (e.g. new vessels); (2) removing systems which will be retired during the 16-year plan; (3) adjusting project scopes to reflect likely needs as opposed to the “full replacement cost” in the LCCM; and (4) timing changes to reflect shipyard availability and/or grouping systems into a single shipyard layup. It is important for WSF to continue to improve the base LCCM outputs to ensure that the 16-year financial plans are based on the best available information.

Out-of-service time. In order to meet WSF’s goal of 60-year vessel service life, a well planned maintenance, preservation and improvement program is an absolute necessity. Informed, dedicated and consistent maintenance will extend the life of major systems, increase the intervals between preservation activities, and streamline to the maximum extent practical the maintenance and preservation work to effectively reduce out-of-service time. Further, a well-articulated plan will build confidence among key stakeholders (WSDOT, OFM, Legislature, etc ...) that WSF is pursuing the most effective strategies and that budgets are based on a sound maintenance and preservation program.

Asset management principles. During review of the LCCM, WSF also conducted an assessment of incorporating asset management principles into the development of preservation needs. In particular, there was a desire to determine if incorporating a risk assessment into the process would assist in determining the relative risk of lost service associated with extending or deferring specific preservation items.

Toward this end, a conceptual risk analysis model was developed whereby the probabilities of failure for any particular system can be combined with the consequences of failure to arrive at an estimate of the likely impact of such a failure. This model was tested using the M/V Tacoma and the results were compared with the current 16-year plan to determine how well the preservation program might perform. The exercise suggested that most of the deferral or extension decisions were consistent with the risk assessment. However, there were a couple of noteworthy exceptions that resulted in proposed changes to the 16-year projection of preservation needs. As a result of this effort, WSF will explore the practicality of incorporating this type of risk assessment more broadly into the LCCM and preservation needs assessment.

RESPONSE TO SPECIFIC LEGISLATIVE REQUESTS

While there are many detailed elements that are included in the VMPI Plan and LCCM updates that are supportive of the legislative proviso, this section briefly summarizes how WSF plans to address the major findings and recommendations.

Budgeting Tools and Practices for Vessel Preservation

Accurately predicting preservation and improvement costs beyond the current and upcoming biennia is a difficult task. Although the LCCM cost estimates are a good basis for budgeting and longer term budget planning, the exact work scopes for preservation items cannot be known in detail far into the future. One way to improve the validity of these values as a basis for budgeting is to provide regular updates to the LCCM intervals and cost estimates with information as preservation is accomplished in order to continually improve forecasting ability. The following list is a brief summary of specific elements of the VMPI and LCCM update efforts designed to improve WSF’s budgeting tools and practices related to vessel maintenance and preservation.

- **LCCM intervals.** In the summer of 2009, each Staff Chief Engineer was given his or her vessel's inventory of systems. They were tasked with evaluating the condition of each system, and reporting recommendations that addressed the following: (1) the overall condition of each system; (2) the relative amount of routine repairs needed to keep each system operational compared to a typical new or repaired system; (3) an evaluation of condition monitoring, if any; (4) the availability of spare parts and general supportability of that system from the vendor community; and (5) a professional opinion as to whether that system will last at least two years past the scheduled replacement year.

These condition assessments helped determine that a significant number of planned preservation items could be delayed, and in many cases the expected intervals between conducting preservation items could be increased. These changes have been incorporated into the LCCM and subsequently used in developing budget requests. In addition to these adjustments, an analysis of deferred or extended items suggests that additional interval adjustments may be warranted in future updates to the LCCM, particularly when the condition of vessel systems is monitored and routinely reported on and maintained with the extension in mind. Examples include:

- **Boilers:** the fleet interval is set at 20 years. However, the Jumbo Class vessels are currently operating at 38 years since the last interval, and the Issaquah class is at 25 to 30 years.
- **HVAC systems and Controls:** the fleet interval is set at 12 years, with MKII-specific interval recently increased to 20 years. However, the Hyak is operating at 43 years, Jumbo Class vessels at 38 years, and five of six Issaquah Class vessels are at 28-30 years.
- **Fresh Water Tanks:** the fleet interval was just raised to 20 years. However, the Walla Walla is operating at 38 years since the last interval and four of six Issaquah Class vessels are at 28-30 years.
- **Cost factors in the LCCM.** Another key factor in ensuring a good base for budget and 16-year financial planning efforts is to ensure that individual system preservation cost factors are reflective of current costs. A review of current LCCM cost factors and recent preservation work elements identified concerns in two areas, which were addressed as follows:
 - **Most LCCM Cost Factors were higher than the Work Plan cost estimates.** The cost factor of a preservation item in the LCCM currently represents WSF's best estimate of what it would cost to replace or preserve the entire system in the worst case scenario. The 16-Year Work Plan cost estimates represent WSF's best estimate for actual scope and cost for the specific ship in the year that the item is due based on the current and projected condition of the system. In some cases the estimated cost will be very close (+/- 10%) to the LCCM cost factor because the system is well defined and the scope well bounded. However, the actual work scope and cost of Painting, Steel Preservation, and Piping Systems can and usually do significantly differ from the worst case scenario.
 - **Several LCCM cost factors were different within a single vessel class.** Changes to the LCCM cost factors were made so that cost factors for Systems across each vessel class were consistent.
- **Comparison of vessel LCCM and Budget.** The independently produced 16-year plan in the VMPIP (less maintenance) is only 11 % higher than the 16-year plan that WSF produced and reflects that both plans were based on the LCCM. While WSF uses the LCCM to estimate future vessel preservation needs, the 16-year financial plan used for budgeting purposes includes preservation items of vessels not yet built. Also when estimating preservation needs, the LCCM system cost factor is used, but when making a preservation funding request, a budgetary estimate is used. As discussed earlier, the budget is often based on adjustments to the LCCM preservation needs assessment. These adjustments reflect the

professional opinions of vessel preservation engineering staff and are often based on an assumption that the preservation item can be re-scoped to either fit into a shipyard availability window or to meet overall budgetary constraints. In future updates to the LCCM, WSF staff will be developing methods to better capture these scoping issues directly in the LCCM.

- **Expanded inspections.** WSF will continue to evolve and expand its inspection processes to allow for a better understanding of material conditions on the vessels. For example, internal hull inspection coupled with the steel preservation program allows more detailed information to be obtained on the condition of each vessel's hull steel. This enhanced knowledge will allow for more detailed scoping of the work, which will in turn allow for more precise budgeting.
- **Develop maintenance budget by vessel class.** Portions of the maintenance budget should be developed and allocated by vessel class. This would put the WSF maintenance budgeting process more in line with common industry practice and would allow for more detailed budgeting.
- **Methods for evaluating ongoing maintenance and preservation costs associated with improvement projects.** Currently, maintenance and preservation costs are not appropriately factored into either the cost benefit analysis of improvement investments or into the expected long term maintenance and preservation needs of the system. Several methods were evaluated to analyze maintenance and preservation Life Cycle Costs (LCC) associated with improvement projects. WSF will incorporate one or more of these methods into its future project and budget efforts.

Limit the Amount of Vessel Out-of-Service Time

A key underlying assumption of the JTC's Vessel Sizing and Timing fleet size recommendations was that average annual vessel out-of-service time could be reduced from seven weeks to six weeks. A number of specific strategies were identified to support this assumption, some of which were specifically identified in the budget proviso directing WSF to prepare the Vessel Maintenance Preservation and Improvement Plan. The VMPI assesses these key strategies and suggests the most effective way of integrating these ideas into the broader WSF vessel program.

- **Costs and benefits of consolidating Eagle Harbor work with commercial shipyard work.** The JTC's Vessel Sizing and Timing Report suggested that consolidation of shipyard and Eagle Harbor work into the same shipyard layup period could save a significant amount of out-of-service time. Elliott Bay Design reviewed WSF's practice of select Eagle Harbor crews traveling to various Puget Sound shipyards during the vessel's planned availability to perform work on the vessel at the commercial shipyard. Based on this review, it was determined that there are advantages to having Eagle Harbor employees working on WSF vessels while they are at commercial shipyards, but reducing vessel out-of-service time is not necessarily one of the advantages.

The primary benefit of using Eagle Harbor staff for some work items during commercial shipyard layups is potential cost savings. Elliott Bay Design conducted a cost comparison of Eagle Harbor and commercial shipyard rates and concluded that Eagle Harbor offered as much as a 25% lower cost for comparable work. The lower costs were primarily attributable to a much lower overhead rate, due primarily to the high ratio of staff to supervisory personnel at Eagle Harbor. It should also be noted that some of these cost savings can be eroded by Collective Bargaining Agreement contractual travel and penalty pay, which can increase Eagle Harbor costs by 10%.

Elliott Bay Design also determined that having Eagle Harbor employees working on specified scopes of work will not necessarily shorten the duration of a shipyard visit. If the shipyard work's critical path is not

shortened, then no amount of consolidated work outside of the critical path issues will result in a shortened yard period or reduced vessel out-of-service time. In addition, there are definite and restrictive limitations to consolidating work during shipyard periods. For example Eagle Harbor employees are not allowed to perform work that involves hot work, steel replacement, steel preservation, (large) piping system refurbishments, working from extreme heights, and any underwater hull work, inside Puget Sound commercial shipyards.

Based on this evaluation, it is recommended that WSF continue the practice of selectively utilizing Eagle Harbor staff for work accomplished at commercial shipyards, but only when it accomplishes one of the following goals:

- Accomplishes a vital system maintenance event that is either overdue or due before the next scheduled yard or Eagle Harbor availability.
 - Eliminates the need for removing the vessel from service in the immediate future.
 - Reduces the critical path for an upcoming Eagle Harbor lay-up period thereby reducing vessel out of service time.
 - Eliminates or mitigates a potential vessel scheduling problem or Eagle Harbor work force scheduling problem.
- **Maintenance requirements of on-vessel staff.** Currently, WSF provides full engine room staffing 24 hours per day as part of its operations and maintenance program. Staffing vessels with a 24-hour crew in the engine room has proven to be the most cost-effective way to perform all the necessary corrective repairs and preventative maintenance that keep vessels in uninterrupted service. WSF finds that with its large, complicated vessels and extended service hours, this is the system that works best for WSF, both operationally and financially. It is one key element in reducing vessel out-of-service time.

Elliott Bay Design reviewed the work programs for on-vessel maintenance and conducted interviews with engine room personnel to assess the role of this program in reducing out-of-service time and to identify opportunities to further leverage this workforce for additional preventative maintenance responsibilities. It was determined that almost all of the regular preventative maintenance work orders managed through the fleet's Computerized Maintenance Management System were accomplished by on-vessel staff.

The potential impact of completing all or the majority of preventative maintenance work using on-vessel crews has been demonstrated through a recently completed pilot program involving the M/V Puyallup. By consolidating preventative maintenance responsibilities through on-vessel staff, the M/V Puyallup has reduced the time necessary for its annual lay-up at Eagle Harbor. Reductions in the time required for a vessels annual layup result in less vessel out of service time. Due to these results, WSF should identify opportunities to extend the experience of the M/V Puyallup to other vessel classes.

One opportunity that was identified for expanding the role of vessel crews in maintenance would be to engage them in the increased and enhanced vessel system inspections that are needed to support the ongoing updates to the LCCM.

- **Performing maintenance or preservation work while the vessel is underway.** While there are likely opportunities to expand preventative maintenance and inspections accomplished by on-vessel crews, Elliott Bay Design concluded that performing work while the vessel was underway does not offer a significant opportunity. Accomplishing any significant amount of preservation work while underway was found to be impractical at best and in some cases not possible or safe.

- **Expedited delivery.** Elliott Bay Design analyzed the costs and benefits of expediting delivery of commercial shipyard work and concluded that there did not appear to be significant opportunities to achieve reduction in out-of-service time in this way. This conclusion was based on a review of WSF shipyard contracts and interviews with several relevant shipyards. Some of the underlying factors that limit this strategy include:
 - There are noise restrictions within the Puget Sound region that restrict work after 8 p.m. and in some cases 10 p.m.
 - In many cases, the contract duration already forces contractors to work some 10-hour days, weekend work, or second shifts to complete all required work on time.
 - Trying to ramp up to work may be hindered by potential shortages of qualified shipyard workers.
- **Coordination with required Coast Guard drydockings.** The United States Coast Guard requires all subchapter H passenger vessels to be drydocked to permit underwater hull and other underwater vessel systems' inspections twice every five years (two times in every consecutive five year period, not to exceed three years, of the vessel's operational life.) The Under Water in Lieu of Drydocking (UWILD) program permits a vessel owner to inspect the vessel's underwater systems in the water instead of the drydock, at alternate intervals. As a result, drydocking instances can be reduced to once every five years rather than twice in five years, but each vessel must have two diver inspections and two internal hull inspections in that five-year period between drydockings.

A UWILD program is only applicable to vessels that are 15 years of age or younger which are fitted with a corrosion protection system, although a vessel may participate past 15 years of age if a consistent inspection regime has been maintained and the hull has not deteriorated. WSF is currently using the UWILD program in the following ways: (1) the UWILD program is in place for Elwha and Chelan, both serving the Sidney international route; (2) the new vessel Chetzemoka was designed with the required hull markings for the UWILD program, and WSF will be applying to the US Coast Guard for entry into the program; (3) the new vessels Salish and Kennewick are also designed with the required hull markings for the UWILD program, and WSF will be applying for their entry into the program as well once the vessels are delivered.

Additionally, WSF will investigate the cost effectiveness of qualifying the Jumbo Mark II Vessels for the UWILD program. A careful evaluation is appropriate as there are costs to put the vessels into the program. For example, special hull markings have to be installed, under body videos have to be taken, special sea valves have to be installed and any keel cooler opening protections have to have hinged gratings to allow for an underwater inspection. These costs plus the costs of performing the annual dive surveys will be compared to the potential savings of reducing one drydocking per each five-year period.

Given the potentially significant cost and vessel out-of-service time advantages associated with the UWILD program, WSF will continue to assess the feasibility of qualifying more vessel classes in the future.

Preservation Program Needs to be Consistent with Capital Plan

The legislative budget proviso calls out the particular requirement that the preservation program be developed in support of the adopted capital plan. The legislatively adopted capital plan, which is based on the 2009 Long-Range Plan, is the basis for the current preservation program and supports a service element that is largely based on maintaining current levels of service. However, going forward there are two issues related to this legislative requirement that are worth highlighting:

New vessel construction. The capital plan includes an extensive new vessel construction program designed to support the retirements of almost half of WSF's fleet as vessels reach the end of their planned 60-year lives. Currently, the vessel LCCM correctly follows legislative guidelines and does not include any systems that WSF does not currently own. As a result, in the 16-year financial planning efforts WSF staff must make adjustments to the LCCM to include new preservation items related to new vessels scheduled to be delivered in this timeframe. Also, there are adjustments that must be made to LCCM output to reflect the fact that some current vessels will be retired in this timeframe, including assessing which preservation projects should be deferred beyond the retirement date. Given the number of new vessels that are planned for delivery in the future, it may be desirable to amend the LCCM to more directly account for these transition issues.

Funding issues. The other significant issue that must be factored into preservation planning is the likely availability of future funding. Currently the capital plan includes major unfunded future investment needs, particularly the new vessel construction program. By making the preservation program consistent with the capital plan, there is an implicit assumption that these projects will be funded and that the funding will result in on-time delivery of new vessels. This is a major issue for planning future preservation needs, since any delay in vessel delivery will mean that vessels slated for retirement will be required to continue their role in the operating fleet. To do this will likely require additional preservation funding, since in all likelihood some of the preservation investments were deferred beyond the expected retirement date since the risk of failure did not justify making these pre-retirement investments. So long as WSF does not have a funded capital plan, the vessel preservation program will need to consider alternatives to the expected retirements of aging vessels.

RECOMMENDED NEXT STEPS

Both the VMPI and the LCCM update reports include many action items and recommended next steps designed to implement these program elements. The following are the more noteworthy action plan items for each.

VMPI. Implementation of the Vessel Maintenance, Preservation and Improvement Plan is a critical factor in both the success of WSF's vessel programs as well as an important part of communicating with key stakeholders that the vessel programs are working on the right things and that budgets are developed based on implementation of cost effective strategies. Key next steps include:

- **Identify opportunities to expand the use of the US Coast Guard UWILD program.** The United States Coast Guard requires all subchapter H passenger vessels to be drydocked to permit underwater hull and other underwater vessel systems' inspections twice every five years (two times in every consecutive five year period, not to exceed three years, of the vessel's operational life.) The Under Water in Lieu of Drydocking (UWILD) program permits a vessel owner to inspect in the water instead of the drydock, at alternate intervals. WSF will continue to evaluate the costs and benefits of adding additional vessels to this program.
- **Identify opportunities to expand preventative maintenance responsibilities of on-vessel crew.** Opportunities for expanding maintenance activities on board vessels during normal operating hours and/or during overnight tie up periods will be explored by reviewing the success of the M/V Puyallup pilot program. Additionally, WSF will review all the maintenance tasks currently accomplished by Eagle Harbor personnel while the vessels are on their various runs, followed by identification and assessment of all tasks accomplished by Eagle Harbor personnel while the vessels are tied up for the night.

- **Review shipyard work scopes for critical path and consolidation opportunities.** A key factor in reducing vessel out-of-service time is to carefully schedule shipyard time and where appropriate consolidate some Eagle Harbor layup work into the shipyard availability. This will be done by reviewing the critical path items for each shipyard availability to identify opportunities to expedite work and to integrate WSF tasks into the same maintenance window.

LCCM. The vessel life cycle model has been significantly improved in the last year as a result of this effort, but more work needs to be done. In particular, the following are critical next step items to ensure that the LCCM continues to be a solid foundation for the development of preservation program budgets and for ensuring appropriate levels of ongoing funding support.

- **Systematic preservation item inspections and condition ratings.** A major effort was undertaken to assess current conditions of all LCCM systems. These efforts need to continue on a systematic basis. Toward this end, WSF will improve its internal inspection program so that systems are thoroughly inspected biennially and the results reported and included in ongoing LCCM updates. To the maximum extent possible, these inspections will make use of on-vessel staff and be included as part of the regular preventative maintenance program.
- **Reconciliation of budget process and LCCM.** The current approach to budget and 16-year plan development is to use the LCCM outputs as a base and then apply a number of adjustments to reflect everything from vessel retirement and replacement impacts to changes in work item scopes to budget and shipyard availability realities. WSF should continue to refine the LCCM to integrate as many of these external processes as possible directly into the LCCM so the output is more reflective of the budget needs.
- **Integration of a risk assessment protocol.** During the LCCM update a risk assessment methodology was developed to evaluate the impacts of potential system failures associated with extended or deferred items in the 16-year financial plan. The methodology should be incorporated into the budget development and assessment process to assist with decision making in a funding constrained environment.

By April 30, 2011, WSDOT, Ferries Division will draft and submit an action plan which will be developed using the selected recommendations from the LCCM 2010 update report and from the Vessel Maintenance, Preservation, and Improvement plan. The action plan will detail how each recommendation will be implemented, the time line for implementation and what additional resources may be needed, if any.

If you have questions please contact **Captain George Capacci**, Deputy Chief of Operations & Construction, Ferries Division, (206) 515-3414, capaccg@wsdot.wa.gov, or **Paul Brodeur**, Director of Vessel Maintenance & Preservation, Ferries Division, (206) 515-3863, brodeup@wsdot.wa.gov.

ATTACHMENTS

A. VESSEL MAINTENANCE, PRESERVATION, AND IMPROVEMENT PLAN

Prepared for WSDOT Ferries Division

Prepared by Elliott Bay Design Group

November 30, 2010

B. VESSEL LIFE CYCLE COST MODEL UPDATE 2010

Prepared for WSDOT Ferries Division

Prepared by Alion Science and Technology Corporation

September 14, 2010