State of Washington
Joint Legislative Audit and Review Committee
(JLARC)

# Overview of Washington State Department of Transportation Capital Project Management

**Report 05-3**

January 21, 2005

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The Joint Legislative Audit and Review Committee (JLARC) carries out oversight, review, and evaluation of state-funded programs and activities on behalf of the Legislature and the citizens of Washington State. Committee membership is divided equally between the two major political parties. Its statutory authority is established in RCW 44.28.

The Transportation Performance Audit Board (TPAB) conducts performance measure reviews and identifies performance audits to be undertaken for transportation agencies. JLARC staff conduct performance audits on behalf of TPAB. Board members include the majority and minority members of the House and Senate transportation committees, five citizen members with transportation expertise, one at-large member, and the Legislative Auditor in ex-officio capacity. TPAB's statutory authority is established in RCW 44.75.

# OVERVIEW OF WSDOT CAPITAL PROJECT MANAGEMENT

Conducted for the Transportation Performance Audit Board

Funded by the Legislative Transportation Committee

**REPORT 05-3**

**REPORT DIGEST**

JANUARY 21, 2005


STATE OF WASHINGTON

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## Study Mandate

The Transportation Performance Audit Board (TPAB) assigned this overview to the Joint Legislative Audit and Review Committee (JLARC). The review emphasizes critical path management, risk management, project reporting, and organizational structures used to execute capital projects.

## Study Approach

Since the study was intended to be a pre-audit review, JLARC did not assess all projects at WSDOT. JLARC selected eight example projects, intended to represent the diversity of issues and characteristics in WSDOT's capital program. JLARC solicited an engineering consultant to assist with the example project reviews. The review focused primarily on the specific methods used to manage the eight example projects.

## Overview of Procedures, Organization, and Systems

Management of a capital program involves three components, linked in a cyclical fashion: planning and program development, authorization and funding, and project delivery. This report focuses on project delivery.

While there is wide variation in the type and scope of capital projects, there are certain high-level tasks in common. Notably, WSDOT (a) designs the project, (b) works with regulatory agencies, property owners, and governments/utilities to secure permits, acquire necessary right-of-way, coordinate local infrastructure/utility displacement, and (c) hires construction contractors to build roads and structures.

The management of project delivery is decentralized to managers in WSDOT's geographical highway regions and other modes, and the organization for project delivery within each region or mode varies. Headquarters staff generally provide standards, direction, tools, approvals, and technical assistance. Executive management provides oversight and approves changes to the scope, schedule and budget of projects.

WSDOT has implemented a number of initiatives intended to enhance project delivery. These include establishing principles for project management standards, developing advanced risk management techniques, modifying executive oversight processes, developing project management information systems, establishing centralized project reporting and control, and sharing information on innovative techniques.

WSDOT has a number of automated information technology systems that support the delivery of capital projects. These systems operate in silo environments, and don't easily interface to share project management information. Further, data sharing limits constrain the ability to perform analysis and inhibit the efficiency and accuracy of project reporting.

## Observations on Cost and Schedule Increases

WSDOT appears to have reduced the amount construction costs at close-out have increased above initial contract awards, and limited avoidable change orders that do not add value to projects. Schedule increases above the working days bid in construction contracts are higher than prior audits, but still below comparable levels previously identified at other states.

## Findings from Project Reviews

- WSDOT staff have knowledge of the issues that can impact their project schedules, but there is wide diversity in the knowledge and application of critical path management techniques across WSDOT projects.
- Project engineers generally utilize schedules that are comprehensive and measurable. However, multiple staff may be responsible for segments or phases of a project. As a result, schedules are often segmented as well.
- Projects that utilize the Department's advanced software tools yield superior critical path management practices.
- WSDOT generally delegates the management of critical path to contractors when projects enter the construction phase, but several project engineers recognized the importance of additional schedule requirements for larger projects involving more risks.
- WSDOT has training available to address the theory and practice of critical path and scheduling management and has been increasing the number of staff trained.
- Project engineers are universally aware of project risks, but generally use informal methods to manage, mitigate or avoid them.
- There are some advanced methods of risk management being utilized at WSDOT; however, these methods are not widespread. WSDOT can benefit from more universal application of risk quantification on all projects.
- WSDOT has a strong focus on reporting and uses an established network of informal communication to communicate project status and issues posing risks.
- There should be more emphasis on assessing forecasted costs at both the program and project level.
- Automated information systems are outdated and not well integrated. WSDOT is rich in management data, but its ability to use the data for management analysis is limited by a lack of system integration.
- There are examples of excellent regionally developed status reports that could be adopted in other areas.
- Standardized terms and a common definition of "project" are not utilized across all reporting systems, which lead to inconsistencies in data and poses risks to communication within and outside the organization.
- There is an established approach to decentralize project delivery to regions.

- Local organizational structures are generally appropriate for addressing local conditions, but some organizational approaches demand special attention to maintain a project-wide accountability focus.

## General Conclusions

WSDOT fosters local innovation to help improve the performance of project delivery and adapt to the uniqueness of local challenges. However, in order to instill some of the stronger practices across WSDOT, it may be necessary to establish additional mandatory project management standards, in addition to the current principles and tools offered. WSDOT has variety in its project delivery practices and organization, and is continuing to improve its project management disciplines. Opportunities exist for staff to learn from exemplary practices in place in some areas.

Capital delivery at WSDOT is evolving from a program-focused to a project-focused orientation. These are strong practices, which currently aren't universally adopted due to their youth, a focus on local autonomy that can slow implementation, and resource constraints. A lack of standardized definitions poses challenges to project reporting, communication, and clear expectations for accountability.

## Summary of Management Recommendations

Recommendation 1 – WSDOT should extend the application of the Managing Project Delivery, Project Delivery Information System, and Primavera Project Planner for the Enterprise tools and put management steps in place to confirm their adoption.

Recommendation 2 – WSDOT should develop a plan and timeline for implementing recommendations issued by Gannett Fleming, which center primarily on a) using existing exemplary practices in place at some projects to develop minimum standards and/or templates; b) improving the clarity of project communication by documenting terms and definitions; and c) confirming the consistency and currency of reporting information.

Recommendation 3 – WSDOT should conduct an assessment of the effectiveness of current information systems and options for addressing any deficiencies.

Recommendation 4 – WSDOT should develop criteria for extending Cost Risk Estimating and Management (CREM) analyses to a wider universe of projects

## Options for Future Audit/Study Topics

Audit/Study Topic 1 – Audit the effectiveness of Managing Project Delivery (MPD) and the Project Delivery Information System (PDIS) in improving project delivery (with a delayed audit date to allow further agency implementation).

Audit/Study Topic 2 – Audit the practice of determining construction contractor pay estimates.

Audit/Study Topic 3 – Conduct an assessment of contracting methods that are alternatives to the traditional design-bid-build process, such as alliance contracting.

Audit/Study Topic 4 – Conduct a comparative assessment of project delivery performance measures to evaluate actual WSDOT performance compared to similar organizations.

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# CHAPTER ONE – STUDY MANDATE

The Legislature established the Transportation Performance Audit Board (TPAB) with the passage of Substitute Senate Bill 5748 during the 2003 Regular Legislative Session. TPAB is authorized to conduct performance measure reviews and performance audits of transportation agencies. The Legislative Transportation Committee (LTC) provides staff support and funding for TPAB reviews and audits. The 2003-05 Biennial Transportation Budget established funding in the LTC appropriation specifically for studies recommended by TPAB.

TPAB members include the majority and minority members of the House and Senate transportation committees, five citizen members with transportation and construction-related expertise, one at-large member, and, in ex-officio capacity, the Legislative Auditor. The citizen members are nominated by professional associations selected by the Legislature. The Governor appoints committee members to terms of up to four years. The at-large member is appointed by the Governor for a four-year term.

The Joint Legislative Audit and Review Committee (JLARC) is the entity authorized under sate law to conduct performance audits on behalf of TPAB. The enabling legislation directs TPAB to recommend specific audit topics to LTC for approval and assignment to JLARC.

In June 2004, LTC adopted TPAB's recommended work plan for July 2004 though June 2005. This work plan included the pre-audit review of transportation capital programs addressed in this report. This review focuses on management issues surrounding the execution of highways and ferries capital projects at the Washington State Department of Transportation (WSDOT). This report emphasizes critical path management, risk management, project reporting, and organizational structures that WSDOT uses to execute capital projects.

This is a pre-audit review. Its goal is to identify options for future TPAB audits and/or evaluation studies. To the extent practical within the study scope and timelines, the review also identified management recommendations for implementation at WSDOT. These recommendations are addressed in Chapter 8. A copy of the full scope and objectives for the study is included in Appendix 1 of this report.

# CHAPTER TWO – STUDY APPROACH

## This Study Is A Pre-Audit Review

This review assesses the project management methods used to execute highways and ferries capital projects at WSDOT in advance of pursuing a complete performance audit of specific management topics. As such, it is not by itself a comprehensive audit of WSDOT's capital program. Rather, it is intended to provide an overview of issues related to project management methods and techniques utilized at WSDOT.

As with any pre-audit review, the goal of this study is to identify both exemplary practices as well as possible weaknesses. These observations can produce recommendations to extend or strengthen practices, or identify issues that would merit a more focused, formal audit, evaluation, or study. Also, by identifying good management practices, the pre-audit review will help ensure that resources for any subsequent formal audits are focused on areas that provide the greatest opportunity to improve performance and/or outcomes.

The capital program at WSDOT is very large. The 2003-05 Biennial Appropriation for WSDOT totals $2.7 billion. Nearly three-quarters of those funds are for capital projects. The ten-year 2003-2013 Capital Improvement and Preservation Plan (CIPP), upon which the 2003-05 Biennial Budget is based, includes about 1,300 individual capital projects. Ninety-six percent of these projects are for highways and ferries projects.[1] The entire ten-year cost for the 2003-2013 CIPP is approximately $10 billion. Individual projects range in size from hundreds of thousands of dollars for simple repaving projects to hundreds of millions of dollars for large projects, such as the Tacoma Narrows Bridge. The nature of the capital projects in the CIPP are similarly diverse, spanning everything from preserving the condition of existing roadways and ferry terminals, to constructing new urban interchanges, bridges, and ferries.

With a program of this magnitude in size and diversity, project management methods and challenges are likely to be similarly diverse. A clearly representative group of projects may not exist, and the timelines and resources for this review did not allow JLARC to assess all projects.

In order to understand the details of project management methods and processes for such a complex and diverse program, JLARC selected eight example projects for a more detailed examination. JLARC chose projects that would demonstrate the diversity of issues and characteristics inherent in WSDOT projects. The projects are not, however, a statistically representative sample of all WSDOT projects. In fact, the set of example projects likely over-represents the proportion of WSDOT's projects facing challenges and using less sophisticated

[1] The specific number of projects WSDOT will execute during the biennium can depend on the definition of a project, the data source used to identify the project, and the time of the reporting period. WSDOT may manage projects in phases, thus breaking larger projects into smaller units of work and establishing individual project indicators for each phase. Also, the CIPP is continually modified, based on changes in project conditions and management. This can result in increases or decreases to the list of active projects. For example projects may be merged, scope changes can result in the addition of new projects for ease of management, and WSDOT may move initiation of projects forward or backward in the scheduling timeline. In addition to highways and ferries projects, there are a relatively small number of projects related to rail, facilities, technology, and local programs.

tools. This bias was introduced to help contrast the diversity of management methods, tools, and techniques in place across WSDOT.

## Example Project Criteria

JLARC selected the example projects with the assistance of WSDOT staff, to ensure the review covered the following dimensions:

- Representation from multiple regions,
- Inclusion of projects that faced challenges during execution, as well as projects that were delivered with few problems,
- Diversity in project size,
- Diversity in type of project,
- Diversity in use of project management tools and systems,
- Diversity in projects designed by consultants versus those designed by WSDOT staff, and
- Inclusion of projects using a value engineering process.[2]

**JLARC chose projects well into the construction phase**, in order to illustrate the full spectrum of project management issues that occur across the lifetime of a project. In a couple instances, construction on the projects had been essentially completed. JLARC also did not consider projects still in the design phase, since projects in this state have not encountered the full range of delivery issues.

The project selection criteria described above resulted in a profile of eight projects that exhibit some differences from the overall WSDOT capital portfolio. Most notably, the eight examples include projects that are:

- Larger on average than most projects in WSDOT's CIPP,
- Primarily improvement projects, and
- Initiated earlier than many currently active WSDOT projects.

**Because of this selection process, we anticipate the projects reviewed for this study will exhibit greater complexity and risk than the majority of projects in WSDOT's portfolio.** Also, the example projects are likely to utilize more outdated management methods and tools than those currently being used for many projects across the organization. As a result, we have balanced our observations on the example projects with information on recent initiatives WSDOT is implementing. The agency may use many of these relatively new initiatives to a greater degree across other WSDOT projects than they were in projects reviewed for this report.

The following table shows the eight example projects. A map of the WSDOT regions and project locations are shown on page 6.

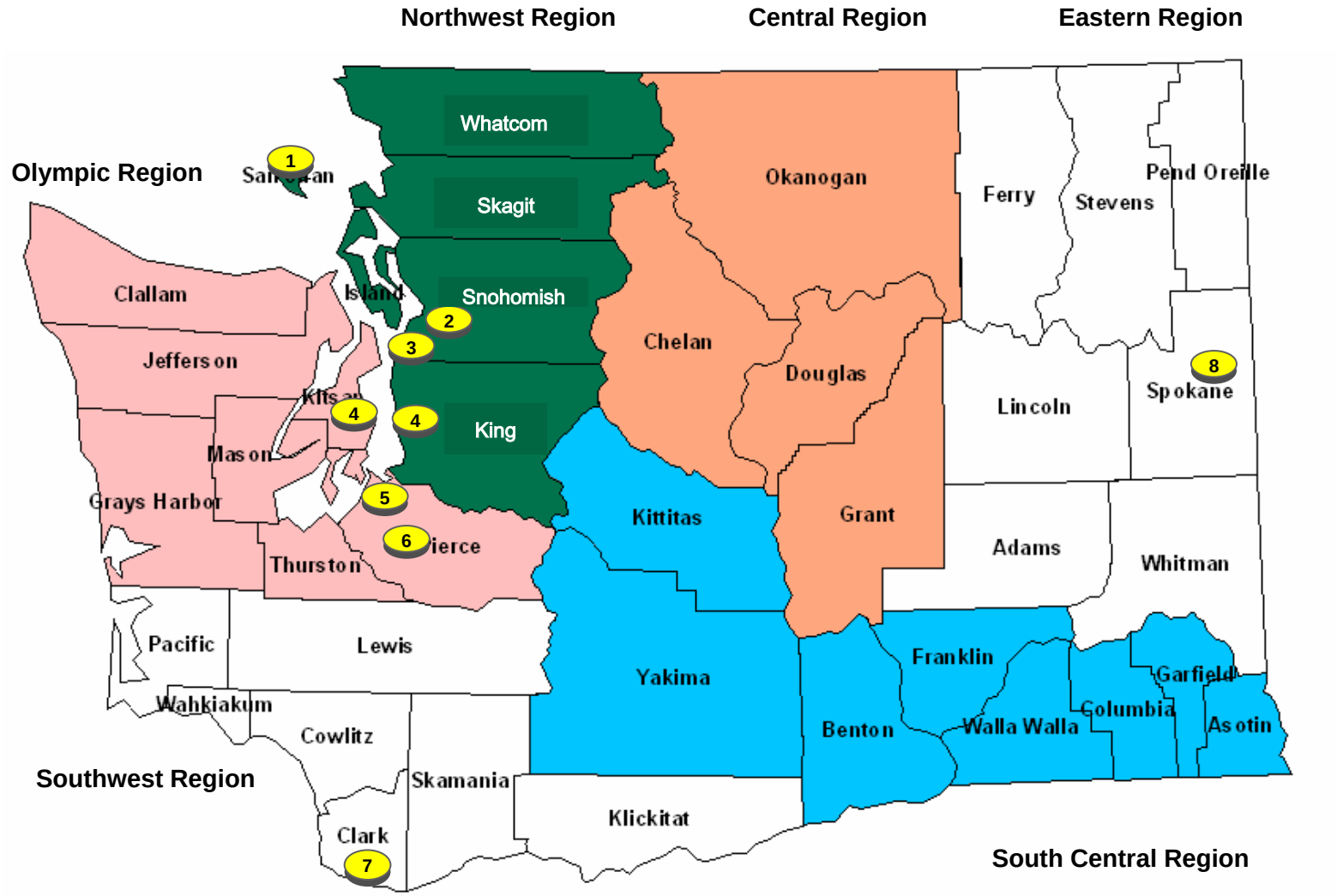
[2] Value engineering is a structured problem-solving process that brings staff and partners together early in a project's design, using a team approach to identify alternative engineering solutions for increasing project value and/or decreasing costs.

Figure 1 – List of Projects Reviewed

| Project | Funding Plan (Dollars in millions) | Nickel Funded? | Type of Project | County/ Region | Status |
|---|---|---|---|---|---|
| SR 16 HOV Improvements | $102 | Yes | HOV Improvements | Pierce/Olympic | One segment completed, one segment advertised pending award, one segment in design |
| I-5 196th Interchange | $61 | No | Interchange | Snohomish/ Northwest | Four phases completed |
| I-90 Lanes Argonne to Sullivan | $36 | Yes | Widening | Spokane/Eastern | In construction |
| SR 161 234th to 204th St. East | $33 | Yes | Widening | Pierce/Olympic | First phase in construction, second phase in design |
| SR 527 Widening 164th to 132nd SE | $28 | No | Widening | Snohomish/ Northwest | In construction |
| SR 500 NE 112th Interchange | $26 | Yes | Interchange | Clark/Southwest | Substantially complete |
| Southworth/ Fauntleroy Slips | $14 | No | Slip Reconstruction | Kitsap, King/WSF | Completed |
| Shaw Island Slip | $9 | No | Slip Reconstruction | San Juan/WSF | Completed |

Source: Highway project funds reported by WSDOT Programming. Ferry project funds represent final costs after the projects were completed.

Figure 2 -- Washington State Department of Transportation Example Projects




1. Shaw Island Terminal Slip Reconstruction
2. SR 527 Widening 164th to 132nd Street SE
3. I-5 - 196th (SR 524) Interchange Project
4. Southworth/Fauntleroy Slip Reconstructions (two slips)
5. SR 16 HOV Improvements – Olympic Drive to Union Avenue
6. SR 161, 234th to 204th Street East
7. SR 500 NE 112th Avenue Interchange
8. I-90 Build Lanes from Argonne to Sullivan

**JLARC employed Gannett Fleming, an engineering consulting firm,** to conduct the individual project reviews. Gannett Fleming staff have extensive experience managing and reviewing transportation capital projects from across the nation. Observations related to critical path management[3], risk management, reporting, and organization are in part based on the evidence collected by the consultants for the eight example projects. The detailed analysis from their review is included in Appendix 3.

Prior to collecting evidence on the example projects, the consultants conducted initial interviews with central management staff and reviewed background documents to orient them to the nature of WSDOT's organization and capital program. Following this background review, the consultants traveled to regional offices to interview project engineers and other regional staff responsible for delivery of the example projects, and to collect documents identifying specific practices. After synthesizing interviews and documentary evidence, the consultants compiled follow-up questions to help clarify issues and solidify their analysis for final observations. More detailed information on the methodology used for the project reviews is included in Appendix 3.

Both JLARC and Gannett Fleming interviewed several headquarters management staff and reviewed numerous management documents to supplement the information obtained in the example project reviews. These interviews provided history and policy direction on a number of topics, including the following:

- WSDOT organization,
- Project control and reporting,
- Programming and budget development,
- Specifications and direction for project management standards and contract execution, and
- Automated information systems related to project delivery.

This macro-level information supplemented the specific observations from the eight example projects, and provided context to balance the bias inherent in their selection.

## PROJECT DELIVERY PERFORMANCE VERSUS MANAGEMENT METHODS

One way to measure capital project performance is to determine whether the project met original schedule and budget assumptions. For individual projects, it can be difficult to identify the relationship between this performance measure and critical path management methods. A number of factors unrelated to critical path management can impact delivery performance. These include, but are not limited to the following:

- The completeness of design used to develop budget assumptions,
- How recently the design was prepared,
- Unanticipated or delayed actions by regulatory agencies,
- Unanticipated or delayed actions by local governments or utilities,

[3] Critical path means the series of tasks that must finish on time for the entire project to finish on schedule.

- Local property-use zoning changes,
- Fluctuations in local real estate markets,
- Property owners that are reluctant to accept real estate offers,
- Site conditions that would be impossible or impractical to detect during design, and
- Fluctuations in market conditions for construction materials.

Drawing conclusions about the relationship between critical path management methods and delivery performance is especially hard when looking at a very small and biased sample. Some of the example projects experiencing relatively high delivery problems actually exhibited some of the strongest critical path management practices. In these cases, project delays were caused by issues such as right-of-way disputes outside of the control of the project engineer. It is likely that the critical path methods in place may have reduced the degree of delay, but they would have been unable to completely prevent it. A more extensive audit would be necessary to isolate the impact of critical path management on schedule and cost performance. Instead, this review focused primarily on the specific techniques and methodologies used to manage the critical path on eight example projects.

# CHAPTER THREE – RECENT HISTORY OF PERFORMANCE ACCOUNTABILITY

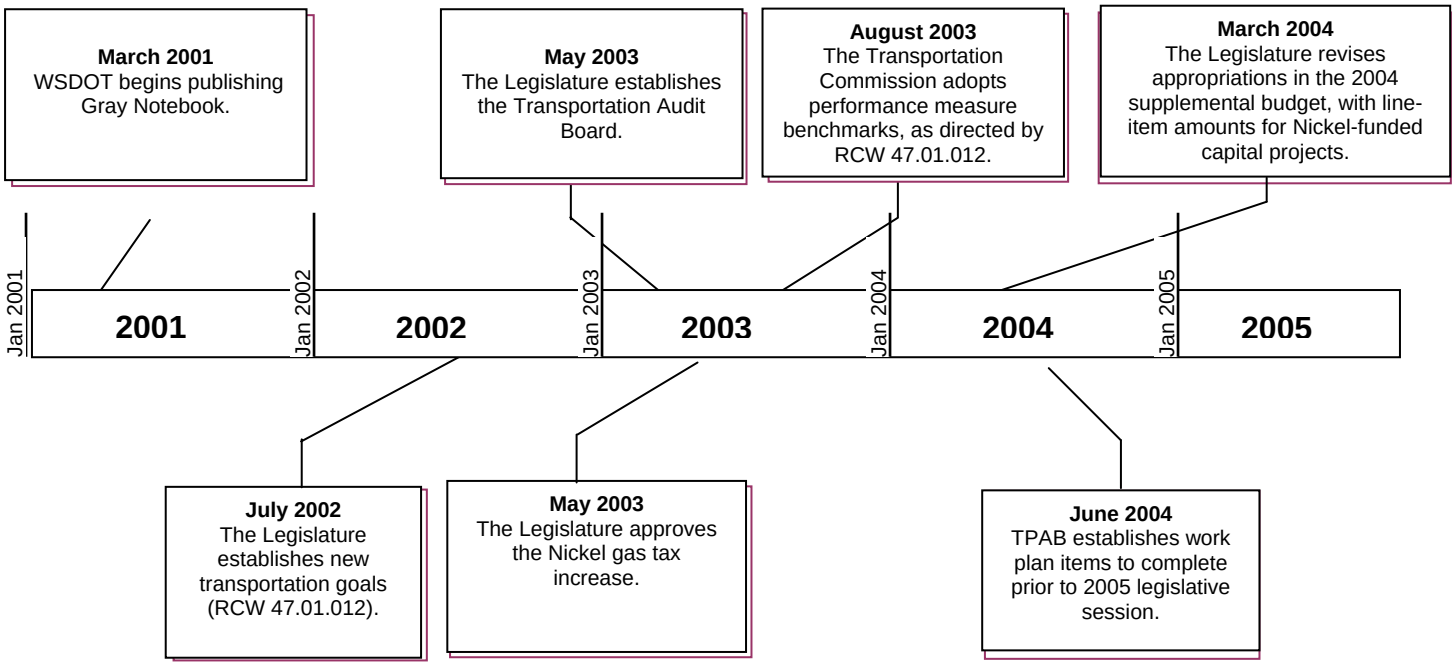
The Blue Ribbon Commission on Transportation was established during the 1998 Legislative Session to conduct a comprehensive analysis of the state's transportation needs and priorities. The Commission issued its final report in November 2000. The report included a variety of recommendations regarding enhancing the investments, funding, and performance of the state's transportation system.

The Commission report set the stage for discussion about the accountability and governance of the agencies that develop and manage transportation systems. Subsequent policy and management changes have been put into place since the Commission report. Some changes were implemented through legislation, others through decisions established by the Washington State Transportation Commission, and still others were initiatives enacted by WSDOT.

While this JLARC report is not intended to discuss the merits of policy discussions resulting from the Commission's report, this background helps explain the context of accountability expectations that relate to auditing the performance of the transportation system.

**Important policy events prompted, in part, by the Commission's report include:**

- **March 2001: WSDOT begins publishing "Measures, Markers and Mileposts,"** also referred to as the "Gray Notebook." The report is WSDOT's flagship medium for communicating its performance and accountability information. The Gray Notebook has received national attention as a vehicle for communicating performance information and progress to a variety of audiences. The layout and content of the Gray Notebook has evolved over time, incorporating new information and refining the measures and method of reporting performance.
- **July 2002: The Legislature sets new transportation goals** (RCW 47.01.012), based on Blue Ribbon Commission recommendations. The goals focus on the structural and seismic condition of roads and bridges, reduction of traffic congestion and driver delays, preventing growth in per capital vehicle miles, increasing commute alternatives in urban areas, achieving administrative efficiency, achieving peer-comparable transit costs, and improving safety. The legislation also directs the Transportation Commission to establish detailed performance measures for these goals.
- **May 2003: A five-cent increase in the gasoline tax** and a variety of other transportation fees are approved in the 2003 Legislative Session. This revenue package, referred to as "Nickel Funds," is targeted for a variety of transportation projects, primarily for mobility and safety improvements.
- **May 2003: The Legislature establishes the Transportation Performance Audit Board** (SSB 5748—C 362 L 03). As noted above, TPAB is authorized to conduct




performance measure reviews, and to contract with JLARC for performance audits of transportation agencies.

- **August 2003: The Transportation Commission adopts performance measure benchmarks**, as directed by state law (RCW 47.01.012). While focused on the goals established in the legislation, the Commission recommended some additional strategies for addressing certain statutory goals (such as focusing on a Least Life Cycle Cost prioritization for road pavement condition instead of preventing the existence of a poor pavement condition on every road).
- **March 2004: The Legislature passes the 2004 Supplemental Transportation Budget**. The legislation clarifies that Nickel funds are provided on a line-item basis for a specific list of projects. The discretion to transfer funds across Nickel projects is limited to managing costs across biennial cut-offs or reducing project budgets when savings occur. These line-item appropriations differ from capital projects funded with other revenues, where the Transportation Commission may reallocate funds across projects. (See Appendix 4 for the proviso language included in the 2004 supplemental budget.)
- **June 2004: TPAB establishes a work plan of reviews** to complete prior to the 2005 Legislative Session. The work plan includes performance reviews of the three main state transportation agencies: WSDOT, Department of Licensing, and the Washington State Patrol). The work plan directs JLARC to conduct pre-audit reviews of WSDOT capital project management and environmental permit streamlining.

# CHAPTER FOUR – OVERVIEW OF PROCEDURES AND ORGANIZATION TO DELIVER CAPITAL PROJECTS

## PROJECT DELIVERY AS PART OF THE OVERALL CAPITAL PROGRAM MANAGEMENT PROCESS

Management of a large capital program involves three essential components: 1) planning and program development, 2) authorization and funding, and 3) project delivery.

While this report focuses on the methods WSDOT uses to deliver projects, all three components are linked cyclically:

- Programming analyses are used to inform funding decisions,
- Funding decisions impact how and when projects are delivered, and
- During project execution, staff discover additional information that can impact the ability to deliver a project within the assumptions developed during the planning step.

Figure 4 – Capital Program Management Cycle

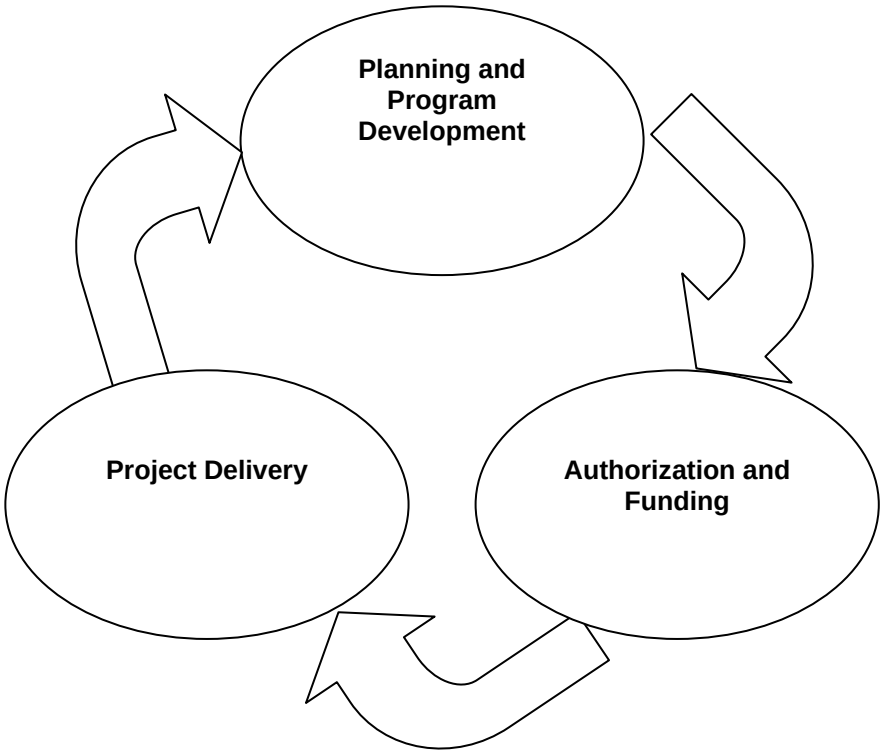


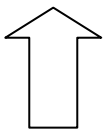
Figure 5 – Capital Program Management Process

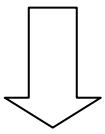
## Planning and program development:

WSDOT proposes or modifies projects to address state transportation needs. Staff use information on current and forecast transportation needs to craft potential construction project ideas to address those needs. WSDOT estimates the costs of potential projects using engineering analysis, statistics and research, and progress on previously authorized projects. Staff compare those costs to available funding to determine whether existing revenues can attain transportation goals. WSDOT identifies revenue shortfalls and prioritizes project proposals to help decision-makers with making budget and revenue decisions. Project lists generated by this process include a blend of existing projects authorized in prior years, in addition to new projects that have not yet been initiated.

## Authorization and funding:

Using information from the planning and program development process, the Transportation Commission adopts a ten-year Capital Improvement and Preservation Plan (CIPP). This plan is the basis for a budget request to the Legislature. The Legislature considers the Commission request and adopts a two-year budget, based on assumptions for projects over the next ten years. Once the Legislature adopts a budget, WSDOT may need to revise its CIPP to be consistent with legislative assumptions. Prior to the 2003-05 Biennium, the Transportation Commission could independently authorize changes to a specific project's scope, schedule, or budget. However, beginning in 2003-05, the Legislature authorized line-item appropriations for about 160 projects funded with the new Nickel gasoline tax. Changes to the budget for these projects require legislative approval, whereas the Commission has authority to shift funds between projects supported by pre-existing revenue sources.





## Project delivery:

WSDOT sets an initial scope, schedule, and budget estimate for each project authorized, consistent with the funding assumptions indicated in the previous section. The project schedule and budget usually span multiple biennia. WSDOT assigns staff project management responsibility for completing projects within the scope, schedule, and budget levels. WSDOT establishes a project budget consistent with the external funding decision, but the estimate for the cost of delivering the budget is refined with greater precision during the course of the project. When project engineers determine an adjustment to the project's scope, schedule or budget is warranted, they use a "change-control process" to authorize adjustments. As noted above, changes to Nickel projects may require legislative approval. These revised cost estimates are factored, as required, into ongoing programming analyses, and eventually result in subsequent funding request changes.

# SUMMARY OF GENERAL PROCESS FOR PROJECT DELIVERY

Just as there is wide variation in the type and scope of capital projects, the nature of project delivery tasks can be different for every project. WSDOT has prepared a "Master Deliverable List", a standardized list of tasks involved with capital project delivery. Any given capital project could employ hundreds of tasks from the Master Deliverable List.

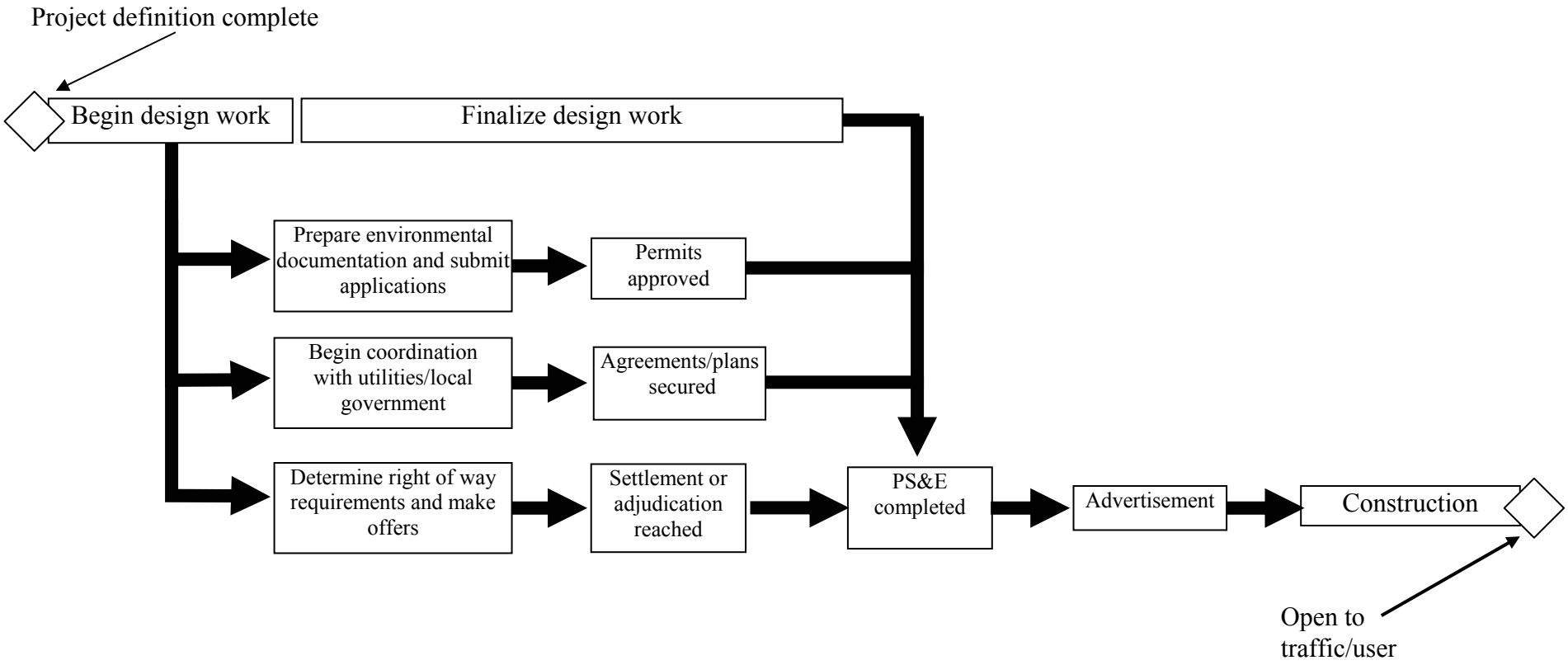
However, most transportation capital projects have certain high-level tasks in common. In general, WSDOT (a) designs the project (or hires consultants to assist with the design); (b) works with regulatory agencies, local property owners, and local governments or utilities to secure environmental permits, acquire necessary property for right-of-way, and coordinate the displacement of utilities or other local infrastructure; and (c) hires a construction contractor to build the road or structure.

Specific tasks and deliverables that are commonly incorporated into a WSDOT capital project include the following:

- Project definition is completed in order to proceed with preliminary engineering.
- Detailed design work begins (may involve collaboration with consultants).
- With sufficient design work completed, environmental documentation is prepared.
- Environmental permit applications are submitted.
- With sufficient design work completed, right of way requirements are identified.
- Real estate property is appraised, and staff negotiate with property owners and/or proceed with condemnation.
- With sufficient design work completed, planning begins for coordinating with other third parties, such as plans to relocate utilities.
- Environmental permits are approved.
- Property is acquired and relocation is undertaken as necessary.
- Third-party coordination/agreements are secured (as required).
- Design work is finished to complete PS&E (Plans, Specifications and Estimates).
- Project is advertised.
- Bids are opened and evaluated.
- Contract is awarded.
- Project is handed-off to construction engineer (as appropriate).
- Construction proceeds.
- Construction is monitored and inspected.
- Project is completed, contract is closed, and structure/item is open to users.

The general procedures for delivering a capital project are indicated in the following graphic:

Figure 6 – Relationship of Tasks for WSDOT Project Delivery

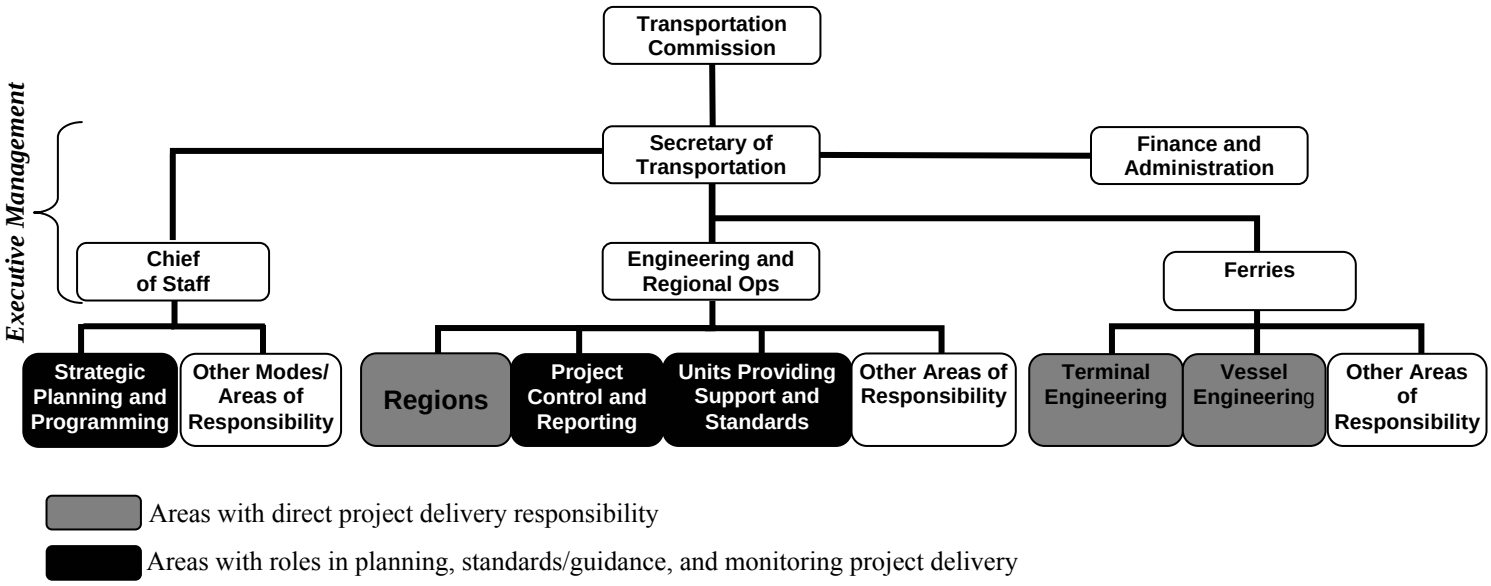


# SUMMARY OF GENERAL ORGANIZATION FOR PROJECT DELIVERY

Engineering responsibilities are organized by geographical regions for highways functions. For other modes, such as ferries, engineering responsibilities may be organized by broad classes or structures (such as vessels and terminals).

The management of capital project delivery is decentralized to engineering managers in the regions and modes. Staff from headquarters units provide standards, direction, tools, approval and technical assistance. Staff in the regions produce the project design, secure environmental permits, acquire property, and manage construction consistent with contractual specifications. Executive management provides oversight and approves certain changes to project scope, schedule, and budget (changes below certain WSDOT thresholds can be approved directly within regions/modes).

Figure 7 – Department of Transportation Organizational Chart




The following provides an overview of the roles of various units in the WSDOT organization as they relate to capital project delivery:

- **Strategic planning and programming:**
    - Coordinate planning and funding assumptions for projects included in budget
- **Units providing support and standards** (includes units such as Design, Construction, Real Estate, Environmental, and Innovative Delivery):
    - Establish project management requirements
    - Establish design and delivery requirements
    - Approve any requested changes from standard requirements (Note: ferry design standards and deviation approvals are managed within WSF)

  - Provide design expertise and estimating assistance to regions/modes
  - Establish standard contract specifications and approve changes from standard specifications[4]
  - Provide technical assistance for regions/modes with environmental analysis and documentation
  - Confirm property assessments and assist with property-owner negotiations, coordinate property-condemnation process
  - Provide training and tools for regions, including software, risk analyses, etc.

- **Regions and modal engineering offices**
  - Manage preliminary engineering design
  - Manage preparation of environmental permit applications
  - Manage real estate acquisition
  - Manage construction, including managing contractors

- **Project Control and Reporting[5] (PC&R)**
  - Coordinate with regions/modes to update CIPP consistent with funding assumptions
  - Monitor project and program progress by the regions/modes
  - Report the status of projects to external audiences
  - Coordinate approved changes to project scope, schedule, and budget (i.e., the "change control" process)
  - Approve work order authorizations (i.e., spending control levels)[6]

- **Executive Management**
  - Supervise regional and headquarters managers
  - Review progress reporting
  - Provide monitoring and guidance to regional/modal staff through quarterly review meetings
  - Decision-making approval on change control (as appropriate)

The major roles of organizational units — as well as of local government, utilities, communities and other groups — can be illustrated by cross-referencing them with four major capital delivery processes.

[4] Washington State Ferries (WSF) establishes standard specifications for ferry contracts.
[5] While PC&R resides within Engineering and Regional Operations, it has reporting and change control monitoring responsibility for the entire capital program, and must coordinate with WSF and other modes in addition to highway regions.
[6] Work order authorizations for ferry projects are approved within WSF.

## Figure 8 – Roles In The Capital Project Delivery Process

| WSDOT Organizational Units | | | External Entities |
|---|---|---|---|
| **Regions/Modes** | **Headquarters Support** | **Executive Management*** | |
| ***Design*** | | | |
| ▪ Develop and manage design | ▪ Provide design standards for regions#<br>▪ Approve deviations from standards#<br>▪ Provide guidance and assistance | ▪ Monitor and review progress<br>▪ Approve change requests for scope/schedule/ budget<br>▪ Report to external audiences | Local govt./utilities: Coordinate changes/displacement of local infrastructure<br>Consultants: design assistance (as solicited)<br>Community: comment and feedback |
| ***Environmental Permits*** | | | |
| ▪ Develop environmental documentation<br>▪ Apply for and secure permits | ▪ Provide guidance and assistance<br>▪ Provide technical expertise for specialty areas (biologists, etc.) | ▪ Monitor and review progress<br>▪ Approve change requests for scope/schedule/ budget<br>▪ Report to external audiences | Regulatory agencies: approve permits<br>Community: comment and feedback |
| ***Right of Way*** | | | |
| ▪ Appraise property<br>▪ Make offers and negotiate<br>▪ Acquire property | ▪ Review appraisals<br>▪ Set compensation levels<br>▪ Support condemnation proceedings | ▪ Monitor and review progress<br>▪ Approve change requests for scope/schedule/ budget<br>▪ Report to external audiences | Property owners: sell, negotiate, refuse settlement<br>Consultants: appraise (as solicited), review appraisals (as solicited), acquire property (as solicited) |
| ***Construction*** | | | |
| ▪ Manage construction<br>▪ Inspect quality<br>▪ Approve contractor payments | ▪ Provide standard contract specifications#<br>▪ Approve deviation from standard specifications#<br>▪ Provide inspection requirements<br>▪ Review inspection documentation<br>▪ Provide guidance and assistance | ▪ Monitor and review progress<br>▪ Approve change requests for scope/schedule/ budget<br>▪ Report to external audiences | Construction Firms: build roads/structures<br>Local govt./utilities: Coordinate changes/displacement of local infrastructure<br>Community: comment and feedback |

* Includes the role of the Project Control and Reporting Office.

# For ferry capital projects, these functions are performed within the ferries division as opposed to headquarters specialty units.

# PROJECT DELIVERY ORGANIZATION WITHIN REGIONS/MODES

The organization of project delivery within each WSDOT region/mode can vary by location. A review of the eight example projects in four regions and the ferries shows that WSDOT uses matrix-based organizational structures to deliver projects. In matrix-based structures, staff on project teams may report organizationally to more than one supervisory area.

One aspect of the matrix is based on establishing the project itself as an organizational unit, with a project manager and a supporting project team. The other aspect of the matrix is that several of the project team staff may also report to a separate functional unit within the region. Functional units are comprised of groups such as a regional design group that oversees all design staff, a regional construction group that oversees construction staff, as well as units for real estate, environmental permitting, and others.

In some regions, the organization for delivering projects changes over the course of the project. In these cases, a project will be managed by one project engineer during the design phase, and then a separate project engineer during the construction phase.

The consultant assisting JLARC concluded that the variety of organizational structures appeared appropriate for the unique issues about workload, staffing size, culture, and expertise of the regions and modes included in this review. Consultants concluded, however, that there is a stronger requirement to focus on risk management and communication for two kinds of projects:

1) Projects where there was a stronger emphasis placed on the functional aspect of the organizational matrix, and
2) Projects in which the assigned project manager changed during different phases of the project.

A more detailed discussion of the specifics of organization within the regions/modes is included in Chapter V of Appendix 3.

# CHAPTER FIVE – RECENT INITIATIVES FOR ENHANCING WSDOT PROJECT DELIVERY

Over the last few years, WSDOT has begun a number of initiatives to improve its project delivery processes. These initiatives have strengthened the effectiveness and accountability of project delivery at WSDOT.

While the organizational initiatives described below (Executive Review Board, Project Control and Reporting Office, and Innovative Project Delivery Office) were established at the time of this review, the other initiatives listed in this chapter are not yet fully implemented across all WSDOT projects. As noted in Chapter 2, because of the selection bias introduced in this review, many of these practices were not in place for the example projects reviewed for this report.

These initiatives are fairly young, and understandably require time and resources to fully implement throughout a large organization with a history of decentralized management. As indicated on the timeline at the end of this chapter, the example projects were typically advertised soon after these initiatives began. As a result, the design work on most of these example projects had begun well before the initiatives were put into place. Evidence suggests that WSDOT is using the initiatives more completely on new projects. We expect additional progress implementing them will further improve management practices.

## Managing Project Delivery (MPD)

- WSDOT issued an instructional letter to managers, establishing MPD as the standardized guideline for managing capital project delivery in August 2000.
- MPD is based on the principles in the Project Management Body of Knowledge, a global standard for project management that has been developed by the Project Management Institute (PMI).[7]
- WSDOT began offering training sessions on MPD in FY 2000. Attendance at these sessions is voluntary, though all the project engineers responsible for the example projects in this review had attended an MPD session.
- As MPD was further refined, the instructional letter was eventually replaced by Chapter 140 of the Design Manual in September 2002, and is a design requirement for all projects across WSDOT.

## COST RISK ESTIMATING AND MANAGEMENT OFFICE (CREM)

- WSDOT established the Cost Risk Estimating and Management Office (CREM) in February 2002, with the development of the Cost Estimate Validation Process (CEVP®).

[7] PMI is a well-established professional association, providing certification and education on project management used across numerous industries.

- CEVP® utilizes advanced risk identification, external independent validation, and Monte Carlo statistical analysis techniques to quantify the level of cost and schedule uncertainty in capital projects.[8] CEVP expresses project costs and estimates in terms of ranges and probabilities, instead of relying on the addition of contingency percentages in budgets and schedules.
- CEVP® has received national attention through transportation professional associations and media accounts.
- Since the original inception, CREM has expanded these analytical practices into Cost Risk Assessment Workshops, a second-tier version of CEVP®, which is less expensive by avoiding the use of outside experts.
- To date, CREM has applied these processes to about 75 large, complex projects. At this point, it is being used more for cost validation in the later stages of projects, rather than for risk mitigation applied earlier in the project.
- On a few of the larger projects, such as the Alaskan Way Viaduct, WSDOT has applied CEVP to revisit assumptions and estimates after changes in project conditions have been identified.
- CREM has begun coordinating with WSDOT's "value engineering process," which uses a standard problem-solving process to identify cost-cutting opportunities as early as possible in project scoping and design.

## Executive Review Board (ERB)

- In March 2002, WSDOT replaced its longstanding Department Project Screening Board, with an Executive Review Board. While similar to the original intent of executive oversight of highway projects, the Board has extended the application of a standardized change management process to all CIPP programs (highways, ferries, rail, etc.). It also has standardized change-management forms and required consistency with Managing Project Delivery procedures.
- The Board instills a continuum approach to executive management, establishing both quarterly reviews and change control as their primary responsibility. As the forum both for quarterly project reviews and change control requests, the Board provides a strong, proactive "early warning" reporting system.

## Project Delivery Information System (PDIS)

- Recognizing the need for tools to help highway project engineers with project planning, scheduling, and management, WSDOT implemented the Project Delivery Information System (PDIS) with an initial roll out in November 2002. PDIS is a computer system that provides scheduling and resource management functions for project engineers.
- PDIS is based on Sciforma's P8 software, customized to WSDOT requirements.

[8] Monte Carlo analyses involve the use iterative computer algorithms to generate a statistical distribution of simulated cost and schedule outcomes. Results of these analyses are expressed in terms of a range of cost and time, and the statistical likelihood of achieving outcomes within that range.

- While providing project management tools to regional project engineers, PDIS is based on a standard work breakdown structure called the Master Deliverables List, which is tailored to WSDOT practices. This offers the advantage of improving the consistency of system-wide status reporting if fully implemented.
- PDIS is not yet in use for all highway projects. The primary focus by WSDOT is to have all highway projects that are in the design phase entered into PDIS, recognizing PDIS provides greatest value if used early in the project life cycle. This is nearly complete, and approximately 600 projects currently in design have schedules loaded into PDIS.
- WSDOT is making progress implementing PDIS; however it is not clear at this point how actively project engineers are maintaining project schedules. WSDOT strongly encourages the use of the system, but do not yet require it. Also, more advanced features to assist with project management (such as the integration of actual costs and earned value) are not being utilized at this time.
- WSDOT is currently undertaking the third phase of PDIS system development, which will make it more useful for specialty support groups such as environmental and real estate staff, improve data access, provide for tracking actual schedule and cost performance, and allow integration of construction schedules and linkages to other WSDOT information systems. This phase should be completed by September 2005.
- Projects managed from the Urban Corridors region use a separate project delivery information system based on Primavera software.

## Primavera Project Planner for the Enterprise (P3e)

- Beginning in July 2000, the Washington State Ferries began phasing in implementation of Primavera software for their standard project delivery management system. The system provides schedule and resource management functions for project engineers working on terminal projects.
- During the 2003-05 Biennium, the Washington State Ferries had fully implemented P3e across its terminal capital projects. The system is not employed for vessel engineering capital projects.
- Washington State Ferries project engineers use a number of advanced features available in P3e that are not in place with scheduling systems elsewhere at WSDOT. This includes linkages to the financial system for identifying actual expenditures, full reporting of actual schedule progress, and the use of "earned value" calculations to indicate the status of project progress.

## Project Control and Reporting Office (PC&R)

- To provide heightened visibility and attention for both executive and legislative audiences, WSDOT created a separate office for Project Control and Reporting in July 2003. A major focus of the office is on increased reporting requirements expected for projects supported by Nickel funds. The office resides within the Engineering and Regional Operations division, and reports directly to the Assistant Secretary for this area.

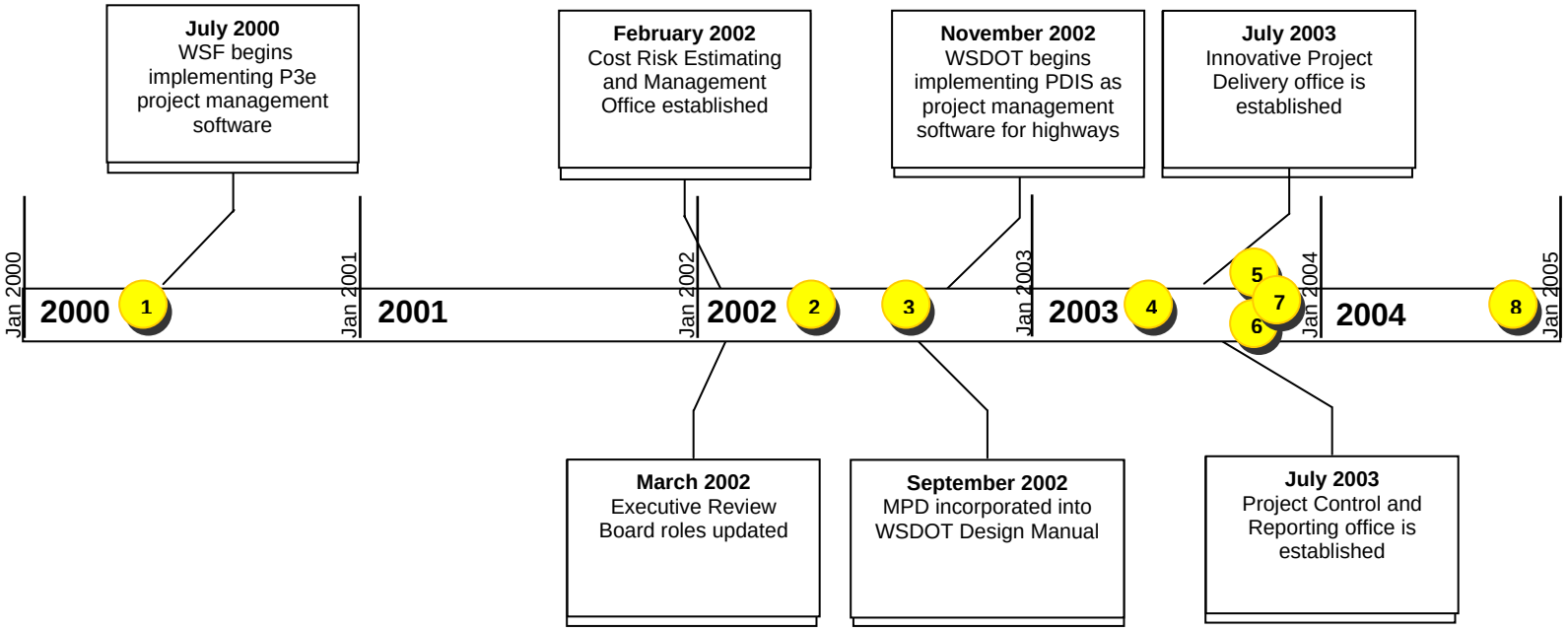
- Project Control and Reporting has primary responsibility for external status reporting, internal change control, work order authorization, and overall program management including forecasting expenditures.
- In September 2003, this office established the Quarterly Project Review process, whereby senior management travels to regional field offices and receives presentations from project managers on status, issues, and risks.
- The office published the Project Control and Reporting Guide in October 2004, specifying organizational roles and responsibilities, describing change control, and documenting reporting processes.

## Innovative Project Delivery Office

- WSDOT established the Innovative Project Delivery Office in July 2003. It focuses on strategies that many projects can use to improve performance of capital project delivery, with a special emphasis on reducing delivery times. Staff at the office serve as a resource for regional managers for designing practices that could be used for other projects, and sharing information with regional managers.
- Staff from Innovative Project Delivery helped develop WSDOT's design-build contracting approach, identifying criteria for instances when the approach may be beneficial.[9]
- This office also participated in setting up inter-agency teams to streamline environmental permitting, developing a clearinghouse to share lessons learned across projects, and advocating ways to creatively implement the principles of Managing Project Delivery.
- Innovative Project Delivery staff focus especially on areas involving third-party coordination, which often delay projects (such as environmental permitting and mitigation, right-of-way, and utilities).

[9] Design-build uses a single contract to both design and build a project, as opposed to staff preparing design specifications and then soliciting a contractor only for the construction phase.

Figure 9 -- Initiatives Compared To Contract Advertisement Dates For Example Projects




Example Projects*

1. SR 161, 234th to 204th Street East
2. I-90 Build Lanes from Argonne to Sullivan
3. SR 500 NE 112th Avenue Interchange
4. SR 16 HOV Improvements - Olympic Drive to Union Avenue
5. I-5 - 196th (SR 524) Interchange Project
6. SR 527 Widening 164th Street SE to 132nd ST SE
7. Shaw Island Terminal Slip Reconstruction
8. Southworth / Fauntleroy Slip Reconstructions

*Construction advertisement dates

# CHAPTER SIX – OVERVIEW OF REPORTING AND INFORMATION SYSTEMS

WSDOT has a number of different automated information technology (IT) systems that either directly support the delivery of capital projects, or link capital processes to overall agency management processes.

The IT systems involved in the capital delivery process were developed over the course of several years. They operate on a variety of different technology platforms, and most were developed for addressing singular aspects of project management tasks. For example, one system was developed to administer construction contracts, one system to pay construction vendors, and one system to chronicle the history of per-unit contract costs paid by WSDOT.

For the most part, these systems operate in "silo" environments. Having been developed individually, over several years, and with different technologies, they are not integrated and cannot easily transfer data from one system to the other.

The key information systems related to capital project delivery, and their associate development dates, include the following:

- CPMS (Capital Program Management System) - 1987: Used to develop high-level schedule and cost assumptions and track changes for projects within WSDOT's Capital Improvement and Preservation Program.
- PDIS (Project Delivery Information System) - 2002: Used by highway project engineers to manage the detailed task schedules and work for individual projects.
- P3e (Primavera Project Planner for the Enterprise) – 2000: Used by ferry terminal project engineers to manage the detailed task schedules and work for individual projects.
- TRAINS (Transportation Reporting Accounting and Information System) – 1991: Used as WSDOT's general ledger accounting system.
- CCIS (Construction Contract Information System) – 1990: Used to track construction vendor-contract levels and change orders for highways projects.
- CAPS (Contract Administration and Payment System) – 1983: Used as the accounts payable system to make payments to highways and ferry contractors.
- EBASE (Estimate and Bid Analysis System) – 1998: Used for developing engineers' estimates for construction projects, utilizing detailed historical per-unit contract costs.
- FIRS (Financial Information Retrieval System) – 1995: Used to extract information from the general ledger accounting system for status reporting and monitoring.
- TEIS (Transportation Executive Information System) – 1993: Used for legislative budget planning and monitoring, utilizing information provided by WSDOT systems on a periodic basis.

- WOA (Work Order Authorization) – 2003: Used to automate the initiation and subsequent changes to authorized spending control levels on individual phases with each capital project.

There are numerous other automated systems used by WSDOT, many of which are employed to track performance, assess infrastructure condition, identify operational and safety data, and provide planning and prioritization functions. The key systems used in daily project delivery have been listed above.

## WSDOT's "Silo" Information Systems

While these systems generally operate in an independent manner, each houses information critical to the management of capital projects. The capital delivery process involves several dimensions of project data. There are numerous points where the transfer of information from one step in the project management cycle is necessary to proceed to the next step. However, in most cases computer systems don't allow direct transfer of information. Instead staff must transfer information via non-automated means.

WSDOT has periodically undertaken efforts to improve specific problematic data interfaces between systems. These have been limited in scope, and are often constrained by the existing technology platforms, which are often not easily interfaced.

The complex information needs for managing a large capital program are extensive. JLARC did not attempt to comprehensively identify the linkages between all the information systems in use at WSDOT and the business processes involved in capital project delivery.

To illustrate some of the complexity and weaknesses of information management at WSDOT, figure 10 provides an example of how staff use system information. The figure represents a scenario of establishing a construction contract that must be later updated with a change order. In this example, one can see that there is interaction among several different automated systems. In many cases data must be transferred manually to complete tasks, and data updates to reflect project changes are not cycled back through related systems. There is an especially large amount of manual data-transfer that takes place for reporting purposes.

## Figure 10 – Sample Use of Information Technology Systems

**1:** Project engineer estimates cost from project specifications, advertises, and evaluates bids.

**2:** Award is made to successful bidder, and project schedule is updated to reflect contract.

**3:** Unforseen site condition is identified--project engineer and contractor review potential need for change order.

**4:** Project engineer develops scenarios for revised project schedule, based on analysis of cost-to-complete.

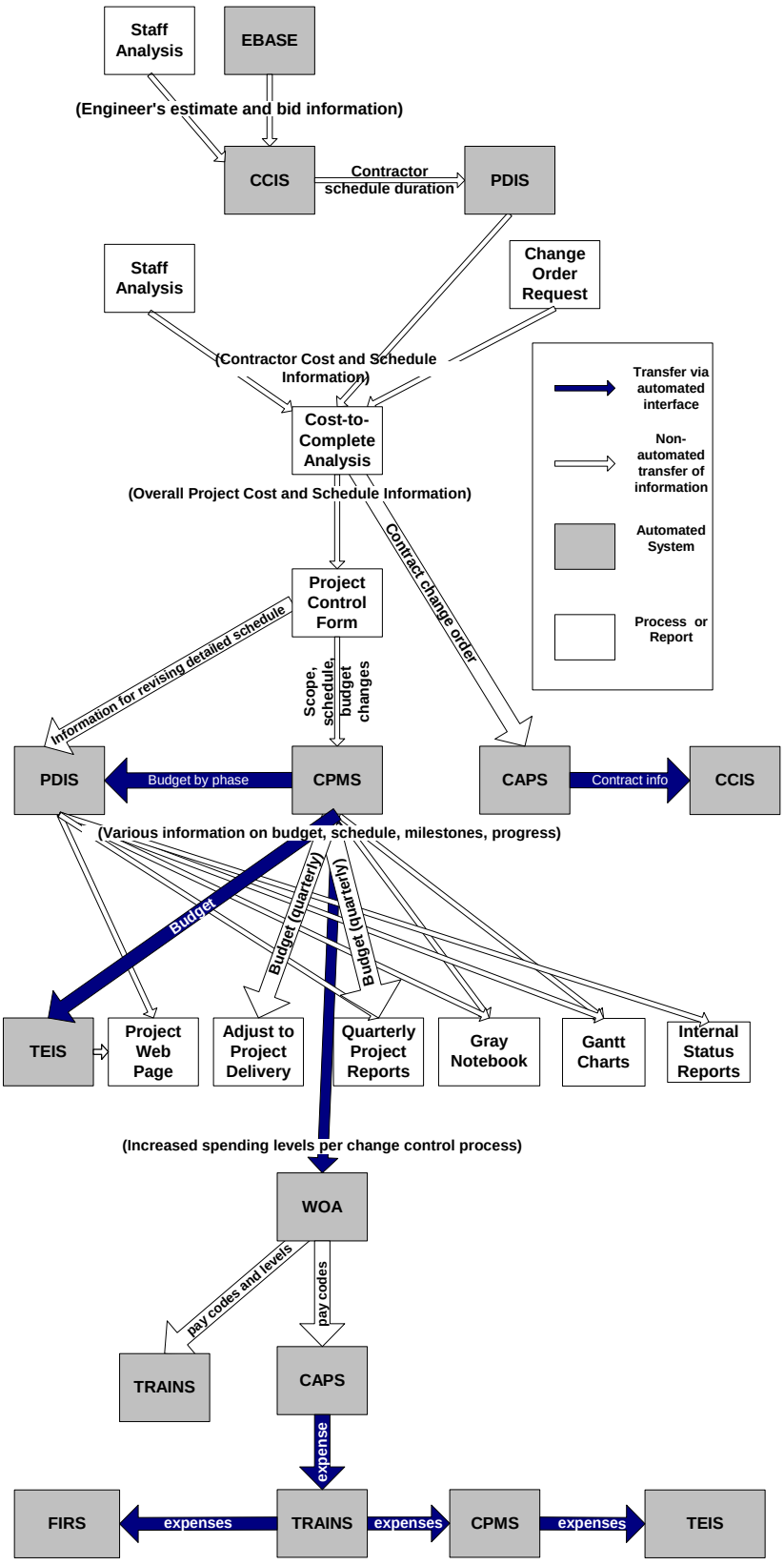
**5:** Project engineer requests a change to scope/schedule/budget through the Department's change control process. (May require additional reporting for external approval.)

**6:** Approved changes are updated to reflect revised CIPP, budget, construction contract, and project schedule.

**7:** Various reports and reporting systems are updated to reflect revised project assumptions.

**8:** Additional spending authority is provided to DOT staff to implement change order.

**9:** Contractor is paid and expenses are reflected in general ledger and reporting systems.



# CHAPTER SEVEN – OBSERVATIONS ON COST AND SCHEDULE INCREASES

While a complete audit of schedule and cost performance was not conducted for this review, JLARC revisited an issue that had been an audit topic in prior WSDOT audits. In a 1998 performance audit, JLARC found WSDOT had highway construction cost increases beyond initial bid awards of about 10 percent, and concluded this was comparable to other states.

The 1998 JLARC audit recommended WSDOT begin tracking construction change orders that are avoidable (preventable through appropriate design or construction management) and that add no value (result in inefficiencies as opposed to merely correcting inaccurate bid estimates). At the time, JLARC found that out of all change orders, 38 percent were of the "avoidable/no-value added" nature.

For this review, JLARC analyzed data WSDOT extracted from its contract information database for Fiscal Years 2003 and 2004, using the additional tracking information. While JLARC did not audit the accuracy of this data, it does indicate that WSDOT has had construction cost increases between bid and close-out of only 6 percent during the last two years, and that only 29 percent of change orders were avoidable with no-value added.

However, while construction cost increases appeared to have gone down compared to the 1998 audit, construction time increases appeared to have gone up. The 1998 JLARC audit found actual highway construction contract work days exceeded bid work days by three percent, whereas contract information from Fiscal Years 2003 and 2004 indicate actual work days exceeded bid days by 8 percent. If the four largest time increases are excluded, the average increase is 6 percent. The cause for time delays is not readily identified in database records. These time increases, though larger than the 1998 study, still compare favorably to much higher rates identified by that audit for other states.

This information, however, reflects cost and schedule performance related to highway construction contracts only. Also, numerous other factors, some of which occur prior to construction, can affect project schedules and cost performance. Some of these factors include external approval of environmental permits, challenges getting settlements to acquire right-of-way, and improved information obtained by completing additional design work.

An analysis of overall cost and schedule performance was not undertaken for this review. This effort would require a more complete audit. An audit of this nature would be complicated due to inconsistent project definitions, the completeness of design work used to establish various project budgets and schedules, and challenges with verifying changes in numerous CIPP assumptions across several biennia.

WSDOT does track performance measures related to meeting advertised construction dates. According to measures published by WSDOT for the period July 2003 through September 2004, 8 percent of the projects with advertisement dates scheduled during this time period were delayed.

# CHAPTER EIGHT – SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

**JLARC has identified several opportunities to improve capital project delivery,** based on the detailed reviews of example WSDOT projects, and of information that describes WSDOT project delivery initiatives, organization, and information systems. These findings and conclusions lead to management recommendations that WSDOT can pursue without further audit work.

**JLARC also identified further project management-related audit and assessment topic**s for consideration by TPAB. These topics are intended to provide a menu of capital project management issue areas, from which TPAB could select for further study. They have been categorized into topics that could be explored in more detail in the next six to 12 months, and issues JLARC could assess after allowing more time for WSDOT to implement this report's management recommendations. They are based on information that arose during the pre-audit review, and could result in future benefits to the state.

## Findings for critical path management (for more details see Appendix 3 Chapter II):

- **WSDOT staff possess knowledge of the issues that can impact their project schedules** and they take steps to monitor these issues.
- **There is diversity in the knowledge and application of critical path management techniques across WSDOT projects.**
- **Project engineers generally utilize schedules that are comprehensive and measurable**. **However, multiple staff may be responsible for segments or phases of a project, and schedules are therefore often segmented as well.** It was more difficult for staff with segmented schedules to articulate the critical path and task dependencies across various schedule segments than in cases where schedules were integrated across the entire project life cycle.
- **Projects that utilize the Department's advanced software tools yield superior critical path management practices.** Currently, not all projects use these tools, but WSDOT has been increasing the level of their use.
- **WSDOT generally delegates the management of critical path to contractors when projects enter the construction phase**, as contractors absorb a greater share of the cost risk. Some project engineers have closely monitored the critical path during construction, and as a result found opportunities to improve schedule performance. Several project engineers recognized the importance of additional schedule requirements for larger, more risky projects. In these cases, they established additional scheduling requirements for contractors that can serve as models for other complex projects.
- **WSDOT has training available** to address the theory and practice of critical path and scheduling management. WSDOT has been increasing the number of staff exposed to training courses during the last few years.

## Findings for risk management (for more details see Appendix 3 Chapter III)

- **Project engineers were universally aware of project risks, but generally use informal methods to manage, mitigate or avoid them.**
- **There are some advanced methods of risk management being utilized at WSDOT; however these methods are not widespread.**
- **WSDOT can benefit from more universal application of risk quantification on all projects**, and has superior examples in place that could be adopted in other areas.

## Findings for reporting (for more details see Appendix 3 Chapter IV)

- **WSDOT has a strong focus on reporting**, especially to provide greater insight to external audiences.
- **WSDOT uses an established network of informal communication** and formal executive management reviews to communicate project status and issues posing risks.
- Most status reports focus on funding, current expenses, and the general status of activities, but **there should be more emphasis on assessing forecasted costs at both the program and project level**.
- **Automated information systems are outdated and not well integrated.** This complicates and slows the task of reporting, leads to examples of inconsistent information, and requires staff to spend more time on data manipulation and presentation to the detriment of performing analysis.
- **WSDOT is rich in management data, but its ability to use the data for management analysis is limited by a lack of system integration.**
- **There are examples of excellent regionally developed status reports that could be adopted in other areas.**
- **Standardized terms and a common definition of "project" are not utilized across all reporting systems,** which leads to inconsistencies in data and poses risks to communication within and outside the organization.

## Findings for organization (for more details see Appendix 3 Chapter V)

- **There is an established approach to decentralize project delivery to regions** and modes, which results in a wide variation of organizational structures for specific projects.
- **These structures are generally appropriate for the unique conditions within each region or mode.**
- **Regional/modal project organization typically involves some form of matrix organization.** Staff are assigned to an individual project team, but also may report to functional units such as construction or real estate.
- **Some organizational approaches demand special attention across the team(s) to maintain a project-wide accountability focus.** These approaches includes projects that segment project responsibilities across certain phases of the project or require the transition of duties from one project team to another.

# GENERAL CONCLUSIONS

- **WSDOT fosters local innovation to help improve the performance of project delivery and adapt to the uniqueness of local challenges.** This is laudable, and some local practices that offer strong promise could be shared as templates for assisting other regions. However, in order to instill some of the stronger practices across WSDOT, it may be necessary to establish additional mandatory project management standards, in addition to the current principles and tools offered. Scalability and adaptability to local needs can still be recognized by providing tiered standards for some practices, and allowing regions to make requests for exceptions to relax standards when appropriate.
- **WSDOT has variety in its project delivery practices and organization**, and is continuing to improve its project management disciplines. There are opportunities available for staff to learn from exemplary practices in place in some areas. The Innovative Project Delivery office has started an initiative to share lessons learned across WSDOT, and exemplary project management practices could be included in this information sharing exercise.
- **Capital delivery at WSDOT is evolving from a program-focused to a project-focused orientation**. WSDOT has strengthened its project management principles and tools recently, especially with the development of Managing Project Delivery (MPD), the Project Delivery Information System (PDIS), Primavera Project Planner for the Enterprise (P3e), and Cost Risk Estimating Management (CREM). These are strong practices, which currently aren't universally adopted due to their youth, a focus on local autonomy that can slow implementation, and resource constraints.
- **A lack of standardized definitions poses challenges to project reporting, communication, and clear expectations for accountability.** Specifically, projects are defined differently in different settings, and certain terms are used interchangeably on internal reporting systems. The challenges around standardizing project identifiers are not completely controlled by WSDOT, as the Legislature may impose different project definitions through its funding decisions. In an organization with an emphasis on decentralization, the standardization of data is essential to ensure different practices are displayed in reports with a common language. In other areas, such as establishing improved external reporting and creating comprehensive work breakdown structures, WSDOT has made strides by standardizing when appropriate.

# MANAGEMENT RECOMMENDATIONS

**Recommendation 1**

**The Washington State Department of Transportation should extend the application of the Managing Project Delivery, Project Delivery Information System, and Primavera Project Planner for the Enterprise tools and put management steps in place to confirm their adoption.**

| | |
|---|---|
| **Legislation Required:** | **None** |
| **Fiscal Impact:** | **JLARC assumes this can be accomplished within existing resources.** |
| **Completion Date:** | **January 2006** |

| | |
|---|---|
| **Benefits:** | **Ensures that project management standards and tools are made available in practical form and are placed into practice for all capital projects.** |

WSDOT should set additional standards to enforce adoption, further training, create checklists and templates, and confirm actual use of tools and practices. Special consideration should be given to reviewing methods at Washington State Ferries (WSF) Terminal Engineering as model practices for consideration in other areas.

**Recommendation 2**

**The Washington State Department of Transportation should develop a plan and timeline for implementing recommendations issued by Gannett Fleming in Appendix 3 of this report. These recommendations center primarily on the following issues:**

- **Using existing exemplary practices in place at some projects to develop minimum standards and/or templates** for risk quantification; risk-based cost contingencies; project hand-off protocols; status report contents; cost forecasting; and construction schedule monitoring.
- **Improving the clarity of project communication by documenting terms and definitions**, such as uniform project identifiers, financial terms often used interchangeably, roles and responsibilities of project engineers across all stages of the projects, and the individual roles and responsibilities of other project team members.
- **Confirming the consistency and currency of reporting information,** including ensuring that various reporting systems are reconciled and information is kept up-to-date.

| | |
|---|---|
| **Legislation Required:** | **None** |
| **Fiscal Impact:** | **JLARC assumes this can be accomplished within existing resources.** |
| **Completion Date:** | **January 2006** |
| **Benefits:** | **Shares knowledge of internal exemplary practices for improvements in other areas. Raises the expectation of minimum project delivery standards. Improves the accuracy of management reporting, to assist managers and decision makers. Improves coordination of project teams.** |

**Recommendation 3**

**The Washington State Department of Transportation should conduct an assessment of the effectiveness of current information systems and options for addressing any deficiencies.**

| | |
|---|---|
| **Legislation Required:** | **None** |
| **Fiscal Impact:** | **This assessment will require additional resources. WSDOT currently estimates a systems-assessment study will cost $700,000.** |

| | |
|---|---|
| **Completion Date:** | **July 2006** |
| **Benefits:** | **Assesses strengths and weaknesses of existing systems. Provides options to improve information for capital project management and decision-making support. Identifies opportunities to improve data interfaces between existing systems.** |

The assessment should be focused on identifying key capital business and analytical processes, and demonstrating to what extent they are supported by automated systems.

**Recommendation 4**

**Washington State Department of Transportation should conduct an analysis to develop criteria for extending Cost Risk Estimating and Management (CREM) analyses to a wider universe of projects.**

| | |
|---|---|
| **Legislation Required:** | **None** |
| **Fiscal Impact:** | **JLARC assumes this can be accomplished within existing resources.** |
| **Completion Date:** | **May 2005** |
| **Benefits:** | **Provides information to assess the types of projects for which CREM analyses will provide the best cost-benefit return.** |

From this analysis, specific criteria should be developed for identifying projects most likely to benefit from analyses by CREM staff and consultants.

# AGENCY RESPONSES

We have shared the report with the Washington State Department of Transportation and the Office of Financial Management. JLARC received written comments from both organizations, which are included as Appendix 2.

# ACKNOWLEDGEMENTS

We would like to thank the numerous staff at the Washington State Department of Transportation who provided information to assist with this report. Ken Smith, Greg Selstead, Dan Sunde, and many others provided invaluable assistance orienting JLARC and our consultants to WSDOT's practices and providing assistance and guidance during the course of the review.

We would also like to thank John Conrad, Russ East, and the various managers and project engineers associated with the example projects that were reviewed. Their candor and time yielded important insights on a number of subjects.

Finally, JLARC is appreciative of the very knowledgeable and efficient work done by Gannett Fleming in support of our review.

This study was conducted by Keenan Konopaski of the JLARC staff, with Cindi Yates serving as project supervisor.

Cindi Yates, Legislative Auditor

On January 21, 2005, this report was approved for distribution by the Transportation Performance Audit Board.

Doug Hurley, Chair

# Options for Future WSDOT Audit/Study Topics

The following additional topics are provided as a menu for TPAB to select from for future audits or reviews. TPAB could select from these topics or other areas of interest for developing a future TPAB work plan.

**Audit/Study Topic 1**

Audit the effectiveness of MPD and PDIS in improving project delivery.

| | |
|---|---|
| **Objective:** | **To determine how new standardized schedule tools are enabling project teams to manage schedules and the critical path.** |
| **Timeline:** | **Nine audit months (recommend delaying start date to allow full implementation of management efforts)** |

**Audit/Study Topic 2**

Audit the practice of determining construction contractor pay estimates.

| | |
|---|---|
| **Objective:** | **To determine if the practice yields greater benefits and efficiencies than practices employed by comparable public agencies.** |
| **Timeline:** | **Six audit months** |

**Audit/Study Topic 3**

Conduct an assessment of contracting methods that are alternatives to the traditional design-bid-build process, such as alliance contracting, to identify conditions where alternative methods offer the best promise to improve project delivery times and reduce risks to the state.

| | |
|---|---|
| **Objective:** | **To analyze the risks and benefits of using alternative contracting, and ascertain whether the practice offers value for the state if use of alternatives were extended.** |
| **Timeline:** | **Twelve audit months** |

**Audit/Study Topic 4**

Conduct a comparative assessment of project delivery performance measures (such as construction cost increases, schedule performance, and advertisement milestone accomplishment) to evaluate actual WSDOT performance compared to that of similar organizations and projects.

| | |
|---|---|
| **Objective:** | **To place project delivery performance in context and identify areas for further improvement** |
| **Timeline:** | **Six audit months** |

# APPENDIX 1 – SCOPE AND OBJECTIVES

**OVERVIEW OF WSDOT CAPITAL PROJECT MANAGEMENT**

Conducted for the Transportation Performance Audit Board

Funded by the Legislative Transportation Committee

**SCOPE AND OBJECTIVES**

JULY 9, 2004


STATE OF WASHINGTON
JOINT LEGISLATIVE AUDIT AND REVIEW COMMITTEE

**STUDY TEAM**
Keenan Konopaski

**LEGISLATIVE AUDITOR**
CINDI YATES

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The Transportation Performance Audit Board (TPAB) and the Legislative Transportation Committee (LTC) have recently approved and funded a targeted set of performance measure reviews, performance audits, and studies to improve the efficiency and effectiveness of state transportation programs. The Joint Legislative Audit and Review Committee (JLARC) is to conduct several of these audits, including this assessment of capital projects management in the Washington State Department of Transportation (WSDOT).

## BACKGROUND

Funding for WSDOT capital projects increased significantly with passage of the "nickel tax" in 2003, for a 2003-2005 Biennium total of $2.6 billion. Goals for this increased funding include congestion relief, safety improvements, and preservation of aging facilities. WSDOT is responsible for implementing capital projects to achieve these goals efficiently and effectively, including meeting the project budget, scope, and expectations of the Legislature and taxpayers.

## STUDY SCOPE

As directed by TPAB, this review will focus on management issues surrounding execution of WSDOT capital projects, with the goal of identifying options for future TPAB audit and evaluation studies.

The management issues reviewed may include: description of the critical path management, risk management, project reporting, and organizational structures used to execute WSDOT capital projects related to highway preservation, highway improvement, and ferry system capital projects.

## OBJECTIVES

1. Describe and diagram the procedures and processes used by WSDOT to execute highway and ferry system capital projects.

2. Describe and diagram the organizational structures within WSDOT used to execute capital projects. Describe the roles and responsibilities within these structures, and the relationships to external entities that have a role in the execution of projects.

3. Review the procedures and processes used by WSDOT to develop and manage the "critical path" for capital projects in order to meet schedule, scope, and budget expectations. "Critical path" means the series of tasks that must finish on time for the entire project to finish on schedule. Critical path management includes identification of tasks, assessment of resources needed to execute tasks, assignment of roles and responsibilities, and sequencing and prioritization of tasks.

4. Review the procedures and processes used by WSDOT to identify, manage, and mitigate schedule, scope, and budget risks in executing capital projects.

5. Review the project reporting systems used by WSDOT to manage capital projects, critical paths, and risks.

6. Based on this analysis, identify options for future TPAB audit and evaluation studies on transportation capital project management.

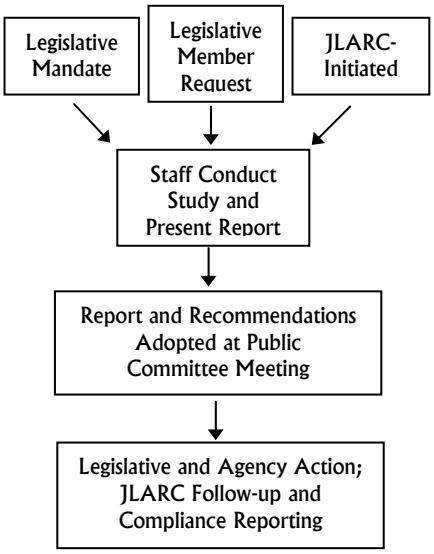
## TIME FRAME FOR THE STUDY

Report to be delivered to TPAB and LTC by December 15, 2004.

## JLARC STAFF CONTACT FOR STUDY

Keenan Konopaski 360.786.5187 *konopaski.keenan@leg.wa.gov*

## JLARC Study Process




**Criteria for Establishing JLARC Work Program Priorities**

- Is study consistent with JLARC mission? Is it mandated?
- Is this an area of significant fiscal or program impact, a major policy issue facing the state, or otherwise of compelling public interest?
- Will there likely be substantive findings and recommendations?
- Is this the best use of JLARC resources: For example:
- Is the JLARC the most appropriate agency to perform the work?
- Would the study be nonduplicating?
- Would this study be cost-effective compared to other projects (e.g., larger, more substantive studies take longer and cost more, but might also yield more useful results)?
- Is funding available to carry out the project?

# APPENDIX 2 – AGENCY RESPONSES

- Department of Transportation
- Office of Financial Management

**Washington State Department of Transportation**
**Douglas B. MacDonald**
Secretary of Transportation

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December 29, 2004

Ms. Cindi Yates
Joint Legislative and Audit Review Committee
PO Box 40910
Olympia WA 98504-0910

**RE: Overview of Washington State Department of Transportation (WSDOT) Capital Project Management-Preliminary Report, WSDOT Agency Response**

Thank you for the opportunity to provide the Washington State Department of Transportation's (WSDOT) perspective on the "Overview of Washington State Department of Transportation Capitol Project Management" dated December 17, 2004. We are pleased the report recognizes they project management and accountability efforts WSDOT has been working to implement in the last several years.

This report provides us with suggestions for improving and strengthening project delivery and endorses the direction WSDOT has taken in delivering capital projects. WSDOT has, in general, an excellent delivery record. The Gray Notebook - *Measures, Markers and Mileposts* provides quarterly updates on how well WSDOT is doing delivering projects on time and within budget, and provides project by project explanations on issues presented on specific projects.

As shown in chapter seven of this report 92% of the projects scheduled for advertisement thus far this biennium have been advertised on time. For the first five quarters of this biennium 175 projects have been delivered to advertisement. Delays occur for a number of reasons, including: environmental permitting, right of way acquisition, stormwater mitigation, and project consolidation. For additional details on why projects are adjusted please refer to page 29 of the Gray Notebook - *Measures, Markers and Mileposts, Volume 15.*

This report also states that the construction cost overruns are down from the previous JLARC audit performed in 1998. For fiscal years 2003 and 2004 the cost increase between the contractor's bid and close out was limited to six percent. As shown in the Gray Notebook - *Measures, Markers and Mileposts, Volume 14* the costs of the 322 projects completed with in these fiscal years exceeded $650 million. Cost growth occurs on some projects due to unforeseen conditions and issues during construction. As a project owner WSDOT assumes and accounts for in the form project estimates normal risk outside of the contractors control that is inherent to construction of capital projects. By not passing this risk on to contractors' WSDOT ensures lower bid prices for construction projects. An example of how we are doing at this for this same portfolio of

portfolio of projects the final contract costs were approximately one percent under the engineers estimate.

This report confirms that the new initiatives that were recently undertaken, such as emphasis on accountability, reporting, and quarterly project reviews by executive management have assisted with delivering projects on time and within budget. In addition the process and tools such as Managing Project Delivery (MPD) process and Project Delivery Information System (PDIS) are assisting us in these efforts.

The eight projects reviewed for this study were intentionally chosen to meet the JLARC selection criteria of exhibiting a greater complexity and risk than the majority of the projects in WSDOT's capital improvement and preservation project list. Since the example projects were well into the construction phase, some management methods and tools for development they rebid upon having already been updated on projects that have been developed more recently.

The Department has taken a number of steps that have already initiated implementation of some of the recommendations found in this report.

- On December 13th, the Department went live with a new project management web site. This web site includes detailed information on our MPD process, PDIS, Project Control and Reporting, Innovative Project Delivery, Value Engineering, and Cost Risk Assessment. http://www.wsdot.wa.gov/Projects/ProjectMgmt/. In addition we are assembling an oversight team to assist in drafting a Project Management Manual. This manual will establish standardized definitions, processes, and templates. The new manual will mandate our MPD process and include the exemplary process referred to in this report to be used on projects statewide.
- The Department has an agency request for $715,000 in the 2005 budget to perform a critical applications assessment of our current information systems.
- The Department is currently drafting a policy for cost risk assessment and when and how to apply our Cost Estimate Validation Process (CEVP).
- The Department will continue to communicate project specific information and program performance measures on our web pages and our nationally recognized Gray Notebook - *Measures, Markers and Mileposts.*

The agency's formal response to JLARC's recommendations shown in the preliminary report is as follows:

| RECOMMENDATION | AGENCY POSITION | COMMENTS |
|---|---|---|
| Recommendation 1 – WSDOT should extend the application of the Managing Project Delivery, Project Delivery Information System, and Primavera Project Planner for the Enterprise tools and put management steps in place to confirm their adoption. | WSDOT concurs with this recommendation. | |
| Recommendation 2 – WSDOT should develop a plan and timeline for implementing recommendations issued by Gannett Fleming, which center primarily on a) using existing exemplary practices in place at some projects to develop minimum standards and/or templates; b) improving the clarity of project communication by documenting terms and definitions; and c) confirming the consistency and currency of reporting information | WSDOT concurs with this recommendation. | |
| Recommendation 3 – WSDOT should conduct an assessment of the effectiveness of current information systems and options for addressing any deficiencies. | WSDOT concurs with this recommendation. | Implementation of this recommendation is pending legislative approval of the Department's agency request for $715,000 in the 2005 budget to perform a critical applications assessment of our current information systems. |
| Recommendation 4 – WSDOT should develop criteria for extending Cost Risk Estimating and Management (CREM) analyses to a wider universe of projects | WSDOT concurs with this recommendation. | |

If you have comments or questions, please contact Ken Smith at 360.705.7233 or me at (360) 705-7054.

Sincerely,

Douglas B. MacDonald
Secretary of Transportation

cc: Paula Hammond, Chief of Staff, WSDOT
Ken Smith, Deputy State Design Engineer, WSDOT
Marty Brown, OFM MS 43113
Theo Yu, OFM MS 43113

STATE OF WASHINGTON
OFFICE OF FINANCIAL MANAGEMENT
*Insurance Building, PO Box 43113 · Olympia, Washington 98504-3113 · (360) 902-0555*

January 11, 2005

**TO:** Cindi Yates, Legislative Auditor
Joint Legislative Audit Review Committee

**FROM:** Marty Brown, Director MB

**SUBJECT:** **RESPONSE TO JLARC OVERVIEW OF THE DEPARTMENT OF TRANSPORTATION CAPITAL PROJECT MANAGEMENT PRELIMINARY REPORT**

Thank you for the opportunity to respond to the Joint Legislative Audit Review Committee Overview of the Washington State Department of Transportation Capital Project Management Preliminary Report dated December 17, 2004.

Following is our response to the report management recommendations and options for future audit/study topics in the format that you requested:

| **Recommendation** | **Agency Position** | **Comments** |
|---|---|---|
| Recommendation 1 | Concur | |
| Recommendation 2 | Concur | |
| Recommendation 3 | Concur | |
| Recommendation 4 | Concur | |

Please contact Theo Yu at (360) 902-0548 if you have further questions.

cc: Theo Yu, OFM

# APPENDIX 3 – GANNETT FLEMING EXAMPLE PROJECT REVIEW

# CHAPTER I - INTRODUCTION

## OVERVIEW

The scope of this review was to conduct a high-level examination of the WSDOT Capital Project Management practices associated with the delivery of eight specific capital projects. The following four key project management areas were reviewed as they relate to project delivery:

- Critical path management
- Risk management
- Project reporting
- Organizational linkages.

## SUMMARY OF FINDINGS

WSDOT is in the process of strengthening project management and is embracing advanced project delivery tools. However, these new initiatives, for the most part, were not at work on the eight example projects. The capital project management practices and strategies, in fact, varied appreciably from project to project and region to region.

The department appears to be wrestling with achieving the appropriate balance between a desire to foster local innovation through decentralization and the need to centrally control capital projects to sustain public accountability. In order for WSDOT capital project management initiatives to be fully embraced by the whole department, WSDOT may need to allow the pendulum to swing a little more in the direction of uniform standards. As a case in point, the definition of a project is inconsistent throughout the department, creating an underlying weakness in project management practices.

On the other hand, local innovation has helped to create some fairly evolved project management practices at the regional and mode level. Some of these distinct practices offer strong models of good capital project management practices. In particular, the example projects that were managed by Washington State Ferries (WSF) offered high-quality examples of risk assessment and schedule management.

Another central finding is that the financial systems that support delivery of the capital program are driven by funding perspectives and do not easily provide information on project costs and budgets in a manner that is essential to project management.

The chapters that follow describe the practices that are at work on the example projects and provide detailed findings in the four key areas of this review. The most notable findings in each chapter are highlighted below:

1. Critical Path Management:

- The principles of critical path management were not completely understood by all managers responsible for the critical path; in fact the level of scheduling expertise available to support project management varied significantly from project to project
- Critical path management practices were not consistently applied
- Comprehensive project scheduling tools were in place for a few of the example projects, but were not commonly used to manage all of them.

2. Risk Management:

- The process for managing threats and opportunities is evolving
- There are a number of good initiatives underway in the department, however use of these methods was an exception in the example projects
- Project engineers uniformly demonstrated an understanding of project risks
- The risk assessment process was informal and undocumented for most of the example projects.

3. Project Reporting:

- Outdated information systems make it difficult for WSDOT to produce useful project reports
- Project reports are focused on funding and as a result do not provide cost trending and forecast information essential to project management
- There is an opportunity to improve the linkages between the systems that support reporting
- Terms used to define and manage projects have varied meanings within the department, leading to confusing reports
- There are few department-wide reporting standards at the project level
- Reports often focused on only one phase or segment of the project
- There are examples of excellent regionally developed reporting tools
- For the example projects, a number of reporting inconsistencies were identified.

4. Organizational Linkages:

- The management structures that support project delivery vary from region to region; yet the structures appear appropriate for the specific regional circumstances
- The WSF structure has a stronger project focus and is consistent with successful structures in comparable public entities

- Project engineers are responsible for a specific project phase as defined by work authorizations and are resistant to being held accountable for the total project.

## METHODOLOGY

The review focused on two resource pools to gain insight on capital project management practices: general and project-specific documentation; and WSDOT human resources responsible for delivering capital projects.

## DOCUMENTATION REVIEW

A focused review of general WSDOT documentation on capital projects was performed. This review emphasized project management guidelines with additional general background and historical information for context.

In parallel with the general documentation review, project-specific reviews of reporting documentation were also undertaken. These reviews provided perspective on projects including status, accomplishments and challenges, as well as an appreciation of the tools by which reporting is accomplished. Additionally, the reviews afforded a backdrop for understanding how the example projects related to the whole WSDOT portfolio of capital projects, as well as the other missions being carried out by the department.

Attachment A highlights related documents reviewed.

## PROJECT INTERVIEWS

Complementing the document review were interviews of project teams. These interviews engaged project and regional management representatives responsible for each of the subject projects. Interviews were designed to facilitate a dialogue on project management practices employed by each respective team.

In advance of scheduled interview sessions, a list of themes and sample questions were provided to all project teams to orientate participants to the breadth of discussion topics. While discussions were generally allowed to flow in many directions during the course of the interviews, responses to base questions from each project team were gathered.

Interviews spanned an average of four hours per project with each interview involving an average six WSDOT project/regional representatives. At the close of each session, a mini de-briefing was provided to the WSDOT representatives to review the key elements shared and understood by the review panel. This de-briefing served to clarify and/or confirm interview findings.

The focal point for each interview was the individual identified as being responsible for delivering the project. In most regions, this person was identified as the project engineer, but in other regions, an equivalent to the project engineer was identified as responsible.

In all instances, the responsible individual was accompanied by regional managers to include at least one Assistant Regional Administrator or equivalent. Participation by other regional representatives varied from project to project and included programming staff, engineering managers and operations engineers.

Through the interviews, WSDOT representatives universally conducted themselves professionally and were generally open in discussing their projects, challenges and ideas for improvement. Despite heavy workloads, the project teams, and particularly the project engineers, were prepared and willing to devote the time necessary to ensure our understanding of their particular situation.

We observed that project teams, along with their regional support structure, are reliant on long-standing professional relationships to ensure effective communication and support. In some situations, this review may have strengthened those relationships by fostering reflection and communication of what plans and practices succeeded, and which did not.

Attachment B identifies interview participants.

## ADDITIONAL PROJECT DOCUMENTATION

Each project team provided many varied documents to demonstrate specific project management practices and/or tools employed. These project-specific documents generally followed the course of the interview discussion subjects. All materials were subsequently reviewed and follow-up telephone discussions were conducted with the project engineers (or equivalent) as necessary to clarify new or remaining questions.

## HEADQUARTERS INTERFACE

WSDOT managers and staff, based in Olympia, provided overviews of standard processes and the initiatives related to capital project delivery.

These overviews were conducted over one working-day and included presentation and discussion on the following areas:

- Project Control and Reporting
- Strategic Planning and Programming
- Project Delivery Information System
- Cost Risk Estimating and Management Office
- Value Engineering
- Construction Specifications.

In addition, a telephone interview was conducted with the Assistant Secretary for Engineering & Regional Operations and the Director for Environmental & Engineering Programs to review macro-level topics related to project management.

## SELECTED PROJECTS

The evaluation of WSDOT project delivery practices is based on the reviewers' understanding of the tools, procedures and practices employed by WSDOT as demonstrated in delivering the specific eight projects listed in the table below:

- Shaw Island Terminal Slip Reconstruction (Shaw)
- Southworth/Fauntleroy Terminal Slip Reconstructions (Southworth/Fauntleroy)
- SR 500 NE 112th Avenue Interchange (SR 500)
- SR 527 164th Street Widening (SR 527)
- SR 161 Corridor Improvements (SR 161)
- I-90 Argonne to Sullivan Widening (I-90)
- I-5, 196th (SR 524) Interchange (I-5)

- SR 16 Olympic Drive to Union Avenue HOV Lanes (SR 16)

JLARC, in conjunction with WSDOT, selected the eight example projects for review. These projects provide a small sample from the WSDOT $9.5 billion Ten-Year Capital Program, but were identified to represent the diversity of project delivery approaches and challenges encountered by WSDOT. The projects selected for the review were not intended to be statistically representative of the entire capital portfolio. The main text of the JLARC report contains more information on the selection criteria used by JLARC for this review.

The sampling includes six highway improvement projects - three widening projects, two interchanges and one HOV lane improvement, as well as two WSF terminal slip reconstruction projects. Four different regional offices and the WSF Terminal Engineering Office are responsible for delivering these projects.

Most of these projects include design, right of way and construction phases. In addition, the majority of projects involve multiple design package segments or stages and/or multiple construction segments. At the time of the review, the eight projects were in advanced stages of development or completed. Table 1 below provides the projects ranked in descending order by funding plan value.

**Table 1 - Example Projects** [10]

| | Project Funding Plan | Nickel funded | Type of Project | County/Region | Status |
|---|---|---|---|---|---|
| SR 16 | 102 | Yes | HOV Improvements | Pierce/Olympic | One segment Completed<br>One segment Advertised<br>One segment in Design |
| I-5 | 61 | No | Interchange | Snohomish/ Northwest | Four Phases Completed |
| I-90 | 36 | Yes | Widening | Spokane/Eastern | In Construction |
| SR 161 | 33 | Yes | Widening | Pierce/Olympic | First Phase in Construction<br>Second Phase in Design |
| SR 527 | 28 | No | Widening | Snohomish/ Northwest | In Construction |
| SR 500 | 26 | Yes | Interchange | Clark/Southwest | Substantially Complete |
| Southworth/ Fauntleroy | 14 | No | Slip Reconstruction | Kitsap, King/WSF | Completed |
| Shaw | 9 | No | Slip Reconstruction | San Juan/WSF | Completed |

* Highway Project Costs as reported from Program Management; WSF costs represent close-out statistics. The project budget for the I-5 interchange includes five construction phases. This review focused only on phase B-3.

[10] In millions

The current funding plans for these projects range from $9 million for Shaw to $102 million for SR 16. Planned expenditures for these projects in the current biennium represent less than 3% of the biennial capital budget. Four of the projects are Nickel funded.

# CHAPTER II - CRITICAL PATH MANAGEMENT

## OVERVIEW

Critical path management is the process of controlling the project schedule to gain the greatest time and cost benefits for a project.

The project schedule on which the critical path management process is founded should reflect logical sequences for accomplishing the required project work. In this regard, the project schedule must consider all elements of the project through its progressive phases. With respect to WSDOT capital projects, these phases may include: planning; environmental clearance; design and engineering; permitting; real estate acquisition and relocation; and construction.

The project schedule should provide a comprehensive depiction of the project reflective of the current scope and planning strategies. Additionally, constraints on the project, whether of an internal or external nature, should be identified and considered.

As a project schedule is developed, logic network methodologies should be employed to identify relationships of activities within and between phases, and to assign estimated durations for those activities. Through standard algorithms that compute activity durations and account for their relationships, a total project duration would thus be determined through the identification of its critical path. The critical path is defined as the longest continuous sequence of activities through a project.

Accordingly, there is a direct correlation between the quality of the project schedule and the effectiveness of managing the critical path.

## OBSERVATIONS

## CRITICAL PATH AS A PRACTICE

Among the example projects reviewed, the practice of critical path management was not fully understood and its application was inconsistent. While all teams demonstrated an awareness of time sensitivities to key milestones within the phase with which they were engaged, the project context of those milestones were often not understood. That is, many project teams were not able to articulate the project critical path. Nor were many project engineers able to convey the float value of the project as a whole and/or the milestone they were focused on.

Two major factors contributed to this situation:

1. Scheduling expertise varied
2. Schedules by project phase are in use, but integrated schedules for the entire project were the exception for the example projects.

## SCHEDULING EXPERTISE

A wide range of scheduling expertise was demonstrated on the example projects. Scheduling expertise ranged from those who are strong in critical path theory and practice, to those who did not understand its fundamentals.

Strong scheduling expertise was demonstrated at WSF where a full spectrum of tools and analyses are used. WSF schedules were developed with an integrated project-wide approach. Further, these

schedules were regularly updated reflecting an awareness of the dynamic nature of the project execution process and its impact to schedule, the critical path and float values. On these projects, the critical path was clearly articulated and the patterns for float values were communicated.

On the other hand, where schedule expertise did not prevail, the practice of traditional critical path management was absent. This reflects a need for a better foundation in schedule theory and development and/or more importantly, the ability to apply effective schedule concepts onto the project.

## USING OUTSIDE EXPERTISE

In some example projects, scheduling expertise was contracted or otherwise obtained through other WSDOT resource pools. In these instances, the team did not possess the expertise to either:

- Express the plan and schedule in a critical path network and/or maintain it
- Develop a construction schedule network from the plans, specifications and estimates (PS&E) documents to establish a credible work-day performance requirement
- Perform reviews of contractor schedule submittals and change order requests for additional time.

Securing outside expertise signaled that project teams were sensitive to the importance of schedule management. The experience of securing outside expertise provided generally positive net results on those projects where expertise needed to be bolstered.

## INTEGRATED PROJECT SCHEDULES WITH A CLEAR CRITICAL PATH WERE THE EXCEPTION

As would be expected, the range in scheduling expertise above also manifested itself in the breadth and quality of the schedules forming the bases of critical path management. Table 2 depicts the range of schedule features incorporated into various schedules employed by the example projects.

**Table 2 - Scheduling Features of Schedules Employed by Project Teams**

| Project Feature | Comprehensive | Integrated | Continuous Critical Path | Measurable | Scalable |
|---|---|---|---|---|---|
| SR 16 [1] | √ | | √ | √ | √ |
| SR 161 [2] | | | | √ | |
| SR 500 [3] | √ | | | √ | |
| I-90 [4] | √ | | √ | √ | √ |
| I-5 [5] | | | | | |
| SR 527 [6] | √ | | | √ | |
| Shaw [7] | √ | √ | √ | √ | √ |
| Southworth /Fauntleroy / [8] | √ | √ | | √ | √ |

Notes

1. Numerous phase-specific schedules available including: design; construction work day basis; 10-week advertise date; and environmental permitting. No project schedule developed that combines pins or phases.
2. WSDOT manual interpretation of two-week windows of contractor's schedule available. No project schedule developed that combines pins or phases.
3. Contractor construction schedules available. Project at Substantial Completion but no project schedule developed that combines phases.
4. WSDOT design and construction phase-specific schedules available. Project team maintains construction phase schedule. No project schedule developed that combines pins or phases.
5. Project completed in late 2003, no schedules reviewed. Project reported construction phases monitored with contractor schedule.
6. WSDOT design phase schedule and contractor construction schedules available. No project schedule developed that combines pins or phases.
7. Integrated schedule available that is inclusive of scoping, design, PS&E, real estate, environmental permitting, reviews, construction and commissioning. Construction activities summarized in this presentation. This presentation is also cost loaded. Construction monitored using contractor schedules.
8. Integrated schedule available inclusive of design, PS&E, and environmental permitting, reviews, construction and commissioning. Construction activities summarized in this presentation. This presentation is also cost loaded. Construction monitored using contractor schedules.

As Table 2 suggests, there were excellent examples of integrated project schedules. For example, WSF project schedules, through their advanced use of Primavera Project Planner, provided a comprehensive portrayal of their projects. Time and costs were well integrated and complementary. Their project schedules incorporated all project elements and phases, identified the critical path, and prominently displayed project key interfaces and milestones. In addition, resource allocations were clearly discernable, demonstrating the ability to efficiently identify requirements against available resource pools. Prioritization of resources in support of the schedule was easily managed.

In critical path management, the importance of a well-developed integrated project schedule cannot be over emphasized. The WSF schedule examples support a comprehensive examination of the project as a whole. This type of tool facilitates a global perspective which is basic to effective critical path management.

## PHASE-SPECIFIC SCHEDULES

While the WSF examples were exemplary, the other example projects did not have nor use a project schedule for the purpose of managing the critical path. Rather, these project teams more often focused their schedule tools (and thus management efforts) on the specific phase they are authorized to execute.

While there were some excellent examples of phase-specific schedules on many of these projects, these schedules did not always integrate parallel project elements or phases even though there may have been direct interdependencies. Also, if the phase-specific schedule was related to the PS&E phase, the link to the follow-on construction phase, and its project completion, was not provided.

From this practice comes a narrow view of schedule that limits the ability to effectively manage the *project* critical path.

This is a reflection of project engineers' perceptions of project responsibility being limited to authorized work orders rather than a global view that embraces all elements and phases of the project. This theme is discussed in Chapter IV - Organization.

## PROGRAMMING SCHEDULES

WSDOT's Capital Program Management System (CPMS) provides a whole-project perspective of project schedules. CPMS schedules are developed and maintained at the macro level. These schedules reflect a top-down approach based on historic data and varied project development bases.

However, CPMS is an antiquated tool designed for biennial cost and schedule programming. It is not an effective tool for project management scheduling use (nor is it intended for that use). Accordingly, there are no practical links between CPMS schedules and those schedules employed by project teams for the purpose of project management. Further, any translation of milestone data between the systems is performed on a manual basis and reflects macro-view perspectives.

## DESIGN SCHEDULES

Universally, those projects in the PS&E phase developed schedules focused on achieving the Advertise Date milestone. While these schedules varied in format, and level of detail, they were available.

As was the case with the SR 16 Project, most of these design schedules were developed in Microsoft Project. The schedules reflected a thorough understanding of the design elements and

their support activities. In some instances, like SR 16, full use of the new Master Deliverables List (MDL) was made in developing the design schedule.

The MDL is a foundation of the Project Delivery Information System (PDIS) that offers a comprehensive listing (sixty pages) of deliverables associated with discrete design disciplines and activities. This listing thus affords an outstanding basis for identifying appropriate design activities, and their structure, in the schedule.

Due to the timing of design schedule development related to the example projects, PDIS was employed by only two projects. Most of the example projects were nearly in construction before PDIS was available.

The project teams conveyed consistent general logic constraints in their PS&E schedules. The constraints seek to ensure that third party activities, e.g. real estate acquisitions and relocations, permitting, and major utility relocations are completed prior to bid.

In one instance where the above general constraints were not relieved prior to the advertise date, WSDOT was seen assuming a degree of risk in proceeding with the related procurements. Unresolved issues in this instance led to severe schedule delays.

## CONSTRUCTION SCHEDULES

In contrast to the PS&E phase, most example project teams did not maintain a schedule in the construction phase but rather relied on the contractor's schedule to gain any perspective of the critical path through the construction phase. In these instances, WSDOT was without a ready tool of its own design and making to control the critical path.

On one project, the reliance on the contractor's schedule led to a situation whereby WSDOT proceeded through construction for many months without a working schedule at its disposal. This was the result of the contractor failing to submit a baseline schedule for review for several months before starting a lengthy process of negotiating an acceptable baseline.

While a construction schedule for this project would not have reconciled the delay issues now being addressed on the project, the perspective gained from a credible schedule likely would have afforded tangible appreciation for the magnitude and escalating nature of the issues at the onset of the contract. This timely insight would have been available for management advice.

As consistently conveyed by the project teams, the WSDOT posture with regard to construction schedules was that the contractor is obligated to deliver the contract (and thus the project) within the specified working days. Accordingly, the contractor determined the schedule appropriate for meeting that obligation. In effect, WSDOT placed the responsibility for planning and scheduling of the project during construction on the contractor.

The contractor's construction schedule was thus regarded by WSDOT as a planning tool for defining which WSDOT resources would be required and when. Critical path management during construction is therefore in effect minimized to simply supporting contractor requirements.

## EFFECTIVE CRITICAL PATH MANAGEMENT DEMONSTRATED

While the above philosophy was clearly articulated, the SR 500 Project team actually took an active role in construction scheduling to effect a considerable schedule improvement. Although this team did not have particular scheduling expertise within its own ranks as demonstrated by elaborate tools and trending techniques, it clearly understood construction staging and its effect on schedule.

Through a concerted effort over several months, the project team was able to define an alternative staging sequence late in the construction phase that yielded many weeks of schedule improvement. This effort involved a multi-discipline review that carried new risks and careful stakeholder liaisons.

The team relied on scheduling resources from the greater WSDOT organization to assess the effects of the new planning scenario on the existing construction contract to ensure the greatest positive schedule return was realized.

While planning and scheduling were the responsibility of the contractor and staging had already been defined in the contract documents, the project team seized the opportunity to define an improved scenario. As noted, the new strategy carried risks to third party stakeholders. Therefore, regional management support was required before contact was made to those stakeholders likely to be effected. The merits of the new plans and their measured risks were flushed-out with regional managers thus gaining their support and cooperation.

Through this team effort, the project was completed weeks ahead of the originally contemplated date. The efforts of this team provided an example of effective critical path management.

## CONTRACT WORK DAYS

One key deliverable at the conclusion of the PS&E phase is the development of a construction schedule. This schedule is reflective of WSDOT plans and specifications representing the scope of the project. The purpose of this schedule is to determine a fair and reasonable duration for construction that will be specified in the contract documents. This duration is expressed in work days.

All example projects reported producing such a schedule which formed the basis for their construction phase contractual duration. The manner in which this schedule was developed varied from project to project with WSDOT and/or consultant resources participating in the effort.

WSDOT administered the subsequent construction contract with work days evaluated on a daily basis per WSDOT specification 1-08.5. Project engineers generally relate schedule completion to the remaining number of work days. However, a translation from remaining work days to a calendar date completion was not always performed.

While half the project engineers easily translated their specific situation of working days to a calendar date, the other half found it difficult to convey where their project completion stood against a specific calendar date.

This is relevant in critical path management in as far as the basic computation of a planned finish date versus an expected finish date provides the measure of float, or flexibility in the schedule.

## WSDOT MAINTAINED CONSTRUCTION SCHEDULE

Unlike the other projects reviewed, the I-90 Expansion Project team maintains a fairly elaborate WSDOT construction schedule in parallel with the contractor's. The WSDOT schedule incorporates the remaining elements and phases on the project to provide a global perspective of how independent efforts leading to key interfaces were progressing. The I-90 team approach affords the access to a schedule, developed in software in which they were proficient, for regular "what-if" exercises where alternative sequencing and interface scenarios are explored.

This project team reported that the perspectives afforded through the maintenance of their own schedule tool were invaluable. They shared that the understanding of potential schedule scenarios through regular simulations provides added strength to their management capabilities.

Additionally, they indicated that their regular development of construction schedules for the determination of contract working days is improved through the maintenance of their own construction schedules. They reported that through the schedule maintenance process, they maintain a constant pulse on production rates, contractor work plan strategies and equipment utilization patterns. These perspectives provide a strong foundation for establishing realistic work day provisions.

## WSDOT STANDARD SPECIFICATION

Contractor responsibilities for schedule development and maintenance are specified in WSDOT's standard specification 1-08.3. However, the specification provides WSDOT with little perspective on the contractor's schedule when the project is large and/or complex. For example, a requirement for the delineation of logic ties between activities is not specified. Such a requirement would clarify the nature of the relationships and any associated lags. Such schedule details are available through the review of the electronic copy of the schedule. However, delivery of an electronic copy is also not specified. The current specification is, in part, a reflection of WSDOT's theory that specification 1-08.3 is suitable for all projects.

Several example projects used contract special provisions to augment specification 1-08.3. These teams considered the standard specification insufficient in prescribing WSDOT requirements to maintain a proper perspective on contractor scheduling.

## EXAMPLES OF STANDARD SPECIFICATONS FROM OTHER COMPARABLE PUBLIC ENTITIES

Many public entities who are engaged in major capital programs have more than one specification for schedule maintenance. These entities include the California Department of Transportation as well as numerous transit agencies and public works organizations throughout the country. The schedule maintenance specifications of these organizations are calibrated for the size and complexity of projects. Generally, specifications for small routine projects require less stringent deliverables and outline few schedule development restrictions. Conversely, specifications for large and/or complex projects have sophisticated requirements of the deliverables and may include restrictions on schedule development as well as other appropriate provisions.

On larger projects, as typified by the example projects reviewed in this study, other public entities are seen regularly including the following *minimum* provisions in their specification:

Requirements for the specific scheduling technique to be used, e.g. precedence diagram method

- Requirements for the timing of schedule submittals
- Delivery of electronic versions of the schedule
- Restrictions on the use of float suppression features
- Restrictions on the use of constrained dates
- Restrictions on the duration of activities

## NEW STANDARD SPECIFICATION

There is a Headquarters sponsored effort underway to update the current specification. However, the draft reviewed retains the one specification approach. This approach is counter to the nature of the capital improvement portfolio that features a broad range of projects. The draft version of the new WSDOT 1-08.3 specification, if applied to the large/complex projects, does not include all the minimum provisions identified above that serve to provide needed insight on schedule development and maintenance.

# CHAPTER III – RISK MANAGEMENT

## OVERVIEW

One of the important drivers that can influence overall project delivery performance is the effectiveness of the risk management process over the life of a project. Effective risk management involves a systematic process of planning for, identifying, analyzing and responding to threats and opportunities. Risk management strategies should minimize the likelihood and severity of unfavorable risks as well as maximize the likelihood of uncertain events with positive consequences. An appropriate emphasis on risk management can have a widespread positive affect on project performance.

## WSDOT RISK MANAGEMENT PROCESS IS EVOLVING

On all eight projects examined, the project engineers demonstrated a solid understanding of the threats that potentially put each project at risk. The processes for managing threats and opportunities appear to be evolving in the department. There are a number of individual initiatives underway in the department to incorporate more advanced and disciplined risk management methodologies. However, for the projects reviewed in this report, use of these methods was the exception.

## SIMILAR RISKS

The challenges the project engineers faced are not very different from region to region. To be sure, the eight projects grapple with the same basic threats. Each project engineer works toward minimizing harmful impacts to budget, schedule and scope commitments while seeking to minimize disruptions to the public.

The potential threats common to the eight projects include:

- Complex third party interfaces
- Limited construction windows
- Changing regulatory environments
- Funding vagaries that had the potential to cause disruptive stops and starts in project development
- Problematic real estate acquisition
- Unpredictable private parties, and
- Third party stakeholders' concerns including utilities and local governments.

## INFORMAL PROCESSES

Our findings show that the risk processes were largely unstructured, mostly informal and not documented. The precise methods followed by the project teams to identify, quantify, plan for and manage risks differed from region to region and even project to project.

Some good examples of risk management tools and strategies were at work on individual projects. These methods and approaches which are discussed in the section below could serve as templates for use on other projects throughout the department.

## OBSERVATIONS

## RISK IDENTIFICATION/PLANNING

A risk identification process determines which risks might affect a project and documents the nature of those opportunities and threats. A risk planning process provides a roadmap for how general risks will be addressed by the project team.

## FORMAL PROCESSES AT WSF

The Shaw Project conducted a structured and documented risk assessment to identify specific risk events that could affect the construction phase of the project. This WSF-specific risk assessment process resulted in various risk management tools that comprehensively identified and documented potential risks.

Appendix A provides a sample page of the Risk Response Log. This log provides the project team with a useful tool for tracking and monitoring risks. The process used by the Shaw Project Team is repeatable and scalable.

## RISKS WELL DOCUMENTED AT TRANSITIONS

Though risks were not universally documented on the example projects, they were formally documented at certain key transition points. For example, the SR 16 Project has planned for the transition from the design team to the construction team with a multi-discipline checklist and document library. This process appropriately addresses risks and project configuration issues. These transitions are discussed further in Chapter IV.

## DEPARTMENT INITIATIVES

Additionally, WSDOT has developed the Cost Estimation Validation Process (CEVP®) which is an advanced cost estimating process that incorporates a disciplined risk identification process and a Cost Risk Assessment (CRA) process. This CEVP® process is costly and complex and is designed to be used on large multifaceted projects.

Within the example projects only SR 16 had a CEVP® performed. The CEVP® addressed the entire Pierce County HOV program. The results were, therefore, fairly broad and not directly applicable to the SR 16 HOV project. Yet, the SR 16 Union to Jackson Avenue project engineer did indicate that the CEVP® process crystallized the importance of certain risks such as coordination with specific cities and created a keener sensitivity to those risks for the project team.

## RISK IDENTIFICATION NOT SYSTEMATIC

With the exceptions noted above, the risk identification process was unsystematic for the projects reviewed. As mentioned earlier, each project engineer demonstrated an understanding of project risks, but risk identification for most of the highway projects was a natural outgrowth of other project development activities, rather than as a distinct and concerted process in and of itself. Commonly, we observed that risks were identified as part of routine project status reviews, weekly meetings, and through ongoing evaluations during the life of the project.

Given the informality of the process, the individual project engineers' knowledge and experience greatly influenced the success of the process. The projects demonstrated that formal risk planning is not taking place early in the project life cycle nor are approaches to risk management incorporated in project management plans.

## QUALITATIVE AND QUANTITATIVE ANALYSIS OF RISKS

Qualitative and quantitative risk analyses are processes that assess the expected probability of events occurring and the potential impact of consequences. These risk analyses can range from rigorous statistical evaluations involving Monte Carlo simulations (i.e., CEVP®), to the department's modified Cost Risk Assessment, to a simple sensitivity analysis. The results provide project managers with a prioritized list of quantified risks to address as they manage project delivery.

## ANALYTICAL PROCESSES AT WORK

Two of the eight projects reviewed, Shaw and SR 16, demonstrated that an analytical process took place to prioritize risks. Interestingly, the Shaw project is the smallest project in our review and SR16 is the largest. As part of the construction risk assessment process discussed above Shaw developed a Risk Strategy Log as shown in Appendix B. The log describes the probability of risk events occurring and potential impact of those risks. Again, the CEVP® conducted on SR 16 demonstrates a quantitative analysis. The CEVP® analysis was performed at the program level and project results were not maintained through the use of a project-specific risk register or similar tools.

## INFORMAL AND UNDOCUMENTED PROCESSES WAS RULE

Measuring the probability and consequences of risks for the remaining projects was informal and undocumented. Risks were not formally ranked nor were risk response priorities based on systematic analysis. Yet, most projects provided examples of actions taken by the project managers that demonstrate that quantitative analysis takes place for individual risks perceived to be potentially significant. This analysis was used to support strategies for addressing individual risks. A review of the risks associated with the Southworth/Fauntleroy slip reconstructions resulted in combining the two projects into one effort to reduce disruptions to the public and gain efficiencies.

Another example is the Northwest Region where an analysis of the potential cost impact associated with delaying advertising the SR 527 project was documented and reviewed at various levels of management. An analysis of the potential cost impact associated with delaying the advertise date beyond the targeted January 2003 milestone was performed, documented and reviewed. However, the balancing of risks associated with moving forward to advertisement, were not documented.

In this instance, a concern about losing the construction funding loomed if commitments were not made quickly. Additionally, due to changing regulatory standards, direct cost impacts for an advertise date beyond August 2003 were estimated in excess of $ 2.7 million. These costs were related to redesign, additional real estate acquisitions and construction that would be necessary to comply with new standards. Compliance to new standards was forecast to delay completion two years.

The estimate for an additional $2.7 million and two years delay, together with the known funding pressures, provided a compelling rationale for proceeding forward with the procurement. However, as the PS&E phase progressed, these perspectives were not complemented by quantified analysis of the risks associated with proceeding without resolution of third party issues that were known to exist.

These unresolved third party issues later became the source of significant schedule delay to the contractor. These delays precipitated a new series of issues including potential contractual disputes. Perhaps more significant are the likely negative public perceptions associated with prolonged construction disruptions.

Several factors indicate that management took the proper course. On a cost basis, contractual disputes appear to be less than the $2.7 million estimate. With regard to schedule, it is clear WSDOT will be providing the public a meaningful benefit realized from completion of the project at least two years sooner.

Hindsight also indicates that had a complementary risk analysis been performed, the evaluated probabilities for the realization of third party delays would have been minimal. However, if realized, the delays would have been identified as having the potential for significant adverse schedule impact and additional costs.

Further, through a more formally structured analysis, WSDOT management response to the potential third party delays and recognition of a unique situation that required acceptance of a measured risk would have been quantified. It may have provided a more realistic staging of work, as well as an allocation of contingency dollars and/or schedule float into project plans.

No such recognition was made in the case of the SR 527 Project. Rather, the standard 4% programmatic contingency allocation was authorized. Current forecasts indicate costs at completion for the construction contract are higher than the programmatic contingency.

## RISK RESPONSE AND MONITORING

A risk response plan should describe the project team's approach for averting risks or pursuing opportunities, as well as define strategies to address risk events should they come to pass. Response plans are often documented in a matrix that identifies the risk event, the responsible party, the strategy and the status. Risk responses may take many forms to include:

- Schedule float and or/lag assignments
- Contingency and design allowance allocations
- Procurement refinements to address contract requirements
- Revised quality management
- Revised procurement strategies, i.e. owner supplies long-lead materials.

Good risk monitoring is an ongoing process throughout the life of the project and a risk matrix provides information that can assist the team in making decisions in advance of risk events. Risk response is the process of choosing strategies to avoid, transfer, accept or mitigate risks. It involves contingency planning and other specific actions.

## EXAMPLES OF EXCELLENT MONITORING TOOLS

The Shaw and SR 16 project engineers developed and used risk response matrices. The project engineers used these tools to manage progress at specific points in the life cycle. On the SR 16 project, a risk matrix was used to monitor the team performance in the ten weeks prior to going to advertisement. On the ferry project the risk matrix was used to manage and respond to construction risks.

## AD-HOC MONITORING THE NORM

Risk monitoring was far more ad-hoc and informal on the other projects. Yet, the assistant regional administrator(s) and regional administrators were included in the monitoring process whenever risks were perceived to have the potential for significant impact and expected to result in a request to change the authorized budget for a phase of the project or to slip a schedule commitment. The Eastern Region used the monthly meetings and associated confidence reports as a tool to systematically review and address risks. Confidence reports are now generated for all Nickel projects.

## CHANGE PROCESS AS TOOL TO TRACK IMPACTS

Changes that are expected to alter programmatic funding on Nickel Funded projects as well as other key projects with significant visibility were monitored by executive level staff through the Quarterly Meetings.

Executive level management use the Quarterly Meetings and their corresponding Quarterly Presentations and Reports to keep current on potential concerns. Based on the example projects, these quarterly meetings have bolstered a cultural focus on reporting potential significant project changes.

## RESPONSE PLANNING GENERALLY INFORMAL

Risk response was generally informal and handled slightly differently from region to region and project to project. In several instances project engineers were proactive. For example on SR 500, the project engineer aggressively sought to take advantage of identified opportunities to compress the construction schedule as described in Chapter II.

## RESPONSIBILITY FOR RISK ASSUMED

More often than not the responsibility for managing a particular risk was assumed to be assigned to the specialist responsible for that element of work. Generally, the subject matter expert in conjunction with the project engineer would assess the risk and evaluate alternative responses. These informal processes seemed to work more effectively in the smaller regions in which project staff had ready access to resources and long-standing working relationships.

## MANAGING TECHNICAL RISKS EFFECTIVELY

Although the process was informal, project teams appeared to be managing technical risks effectively. Project engineers demonstrated appropriate response strategies to technical issues. For example, provisional sums were used in the construction contracts as a way of accepting risks. (Provisional sums are set-aside contract dollars to cover elements of work that are anticipated, but whose location, extent and/or timing is uncertain, e.g. encountering boulders in pile driving operations. The provisional sum in the contract sets a value for addressing such risks with

measuring and compensation protocols identified.) In addition, some project engineers used special provisions to augment schedule specifications to better equip themselves in schedule management.

## THIRD PARTY RISKS MORE PROBLEMATIC

Responses to third party risks were less consistent from project to project, particularly in dealing with local jurisdictions and utilities. In some regions the relationships with local jurisdictions proved difficult. But in others, project engineers were able to work proactively and establish effective partnerships with local stakeholders. In the Olympic Region a few project engineers reported receiving training in public partnership and used that training to develop helpful alliances. The WSF project engineers demonstrated an ability to work with stakeholders, schools, inter-modal operators, and also demonstrated that they knew when to call on private expertise to facilitate better working relationships.

When a third party had an adverse impact on the project, the front-line project engineers were resistant to being held accountable for outcomes that the project engineers could not completely control. In those instances the project engineers defined their role as limited to monitoring and reporting progress against third party risks.

## OPPORTUNITIES TO RELATE ALLOWANCE AND CONTINGENCY TO RISK LEVELS

All six highway projects, despite varying levels of risk, set the project budget with a standard percentage construction contingency.[11] On the SR 527 Project, the project engineer for construction was held accountable for a budget that had a standard construction contingency even though the project risks were considered to be higher than normal. In contrast, WSF approached contingency differently. On the Shaw Project for example, the contingency that was set-aside for the construction was directly related to the evaluation of project-specific risk.

During design development, project teams indicated design allowances were incorporated into the project cost estimate. The approaches to allowance allocation varied from project to project. Allowances were not readily traceable nor were they systematically applied based on a department standard.

[11] A standard 4% of the construction contract award amount is budgeted for contingency currently on Highway projects. WSF contingency allocation for construction is based on an assessment of specific risks.

# CHAPTER IV - REPORTING

## INTRODUCTION

The focus of the project reporting review was to gain an understanding of the project reporting systems used by WSDOT to communicate project status with regard to critical path and risks. A high-level evaluation of reporting for the example projects was conducted to determine consistency, timeliness and general effectiveness.
Information in the reports was not tested or verified.

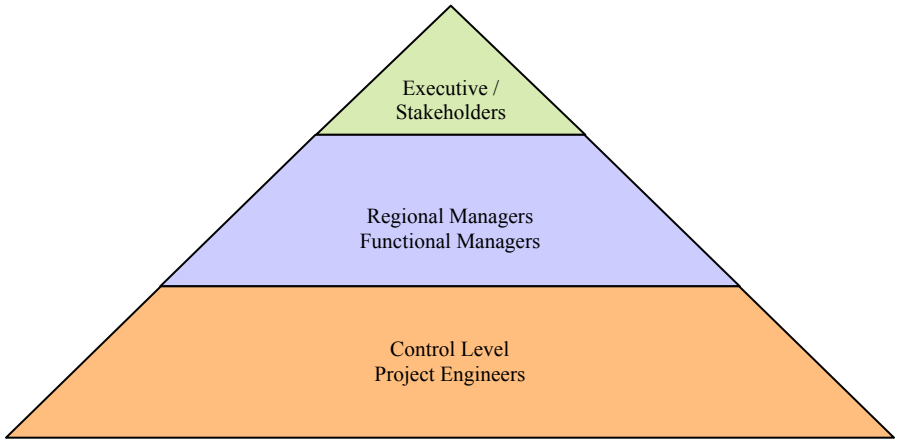



**Figure 1 - Model Reporting Pyramid**

In a model reporting environment, the detailed information used by project engineers to control resources, determine the specific status of activities and deliverables, and produce forecasts of schedule and cost performance, would serve as the foundation for higher level reporting. Figure 1 illustrates the model reporting environment in pyramid form.

The pyramid suggests that the project control details developed by the project engineers should be rolled-up into summary level reports for functional/regional managers, and then further summarized to provide executive management and external stakeholders with key status reports.

Through this chain of reporting levels, project budget and schedule information should be consistent and traceable. Ideally, data used to generate all three levels of reports would be automatically linked.

Project status reports were evaluated against the following criteria:

Reports should:

- Provide a current perspective of project status and plans
- Be flexible enough to furnish necessary information to a variety of intended audiences
- Be standard enough to ensure that information is timely, transparent, accurate, and consistent
- Use clearly defined and easily understood metrics that reflect WSDOT project delivery values
- Provide accurate values for progress, analysis and plans for maintaining baseline schedules and budgets
- Offer insight into the future as well as a snap shot of the present.

## GENERAL REPORTING CHALLENGES

WSDOT demonstrates a continuous effort to produce quality reports that offer transparency and accountability. To meet this objective WSDOT must rise above two challenges:

1. Outdated systems that are not effectively supporting project management needs
2. Balancing regional autonomy and entrepreneurial project delivery strategies against the need for standardized reporting and accountability.

## DEPENDENT ON OUTMODED DATA SYSTEMS

Unfortunately, WSDOT is dependent on various outmoded systems that make data linkages difficult. Important project data resides on different reporting platforms and the data from these systems are not effectively integrated.

The multiple systems related to WSDOT capital project delivery include:

- Capital Program Management System (CPMS)
- Project Delivery Information System (PDIS)
- Primavera Project Planner for the Enterprise (P3E)
- Construction Contracts Information System (CCIS)
- Transportation Reporting and Accounting Information (TRAINS)
- Financial Information Retrieval System( FIRS)
- Estimates and Bid Analysis System (EBASE)
- Contract Administration and Payment System (CAPS).

Reports at different levels of the reporting pyramid for the example projects were disconnected and lacked continuity. Many of the reports formulated by project engineers were pieced together manually from multiple systems. Reporting from the various systems involves manual manipulation and project engineers routinely used supplemental supporting spreadsheets to manage and analyze information.

Efforts to manually transfer report data into useful formats raise opportunities for error and expose the department to potential reporting inaccuracies. This presents significant challenges to WSDOT in maintaining timely reports that offer the transparency and accountability desired. It also diverts valuable staff resources from performing analysis and focuses them more on data preparation and reconciliation.

## DECENTRALIZATION VERSUS STANDARDIZATION

To facilitate the model reporting pyramid that produces an upward flow of consistent and summarized reporting information, a common structure of grass-roots level data is required. Also required is a common project management language that ensures correct and disciplined use of terms for clear communication.

For the most part, the example projects did not have these grass-roots requirements established and/or instituted. As a result, the projects gathered and reported different types of information and data, in varied ways. As the report material was filtered up, it became subject to interpretation and/or restructuring to conform to regional or department norms. Accordingly, while regional and

department reporting structures and requirements were recognized, the basic material from which these reports were built was not standardized. Effectively, a top-down approach to reporting had been instituted without the supporting processes and tools to affect its efficient delivery.

This is now being addressed by several WSDOT initiatives including most notably the development of PDIS. With the Master Deliverable List serving to develop a common work breakdown structure, the task of consistent summarizing of tasks and related budgets will be simplified (see Chapter II Critical Path for a related discussion).

## REPORTING LEVELS

## PROJECT CONTROL/ PROJECT ENGINEER LEVEL REPORTS

At the working level, project status was communicated upward and to the project team through a variety of reporting tools including meeting minutes, e-mails, ad-hoc reports, home-grown spreadsheets, as well as some regionally-developed standard reports. There were few department-wide standards at work at this level. Table 3 provides a list of some of the tools used by the example projects.

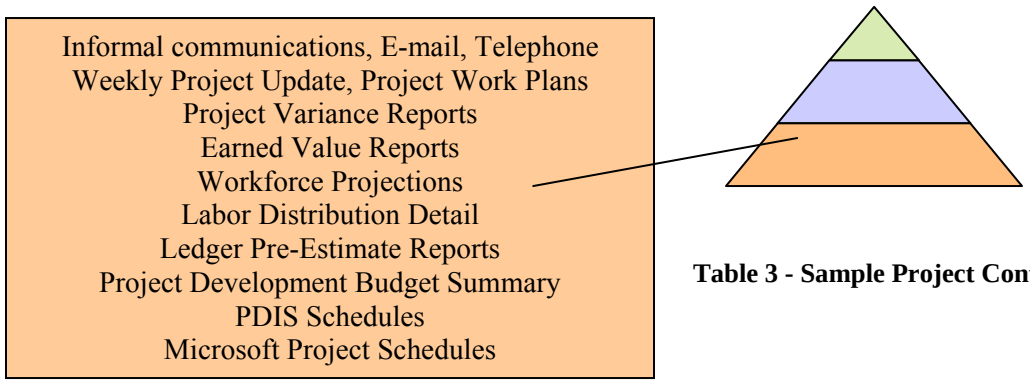



**Table 3 - Sample Project Control Reports**

## SPLINTERED VIEW

One common weakness noted was that most reports focused on a single project phase or even a single segment of a phase. As a result, the total project perspective was lost. This splintered view made it cumbersome to measure total project performance and led to inconsistencies and confusion on some of the example status reports. This fragmented view of projects is discussed further in Chapter V.

The term project was used by the staff managing and monitoring projects to mean different things at different times. The imprecise project definition contributed to confusion among staff and made it challenging for them to readily provide interviewers with a global project perspective.

Moreover, WSDOT staff seemed to struggle to define a project consistently in terms of budget and schedule. A factor contributing to the confusion was that varied criteria was used to establish a work item number (WIN) and a program item number (PIN) for the example projects.

From a programming perspective WSDOT uses PIN and WIN numbers to identify projects. In some instances, projects are defined as a unique PIN and in other instances projects are made up of multiple PIN(s). For the two WSF projects, multiple projects were associated with a single PIN and a single project was associated with multiple PIN(s).

These inconsistent practices make it challenging to trace projects through the various systems and provide opportunities for discrepancies in reporting. WSDOT staff indicate that it is working to define projects with a single PIN. However, it has proven difficult to put the one PIN definition in place for complex projects with multiple stages and longer development periods.

The challenges around standardizing project identifiers are not completely controlled by WSDOT. Legislative decisions are sometimes made to fund stages of projects incrementally. Further the Legislature is now providing line-item appropriations for individual Nickel projects. This decision making process exacerbates the difficulty with keeping project identifiers consistent between WSDOT work management and funding processes.

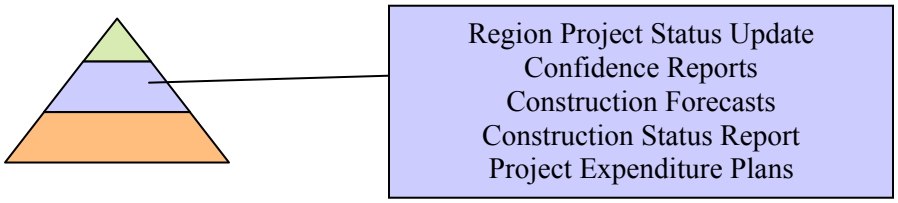
## EXAMPLES OF EXCELLENT REPORTS IN THE CONSTRUCTION PHASE

Despite the narrow view of the project that teams often hold, there are some excellent reports. For example, both the Eastern and Northwest Regions have adopted a standard construction forecast report which provides important information about construction trends and a good early warning of potential cost overruns. These reports offer a complete budget-cost-forecast perspective in addition to the funding status of the project. Also, the discipline exercised in maintaining these distinct fiscal elements appropriately segregated was well demonstrated.

## REGIONAL AND FUNCTIONAL LEVEL REPORTS

Table 4 lists some of the key project reports available at the regional/functional level. There were few department-wide standards at this level. Most projects had a version of the Project Status Report Update available through the intranet, although the type and format of information varied.

**Table 4 - Sample Regional Reports**




## EXAMPLES OF QUALITY REGIONAL REPORT STANDARDS

Examples of high-quality regional reporting tools were observed on the example projects. Some of these reports could easily be adapted to be used widely through the department to improve accountability. The reports are flexible enough to support the unique qualities of each project.

For example, the Eastern Region Status Report illustrated in Appendix C for the I-90 Project provides Project Development Budget Summary and Construction Budget Summary status. The report also highlights accomplishments, challenges, and reports progress against schedule milestones.

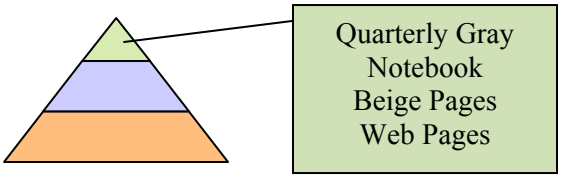
The Shaw Project also produced a quality Project Status Update as illustrated in Appendix D. The Shaw report is a valuable project score card and offers a total project view of status including trends and earned value.

In this regard WSF was unique in its evaluation and reporting of earned value. Earned value is a good integrated measure of project progress as it captures information about the completeness of work by comparing the budgeted cost of work scheduled against the actual cost of the work performed.

## EXECUTIVE/STAKEHOLDER REPORTS

The highest level of the reporting pyramid should provide summary level project status information that can be traced back through the various report levels. Table 5 identifies reports used at the executive level and for external audiences.

**Table 5 - Sample Executive Reports**




## THE QUARTERLY GRAY NOTEBOOK

The Quarterly Gray Notebook is the primary tool used for high level internal and external agency reporting. Each Quarter, the progress of the Nickel funded projects is reported in the Beige Pages of the Quarterly Gray Notebook. The Quarterly Gray Notebook is intended to provide timely, accurate, "no surprises" reporting on the capital program delivery. The Beige Pages provide both selected detail about specific project challenges as well as a broader programmatic view of status.

## WEB PAGES

In addition, WSDOT also maintains web-based project information. WSDOT is advanced in using the internet to provide various levels of project information. Information on the status of example highway projects is contained on project web pages. These web pages provide project descriptions, general information about the project timeline and expenditure plans.

As a standard, these reports provide important information regarding the funding commitments and expenditures against the expenditure plan. However, equally important data on project cost forecasts for particular elements and the project as a whole, as well as current trends against baseline budgets are not provided. In addition, the web makes available Quarterly Project Update Reports for Nickel Projects. For the example Nickel Projects, the format of the Project Update Reports information was fairly consistent from highway project to highway project.

The WSF web pages provided financial information from a programmatic view. The project information was a narrative that had not been kept up to date at the time of our review.

## WEB PAGE UPDATES AND CLARITY

Keeping the web pages up-to-date challenges the resources of several of the project teams. Several project web pages are many months out-of-date with current status.

The information on the web pages is also often confusing. For example, the I-5 Project web page of November 4, 2004, reported that the project was complete in the fall of 2003. The web page then goes on to highlight that there are five phases to the project and that the final phase "C" is in design but is not funded. The term Project is used in this web page to describe a single phase as well as multiple phases. The terms phase, stage and project are used interchangeably.

The Expenditure Plan from the web page as shown on Table 6 reports that the estimated Total Project Cost is $60 million, $44 million of which is unfunded. It is impossible to determine from this information if the phases that have been completed were within budget.

**Table 6 - I-5 Project Web Page**

**EXPENDITURE PLAN**

| Project Funding | Expenditures prior to 7/1/2003 | Remaining Funds | Total |
|---|---|---|---|
| Pre-existing State, Federal, and Other Partnership Funds | $13,308,355 | $3,126,204 | $16,434,558 |
| **Total Available Funding** | **$13,308,355** | **$3,126,204** | **$16,434,558** |
| Amount Required to Complete Additional Project Stage(s) * | | | $43,751,000 |
| **Estimated Total Project Cost** | | | **$60,185,558** |

Financial data is current as of 08/06/2004

* No additional funding source identified

WSDOT PIN(s): 100536N, 100536P

Note: Program Item Numbers (PINs) are used by the Legislature to keep track of financial data associated with a project or segment of work

Another example is the combined I-90 Project Total Project Cost Expenditure Plan, shown below as Table 7, and the June 2004 Quarterly Report Project Cost Summary, shown as Table 8. Both tables are taken from the same web page. There is a reported $5 million difference in total values for the Project between these tables. This variance could be easily misinterpreted to mean that there is a funding shortfall.

**Table 7 - I-90 Project Web Page**

**EXPENDITURE PLAN**

| Project Funding | Expenditures prior to 7/1/2003 | Remaining Funds | Total |
|---|---|---|---|
| Pre-existing State, Federal, and Other Partnership Funds | $1,530,691 | $32,579 | $1,563,270 |
| 2003 Legislative Transportation Package | $0 | $35,552,439 | $35,552,439 |
| **Total Available Funding** | **$1,530,691** | **$35,585,018** | **$37,115,709** |
| **Estimated Total Project Cost** | | | **$37,115,709** |

Financial data is current as of 8/6/2004

WSDOT PIN(s): 609029I, 609029V

Note: Program Item Numbers (PINs) are used by the Legislature to keep track of financial data associated with a project or segment of work

**Table 8 - I-90 Project Web Page**

**PROJECT COST SUMMARY**

| Project Cost Summary: | Dollars in millions | Percent of Total |
|---|---|---|
| **Preliminary Engineering** | $ 1.6 | 4.8% |
| **Right-of-Way** | $ 0.7 | 2.2% |
| **Construction** | $ 30 | 93% |
| **Funded Project Costs** | $ 32.3 | 100% |
| | | |
| **Nickel funds included in above costs** | $ 30 | 93% |

**Planned vs. Actual Expenditures** (Total Project Cost)


## WEB PAGE FOCUS

As of November 9, 2004, the SR 527 Project the web page did not contain a financial table. Instead it stated that the project was fully funded. The web page does not provide a perspective on how the project is expected to perform against budget. At the time of the project team interview in late September, construction costs were forecasted to exceed authorization levels (see Chapter III for a discussion of these projected overruns). The focus of web page reports is on funding rather

than project costs. While this focus may be appropriate for some audiences, it does not provide important insight into accountability for cost performance.

# CHAPTER V - ORGANIZATION

## OVERVIEW

Organizational structures for capital projects reflect a broad set of parameters that include: workload; the nature of staff and their availability; technical interfaces; external influences; control issues; project complexities; and policies.

Once established, a clear understanding of relationships and responsibilities within the organization is needed to effectively manage, and coordinate efforts focused on the stated objectives of the project.

Review of the organizational structures employed by the example projects was designed to identify the strengths and weaknesses of such structures as they relate to delivering capital projects.

## OBSERVATIONS

## ORGANIZATIONAL STRUCTURES FOR PROJECT DELIVERY

The example projects display various combinations of organizational structures and complexities. Generally, the WSF structures demonstrate a strong matrix while highways feature a combination of structures.

Despite the differences in structure and the related strengths and weaknesses of each, the structures appear appropriately reflective of specific regional circumstances. Further, the structures observed for capital project delivery are adequately orientated to the needs of the project.

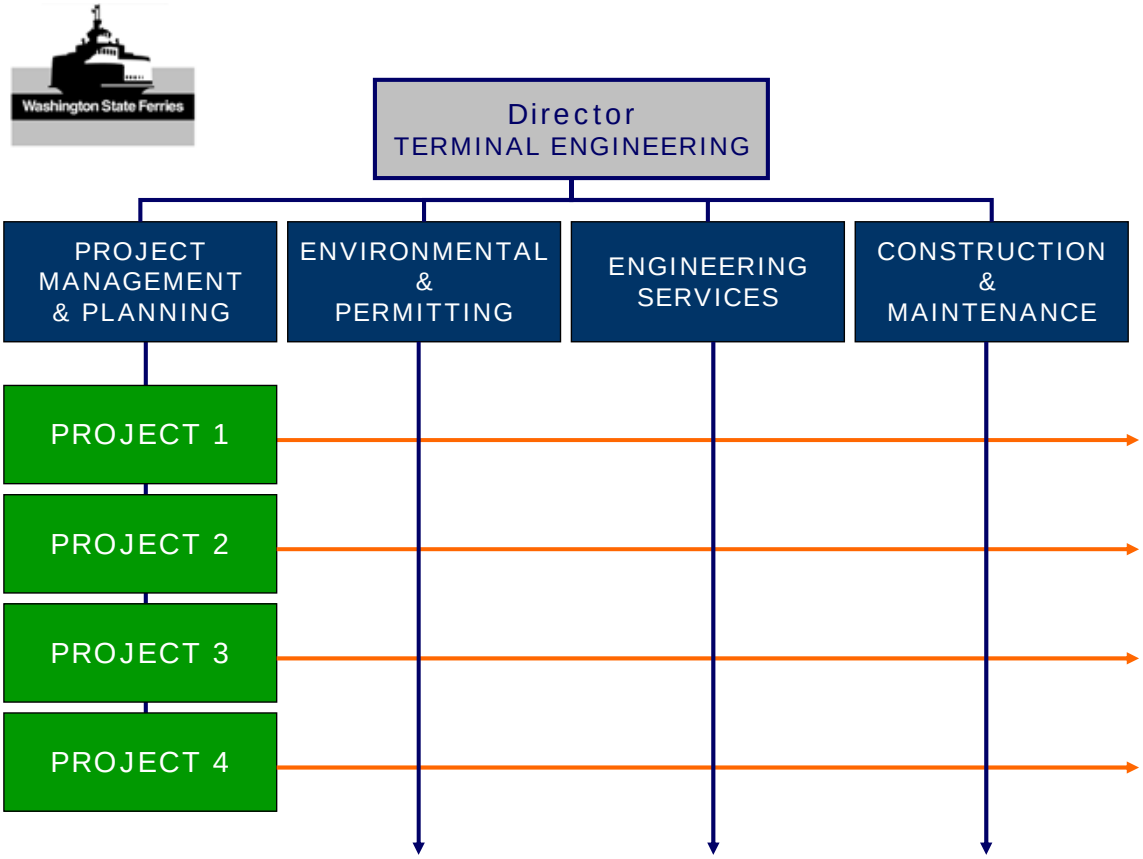
## WSF STRUCTURE

The WSF example offers a classic strong matrix in which the project manager has more influence over the performance of the assigned staff relative to functional managers.

The WSF structure reflects the emphasis on preservation and improvement projects within the Terminal Engineering Section. It is balanced and consistent with successful structures in use by other comparable public entities engaged in large capital programs.

Figure 2 depicts the WSF structure.

**Figure 2 - WSF Capital Project Matrix**




## WSF MATRIX STRENGTHS AND ADVANTAGES

The matrix affords WSF:

- Utilization efficiencies and related cost benefits
- Ensures that a strong technical base is available to projects
- Facilitates a rapid response capability for projects as changes come about
- A compatible model for the roles and responsibilities of managers which are clearly communicated and understood
- A balance between functional and project interests.

## WSF MATRIX CHALLENGES

The classic two-master challenge for staff working in a matrix setting is present at WSF. However, the manageable division size and progressive character of project management practices lends a cohesive spirit to the teams interviewed.

## PROJECT DELIVERY SPONSOR WITHIN TERMINAL ENGINEERING

The position of Manager - Project Management & Planning, is key to how the WSF structure operates and is successful. Responsible for all project and program development aspects, this manager works to ensure that policies, strategies, processes and human resources are all aligned to

effectively deliver the WSF capital program. With all project managers reporting to this position, this manager effectively directs project teams through budget oversight, schedule, and project manager assignments.

The Manager - Project Management & Planning, serves at the same level as functional managers who control resources vital to project development and that are assigned to project teams. This stature ensures that program and project interests are considered when technical and/or management issues arise, e.g. resource prioritization.

## HIGHWAY STRUCTURES VARY REGION TO REGION

The highway projects reviewed demonstrate a far more complex combination of organizational structures. These structures are multi-dimensional with basic commonalities at the project team level. From there, the differences extend in several directions reflecting the manner in which the project team interacts with the balance of the region.

## THE HIGHWAY PROJECT TEAM HYBRID MATRIX

All project teams demonstrate a hybrid matrix organization at the project team level. This hybrid combines both a strong and weak matrix into a project team.

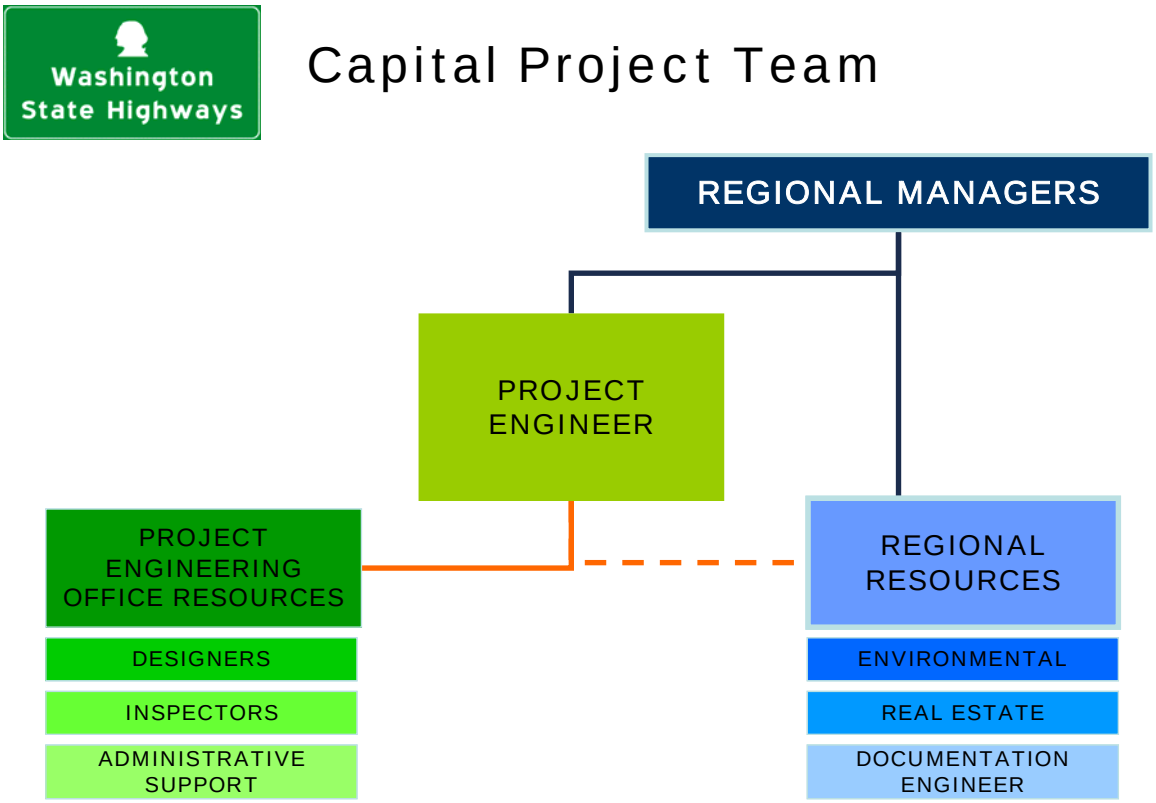
The strong matrix portion features the project engineer and their staff. The project engineer exercises control over deployment of this staff and is the sole administrative manager for this resource pool. Deployments are based on the project engineer's determination of need taking into consideration workload, capabilities and priorities within the project engineer office. Typically, this staff is comprised of designers, administrative support and inspectors.

The weak matrix portion is a function of regional resources made available to projects by regional managers. These regional resources answer administratively to managers within the region other than the project engineer. Project engineers regularly lobby for these regional resources consistent with their established priorities. This lobbying is usually through the office of the Assistant Regional Administrator (or equivalent). These resources typically include environmental expertise and real estate services.

In most cases, the example projects reported that they received high priority allocations of regional resources owing to their project's high priority designation within their respective regions. In only one instance was there a question as to whether regional resources were commensurate with schedule and complexity issues.

Figure 3 depicts this hybrid project team matrix.

**Figure 3 - Highway Capital Project Team**




## THE PROJECT TEAM AS A FUNCTIONAL OR PROJECTIZED UNIT

Once the project team is identified, one of two scenarios defines how it operates within the region:

1. A functional structure whereby the team plans for transitions at the conclusion of the PS&E phase
2. A projectized structure whereby the core team remains with the project from design through construction.

## FUNCTIONAL STRUCTURE

In the functional structure, the design project engineer leads the team through the PS&E and the procurement efforts, followed by a formal transition whereby the construction project engineer assumes leadership. The respective project teams associated with each project engineer above are also transitioned.

Protocols to effect transitions of projects under these circumstances are developed and followed with demonstrated discipline. These protocols include considerable coordination by the receiving construction project engineer during the latter stages of the PS&E phase which includes a constructability review.

## TRANSITION AND ISSUES OF ACCOUNTABILITY

As discussed in Chapter III, in at least one project where a transition was planned, the review of the designed project by the receiving project engineer identified specific issues related to construction risk. Consistent with typical practice, a standard 4% construction contingency was provided for this project. However, as the assessed risk and programmatic contingency were not aligned, the construction project engineer was challenged with unrealistic expectations.

This example raises questions related to accountability. Namely, should the project engineer performance of delivering the project be judged against the contract with programmatic contingencies, or rather against the specific assessed risks determined to be present?

Notwithstanding the transition protocols, under a planned transition strategy, it was observed that on some projects the lost continuity was detrimental to the project. These projects also suffered from attrition rates and lost funding events, e.g. Initiative 695, which contributed to the perception of continuity issues. The fact that many projects were disrupted by lost funding has clearly adversely impacted effective continuity. This is evident in various forms and includes, within the context of organization, issues of performance and accountability.

## PROJECTIZED STRUCTURE

The projectized scenario is a developing trend in WSDOT's highway projects referred to as the cradle to concrete approach. This approach works to maintain a single project engineer (and their project team) from design through construction. The intent of this approach is two fold:

- To foster development of staff with complementary design and inspection expertise
- To create a greater sense of responsibility for the project as a whole.

With regard to staff development, the full spectrum of design and construction responsibility is seen as a means to enrich individual's capabilities as well as stabilize staffing requirements through winter (non-construction) seasons and downturns of backlog.

Greater responsibility is demonstrated as fruition of the merits and liabilities of the design and constraints built into the project are experienced by the same core-team rather than passed on to others. An emphasis in doing it right the first time is accented through this structure.

This cradle to concrete approach was seen employed, in one form or another, on three of six highway projects reviewed: SR 500; SR 161 and I-90. In these three examples, it is embraced as a positive organizational advancement.

In the Olympic Region, the cradle to concrete approach is not being applied to larger design offices where a functional approach is the chosen strategy. In such instances, benefits realized from design efficiencies are seen as overshadowing the merits of the cradle to concrete approach.

## REPORTING LINES FOR PROJECT ENGINEERS

The final structural dimension to the highway organization involves the reporting line of the project engineer to management.

### Project Sponsors

In the Eastern and Olympic regions, regardless of the functional or projectized scenario discussed above, the reporting line for the project engineer changes as the project advances from the PS&E

phase into construction. That is, while the project team may or may not be intact, the management sponsor changes.

In these two regions, there is no single representative designated to balance the interests of functional groups against those of the capital projects as the project progresses. Rather, the project's sponsor and advocate during project design is the Assistant Regional Administrator (ARA) for Project Development. When the project is in construction, the sponsor and advocate is the ARA for Construction. In addition, under this arrangement, it is common that one project engineer with their portfolio of projects in different phases, will report to two ARAs.

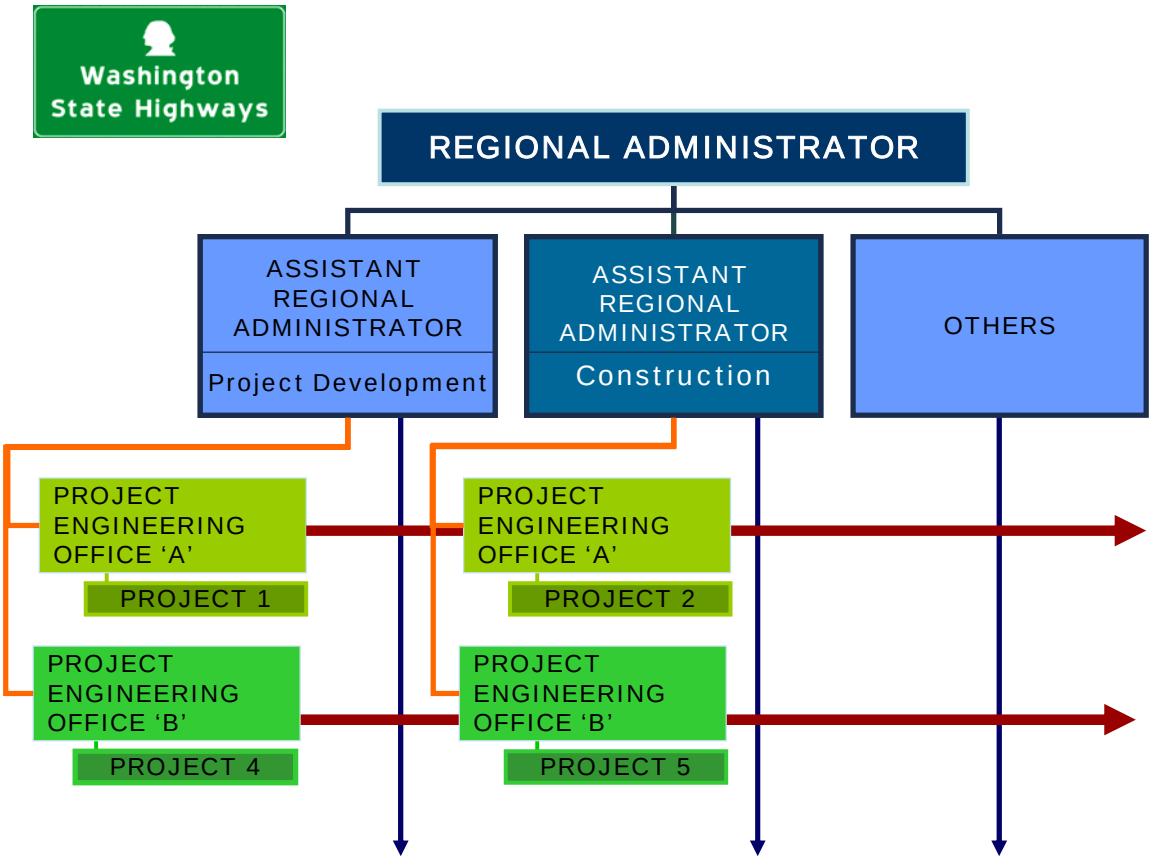
Under the above circumstances, the ARA's responsibility is split between functional and project lines which often times are competing interests. These competing interests can manifest themselves in resource allocations, interpretations of compliance to standards, or in a similar manner that effectively places the project behind functional roles within the region or the department.

Figure 4 depicts how these reporting lines are configured as the project progresses.

The Southwest Region has a similar circumstance built into its structure due to the fact that the equivalent to the ARA shares functional and project responsibilities. While there is only one project sponsor throughout the project's execution, the Southwest Region sponsor has similar competing interests between functional groups and capital projects.

The Northwest Region assigns project sponsors (ARAs) based on a geographic area within the region. This arrangement provides a dedicated role for the sponsor from project definition through construction. Unlike the other three highway regions observed, this organization affords a constant sponsor and focused attention to the capital project. This arrangement is similar to the WSF model of the Project Management Office discussed above. With the size and complexities of the region, an intermediate management level between the project engineers and ARA was observed that functions to reduce the immediate control span of the ARA which would otherwise be too large to be effective.

**Figure 4 - Highway Project Engineer Reporting Lines**




## ROLES & RESPONSIBILITIES

Documented project-specific roles and responsibilities for project teams and regional managers were the exception among projects reviewed. While these traditional forms of clarification serve to reinforce structures, their absence on most projects served notice that there is a reliance on informal understanding rather than formal delineation.

To be sure, most project engineers and regional managers interviewed have enjoyed a long tenure with WSDOT. Accordingly, despite numerous changes in organizational structures and strategies within regions, most individuals are able to articulate how their respective structure operates. In addition, many of these individuals can also relate how WSDOT initiatives related to project management now underway effect their responsibilities.

## LIMITED RESPONSIBILITIES

In the example highway projects there is a disconnect in the articulated roles and responsibilities for project engineers managing projects. These project engineers readily accept responsibility for the phase they are authorized to work. However, they do not acknowledge responsibility for other phases of the project.

For example, if a project is in the PS&E phase, the parallel real estate phase or resource agency permitting effort may be considered the responsibility of regional staff or managers – not the project

engineer's. In one region, the Plans Preparation Manual indicates that the project engineer is responsible to "coordinate" with regional offices for permitting and real estate. Specific responsibility of the project engineer to secure real estate or permits is not found.

As a result, segmented accountability and responsibility exists on most projects. Meanwhile, executive management and the Project Control & Reporting Guide (October 2004) indicate that the project engineer is responsible for the delivery of the project. Defining the term "Project" may be at the root of this disconnect.

This ambiguity associated with a project definition was clearly demonstrated when each project engineer was asked the value of their project budget. Most project engineers responded with figures representative of the phase or contract in which they were engaged. Project engineers responding in this fashion reflect their view of the project and their responsibilities. Many project engineers had similar responses to inquiries related to schedule and the critical path which reflected the phase, segment or contract under their supervision. This view contrasts to the global perspective portrayed in public reports, including the web-page reports.

As discussed in Chapter III, the definition of a project appears to be at the heart of many issues related to project management.

## COMMUNICATION WITHIN PROJECT TEAMS

Despite the organizational structure employed, it is apparent that informal communication flows freely within most teams and regions. Positive professional relationships built on years of association are evident.

Project engineers indicated that open communication existed through all levels of the team including regional management. In addition, as discussed in Chapter III, quarterly Executive Review Board briefings in each region offer a valued opportunity for project teams to communicate status, issues and risks with department executives.

## TRAINING

WSDOT's initiatives to improve project delivery include a curriculum and guide entitled Managing Project Delivery (MPD). While all project engineers reported that they had received WSDOT's MPD training, only a few regularly employed the concepts, tools and discipline incorporated in the curriculum. Acknowledging that many of the example projects were initiated before MPD training was available, in part, accounts for this situation. Another contributing factor is that the practices in the MPD guide have not been mandated. Rather they are available for application as deemed appropriate by regions and/or project engineers.

As indicated earlier, project engineers interviewed generally have a long history with WSDOT. Through their tenures, most have received a long list of training courses covering an array of subjects including both technical and management topics. All project engineers indicated that on-the-job learning and formal training opportunities equipped them to perform their management duties. Nonetheless, all indicated interest in further specialized training that could be applied to their project management assignments.

# QUALITY MANAGEMENT

Through the review of the example project organizations, the elements of quality management were explored to assess how it is integrated into project teams, where responsibilities for its practice are assigned, and to identify its impact on project delivery.

Consistent with industry accepted roles and responsibilities, all project engineers readily accept the responsibility for quality management on their projects.

## Quality Planning

Each project engineer is able to identify various quality control functions faithfully performed on their projects, demonstrating that quality control is actively pursued in all phases of project development. The WSDOT Design Manual and Construction Manual are often cited as the guide for defining what is checked, when it is checked, and how it is checked. Reference to these manuals indicate that they are the de facto quality planning document as no example project had developed a project-specific quality plan.

## Quality Control

The Project Management Institute (PMI)1 refers to quality control as the technical aspect of quality management. In this regard, WSDOT brings to bear a cadre of staff with specific expertise and credentials to review different elements of the project for conformance to standards.

In design, quality control functions are generally related to document reviews at various stages of development. These reviews, from a broad range of stakeholders, provide a comprehensive critique of designs that includes: code compliance; consistency; and constructability. Issues identified by reviewers are reconciled by the project team and documented thus properly closing the loop on the issues.

A complementary pattern of quality control functions in construction are cited by project teams that are focused on materials and their placement into the project. These functions are performed by inspectors from project engineer offices as well as by regional, and even Headquarters, resources performing sample testing of materials.

Project engineers universally conveyed a comfort level with the training and qualifications of those performing the quality control checks.

[1] The Project Management Institute (PMI) is a globally recognized leader in the practice and profession of project management. Through its extensive research, education and training, and development of professional standards, PMI is often a reference source for processes and practices in project management.

## Quality Assurance

PMI in its *Project Management Body of Knowledge, 2000* defines Quality Assurance as "…all the planned and systematic activities implemented within the quality system to provide confidence that the project will satisfy the relevant quality standards." Accordingly, quality assurance is the management aspect of quality management, in contrast to the technical aspect related to quality control.

In this context, the systematic activities are designed to ensure that the activities within the quality management plan will be properly performed.

These activities generally include:

- The identification of quality standards, in WSDOT's case, this would include the Design Manual and the Construction Manual
- A plan for the collection and use of data related to continuous improvement
- A plan for identifying and maintaining measures of quality performance, such as scheduled audits, ad hoc reviews and training
- The performance of quality audits by individuals not associated with the production phases of the project.

The project engineers on the example projects did not assume the responsibility for the quality assurance as defined above. Project engineers did not have designated staff dedicated to, or responsible for, quality assurance. In most instances, project engineers were not aware of specific quality assurance efforts that were performed on their projects. In two regions, quality audits were performed based on Construction Manual outlines. These efforts were directed by regional management. In addition, FHWA stewardship reviews were reported in construction that served to bolster quality assurance. Based on a recent informal review of a handful of other state DOTs that included a check on quality assurance practices, WSDOT is not different in this regard.

### Quality Control Emphasized

WSDOT has designed its quality management practice based on an aggressive and iterative quality control processes. These processes are performed by qualified staff who follow prescribed standards with demonstrated discipline.

The technologies built into the example projects are not complex. The features of each project have been designed and constructed by WSDOT time and time again. As a result, with the discipline exercised and the expertise of those performing the quality control function, the quality control records indicate that the projects are being delivered with the specified quality built into them.

However, the quality management program as practiced on the example programs does not measure performance as it relates to quality. Accordingly, data on specific aspects of quality is not available for study and possible improvement.

# CHAPTER VI – KEY RECOMMENDATIONS

BASED ON THE FINDINGS IN THE BODY OF THE REPORT, A NUMBER OF RECOMMENDATIONS HAVE BEEN DEVELOPED THAT ARE LISTED BELOW.

1. Adopt and implement risk management standards that require processes to formally identify, qualify and quantify project risks. These analyses should be scaled appropriately to suit the range of projects' complexity and size, and can be as simple as ranking the risks in terms of potential costs and the likelihood of occurrence. Further, risks should be documented and monitored by the team throughout the project life cycle
2. Consider using more risk-specific cost contingencies on highway construction contracts rather than a programmatic standard.
3. Project handoffs between project engineers and/or regional mangers should be minimized wherever possible. Where handoffs are planned, ensure systematic review of the project. In this regard, the Olympic Region model for managing project handoffs should be considered for wider application throughout the department.
4. Review WSF use of recognized project management software as a model for department-wide standardization of multi-dimensional project management software.
5. Undertake an effort to review the Master Deliverable List (MDL) and the WSF work breakdown structure to capture the breadth and efficiency of these two tools for department-wide standardization.
6. Revise the WSDOT construction standard specification 1-08.3, to include additional contractor schedule requirements for large projects, consistent with language contained in regular Olympic, Eastern or WSF special provision modifications to the specification.
7. Require immediate application of the Project Delivery Information System (PDIS) schedule standards for all highway projects.
8. Augment the breadth of PDIS schedules to include details of the construction phase thus ensuring the development of schedules that encompass all phases of the project.
9. Require that project engineers have demonstrated knowledge of scheduling theory and practice sufficient to effectively apply basic concepts, or manage their application on assigned projects.
10. Develop a strategy for improving the ability to share and integrate capital project data housed in numerous independent automated systems. In the interim, continue investigating opportunities to improve interfaces between IT systems.
11. Maintain original and revised schedule and budget values to appropriately gain a perspective of baseline performance through the life of the project.
12. Establish a clear discipline for the use of work item numbers (WIN) and program item numbers (PIN) in defining projects, and explore opportunities for using technology to crosswalk departmental definitions with funding definitions.
13. Adopt an updated standard glossary of project management terms for use by the whole department. These terms should be universally applied in all forms of communication.

14. Identify effective project and regional reports in use throughout WSDOT that can be adopted for department-wide use.
15. Ensure web page information is current and accurate through regular updates.
16. Standardize fiscal reporting on internal reports to include the status of total project budget, costs and forecasts.
17. Expand web page reports to include status on select schedule milestones of interest to external stakeholders.
18. Consider using earned value and other measures of project trends in standard reports.
19. Examine the character of executive-level and project-level reporting information to ensure there exists a consistent and efficient relationship.
20. Expand project manager's responsibilities in managing project's scope, schedule and costs to include deliverables produced by other regional resources, such as environmental documentation and real estate acquisition.
21. Require immediate application of Managing Project Delivery (MPD) course concepts, standards and tools as minimum standards for the management of projects, and establish a process to monitor their application.
22. Require project teams to document specific roles and responsibilities of key staff and support functions.
23. Review the current quality management practices for opportunities in which a broader quality assurance discipline may improve project performance.

| Number | Document | Date | Notes |
|---|---|---|---|
| 1 | Substitute Senate Bill 5748, Chapter 362, Laws of 2003, 58th Legislature 2003 Regular Session, State of Washington 58th Legislature; Transportation Performance Audits | May 2003 | Reference |
| 2 | Managing Project Delivery<br>Overlapping Disciplines for Successful Project Delivery | September 2004 | PM Guidance<br>Reference |
| 3 | WSDOT Improvement Program<br>2001-2003 Projects to Watch | November 2002<br>Month-end | |
| 4 | WSDOT Organization Chart | July 2004 | Provided By JLARC<br>Includes Capital Project Delivery |
| 5 | CD-Confidence Reports –WSDOT Capital Projects | August 2004 | Provided By JLARC |
| 7 | Department of Transportation Highways and Rail Programs Performance Audit Report 98-2; Prepared by Cambridge Systematics, Inc. for the JLAR Committee | March 1998 | Provided by JLARC<br>Background Reference |
| 8 | WSDOT 2003-2007 Business Directions | May 2004 Update | Reference |
| 9 | Measures, Markers and Mileposts; The Gray Notebook for the quarter ending | September 30, 2003<br>December 31, 2003<br>March 31 2003<br>June 30, 2003<br>March 31, 2004<br>June 30, 2004 | Executive Level Reporting Tools<br>Provided by Ken Smith |
| 10 | WSDOT Project Updates:<br>• SR 161, Corridor Improvements – 176th to 234th<br>• SR527 – 164th St. SE to 132nd St. SE additional Lanes<br>• I-5 -196th (SR 524) Interchange Project<br>• I-90 Argonne to Sullivan<br>• SR 16 HOV Improvements –Olympic Drive to Union Avenue<br>• SR 500 –New Interchanges and Additional Lanes | September 2004 | Provided by Ken Smith (from the WSDOT Web) |
| 11 | Excerpts from Transportation Capitol Project Management on Capital Program Management System, PDIS, MDL, CCIS, and Trains | Undated | Provided by Ken Smith<br>Synopsis of Legacy Systems |
| 12 | Getting Started, Working in CPMS, Reporting from CPMS, Learning more, Screen Samples, Report Samples, CPMS Fields, CPMS Tables, Month-End Schedule, Site Map | Undated | Reference |
| 13 | Quarterly Report Update for June 2004-I-90 Argonne to Sullivan | September 2004 | Provided by Ken Smith |
| 14 | JLARC Candidate Projects List | | Provided by JLARC<br>Reference |
| 15 | Project Control and Reporting Manual, Delivering the Program at the Project Level | October 2004 | Also Reviewed July 2004 Draft Version |

| Number | Document | Date | Notes |
|---|---|---|---|
| 16 | SR 16, Union Ave to Jackson –HOV- MPDIS Reports | September 2004 | Schedules |
| 17 | Summary of Adjustments to Project Delivery Through June 30, 2004:Presentation | August 2004 | Funding |
| 18 | Summary of Adjustments to Project Delivery Through May, 2004:Presentation | | Funding |
| 19 | Analysis of WSDOT Construction Cost Overruns | July 1991 | Final Report Reference |
| 20 | Southwest Region Fourth Quarter Project Delivery Meeting Agenda | | Reference |
| 21 | Highway Construction Program Delivery, South West Region, Month Ending Report | May 2004 | Reference |
| 22 | Summary of Pre-Nickel and Nickel Capital Projects, Transportation Performance Audit Board | May 2004 | Project List |
| 23 | Blue Ribbon Final Report, Paula J. Hammon WSDOT | November 2000 | Performance Measures Reference |
| 24 | Department of Transportation Ferry System Performance Audit Report 98-6, Prepared by Booz Allen & Hamilton, Inc. for JLARC | October 1998 | Provided by JLARC Reference |
| 25 | Standard Specifications for Road, Bridge and Municipal Construction 2004 | 2004 | Reference |
| 26 | Navigating the Roadmap<br>Roadmap to on-line Project Information<br>Version of Gray Notebook | May 2004 | Reference |
| 27 | WSDOT Current Law Budget 2005 – 2007 Adopted by the Washington State Transportation Commission | August 2004 | Reference |
| 28 | Certification of Enrollment<br>Substitute Senate Bill 5748 | May 2003 | Reference |
| 29 | Master Delivery List | Undated | Synonymous with WBS |
| 30 | Design Manual Revision 2004-1 | 2004 | Standards |
| 31 | Quality Assurance Specifications 4.2 User Manual | July 2004 | Reference |
| 32 | 2005-2007 Capital Improvement and Preservation Program – Project Detail | August 2004 | Budget Request Reference |
| 34 | 2005-2007 Capital Improvement and Preservation Program – Program Overview | August 2004 | Budget Request Reference |
| 35 | 2005-2007 Current Law Budget | August 2004 | Budget Proposal Reference |
| 36 | Olympic Region – Project Development Support Office Function | February 2002 | Reference |
| 37 | ESHB 1163 Section 214 Synposis | February | Reference |
| 38 | Programming and Operations Manual – Appendix B Glossary | April 2001 | Reference |
| 39 | VE Performance Measures – Briefing Materials | Undated | Provided by Ken Smith |
| 40 | PDIS - Briefing Materials | May – October 2004 | Provided by Jaime Selby |
| 41 | Cost Risk Estimating & Management Office – Briefing Materials | Undated | Provided by Monica Bielenberg |
| 42 | VE: How WSDOT Uses This Valuable Tool – Briefing Materials | Undated | Provided by Ken Smith |
| 43 | Final Draft Specification 1-08.3 | Undated | Progress Schedule AGC/WSDOT Admin Team |
| 44 | WSF Design Process Standards | July 2003 | Reference |

| Number | Document | Date | Notes |
|---|---|---|---|
| 45 | WSF Manual on Document Quality Control V 2.00 | August 2002 | Reference |
| 46 | Introduction to Project Scheduling | September 2003 | WSDOT Project Development Training Manual |
| 47 | Introduction to Project Development | August 2003 | WSDOT Project Development Training Manual |
| 48 | Managing Scope, Schedule & Budget | September 2004 | WSDOT Project Development Training Manual |
| 49 | Shaw Island Ferry Slip Reconstruction – Project Details (3 Volumes) | Undated | Varied Materials Provided by Lisa Parriott |
| 50 | Southworth/Fauntleroy Ferry Slip Reconstruction – Project Details (4 Volumes) | Undated | Varied Materials Provided by Joel Colby |
| 51 | SR 16 HOV – Project Details (2 Volumes) | Undated | Varied Materials Provided by Nancy Boyd |
| 52 | I-5, SR 16, SR 167 Tacoma/Pierce County HOV CVEP report to the Project Team | March 2002 | Provided by Pasco Bakotich |
| 53 | I-5, SR 16 and Tacoma HOV CVEP Study Materials | Undated | Varied Materials Provided by Nancy Boyd |
| 54 | Project Evaluations; Interview Topics and Sample Questions (8) | Undated | Notes from project Interviews One for Each Project |
| 55 | SR 500 Miscellaneous Project Details | Undated | Varied Materials Provided by Leon Winger |
| 56 | SR 161 Miscellaneous Project Details | Undated | Varied Materials Provided by Howard Diep |
| 57 | I-90 Miscellaneous Project Details | Undated | Varied Materials Provided by Darrell McCullum |
| 58 | I-5 Miscellaneous Project Details | Undated | Varied Materials Provided by David Lindberg |
| 59 | SR 527 Miscellaneous Project Details | Undated | Varied Materials Provided by Dawn McIntosh |
| 60 | WSDOT Capital Project Reviews; Project Data | September 2004 | Various Project Status Reports Provided by Ken Smith |
| 61 | Caltrans Standard Special Provisions – Progress Schedule 08-010, 012 & 015 | October 2002 | Reference |
| 62 | Caltrans Project Management Handbook | September 2002 | Reference |
| 63 | WSDOT Automated Training Management System; Recommended Training Plan | October 2004 | Each PE's Training File |

| SR 500 | SR 161 | SR 16 | I-5 | I-90 | Fauntleroy / Southward | Shaw Island | SR 527 |
|---|---|---|---|---|---|---|---|
| Leon Winger, Assistant Area Engineer (Construction) | Howard Diep, Project Engineer (Design & Construction) | Nancy Fenno Boyd, Project Engineer (Design) | David Lindberg, Project Engineer (Construction) | Darrel McCallum, Project Engineer (Construction) | Joel Colby, Project Manager (Design & Construction) | Lisa Parriott, Project Manager (Design & Construction) | Dawn McIntosh, Project Engineer (Construction) |
| Don Wagner, Regional Administrator | Steve Roark, Assistant Regional Administrator - Construction | Steve Roark, Assistant Regional Administrator - Construction | Lorena Eng, Regional Administrator | Keith Metcalf, Assist. Regional Administrator - Development | Russell East, Director - Terminal Engineering | Russell East, Director - Terminal Engineering | Lorena Eng, Regional Administrator |
| Bart Gernhart, Regional Engineer | Pasco Bakotich, Assistant Regional Administrator - Project Development | Pasco Bakotich, Assistant Regional Administrator - Project Development | William Vlcek, Assistant Regional Administrator | Ralph Robertson Assistant Regional Administrator Construction | Bill Green, Director - Program Development and Management | Bill Green, Director - Program Development and Management | William Vlcek, Assistant Regional Administrator |
| Rick Keniston, Project Development Engineer | Mike Morishige, Assistant Construction Engineer | Dave Ziegler, Project Engineer (Construction) | Patrick McCormick, Engineering Manager | Mike Frucci, Project Development & Construction Engineer | Lisa Parriott, Shaw Island Project Manager | Joel Colby, Fountleroy / Southward Project Manager | Patrick McCormick, Engineering Manager |
| Michael Williams, Engineering Services Manager | | Kathy Johnson Design Engineer | Sharif Shaklawun, Project Engineer | Bob L. Hilmes, Project Engineer (Design) | Eddy Chu, Terminal Construction & Maintenance Manager | Eddy Chu, Terminal Construction & Maintenance Manager | Richard Mitchell, Engineering Manager |
| Chuck Ruhsenberger, Area Engineer | | | | Harold White, Program Manager | | | Sharif Shaklawun, Project Engineer |
| Joanna Lowrey, Design Team Leader | | | | Gordon Hurt, Transportation Project Manager | | | |

## RISK RESPONSE LOG

**Project: Shaw Ferry Terminal, Slip Reconstruction**
**Date: June 12, 2003**

| Risk # | Priority | Risk Owner | Identified Risk Event | Monitor: Monitoring Plan | Trigger | Response Plan |
|---|---|---|---|---|---|---|
| | | | *Event causing impact -- List the event and the impact that it would have, i.e. - Weather slows down construction during closure causing a delay in re-opening.* | | | |
| | | | **Upland** | | | |
| 1 | | Mark | hit rock during trenching | Observe on site trenching operations | Hit rock or other type of obstruction | Stop trenching; consult Scott H or NW region Elec. Insp. Seek alternatives |
| 2 | | Lisa | archeological find during trenching | Archeologist: Archeologist on-site during Trenching | object found | stop trenching; respond appropriately; document in IDR |
| 3 | | | inclement weather | accept | | |
| 4 | | Scott | existing unidentified/poorly located utilities damaged during trenching | | | Contract already transfers risk to the Contractor |
| 5 | | | Rock prevents setting utility vault | accept | | |
| 6 | | Scott | Utility service not available (another emergency delays utility) | Mark/Roger/Scott: Communicate with Contractor and OPALCO | Notice from OPALCO | Use vessel backfeed to operate the transfer span. Leave temporary single phase feeds in place to power Toll Booth and Waiting Building. |
| | | | | | | |
| | | | **Foundation** | | | |
| 7 | | Dave/Tom | Driven pile/Micropile to sloping rock (effects trestle and bridge seat only) | Mark: Observes alignment for any evidence of pile "walking" during driving/drilling | Once rock is encountered, pile begins to lean upslope (or "walks") | Cease pile driving and initiate diver to begin chipping rock; For micropiles, driller should back-off on drilling torque and attempt to chisel rock with rock bit. |
| 8 | | Dave/Tom | Anchor fails because A) rock too fissured to hold or B) fissures leak grout | Mark observes contractor's micropile and anchor testing | Anchor moves more than 0.04 inches between 1 and 10 minutes, etc.. | Contractor informed micropile or anchor is not acceptable. Must redrill and retest. Secondary grouting possible with rock anchors. |
| 9 | | Tom/Dave | design errors | Virtually impossible to monitor or prepare for. | | Call Steve Whitman-Todd and chew him out! (it's obviously not Tom or Dave's fault, duh) |

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## RISK STRATEGY LOG

**Project: Shaw Ferry Terminal, Slip Reconstruction**
**Date: June 12, 2003**

| | | | | | After Implementing Selected Strategy | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Risk # | Risk Owner | Identified Risk Event | Strategy Summary | Cost to Implement Strategy | Probability of Occurrence as a Percentage | Impact to Project if Risk Happens | Contingency Set-Aside $ | Schedule Contingency in Working Days | Impact to Credibility L/M/H |
| | | *Event causing impact -- List the event and the impact that it would have, i.e. - Weather slows down construction during closure causing a delay in re-opening* | Avoid, Transfer, Mitigate, Accept | | % | $ | Expected Value (% x $) | | |
| | | **Upland** | | $ - | | $ - | $ - | | |
| 1 | Mark | Hit rock during trenching | | $ - | | $ - | $ - | | |
| 2 | Lisa | Archeological find during trenching | Mitigate: develop response plan | $ 500.00 | 10% | $ 5,000.00 | $ 500.00 | 7 | L |
| 3 | | Inclement weather | | $ - | | $ - | $ - | | |
| 4 | Scott | Existing unidentified/poorly located utilities damaged during trenching | Transfer | $0.00 | 10% | $0.00 | 10.00 | 0 | L |
| 5 | | Rock prevents setting utility vault. | | $ - | | $ - | $ - | | |
| 6 | Scott | Utility service not available (another emergency delays utility) | Accept | $0.00 | 1% | $0.00 | 10.00 | 0 | L |
| | | | | | | | | | |
| | | **Foundation** | | $ - | | $ - | $ - | | |
| 7 | Dave/Tom | Driven pile/Micropile on sloping rock (effects trestle/bridge seat only) | Mitigate:See Risk Strategy Log | $ - | 75% | $ 20,000.00 | $ 15,000.00 | 2 | M to H |
| 8 | Dave/Tom | Anchor fails because A) rock too fissured or B)fissures leak grout | Transfer: Contractor replaces anchor or micro | $ - | 2% | $ 20,000.00 | $ 400.00 | 2 | VL (very low) |
| 9 | Tom/Dave | Design errors | Mitigate by meeting with designers to develop immediate response plan (highly dependent on actual "error") | $ - | 10% | Highly dependent on structure affected | #VALUE! | One day to two weeks or more | L |
| 10 | Dave | Containing sediments during drilling | Mitigate:See Risk Strategy Log | $ - | 35% | $ 10,000.00 | $ 3,500.00 | 1 | M |
| 11 | Dave | Piles damaged during driving into rock and can't be cleaned out | Mitigate:See Risk Strategy Log | $ - | 2% | $ 1.00 | $ 0.02 | 1 | VL (very low) |
| 12 | Lisa | Drill equipment breakdown causes delay | | $ - | | $ - | $ - | | |
| 13 | Mark | Concrete cannot meet specifications | | $ - | | $ - | $ - | | |
| | | | | | | | | | |
| | | **Trestle** | | $ - | | $ - | $ - | | |
| 14 | Tom | Existing trestle layout differing from drawings | | $ - | | $ - | $ - | | |
| 15 | Tom | Existing trestle and pile conditions different from structures inspection | | $ - | | $ - | $ - | | |
| 16 | Mark | Rock drill equipment set up under WSF slip operation difficulties | Mitigate: large vehicle reservations during foundation work | $ 260.00 | 2500% | $ - | $ - | | L |
| 17 | Tom | Load limit on structure reduced even further after work begins. | | $ - | * | $ - | $ - | | |
| | | | | | | | | | |
| | | **Transfer Span** | | $ - | | $ - | $ - | | |

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## I-90/Argonne Road to Sullivan Road – Reconstruction

| | |
|---|---|
| **Project Manager:** | Gordon Hurt |
| **Project Description**<br>0L3515<br>RW4756 | • **This 4.18 mile project on I-90 in Spokane from Argonne Road to Sullivan Road improves mobility and capacity by constructing additional lanes eastbound and westbound.** |

**Accomplishments**

- Held a "project changes" meeting at the Region on 4/29/03.
- Met with affected utilities on 5/8. Region Utility office is working on necessary agreements.
- Met with Dick Thiel, City of Spokane Valley, on 5/8 to discuss the project, impacts on the City, work at the ends of city streets and the proposed detour route when Evergreen Interchange ramps are closed. Have set up a meeting with the City council on June 17 to go over the same information.
- Determined a turnback agreement with the City is not needed for the work at the ends of the city streets. RES is working on a construction easement for this work.
- Plans, specials and estimate to Region Plans office on 5/5/03
- Final set of plans and specials for printing turned in on 5/19/03.

**Current and Upcoming Activities**

- Finalize utility agreements.
- Present findings and recommendation of EB Evergreen on-ramp/Sullivan EB off ramp to Keith.
- Approval of Monumentation Map
- Project on ad May 27
- Special Provisions
- Survey Agreement

**Risk/ Challenges/ Issues**

**Action Plan to Resolve Outstanding Issues**

**Schedule** ***Book Ad date*** ***Scheduled Ad***

- Preparing for project for ad 5/27/03
  Bid Opening on 7/2

**Changes to Scope, Schedule or Budget**

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| Project Development Budget Summary | | | |
|---|---|---|---|
| | PE | R/W * | CN |
| Original CIPP | | | $27,918,000 |
| Current CIPP | $1,480,000 | $575,000 | $33,510,000 |
| Initial WO Authorization | $700,000 | $711,250 | $33,106,000 |
| Authorized WO Changes | $780,000 | $0 | $0 |
| Current Authorized WO amount | $1,480,000 | $711,250 | $0 |
| Spent to Date (4/30/03) | $1,480,852 | $579,424 | $0 |
| Authorized WO remaining Balance | ($852) | $131,826 | $0 |
| Estimate to Complete | $25,000 | $35,000 | $31,524,000 |
| Pending WO Changes | | | |
| | | | |
| Future Landscaping project PE **** | $80,000 | | $400,000 **** |
| Budget Confidence Level | H | | |
| % of Approved. Budget Spent | 100% | | |

- Authorized R/W Work Order amount is $711,250. CPMS plan amount is 576,110.

**** Book construction amount includes landscaping costs.

**Schedule Overall Rating: Good**

**Budget Overall Rating: Good**

| Construction Budget Summary | | | | |
|---|---|---|---|---|
| | CE | CN 000000 | Contingencies | Totals |
| Original CIPP amount | | | $1,360,000 | $28,000,000 |
| Total Current CIPP Project | $3,400,000 | $29,240,000 | $1,360,000 | $34,000,000 |
| Engineers Estimate for Ad** | $2,861,253 | $28,512,533 | $1,144,501 | $32,518,288 |
| Authorized WO at execution | | | | |
| Authorized WO Changes | | | | |
| Current Authorized WO Amount | | | | |
| Spent to Date | | | | |
| Authorized WO Remaining Bal. | | | | |
| Estimate to complete | | | | |
| Pending WO Changes *** | | | | |
| Total of Pending CO's | | | | |
| Total of Approved CO's *** | | | | |
| Budget Confidence Level | H | H | | |
| % of Approved. Budget Spent | | | | |
| ***Projected Excess or Shortfall*** | | | | $0 |

Utilities 100,000
State force 10,000
These amounts not included in the CN amount above.

Washington State Ferries

# PROJECT STATUS UPDATE

**STATUS DATE:** February 20, 2002 **PROJECT MANAGER:** Lisa Parriott
**TERMINAL(s):** Shaw Island
**PROJECT NAME:** Slip Reconstruction
**PROJECT DESCRIPTION:** This project includes trestle, passenger waiting and ticket booth buildings, bridge seat, transfer span, towers and headframe, tower foundations, mechanical and electrical systems, wingwalls, and dolphins replacement -3, new generator, potential dock expansion

**PROJECT WORK ORDER:** XL-1357 **PROJECT ID CODE (PIC):** Not Applicable
**PIN:** 999920A, 999920B, 999920C, and 989920D

| SCHEDULE: | Planned Start | Forecast or Actual Start | Planned Finish | Forecast or Actual Finish |
|---|---|---|---|---|
| Design Report: | Sept. 2001 | Sept. 2001 | April 2002* | |
| Permitting: | February 2002 | February 2002 | February 2003 | LAST PERMIT APP. APPROVED |
| Design: | May 2002 | May 2002 | February 2003 | |
| Ad Date: | February 2003* | February 2003 | | |
| Construction: | August 2003 | | Spring 2004 | |

*These dates reflect our compressed work schedule pending funding in the '01-'03 biennium budget, permits, and construction schedule.

| PROJECT STATUS: | In this section please write any appropriate narrative. |
|---|---|
| Earned Value | • This month's CPI=0.87. I anticipate this number will rise as the project status progresses. |
| | |
| Environmental: | • The BE and permit applications have been started.<br>• A benthic survey is scheduled for March 4, 2002.<br>• We are pursuing mitigation sites for increased overwater coverage.<br>• We're analyzing temporary floats vs. use of existing docks for our passenger only service. |
| | |
| Operations: | • Traffic counts are being collected by Mother Kateri.<br>• Leonard is pursuing passenger only boat availability |
| | |
| Design: | Geo-tech completed drilling. We're meeting them 2-20-02 to discuss foundations.<br><br>The public outreach plan was posted on WSF web site. Project flyers were mailed out to Shaw landowners. Internal public outreach plan meeting in March. |

# APPENDIX 4 – Proviso language in 2004 Supplemental Budget (ESHB 2474)

**Sec. 302(1)** The entire transportation 2003 account (nickel account) appropriation is provided solely for the projects and activities as listed by project, biennium, and amount in the Legislative 2003 Transportation Project List – New Law List under the heading "Nickel Funds" as transmitted to LEAP on March 11, 2004. However, limited transfers of allocations between projects may occur for those amounts listed for the 2003-05 biennium subject to conditions and limitations in section 503 of this act.

**Sec. 302(14)** The Department shall, on a quarterly basis beginning July 1, 2004, provide to the legislature reports providing the status on each project in the project lists submitted pursuant to this act to LEAP on March 11, 2004, and on any additional projects for which the department has expended funds during the 2003-05 fiscal biennium. The department shall work with the transportation committees of the legislature to agree on report formatting and elements. Elements shall include, but not be limited to, project scope, schedule, and costs. The department shall also provide the information required under this subsection via the transportation executive information system (TEIS).

**Sec. 503** A new section is added to 2003 c 360 (uncodified) to read as follows:

(1) The transportation commission may authorize a transfer of spending allocation within the appropriation provided and between projects as listed in the Legislative 2003 Transportation Project List - New Law to manage project spending near biennial cutoffs under the following conditions and limitations:

a) Transfers from a project may be made if the funds allocated to the project are in excess of the amount needed to complete the project, but transfers may only be made in the biennium in which the savings occur;

b) Transfers from a project may not be made as a result of the reduction of the scope of a project, nor shall a transfer be made to support increases in the scope of a project;

c) Transfers may be made within the current biennium from projects that are experiencing unavoidable expenditure delays, but the transfers may only occur if the commission finds that any resulting change to the Nickel program financial plan provides that all projects on the list may be completed as intended by the legislature; and

d) Transfers may not occur to projects not identified on the list.