Alaskan Way Viaduct & Seawall Replacement Program

U.S. Department of Transportation Federal Highway Administration | WSDOT | King County | City of Seattle

Final Report

Single Bore Tunnel Project Construction Strategies Workshop Expert Panel

March 9-11, 2009

Washington State Department of Transportation

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Alaskan Way Viaduct & Seawall Replacement Program

Single Bore Tunnel
Construction Strategies Workshop
March 9-11, 2009

Tunnel Industry Panel

Name	Expertise, Input
1. Brenda Bohlke	CHAIR. Geological, Tunnels, Management, current UCA President, SR 520 Tunnel Panel member
2. Jan Keiser	Engineer, Attorney, former Construction Counsel for Sound Transit, SR 520 Panel Member (Contracting)
3. Ed Plotkin	Former Engineer, Contractor, Owner – Consulting on underground construction and contracting, New York, Toronto
4. Jo Bhore	Extensive construction experience across US; presently consultant on San Francisco Central Subway for Construction Strategies and DRB in New York
5. Walter Mergelsberg	Former Director of Construction, Washington Metro System (26 years); currently with Dr-Sauer Corporation
6. Otto Braach	Former Hochief + Weiss and Freitag Chief Tunnel Engineer, TBM Expert, Consultant to Lake Mead Tunnel Project
7. Gianni Arrigoni	Extensive construction, plus international tunneling experience, author regarding contracting and delivery (see Annex, Mechanized Tunneling Book)
8. Richard Sage	Construction Manager for Sound Transit (10 years); extensive construction management experience with pressure face machine, CMAA, TRB Tunnel Committee

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Table of Contents

Appendices

Introduction

Following the January decision by the Governor of Washington in favor of a single large bore tunnel to replace the Alaskan Way Viaduct, a panel of tunnel industry experts was invited to assist the Washington State Department of Transportation (WSDOT) with the identification of alternative contracting strategies as one of the earliest steps in advancing the project. A three-day workshop was held March 9-11, 2009 and included eight members representing almost 300 years of collective experience as owners, designers, contractors, construction managers and attorneys.

The identification and evaluation of the alternative contracting strategies was based on the very conceptual level design associated with early project definition. It must be recognized that the panel members only had a limited time to become acquainted with, reflect on and understand the many complex issues associated with this project. Moreover, their formal meeting together only lasted three days. As a consequence, the recommendations set forth in this report are to be considered preliminary and are based on a few givens, such as the announced delivery schedule; basic tunnel configuration and alignments; the duration of the environmental process; and other assumptions.

The announced delivery schedule (target completion date) was December 2015 for the tunnel to be open to traffic. This was a primary driver throughout the Panel's deliberations and was instrumental in the identification of those activities which are on the "critical path."[1] It was immediately clear that a very aggressive and comprehensive project implementation strategy was needed to meet the target date of December 2015. This is a very optimistic target. The panel noted that the schedule to achieve that date carries significant risks of project delays from the early process and implementation phase through construction and build out. In particular, delays in the environmental approval process and projected date for the Record of Decision (ROD) changed from late 2010 to mid 2011 within the three days of the workshop (and in the absence of an environmental strategy). Other risks of project delays are numerous and include: project set-up and development and implementation of all the necessary management plans, risk assessment and management, contracting, geotechnical program, utilities and third party agreements, to name just a few. The panel used their time in this workshop to recommend a preliminary strategy based on aggressive management and decision making on the part of WSDOT management and aggressive assumptions, at the same time identifying those key activities that must be completed, in the very near term, to advance the project.

These key activities, henceforth identified as Recommended Immediate Action Items and defined in this report (see Appendix A), have been assigned to the person who will be accountable for resolving the issue within the time allotted and must be established in concert with that individual. Completion of the action items is essential to final implementation strategy, procurement strategy and final construction strategy. These recommendations require quick, clear and strong direction and support from the project management team and the agencies involved in delivering the project.

[1] The "critical path" is the path through the "task network" that defines the minimum completion time of the project. It is the shortest schedule that is achievable under the conditions.

Project Goals and Workshop Objectives

The most important goals considered in this workshop are:

- Tunnel open for operations and traffic in December 2015
- To manage the project and construction within the $1.9 Billion budget

Given the nature of the Alaskan Way Viaduct and Seawall Replacement Program (the Program) and considering schedule and budget goals, the Tunnel Industry Panel members (the Panel) met to identify, evaluate and recommend delivery strategies to meet these goals considering:

- Scope, size and complexity of potential contract packages
- Alternatives for project delivery and contracting methods
- Risk identification and risk management strategies
- Other strategies and actions that will be necessary to meet program goals

During the workshop, the Panel reviewed all relevant contracting and packaging strategies, considered the pros and cons, and recommended the range of alternatives for further consideration or evaluation.

This report on the Panel findings represents the summary description of the Panel's recommendations on the contracting packaging and strategies, preliminary risks, and critical actions based on the conceptual project definition. The action items are necessary to advance the project in an effort to meet the target opening date of 2015.

Executive Summary

Considering that the Alaskan Way Viaduct and Seawall Replacement Program is in excess of two and a half miles long and involves many disciplines of heavy construction, some of which are first time challenges in Washington state, a prudent approach to assure efficiencies in schedule and economies in cost would be to plan concurrent design and construction activities utilizing the most appropriate contracting procurement methods. The large bore tunnel and its portal areas were the focus of the March 2009 workshop on construction strategies, however, the Panel also wishes to recognize the key interfaces at and beyond at the tunnel portal areas.

Contractor procurement methods considered by the Panel included conventional design-bid-build (DBB), design-build (DB) and general contractor-construction manager[2]. (GCCM) The WSDOT report on the "Study of Alternative Contracting and Project Management Authorities" is referenced here and included in Appendix B as a source for the descriptions of the various alternative contracting methods as well as the outline of the pros and cons of each. The following discussion assumes the reader is familiar with these methods. WSDOT has the authority and extensive experience with design-bid-build as well as more recent design-build contracts. The experience with GCCM is limited to a recent and comparatively small ferry project. Based on this limited experience and the legal constraints of the GCCM authority on prime contractor involvement and competitive bidding of all subcontracts, the Panel eliminated this method from further consideration early in the deliberations.

In selecting the most effective method of procurement, the following important issues were considered by the Panel:

- Ability to coordinate design, environmental and permitting processes to achieve "early start dates" for critical activities
- Packaging of projects to assure bidding by multiple contractors on contracts of different size
- Opportunities to package and procure different segments or portions of the project using different contracting methods
- Stand alone (specialized) contracts such as utility relocation, restoration and signage, which if addressed independently, would minimize impacts and changes to larger contracts, resulting in higher costs and time delays while providing opportunities for local contractor participation
- Significance of early and comprehensive geotechnical investigation and documentation for bidding
- Long lead time for procurement, delivery, assembly and launch of the tunnel boring machine

[2] Definitions of these contracting methods are included in the *Study of Alternative Contracting an Project Management Authorities*, WSDOT, prepared by Bob Dyer, Appendix B.

- Convenient definition of contract packages compared to the bonding limits
- Risk allocation/sharing

Packaging

Three primary packages were defined for the analysis: the tunnel, the South Portal, and the North Portal. Smaller packages, including tunnel structures, tunnel systems, utility relocation, and ventilation buildings, portal build out and restoration were evaluated singularly or in combination(s) to test against the schedule and assumptions. For example, one scenario included just the six contracts: the tunnel, the South Portal, the North Portal the interior structures and systems, the portal build out and restoration, and ventilation structures and connections. A second scenario looked at the tunnel combined with the interiors and systems to be one 'turn-key' contract with the rest as separate contracts to provide schedule advantages for the early fitting out of the tunnel at some distance behind the advancing tunnel boring machine. Whatever the combination, each scenario had its assumptions, its advantages and disadvantages. The 'test' scenario at the workshop report out included following primary packaging:

- The tunnel with interior structures
- The excavation and South Portal development for TBM launch
- The excavation and North Portal development for TBM extraction
- The utility relocation (as a possible early pre ROD activity)
- Ventilation buildings and connections
- Roadway and tunnel systems and signage
- Portal build out for final roadway and commissioning

Separation of the portals and the tunnel into separate contracts provides well defined limits of work as well as interfaces between contracts, as well as appropriate project size to appeal to the greatest number of contractors.

Final development of the packaging could include variations on the smaller contracts and combinations, but the key areas of concern are the South Portal and the tunnel. Before final recommendations of the best contracting approach could be made, the project definition and concepts require further development.

In selecting the most effective method of procurement, the following are important issues considered:

- Ability to coordinate design, environmental and permitting processes to achieve "early start dates" for critical activities;

- Packaging of projects to assure bidding by multiple contractors;
- Identify opportunities to package and procure different segments or portions of the project using different contracting methods;
- Identify stand-alone (specialized) contracts such as utility relocation, restoration, signage, which if addressed independently, minimizes impacts and changes to larger contracts, resulting in higher costs and time delays, while providing opportunities for local contractor participation;
- Significance of early and comprehensive geotechnical investigation and documentation for bidding;
- Long lead time for procurement, delivery, assembly and launch of the tunnel boring machine (TBM); and
- Convenient definition of contract packages compared to the bonding limits.

Advantages of design-build for the tunnel procurement include:

- The ability to pre-qualify and select the tunnel Contractor during the early design phase
- Save time by having the ability for early delivery of the TBM;
- Ability to treat the tunnel as a turn-key project;
- Mutual participation by the machine manufacturer, tunnel contractor, geotechnical engineer, tunnel designer and the Owner where everyone's concerns are addressed;
- Earlier TBM procurement under the Contractor's control; and
- Contractor can more effectively build cost efficiency into the design.
- Improved ability to share risks and assign risks to the appropriate partner, be that the Owner or the Contractor
- Risk allocation/sharing strategies

Tunnel Contracting Recommendations

Recommendations are divided into the tunnel contract and other contract packages. These definitions again are based working toward the shortest possible schedule. As a consequence, the panel combined some packages to allow for early starts on the installation of the interior and structure

The Tunnel Contract

The major component of this project is the design and construction of an approximately 54-foot (ft.) diameter tunnel that has the ability to accommodate four lanes of traffic. Recognizing that this element will drive the entire program schedule, the Panel recommends design-build procurement method for the tunnel contract as it appears most appropriate to assure essential input from the TBM and tunnel Contractor industries and its inherent schedule advantage.

During deliberations, the Panel also was mindful of the current contracting climate for the underground construction, competition for skilled and experienced labor, the size of the contract, and the need to attract well-qualified contractors from across the globe to bid the large bore tunnel, and to partner with WSDOT. Early Contractor involvement that addresses these issues in the speediest manner is vital to a construction schedule that satisfies the 2015 opening date. The design-build strategy allows for early involvement of the qualified contractors and is recommended to attract the widest field of design-build teams and to expedite the project. The design-build method, as currently authorized for WSDOT under Washington state law, provides great flexibility in how a design-build contract is administered or how the procurement is tendered. It would be easy to build the necessary benefits of the design-build method for the large tunnel project into a Washington state design-build contract.

Selection of an alternative delivery method must be followed by a decisive plan to engage all of the parties on the Owner side, as well as those in the contracting community to find a common understanding of the "design-build alternative" contracting for the large bore tunnel. The design-build alternative should not be seen simply as a convenient means to "pass on the risk to the Contractor," but rather as an opportunity to establish a long relationship based on trust and the common goal of a successful project with minimal impact on the communities during construction, but a maximum impact on the quality of life provided post construction.

Because of the size of the tunnel, the complexity and challenges of the regional geology, and the urban setting, seismic requirements, we feel a straight forward design-build division of effort would be not be used, but rather one in which more detailed development of certain tunnel design elements would be developed and specified in greater detail. And many elements would be worked out in partnership among the engineering, owner, contractor and TBM manufacture.

Early Action: The Panel recommends that WSDOT immediately develop a strategy, implementation plan (including a procurement schedule) and contract for the construction of the large bore tunnel using the design-build concept. This includes a review and improvement to be made, if possible, of the existing design-build procedures and contracting language to determine

what, if any, changes are required, to be consistent with an underground project of this size and complexity.

Contractors' Concerns with Design-Build vs. Design-Bid-Build Tunnel Contracts

There is concern in the underground construction industry that an Owner new to complex underground work will have sufficient experience with design-build subsurface projects. Aboveground projects such as public works structures and facilities, treatment facilities, highways and bridges usually do not have the type of specific risks associated with underground works. The Owner must define these risks, and accept their appropriate share of them, on the principle of "best entity to manage the specific risk" for a design-build consortium and its bonding agency to understand, consider and price when submitting a proposal. This should be part of an immediate risk assessment and management strategy or plan to be initiated as soon as possible, and carried through all phases of the project from concept plan through the final punch lists and opening day ribbon cutting.

It should be noted, however, that given the competition among numerous tunnel projects worldwide, contractors are being selective in their pursuits by evaluating a project's risks to determine if a project fits their corporate risk and exposure profile prior to spending time and money to study, estimate and bid the project. Based on conversations with contractors on other projects across the country, the industry contractors are concerned about the sufficiency of the design, sufficiency of geotechnical information and definition of "baseline," as well as the level of specification of the TBM, and the liner system for a tunnel of this size in these geologic conditions. Institutionally, concerns have been raised about the size of the project, retention, policies, bonding capacity, local labor laws, and as yet unspecified issues with standard WSDOT highway design-build contracts.

It is strongly recommended that the Owner provide strong functional requirements for the tunnel contract, in particular, the TBM. The Lake Mead Project (Lake Mead Intake #3, Shafts and Tunnel, Contract No. 070F-01-C1) was cited as a good example and reference. The design-build contract redefines the Owner responsibilities and level of involvement with a focus on the safety; quality assurance/quality control; risk identification and mitigation; review of the shop drawings; and construction methods to ensure compliance with contract documents, third party utility coordination and public interface. The Owner should not assume responsibility for the performance of the equipment.

Labor Issues

In the past few years, there has been a worldwide increase as well as national increase in the number of major underground projects. Tunneling equipment has become more sophisticated. However, the number of experienced miners, equipment operators and mechanics does not appear to have increased to meet the personnel demands and shortages that are evident in some areas.

There must be an incentive for qualified labor to participate on this project. The Contractor will supply its key personnel and employ additional crews in the area. The "open shop" work rules allow union and non-union workers, however, the work hours and days are often established in

the contract. Maximizing the work period is necessary to meet the documented schedules. The usual work week may be required to be modified to allow a 24-hour per day, 7-day week to expedite the works.

The 7-day work week provides several advantages:

- An example of the crews needed to man a continuous operation is four crews, each working 12-hour shifts that alternate each week from four days to three days. An agreement is necessary for work weeks to alternate from 36 hours to 48 hours. Other examples include 3 8-hour shifts; or others
- Work shift changes can be scheduled to avoid travel rush hours.
- There is only one shift change of crew each day, thereby reducing communication errors (similar to the nursing industry).
- The public is cognizant of the project's urgency evidenced by the construction effort.
- Commuting travel by workers is reduced by extending the work period.
- It provides an incentive for experienced workers to join this project who are considering the opportunity for three- and four-day extended weekends.
- The continuous mining operation allows an efficient TBM operation and monitoring of the excavated tunnel face.

Money Issues

The following are recommendations from the Panel on pricing strategies and incentives to consider in the contracts:

Unit Price Items

Pay for each cubic meter of grout applied at the owner-specified price. Grouting is necessary to accomplish the following:

1. Compaction grouting required to alleviate settlement under existing buildings.
2. Grouting required to stabilize the ground. Allow a contingency of 30% of the theoretical space for this item.
3. Forward grouting necessary to prepare unstable ground identified by probe holes.

Lump Sum Price

Tunnel construction, including all labor, equipment and materials required to perform the following work:

1. Furnish the TBM.
2. Drive the tunnel.
3. Install the interior build-out, including architectural finishes.

4. Install electrical conduit, conduits for systems installations, mechanical ducting.
5. Installing the holes for the *tubesmachettes* (advance probe holes).
6. Contractor is responsible for escalation of labor and materials.
7. Any back grouting.
8. Contractor is required to leave temporary lighting and ventilation in place.

Incentives

Schedule incentives would pay the contractor an incentive fee when particular milestones are achieved, including:

1. When the TBM is operable and contractor has installed the first ring.
2. When the tunnel is 50% complete, reduce retainage or accept a bond in lieu of retainage.
3. When all the pre-cast elements have been installed.
4. When tunnel is ready to be turned over to the systems installation (Contractor).
5. At substantial completion.

Insurance

An insurance package is not much different for a tunnel project, but it could be more difficult to obtain. It will be easier and cheaper for the Owner to obtain the insurance, particularly coverage which applies to local building settlement. Further, there are intangible factors to be considered. For example, the public will be more comfortable dealing with the Owner's agent rather than a Contractor; plus, administration of the claims program will be more effective if administered by the Owner.

Contracting Portals and Ancillary Works

These recommendations are made without the ability to review a detailed programmatic schedule that shows the scheduling and interdependencies of all projects included in the Program. In the area of the South Portal in particular, there are significant risks of conflicts. With that in mind, but assuming that the schedule for the portals and tunnels were not impacted by the precedent projects (e.g. Holgate to King), the Panel considered both design-bid-build and design-build for the portal structures and ancillary works during the workshop. The design-bid-build procurement for the portals and structures and systems provides:

- Opportunities to local contractors (smaller bonding requirements, less specialized work);
- Maximum competition in the bidding process with the low bid as the determining factor;
- The Owner has the ability to specify actions to satisfy concerns of the community with the associated cost included in the lump sum bid; and
- Staging of work is at the discretion of the Owner.

The panel also recognizes that design-build contracting provides schedule advantages, and allows for the introduction of innovative construction methods based on the contractors' strengths.

However, given consideration of all of these observations and the present level of uncertainty, the Panel recommended design-bid-build for the portals and ancillary work. This recommendation is made because of the opportunities for the local contracting community and because of the proximity of the portal and the impacts on the community, business, and environment, where the Owner needs to have the most involvement through the planning, design and construction process. After further development of the portal configuration and the overall construction plan and schedule, reevaluation of this contracting approach is warranted to ensure that the schedule can be met and the South Portal is available for the tunnel contractor.

Early Action: Procure the design engineer; plan and initiate utility relocation; and accelerate the geotechnical investigation to satisfy the overall schedule and avoid delays on the tunnel contract. Coordinate configuration definition with other projects within and use the programmatic schedule, and avoidance of conflicts to help define the packaging of the portals and ancillary works.

Project Schedule

The first step to a successful project is the development of a schedule that recognizes and addresses planning, design and constructability issues along with corresponding time restraints. The schedule should be comprehensive, developed by an individual or team with input from the project team members, each with designed responsibility to update their activities. The project schedule should be updated weekly and made available for all members to manage their activities and priorities relative to other project elements. The schedule available at the time of the workshop was rudimentary, but adequate to evaluate contracting options.

In the limited time available and with the information available at the time of the Panel's deliberations, a comprehensive scheduling exercise was not possible; however, the Panel was able to analyze the constrained schedule showing the tunnel opening to traffic on December 31, 2015 to see the implications on the key activities and their durations.

Key Assumptions	Duration
Contractor RFQ/selection	3 months
Begin Preliminary Design	As early as possible
Record of Decision (ROD)	3 months following EIS submittal
South Portal development in preparation for tunnel contract	18-24 months
TBM procurement, including delivery	18 months
Tunnel drive	12 months (6-day workweek)
Tunnel interior structures	19 months (with a 4-month lag)
Systems fit out; commissioning including	13 months (start after TBM drive complete)
Portal final build out for operations	

Critical Path activities included:

- Right of way (R/W) / easement acquisitions
- Geotechnical site investigation/Geotechnical Baseline Report (GBR) for South Portal
- Geotechnical site investigation/GBR for tunnel
- Procurement/legal definition of design-build contract language
- South Portal utility relocation
- Assumed date of the ROD – 27 months (April 2011 to July 2011)
- Design and construction of South Portal - clear for tunnel Contractor
- TBM procurement (18 months assumed—procure)
- Tunnel interior and system fit out

- Ventilation system installation and commissioning

Findings

Typical durations for important activities were unknown, but will have significant impact on the early schedule and project implementation. These activities may include procurement and legal definitions of "new types" of design-build contracts, procurement cycles for designers, and contractors, reviews and approvals of designs, R/W acquisition and easements, permits and third party negotiations and approvals.

The opening date of 2015 was the working premise for this workshop and one of its goals. This date has not been tested against the risk analysis to identify potential delays in the environmental approvals, permitting, third party agreements or South Portal build out for the tunnel contract. The recommendation for a turn-key approach on the tunnel is driven by this constrained schedule and the need to eliminate contractor interface issues that would occur if these tunnel, structures and systems were separate. An aggressive environmental approval strategy in parallel with the project configuration, contractual review and development for design-build tunnel contracting plan and contract; risk analysis and management; project implementation strategy and initiation of work plan are required to achieve the December 31, 2015 target date. Additional early contracts that provide maximum local Contractor participation early in the program include the utility relocation, full final design, full final investigation, geotechnical site investigation program, South Portal site development, traffic management, and (later) restoration.

The South and North Portals were separated into design-bid-build contracts with the intent of accelerating this work, allowing design at risk within state funds, and allow for more direct owner control of the community and third party interface issues and relationships. The final build out follows the completion of the tunneling contract.

For the South Portal construction to be completed in time for the start of the tunnel contract, the overall configuration of the project must be set immediately, the geotechnical site investigation must be complete, and the procurement of the design team for the South Portal must be in place by spring 2010 or earlier, consistent with what can be achieved (at risk if necessary) prior to ROD. Portal construction and preparation for the TBM Contractor must be complete and ready by fall 2012, assuming the TBM will arrive onsite by December 2012 (18 months following simultaneous receipt of the ROD and immediate procurement of the TBM).

Scheduling considerations were significant in the Panel's definition of the contract packages, whereby the Panel divided out the North Portal, South Portal, and tunnel package (including the systems, fire/life safety/architectural finishes and all pre-cast concrete fabrication and installation). The Panel recognizes that the tunnel package is large without the inclusion of the other elements but the early installation and fitting out at sufficient distance behind the machine gives some schedule advantage and avoids interface risks.

If a design-bid-build tunnel contract were to be assumed, the Panel estimates that an additional 12 to 18 months would be required to account for the procurement of the design engineer, design submittals for the 30%, 60% and 90% design, plus their respective review cycles, specifications and contract document preparation, and procurement of the Contractor. With design-bid-build,

the tunnel boring machine would have to be procured by the Owner. Alternative strategies for the procurement of the tunnel boring machine have not been fully vetted at this time.

Recommended Early Action: A detailed and thorough programmatic schedule should be developed as the first step in the project implementation and used as the fundamental management tool against which all activities, sequence of events and management decisions are charted and monitored. Construction packages and interfaces will need to be tested against the demands of the programmatic schedule. This is a fundamental tool for the entire project team to be used in conjunction with the Project Management Plan and the Risk Management Plan.

Project Risks

Any project, particularly in the urban environment, has a number of risks to avoid, eliminate or mitigate and ultimately manage. On top of the typical risks and challenges, the risks of schedule delays are amplified with the optimistic schedule of 2015 for the tunnel to be open to traffic. Given the challenge of the proposed schedule for project completion of 2015, the risk of schedule delays are many. The Panel immediately recognized the need for a thorough project risk assessment and management program to be used as a key management tool from the earliest planning through construction to project completion. As part of this Program, a risk identification and register would be employed to guide the design, whereby the risks can be avoided, eliminated, or mitigated. This activity was beyond the scope of this workshop, but several key risk categories were identified during deliberations concerning the construction strategies and schedule (see Table 1). From project planning through construction, the program and project risks, once identified and documented, can all be eliminated, avoided, mitigated or managed.

Table 1. Risks Identified During Workshop

CATEGORY	RISKS
I. Organizational/Management	• Political • Experienced Owner team • Team synergy, and integrate/collaborative • Communication • Facility /system requirements; • QA/QC • All the plans: Project Management Plan, Work Plan, Implementation Plan, decision process and schedule, etc
II. Schedule Risks	• Environmental process and ROD • Utility relocation • Permitting • Third party issues • R/W acquisition and easements • TBM procurement, delivery and assembly
III. Third Party Impacts	• Power supply for TBM • Sustained utility reliability • Railroad/Port service continuity • Water/sewer disruption • Waterfront business accessibility and continuity • Historic building damage • Adjacent building damage • Damage to utilities and roadway facilities • Construction disruption to public
IV. Contractual	• Adequate competition • Committed skilled and experienced labor • Project size and bonding capacity • Sequencing and delays • Inadequate or incomplete contract and procurement process

CATEGORY	RISKS
V. Geotechnical Conditions	• Sufficiency of data and adequate characterization • Machine compatibility and performance • Methane, hazardous materials, contaminants • Pre-existing foundation elements (e.g. buried timber piles, tiebacks) • Access and permitting for ground stabilization and building protection • Ground control and surface settlements monitoring • Geotechnical baseline definition
V. Tunnel Design/TBM	• Spectrum of soil and ground conditions • Bearing failure • Alignment control • Rite of advance • Loss of ground • Muck removal and disposal • Abrasion, sticky clay • Cutter change hypersonic intervention
VI. Financial	• Owner cash flow • Contractor cash flow-availability of Contractor credit • Interest costs/fluctuating rates • Price escalation • Insurance • Bonding

Early Action: The Panel strongly recommended an early development of a risk assessment and management strategy and implementation for use by all project team members.

Recommended Immediate Action Items

During their evaluation of the project and alternative delivery strategies, the Panel identified a number of key activities or action items for immediate evaluation and resolution. Timely completion of these activities and execution of the work plan are imperative to move the project through the transition and to direct the project implementation work plan.

The activities are listed below by major categories. A description of the importance and priority is provided in the following section. It is intended that each activity be assigned to a person who will be responsible for the study and schedule.

I. Define Project Functional Requirements and Design Criteria

II. Key Management Tools

- Establish and implement an accelerated environmental approval strategy
- Determine and implement the construction strategies for entire project
- Establish a risk assessment and management strategy
- Establish a detailed program schedule
- Establish community outreach and partnering programs
- Establish public relations and project education
- Early industry outreach and dialogue
- Meaningful Contractor involvement

III. Establish Project Configuration Definition

- Set tunnel alignment
- Evaluate tunnel profile alternatives
- Optimize tunnel size to meet functional requirements
- Define fire/life safety requirements
- Define portals limits and requirements for construction and long term operational
- Define right of way (R/W) and easement requirements

IV. Accelerate Geotechnical Site Investigation and Documentation

V. Identify and Define Engagement Plans with Third Parties

- Utilities - Relocation as well as power continuity
- Power supply requirements for construction and operation
- Permitting
- Easements and R/W acquisition
- Pier 48 condition assessment and permitting requirements for Contractor use
- Port and rail operations
- First Avenue access during construction
- Muck disposal strategies and methods, effect on communities
- Interaction with stakeholders
- Minimizing noise and construction disruption

These action items are meant to serve as a transitional work plan to advance the project and accelerate early programmatic tasks if there is any chance of meeting the aggressive construction schedule. On the other hand, these actions items are required to advance the project with or without the schedule impacts.

Appendix A

Recommended Immediate Action Items

Appendix A

Recommended Immediate Action Items

As a consequence of the Panel's evaluation of the tunnel project construction strategies and the schedule, the Panel identified a number of key activities or action items for immediate evaluation and resolution. These activities are necessary to move the project through the transition and to direct the project implementation work plan.

The activities are listed below by major categories. A description of the importance and priority is provided in the following section. It is intended that each activity be assigned to a person who will be responsible for the study and schedule.

I. Define Project Functional Requirements and Design Criteria

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- Establish and implement an accelerated environmental approval strategy
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- Meaningful Contractor involvement

III. Establish Project Configuration Definition

- Set tunnel alignment
- Evaluate tunnel profile alternatives
- Optimize tunnel size to meet functional requirements
- Define fire/life safety requirements
- Define portals limits and requirements for construction and long term operational

IV. Accelerate Geotechnical Site Investigation and Documentation

- Review geotechnical program and define accelerated and expanded program for the tunnel, portals and other works.
- Establish adequacy of sampling, testing
- Outline requirements for Geotechnical Baseline Report(s)

V. Identify and Define Engagement Plans with Third Parties

- Private and City of Seattle utilities - relocation as well as power continuity
- Power supply requirements for construction and operation
- Permitting
- Easements and R/W acquisition
- Pier 48 condition assessment and permitting requirements for Contractor use
- Port and rail operations
- First Avenue access during construction
- Muck disposal strategies and methods, effect on communities
- Interaction with stakeholders
- Minimizing noise and construction disruption

Recommended Immediate Action Items	
Item: I	Develop the project systems requirements and design criteria
Responsible Party:	
Priority:	Extra High

Description

It is imperative that the program systems requirements and design criteria be developed, approved, and agreed to by all responsible parties to ensure that clarity and consistency in the design. This will establish the limits of the design and will reduce any potential for scope (and cost) creep. Fortunately, the project already has a set of basic design criteria based on previous configurations and WSDOT standard design criteria. However, this is a unique project and it demands that any prior systems requirements and design criteria be re-evaluated for applicability and reconfirmed with the latest technology available. Most likely the main structural engineering criteria will follow the WSDOT standard design criteria but there are other major issues that depend on the human factor that must be addressed.

This task will have to be initiated by the project team and supported by WSDOT management. Not only is this a high priority for WSDOT but it will be essential to get a clear understanding and agreement by the other responsible parties such as the City of Seattle, King County, etc. (possibly others) on many of the issues addressed in the system requirements. Such reviews and approvals may need approval of several people within these organizations and will need time. For instance, fire and life safety would likely involve several people or groups at the City including Seattle Department of Transportation (SDOT) and the Fire Marshal as well as others. Considering the essential fast track nature of this project, this makes this task of highest priority. There is not enough time in the schedule to have to redo any part of the design because of changes. However, it may be necessary to get agreement on the less controversial issues first then work out the more difficult issues.

There are many issues to address but they include essential factors affecting the size and safety of the tunnels and their portals including fire and life safety requirements and roadway design criteria such as traffic flow, design speed, and geometrical requirements such as lane widths, grades, shoulders, height and general requirements for portal and ventilation designs etc. An agreement on the general desired visual appearance of those structures which will be in the public view for the next hundred years of so is likely necessary. Though many of these issues have been addressed before, many are being questioned now. Accordingly, it is prudent to evaluate and understand the impact on cost and schedule for many of these important issues in order to be able to defend the decisions in the light of cost and schedule. This would improve acceptance of the project by all parties including the media and the public and give the design team the direction needed to complete a design efficiently.

Recommended Immediate Action Items	
Item: II A	Fast track environmental strategy and permitting
Responsible Party:	
Priority:	Extra High

Description of Need:

WSDOT is required to issue a new Notice of Intent (NOI) and plans to do so during spring 2009. This will trigger a new set of environmental documentation, public involvement and review of alternatives, which should culminate in a Record of Decision (ROD) being issued at least by April 2011. This schedule represents an expedited process, which shaves off over 2 years of the standard environmental process. Fortunately, this process can, and must, take advantage of the enormous amount of environmental work already done for the project.

Even so, the environmental processes lead the critical path because the Project's ability to expend final design and construction dollars is constrained until the ROD is issued. This means that the ability to fast track the Project as a whole is constrained by the ability to complete the environmental process.

The Federal Highway Administration (FHWA) allows agencies using the design-build process to expend monies for preliminary engineering and qualification of contractors prior to the ROD. Further, it may be possible to engage in final design and construction prior to the ROD if federal funds are not used for these activities. What can and cannot be done prior to the issuance of the ROD needs to be thoroughly investigated and understood. Further, a schedule analysis needs to be conducted to (1) understand what the best and worse case scenarios are; (2) understand the sensitivity of the schedule to various activities and decisions which could occur during the environmental process; and (3) identify ways to enhance the schedule.

That being said, the ability to effectively fast track either the environmental process or design/construction efforts before the ROD will depend on the degree to which the community and the local stakeholders—all of whom have a legal and political right to engage in the environmental analysis process—support fast-tracked activities. Thus, it is important to engage in effective public involvement and collaboration with stakeholders to make sure these people are ready, willing and able to collaborate with any schedule enhancement.

Recommended Immediate Action Items	
Item No. 1B:	Establish a programmatic work plan and schedule to serve as the primary planning tool for the implementation
Responsible Party:	
Priority:	Extra High

Description of Need:

A designated individual and supporting staff should establish a dynamic program schedule of all processes, activities and stages involved in the project, including those design and construction segments extending to the north and south of the "large bore tunnel project." The schedule is the principal planning and management tool for WSDOT and the project team members for planning, implementing, designing and constructing the project. All updates should be fed to the individual responsible for maintaining and updating the schedule. Weekly updates with all major activities are required to manage the various elements, and to note potential conflicts for early resolution.

A dynamic program schedule is also the single most important tool for evaluating various risks and their potential, then real impact on the project throughout the life of the project (from concept to post construction close out). The term "dynamic" is meant to signify the importance of regular (e.g. weekly) update with input from various team members responsible for certain activities, then the posting of the updated schedule so that the entire team is aware of recent changes.

The schedule currently under consideration is constrained by declaration of opening day as 2015. This is a most optimistic target, threatened at the outset by the times typically required for the environmental process and approvals, permitting, procurement and delivery of the TBM. An early realistic schedule also will be a helpful tool for communicating the developments, possibilities and expectations for a project.

Recommended Immediate Action Items	
Item No. 1B:	Establish a risk assessment and management program
Responsible Party:	
Priority:	High

Description of Need:

To assist in the early planning and implementation strategy for the AWVSRP. Early risks identified can be eliminated or mitigated through early planning and design. Other risks can be managed through different phases of the project.

Risk Assessment and Management Strategy:

To avoid unpleasant surprises such as cost and schedule overruns, risk assessment has become a management tool of choice. Most federal agencies mandate such reviews prior to commitment of funds for projects receiving federal grants.

Risk assessment not only identifies areas of concern but also determines the probability of occurrences and worst and best case scenarios. Many risks are inherent in mega projects such as the Alaskan Way Tunnel and can be identified with the use of risk assessment workshops.

Referenced project items such as those identified below need to be analyzed:

- Project Scope
- National Environmental Protection Act (NEPA)
- Contract Packaging
- Cost
- Schedule

Projects need to define specific risks that are unique to its operational viability. For the Alaskan Way Tunnel project, there are identifiable items which will impact both schedule and cost.

- Significant delay and related cost overrun would be avoided if the Environmental Impact Statement (EIS) process could be significantly accelerated.
- Contracting strategy allowing a design-build option would reduce both the final design delay as well as allow early TBM acquisition.
- Geotechnical investigations, rather sketchy and retrieve from the earlier alignment, must be undertaken immediately resulting in an earlier completion of the Geotechnical Baseline Report (GBR). Depending on geotechnical conditions, consideration might be given to a vertical realignment to a shallower depth.
- Another area of concern for the review would be the impact of surface settlement and its effect on building settlements.

Recommended Immediate Action Items	
Item No. 1B:	Establish a risk assessment and management program
Responsible Party:	
Priority:	High

(Risk Assessment and Management Strategy, cont'd)

Risk Assessment workshops would not only identify areas of concern but would also assign probability of occurrence and explore mitigation measures. Such measures would be those mentioned above as well as the following:

- Accelerated contract award.
- Raising tunnel alignment, which would not only reduce roadway grades for TRM drive, but would also reduce excavation quantities for portal and both the South and North Portal area build out. Significant schedule reduction and cost savings would be possible. However, consideration must be given to risk of adverse ground movement.
- Use Risk Management Program to identify opportunities as well as risks.

Recommended Immediate Action Items	
Item No. 2:	Accelerated geotechnical site investigation plan
Responsible Party:	
Priority:	High: Dictates risks and impacts all portal, design and construction TBM, and tunnel alignment, as well as risk during construction of all segment; tunneling, ground control

Description of Need: Understanding the site geology and groundwater conditions along the tunnel alignment are of the utmost importance to the successful tunnel program.
The large diameter tunnel and the complex geology and potential for high groundwater pressures require a thorough assessment and characterization of the ground conditions. A review of the current plan and practices is in order, and an acceleration of the boring and testing program should be undertaken. A determination of the adequate number of borings, samples, number and types of soil tests to assess the material behavior during tunneling is essential.

The current geological profile is based on borings taken along the waterfront alignment of the elevated structure concept. This area has been extensively modified during the past 100 years with infilling of wetlands, and the driving of wood piles throughout. Evidence of the wood piling was recently exposed during excavation for the Starbucks building. The understanding thoroughly of the geology along the tunnel alignment directly influences the design of the portal structures, alignment and profile of the tunnel, water pressures at the face of the tunnel and expected ground behavior. In turn, these properties and conditions dictate the selection of the machine, its design and actual operation and maintenance of the TBM that must drive this tunnel. Understanding the geologic conditions is the essential element of tunneling: selecting the proper methods of excavation and support, as well as the requirements for ground improvement and structural stabilization of buildings along the alignment.

Geologic and hydrologic risks are notoriously the most likely sources of claims regarding rate of advance, stability and overall performance. It is paramount that the site investigation be accelerated to the earliest date possible to maximize the samples, and in situ testing and monitoring of the groundwater conditions. This information forms the basis of the Geotechnical Baseline Report (GBR), the contract document used by contractors and geotechnical engineers to determine their approach, means, methods and estimate to bid the project.

The hydrology and geology along the profile of the project is needed early to assist in risk analysis, set out of the alignment and profile in the most suitable materials and avoid possible risks where noted in the geotechnical site investigation. Recent case histories from the nearby sewer and transit projects also will serve as an important input on the project planning and design. The data from the program are used to define the GBRs used by the contractors to build their jobs. It is recommended that the separate geotechnical reports, including baseline documents, be produced for the South and North Portals, and the tunnel.

Recommended Immediate Action Items

A full, complete final design geotechnical investigation and evaluation must be conducted even for a design-build contract. This is essential in order to provide the prospective contractors with as much reliable geotechnical information in which to select their means and methods, and their schedules and costs.

Recommended Immediate Action Items	
Item:	Community outreach and public involvement plan
Responsible Party:	
Priority:	Extra High

Description of Need:

Seattle has a long history of public advocacy, particularly relating to transportation projects. Public agencies which have underestimated the importance of positive community relations have done so at their peril. WSDOT has engaged in an active public participation process regarding its general operations. For instance, WSDOT's website containing information of general interest and specific avenues for information and involvement is exemplary. WSDOT has engaged in an active public involvement process regarding this Project. It is crucial to the success of this Project that these efforts be continued and enhanced from the next steps in the environmental process to the end of construction and startup.

The environmental process is one of the most critical steps in the critical path toward Project implementation. It is crucial that the public and key stakeholders support this Project so that this process moves forward as seamlessly as possible. A good example of an agency's failure to heed this rule is the Seattle Monorail Project, which was voted out of existence several years ago due to the public's loss of confidence in the Project's viability and the Project's failure to address the public's concerns with authenticity and transparency. A good example of an agency's successful efforts to heed this rule is Sound Transit. Some years ago, Sound Transit tendered a contract to design-build a light rail tunnel to the University District. The procurement failed for a variety of reasons and the agency was embarrassed and accused of poor management. The agency changed management and design direction as well as adopted protocols to ensure transparency and accountability. It not only survived, but is in a few short months, June 2009, ready to commence light rail operations in the City of Seattle. The moral of these stories is: do not underestimate the power of the people to help or hinder a public transportation project. Authentic and transparent communications through effective community outreach and public involvement can make all the difference in a project's success and a project's failure. This Project cannot afford the failure.

Further, it is possible that full funding for this Project may require creative financing and even tolling. It is crucial that the public and key stakeholders understand the basis for any such financing and be given opportunities to provide input. History has shown that the public, taken as a collective whole, can generate remarkably good ideas that are creative and viable, if approached as collaborators and partners, rather than as faceless, nameless voices who don't know as much as the "experts." This is particularly true when addressing issues like time, money and impact, which directly affect members of the public. Given a chance, the public, as a collective whole, can be energized productively. Any community involvement efforts should be developed with this objective in mind.

Recommended Immediate Action Items

Accordingly, it is essential to design and implement the project in a way that minimizes construction noise and disruption to traffic and other potentially affected public activities and concerns.

Recommended Immediate Action Items	
Item:	Evaluate Project organization's readiness to implement the Project
Responsible Party:	
Priority:	Extra High

Description of Need:

The Project is at an organizational turning point. In the Project's past history, the team was devoted to planning, environmental process, and conceptual design. Now, the Project is moving towards a new environmental process, a new design direction and eventually, procurement and construction of complex means and methods. It is a good time to take stock of personnel, both staff and consultant resources, to make sure the best team is in place and the best organizational structure is in place to move the Project forward. This observation is not in any way intended to denigrate the ability or capacity of current team members or obviate the work, which has been done to date. The entire team has performed professionally and competently in the face of many challenges. The observation is intended to highlight the critical importance that having the right team in place plays on the Project's successful outcome. People who have been involved with capital projects, regardless of the value of the project or the nature of the technology, consistently report that having the right team and an effective organization is paramount to project success. Every team member must be on top of his/her game. Just as the Project needs a world-class contractor, the Project also needs a world-class team to represent the Owner.

This is not only true for the Owner's team, but it is also true for third party stakeholders. For example, the City of Seattle will play a critical role in bringing this Project to fruition. All members of the City's team also need the same level and degree of effective organization. WSDOT should play a strong leadership role in ensuring the personnel and organizational infrastructure is in place to support the demanding needs of this Project across all levels of the Project's team. Efforts spent on this now will be repaid in a more efficient and cost-effective Project as well as with reduced risk and enhanced collaboration.

Efforts to manage and enhance the human factors of a large, complex project are often overlooked or perceived to be of limited value, and are frequently the last efforts to be planned and paid for. Some people believe training and team building are not worth the money. This view on this Project would be short-sighted in the best case and disastrous in the worst case. Focused attention needs to be paid to managing and enhancing the productivity and collaboration of the team. For example, personnel should be put or kept into their positions only if they are the best possible person for the job, regardless of who signs their paycheck. Focus attention should be paid to developing effective communication and decision making systems.

Recommended Immediate Action Items	
Item No. 1C:	Develop the procurement strategies and procurement schedule for the deign-build and design-bid-build contracts
Responsible Party:	
Priority:	High:

Description of Need:

As a result of the Panel workshop on the construction strategies, and despite the early conceptual level of design, it is clear that single large bore tunnel will include a number of contracts, some of which will be procured using conventional design-bid-build and the tunnel with a design-build contract. Given that the procurement process, plan and schedule must be reviewed to determine what, if any changes are required in the existing process to accommodate the particular package elements, schedule, partnering, risk allocation, pricing or other issues institutional requirements.

The Panel recommends a procurement team to review the existing WSDOT procurement process and determine what modifications are necessary to accommodate the specific requirements for the large bore tunnel design build contract. A plan to implement and a schedule to determine the capability and impacts on the programmatic schedule should be developed in concert.

Similarly, the existing design bid build procurement process and identification of opportunities to accommodate early contractor involvement if possible to take advantage of schedule and innovative approaches for constructing the South Portal in particular. Alternatives packaging or separation of various smaller contracts should be considered, including utility relocations, final build out and ventilation buildings as well as an evaluation of the potential impacts resulting from contract interface issues in and around the portals and surface, site development.

With the schedule imperatives in play, considerations of incentives for early completion or milestones should be debated to determine if these are applicable and serve both owner and contractor. Other terms and conditions to be evaluated include: Contractor pre-qualifications, selection, early involvement (if and how to administer), bonding, insurance, payment terms, limitations on hours, and operations, minority and disadvantaged requirements, risks, management from the contractors, potential claims, incentives and disincentives.

The plan should include definition of the qualification criteria and selection criteria, selection process, and typical schedule along with the outline of the contract documents.

Item No.	Establish project configuration including alignment, profile, tunnel size based on the approved systems requirements and criteria
Responsible Party:	
Priority:	Extra High

Description of Need:

Appropriate choice of size, alignment and grade is the key to project optimization. The Panel recommends that an over all project configuration, including tunnel size, line, grade, be done to evaluate the tradeoffs and impacts of the various factors and system requirements. It is as important as and even more than the choice of the most appropriate tool, i.e. the type of TBM, and may in fact dictate the type and design of the machine. Actually sizing depends from the traffic, shoulder and lane requirements, fire life safety, ventilation requirements, segments and overall systems requirements in concert with the geotechnical profile and the constraints of existing infrastructure, e.g. Elliot Bay Interceptor, or the Burlington Northern Tunnel, or roadways connections to the north and south. Importantly, the South Portal configuration, in turn is a direct consequence of the tunnel configuration.

- Parameters and issues to include in the parametric study:
- Geotechnical conditions: soils/groundwater pressures in the liner
- Groundwater and associated pressures
- Lining thickness: Water pressures on the lining
- Roadway design criteria (min and max): grades, speeds, shoulders, line of sight, etc. lane widths, etc
- Signage requirements
- Ventilation type and space requirements –hybrid
- Fire and life safety requirements
- Possible need for intermediate shafts for ventilation and egress
- Alignment tolerances
- Grades
- External factors:
- Location, dimensions and depths of existing infrastructure: Elliott Bay, Burlington Northern Santa Fe
- Existing foundations and tie back systems, geothermal installations

The evaluation needs to look at the impact and trade-offs. For example, a deeper tunnel may minimize surface settlements, but requires an evaluation of the tradeoffs against schedule and cost impacts of machine service and maintenance under high water pressures, requiring specialized divers. Steeper grades are required to get to a deeper depth, which again has trades offs for the contractor during and post construction operations.

The final line and grade will define the ground improvement requirements, and define the third party impacts and targets for early engagement.

Recommended Immediate Action Items	
Item No. :	Evaluate and optimize South Portal configuration, constructability which impacts the tunnel schedule and tunnel contractor access
Responsible Party:	
Priority:	Extremely High:

Description of Need:

The South Portal is a pivotal hyper-critical point in the whole procurement, even more than the tunnel itself, with the further aggravation that it is, as presently designed, in a tight deep spot of difficult approach, with complicated construction interfaces with the Holgate to King package. The South Portal activities, starting with design, need to start early and ahead of the ROD to permit the subsequent activities to fit in the remainder time span to completion by December 2015. Particular care has to be placed by WSDOT that the Holgate to King contract does not suffer ANY delay, as it would have immediate repercussions on that of South Portal.

The configuration of the South Portal and the tunnel should be evaluated in concert with the system requirements, project design criteria, and operational criteria. The South Portal area is the principal interface between the project, owner and contractor and the public, and where early outreach and resolution of the construction impact are resolved, including, including traffic, noise, lights, and the like. The South Portal is the most natural location of the TBM assembly, launching of the tunnel boring machine for the start of the tunnel drive. The South Portal will also be the focus for all tunneling activities from setup, contractor lay down, muck transport, segment and concrete movement in and out of the tunnel. Power for the tunnel boring machine and other ancillary tunneling equipment, such as ventilation, will also be situated at the portal and require careful planning in the configuration and definition of the site limits, with those of the adjacent contracts.

A work plan and schedule for the portal in conjunction with the adjacent project tunnel and highway contracts to the north and south must be done during this evaluation to ensure that the plan is optimized and there are no delays or conflicts with adjacent contracts. It becomes necessary to package this South Portal excavation & temporary support in FAST TRACK, with advance utility relocations investigations as soon as possible and the start of actual work in mid 2010.

Since the main tunnel contract has also an interface with Holgate to King contract, the latter boundary has to be re-studied so that it is physically located near the south boundary of the South Portal designated area, with a demarcation “as clean as possible” which would avoid “wait times” for either of the contractors.

The South Portal area becomes “time-wise tight” not only in the early stages (excavation & supp ort), but also for the tail end of contracts, when, ASAP after the invert casting, the activities for portal structural concrete and South Ventilation building MUST be carried out in parallel.

Recommended Immediate Action Items	
Item No. 10	Evaluate Pier 48 use by Contractor
Responsible Party:	
Priority:	High: Affects permitting and logistics risks for Contractor; portal requirements; traffic and third party impacts

Description of Need:

Pier 48 can provide an opportunity for the Contractor to establish a major material handling facility for the project's vital construction activities. The proximity of the Pier to the South Portal can result in minimal transport issues as well as logistics control for the critical schedule necessary to meet prescribed deadlines. The South Portal area will be the location of almost all key tunneling activities, including transport of materials in and muck out.

It is understood that the existing building on the pier appears to be in questionable condition and should be demolished. This project will require a large area for equipment storage (e.g. TBM assembly, muck handling, precast concrete tunnel segments and the tunnel interior highway elements). The pier deck and substructure should be repaired and refurbished for the Contractor's use. The bearing capacity of the piles must be checked.

The total pier may be considered excessive in area that could be, if necessary, reduced by demolishing a portion of the offshore structure and cutting the piling to the mud line. This area reduction would then permit barge or ship docking within the existing pier boundary, thereby minimizing concern of an added environmental impact along the shore.

One of the suggested uses of the pier is for the transfer of tunnel muck to water transport and disposal. The tunneling operation requires the efficient and continuous removal of muck from the TBM necessary for the advance of the tunnel excavation. The muck would be mixed with chemical foaming agents and/or bentonite slurry, to be pumped from the TBM to a pier facility for the treatment of the material prior to deposit onto a barge or ship. Depending on the nature of the treated muck, disposal might be done by acceptable ocean dumping. The number and size of transport vessels are dependent upon the required travel distances and the round trip time to allow a continuous movement of the excavated spoil.

Another use of the pier is for storage of the precast concrete tunnel segments that may be manufactured locally and delivered by truck or rail, or at a casting plant that has ship transport facilities. The segments can be unloaded at the pier, inspected, stored for the installation sequence and then efficiently transported into the tunnel. Sufficient storage area is available for an adequate supply of segments to preclude any impact on the advance of the tunnel due to occasional delivery issues.

Recommended Immediate Action Items	
Item No. 10	Evaluate Pier 48 use by Contractor
Responsible Party:	
Priority:	High: Affects permitting and logistics risks for Contractor; portal requirements; traffic and third party impacts

(Description of Need, cont'd)

A similar use is for the precast concrete sections for the interior highway structure. The elements are large and transport by barge or ship would accommodate efficient delivery. Storage at the pier allows for careful inspection and the scheduling of transport into the tunnel to meet the critical erection sequence.

The delivery of the TBM components utilizes large areas including handling equipment, testing and assembly. Transport may be by truck or rail, however, availability of the pier allows for large components to be delivered by ship or barge. The pier deck would be analyzed for the anticipated crane and storage load characteristics.

The utilization of Pier 48 and transport by water of the muck, precast concrete and TBM components has several other positive aspects for environmental and public impacts. Since the pier is near the South Portal, the opportunity to minimize the Project's contribution to traffic and pollution impacts on city streets and highways. In addition, Seattle would not be subject to the usual road damage resulting from large construction projects' trucking activities. The public generally prefers any means to avoid added truck traffic inherently generated by this type of project.

The railroad transport of muck may impact the rail roadbed as evidenced on other projects where "overloaded" muck cars have caused settlement. The scheduled movement of muck trains would be critical to allow the continuous advance of the TBM. Issues related to material loading often fall into a lower priority when the activity is critical.

Recommended Immediate Action Items	
Item:	Accelerate utility relocation plan
Responsible Party:	
Priority:	Medium—Outreach and Planning

Description of Need:

This Project will impact much of downtown Seattle. It will run down First Avenue, through Pioneer Square and across some of the busiest corridors in the Central Business District. Existing utilities will be everywhere. There are public utilities and private utilities. Besides utilities, there will be other things to contend with: curious pieces of real property called "area ways," which are often perceived as belonging to the private property owner who owns the ground adjacent to the "area way." There are other existing conditions, such as tiebacks, which serve the purpose of stabilizing existing and often fragile, structures and may cross public right of way while serving this purpose. What all of these appurtenances have in common is that their exact location is often unknown; it will cost time and money to move them and in all probability, no one has enough money budgeted or readily available to accomplish the relocation in a timely manner. Further, there are limited options available for remedial or relocation work because the utility corridors, public rights of way and private building footprints are crowded.

This means that creative design, financing and construction will be needed to ensure that when the tunnel comes through the corridor, the utilities and other appurtenances are out of the way. If this is not the case, everyone will suffer increased costs, lost time, disrupted service and bad public relations. The public won't care who was responsible for moving a particular line when a utility service is disrupted. The public will blame the Project as a whole and this always falls to the Owner. This is why it is WSDOT's responsibility and obligation to play a proactive leadership role in ensuring that this issue is addressed effectively.

The history in the Seattle area is that while most private utilities located within City right of way are subject to the City's will and can be directed to move at no cost to the City, these private utilities may not have the means or capacity to do so in a timely manner. If those utilities are still present when the TBM cuts through them, it will not help public relations to merely complain that some errant utility owner didn't do their job. It is the leader's job to make sure the orchestra plays to the same sheet of music or everyone sounds bad. The risk of failure is particularly high in this current economy because all utility owners are suffering from decreased revenues and increased costs. WSDOT must identify the utilities most likely to be affected, engage their owners early and aggressively monitor their performance if it actually expects a clear path.

Further, wherever possible, the actual relocation of utilities should be expedited. It should be the Project's goal to ensure that line items for utility relocations never appear on the critical path.

Recommended Immediate Action Items	
Item:	Coordinate South Portal and S. Holgate Street to S. King Street
Responsible Party:	
Priority:	High

Description of Need:

There are enormous potential conflicts (and opportunities) in terms of schedule, construction, cost, and even driving safety associated with the interface between the South Portal of the tunnel and the work that is almost ready to go out to bid for the Holgate to King Street section.

It is possible that the current design of the Holgate to King Street project may impose unnecessary restraints that make design and construction of the South Portal of the tunnel very complicated, difficult and very expensive to construct.

The two projects, especially the interface should be evaluated carefully to determine if there are ways to apply value engineering concepts which might make either or the combined result of both projects more constructible and less expensive and faster to complete.

This might mean making changes to existing ideas about how this interface works so that the combined interface is more constructible, faster to build, cheaper, and safer for the overall program. There are numerous issues associated with this interface including long term issues such as traffic patterns, grades, etc. However, there is an enormous amount of potential conflict and opportunity associated with the construction and construction interference between the two projects, even though they may be built at slightly different times. It will be important to do this work in a way that does not unnecessarily affect the public. It would be important to try to minimize construction disruption associated with both of these projects.

Recommended Immediate Action Items	
Item:	Industry outreach
Responsible Party:	
Priority:	High

Description of Need: Industry outreach in all of its forms provides the opportunity to learn about the issues that are important to the contractors and initiates the dialog with the owner to set forth the appropriate partnering arrangements, contracting strategy, and establish acceptable levels of design to attract multiple competitive bids.

A project's ability to attract qualified contractors and competitive bids is directly proportional to the Owner's reputation as an Owner of choice. This is particularly true of mega projects where the risks are high, the technology is complex and the logistical issues are challenging. Projects like this are difficult and qualified contractors with the financial, technical and management capacity to successfully perform these projects are few; they need to have world-class levels of experience, equipment and personnel. This is particularly true of tunnel projects where the technology and means/methods of performing the work are particularly specialized. Contractors with the capacity to perform tunneling mega projects are even fewer than their general, heavy civil peers. There may only be a handful of such contractors in the world. They can pick and choose the projects they get involved in and they can practically name their price. These contractors do not work for Owners deemed to be high risk or hard to get along with. This means that to attract one of these few contenders, especially at a competitive price, WSDOT needs to be perceived as an Owner who is willing to consider equitable levels of risk allocation/risk sharing, incentives, and to manage its contractor relationships reasonably.

WSDOT has a good history and reputation with Washington state contractors, but this is not enough. WSDOT needs to reach out to a broader segment of the tunnel contractor and TBM manufacturer industries to educate these industries about the project generally, and about WSDOT as an Owner specifically. Outreach efforts should include the surety and insurance industries since these industries are ultimately the ones that will provide financial underwriting for any contractor who gets involved with the Project.

As an example of industry outreach, WSDOT could send personnel to industry conferences to present papers or set up information booths to promote the Project. Or, WSDOT could invite members of the industry to participate in focus groups in order to provide information about the Project and solicit comments. Efforts spent on educational and promotional efforts will be repaid with greater levels of interest and more competitive bids.

Recommended Immediate Action Items	
Item:	Evaluate First Avenue access
Responsible Party:	
Priority:	Very High: During construction Medium High: As it relates to the design process

Description of Need:

The TBM will enter into and tunnel under First Avenue in one of the City's most popular neighborhoods, Pioneer Square. Not only is this neighborhood popular with pedestrians browsing through antique shops, boutiques and historic taverns, it is a gateway to the two stadiums at the far southern end of the street. Tens of thousands of people, on foot or in cars, travel this area when there's a football or baseball game going on. Disruption to this neighborhood disrupts one of Seattle's most vibrant economic engines.

It is crucial that every effort be made to mitigate the disruptive effects of this Project on this neighborhood. This is deemed to be a high priority because any solutions would affect the design of an element of the Project, which is critical to the critical path – the South Portal area.

In addition to evaluating the design options, it would be important to pay focused attention on community outreach and public involvement efforts for this neighborhood, particularly to the business community.

Recommended Immediate Action Items	
Item:	Evaluate opportunities for local business participation viability including local fabrication/assembly of structural concrete tunnel elements, TBM
Responsible Party:	
Priority:	Medium

Description of Need:

Good public policy demands that large public works projects serve as springboards of economic development of the local community they serve, especially the individuals and businesses that will be paying for the projects. The Alaskan Way Viaduct and Seawall Replacement Program is no exception to this rule. In fact, good public policy suggests that the greater the disruption the project causes, the greater the project's obligation to ensure local business participation and employment. WSDOT has a long history of facilitating participation by local businesses in WSDOT projects. These efforts should be extended and magnified to the particular challenges and opportunities related to this Project.

The Puget Sound region is rich with manufacturing and fabrication facilities, thanks to Boeing and other industrial plants. It may well be possible for some of the equipment, materials, supplies and tools required for the Project to be designed, fabricated, manufactured and/or assembled locally. This would create local employment opportunities as well as build local business capacity, thereby enriching the community long after the Project is completed and mitigating the disruptive effects of the Project on the area during construction. While it will be some years before any such items actually need to be procured, exploration for such opportunities needs to be conducted sooner rather than later. Early exploration may enable mere possibilities to be developed into real life actualities through appropriate planning, training, tooling and other steps toward readiness.

For example, the Project will require many structural concrete elements. These concrete pieces, once installed, are strong. However, they are relatively fragile when handled and delivered. Transport becomes a high-risk task because cracks or exposure to the elements could deteriorate the structural integrity of the pieces. There are several sites in the Puget Sound Region where it may be possible to fabricate these elements. Local fabrication would not only provide local employment and business opportunities, it would minimize the potential risks of long distance transportation and handling of these relatively fragile elements.

Appendix B

Study of Alternative Contracting and Project Management Authorities

Study of Alternative Contracting and Project Management Authorities

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WSDOT REPORT

"ALTERNATIVE CONTRACTING AND PROJECT MANAGEMENT AUTHORITIES"

INTRODUCTION

This report presents a summary of current, and emerging, innovative project delivery methods which the Washington State Department of Transportation (WSDOT) should consider in order to more effectively deliver WSDOT transportation projects. The report outlines promising "new and innovative delivery methods" that have been considered, evaluated, and implemented in the U.S. and internationally, and compares them to traditional, current WSDOT procurement methods. Some of these new methods hold promise to add value for the public through more innovative and collaborative management which has been reported to reduce overall cost and schedule, reduce cost and schedule growth during construction, and reduce disputes, claims and litigation. The report also discusses industry concerns related to current procedures for the delivery of large, complex, transportation projects.

Following discussions and consideration of this topic over the past several years, WSDOT has taken steps to test and implement some of these alternative methods. Projects where this has been done, or is a consideration, include the Tacoma Narrows Bridge, portions of the SR-520 Floating Bridge Replacement, and several design-build projects.

The findings, conclusions, and recommendations have been drawn from case studies, reports, and interviews with industry professionals including Agencies, Consultants and Contractors. The results have not been independently validated, but there is a substantial volume of work in this regard, as noted in the references.

Discussions with members in both houses during the 2005 Legislative Session addressed issues and concerns related to effective procurement, management and delivery of the large, complex transportation projects of the State. These projects include the King County projects around Seattle, the Columbia River Crossing in Vancouver, the North/South Corridor in Spokane, and Snoqualmie Pass. The legislature accordingly asked WSDOT, in House Bill 1541 (59th Legislature, 2005 Regular Session) to report on ways that such projects are being delivered in Washington State, in other parts of the United States and internationally and to address the topic WSDOT "Alternative Contracting and Project Management Authorities". This report is in fulfillment of that request.

CONTRACTING METHODS CONSIDERED

The following table summarizes the contracting methods considered in this report, and the current authority WSDOT has with each method.

Contracting Method[c]	**WSDOT has legislative authorization**	**Number of Projects by WSDOT to date**
Design-Bid-Build	Yes	approx 150 per year
Design-Build	Yes	9
General Contractor/ Construction Manager	Yes[a]	1[b]
Alliancing	No	0

NOTES:
a: Current Legislation for General Contractor/Construction Manager contracts is extremely restrictive for WSDOT highway needs, and requires prior approval by the Capital Projects Advisory Review Board.
b: General Contractor/ Construction Manager (GC/CM) is underway on one ferry terminal project.
c: WSDOT has also used other innovative contracting techniques, such as A+B bidding and Lane Rental. A+B bidding, also known as Price + Time bidding, is an accelerated project delivery method in which the

contractor is selected by considering not only bid price, but time for project completion. A bidding advantage is given to contractors with the fastest time to complete the project. Lane Rental is a contractual mechanism that reduces impacts to the travelling public by charging the contractor a fee for every hour that specified lanes are closed. These tools support current delivery methods, so they are outside the scope of this report.

A comprehensive reading of just a few of the reference sources would result in a much longer list of methods of project delivery. However, for the most part, they are all variations on the four methods above. The intent of this study is to outline the advantages and disadvantages of major project delivery methods so that choices may be made regarding further study or pilot projects.

TRADITIONAL WSDOT CONTRACTING AND PROJECT MANAGEMENT

DESIGN-BID-BUILD

Design-Bid-Build (D-B-B) is the traditional method of civil infrastructure procurement in the U.S. It has remained virtually unchanged for more than 50 years. It is the most basic approach; best used where there is clarity of the deliverable with a low probability of major risk or uncertainty, and in which the owner is in the best position to assume risks.

D-B-B uses a two-step process that separates planning and design from construction. Design is generally done by WSDOT or a consultant under contract to WSDOT, and the subsequent construction contract is procured from the private sector with a low-bid approach. This method has worked well for most WSDOT projects, delivering high quality work for the bid price plus the cost of changes during construction. This is particularly true for those projects where the work and WSDOT's management procedures are well understood by the contracting community, where there is low risk (uncertainty) in the work, and where site conditions (such as the geotechnical environment) are clear. When comparing WSDOT's engineer's estimate to the final cost of the project, we have found that cost growth generally averages less than 5% for most projects.

Strengths of D-B-B

D-B-B is intended to create a clear and objective competitive bidding environment, and to avoid problems of influence, collusion, corruption and/or bid-rigging. The intent is to provide taxpayers with a high quality project at the lowest price that responsible, competitive bidders can offer.

Strengths of the method are price-based competition, lack of bias in the contract award, and resilience against corruption, cronyism and collusion. The success of low bid D-B-B relies on the belief that many firms competing with one another will establish market competition and secure for the taxpayer the best overall price for the job.

This method can serve routine projects well and is likely to continue to serve as the predominant model for public construction contracting in the United States, including use by WSDOT. However, vigorous discussion in the world of public construction contracting has raised questions regarding whether it best suits every project and answers every need.

Concerns with D-B-B for Large, Complex Projects:

There are several concerns with Design-Bid-Build for large, complex projects.

1. Time for project delivery is long because each step is discrete and must be done in sequence without much opportunity for overlap – planning, then design, then bidding, then construction.

2. D-B-B projects are designed to allow the maximum number of bidders to participate. This sometimes means that innovative construction techniques, not accessible to all contractors, are precluded in the design.

3. Because the contactor is not yet involved in the project at the design stage, design work is typically performed with minimal contractor input. This means that opportunity is lost for the construction contractor to contribute to the design with practical suggestions and construction means-and-methods that could add value or reduce cost. At least two levels of opportunity exist here:

    a. The opportunity for construction contractors' input regarding generally available construction best practices and possible improvements, and
    b. The opportunity for a single construction contractor to help design the project that could be most efficiently and economically built by that specific firm, using tools, techniques, and methods unique to, or best performed by, that firm.

4. The contractor's non-involvement in the design can contribute to an adversarial construction process. When this occurs, it results in cost and schedule increases during construction.

ALTERNATIVE CONTRACTING AND PROJECT MANAGEMENT

In the late 1980s, agencies in other countries began to make significant changes to project procurement techniques by considering "alternative" project delivery methods. These alternative methods eventually became primary contracting methods for many major projects in Europe, Asia and Australia. Additionally, as reported in the October 2002 Study "*Contract Administration: Technology and Practice in Europe*", European highway agencies appeared to be better at exploiting the efficiencies and resources of the private sector. They did this through the use of such processes as innovative financing, and alternative contracting techniques such as Design-Build and Design-Build-Own-Operate-Maintain (and variations), Framework Contracting, Early Contractor Involvement, Alliancing, Concessions, Performance Contracting, and Active Asset Management. The United States federal and state agencies were less interested in these changes but, beginning in the late 1980's, began to evaluate some possibilities.

U.S. interest in Innovative Contracting - SEP-14 & SEP-15

In 1987, the Transportation Research Board (TRB) formed Task Force A2T51 on Innovative Contracting Practices to identify promising innovative contracting practices for further evaluation. WSDOT was represented on that task force. In 1989, the Chairman of the task force requested that the Federal Highway Administration (FHWA) establish a means to evaluate some of the task force's more project-specific recommendations. Special Experimental Project 14 (SEP-14) was initiated by FHWA in 1990, to provide a means for evaluating some of the task force's more project-specific recommendations when using federal funds. In December 1991, TRB published the final recommendations of Task Force A2T51 in a benchmark document entitled *Transportation Research Circular Number 386: Innovative Contracting Practices*.

While SEP-14 is still in use today to monitor innovative contracting methods, many methods that were considered innovative at the time, such as time plus cost (A+B) bidding, lane rental, warranties, and the majority of Design-Build projects have become mainstream and do not require SEP-14 approval on Federal-aid projects. SEP-14 continues to be available for the use and evaluation of other promising alternative contracting techniques.

In October 2004, FHWA initiated SEP-15, an experimental program to allow contracting agencies to explore alternative and innovative approaches to the overall project development process, focusing primarily, but not exclusively, on applications with public-private partnerships. As of this writing, several projects in other states have been approved under SEP-15.

WSDOT Initiatives

WSDOT has initiated several projects using some of the alternative contracting methods addressed in this report, including several Design-Build projects, and the introduction of the General Contractor / Construction Manager method (GC/CM) for the Washington State Ferries Anacortes Ferry Terminal Replacement Project.

DESIGN-BUILD

Design-Build procurement is used for billions of dollars of construction projects across the country and around the world in any given year – from complex bridge replacements to school cafeteria construction. The Design-Build process has proven to be a faster project delivery method than the traditional Design-Bid-Build delivery method.

In Design-Build the owner defines the basic project requirements and advances the initial design to a point where one entity, the Design-Builder, can submit a proposal to complete the remaining design and construction of the project and, if selected, complete the work. With Design-Build, some or all of the responsibility to meet specifications and safety codes rests contractually with the Design-Builder.

Use of Design-Build has been steadily increasing in the United States public sector since the early 1980's, but it has only been gaining acceptance on U. S. transportation projects since the mid 1990's. Currently, Design-Build is in use on a wide variety of highway projects around the U.S., from bridges to automated traffic management systems and from new freeways to reconstruction of decaying roads. The Utah I-15 reconstruction, the Transportation Corridor Agencies projects in California, the Transportation Expansion Project (TREX) in Colorado, and numerous other Design-Build mega projects have captured the attention of the transportation community. Although smaller Design-Build projects have not gained the notoriety of the mega projects, the Federal Highway Administration (FHWA) has approved Design-Build on over 200 smaller projects since 1988 under Special Experimental Project No. 14. With the FHWA Design-Build Contracting Final Rule going into effect in January of 2003, Design-Build no longer requires special permission from FHWA.

The 1998 Washington State Legislature authorized approval for a WSDOT Design-Build pilot program under Substitute Senate Bill (SSB) 6439. The 2001 Washington State Legislature passed legislation that expanded the WSDOT's Design-Build authority through 2008 (RCW 47.20.785). In 2006, the Washington State Legislature passed House Bill (HB) 2874 extending WSDOT authority to use Design-Build beyond 2008. Since that time, WSDOT has gained experience on a number of Design-Build projects of varying size and schedule.

WSDOT Design-Build Contracts		
COMPLETE	**UNDER CONSTRUCTION**	**IN PROCUREMENT**
SR500: Thurston Way Project	I-405: South Bellevue Widening	SR-532: Camano Island to I-5 Corridor Improvements
SR16: Tacoma Narrows Bridge	I-405: I-5 to SR 169 Stage 1	I-405: I-5 to SR169 Stage 2
I-5: Everett, SR 526 to Marine View Drive HOV	SR-519: Stage 2	
I-405: Kirkland Nickel Stage 1		

WSDOT maintains an active Design-Build program. The agency's processes have been developed in cooperation with the Washington chapters of the American Council of Engineering Companies (ACEC) and Association of General Contractors (AGC). The Design-Build program maintains transparency through a public website with information including Design-Build project information, policy, and project development guidance.[1]

Design-Build has proven to be faster than traditional methods, due primarily to two factors:

1. Schedule compression obtained by integrating final design and construction.
2. Since the construction contractor and designer operate as a team, design can be tailored to work with the methods and equipment of the (already hired) construction contractor.

Several studies show that Design-Build can achieve faster results:

- A University of Colorado study for the FHWA found an average 14 percent time savings on 61 Design-Build projects when compared to Design-Bid-Build schedule estimates (*University of Colorado, 2005*).
- A study by Warne and Associates found that 76 percent of the 21 Design-Build projects studied were completed ahead of the schedule established by the owner and 100 percent of the projects were finished faster than if Design-Bid-Build were used (*Warne and Schmitt 2005*).
- A report by the University of Florida for the Florida DOT found a 37 percent time savings on FDOT's first 11 Design-Build demonstration projects when compared to Design-Bid-Build (*Ellis et al 1991*).
- The Construction Industry Institute and Penn State University found a 33 percent project delivery time savings and a 12 percent construction time savings for Design-Build vs. Design-Bid-Build projects on the 351 Design-Build, Design-Bid-Build, and Construction Management At Risk (termed GC/CM in Washington State) projects studied in the building sector (*Sanvido and Konchar 1999*).
- The University of Reading in the UK found a 30 percent overall project delivery time savings and a 13 percent construction time savings for Design-Build vs. Design-Bid-Build projects on the 330 Design-Build and Design-Bid-Build projects studied in the building sector (*Bennett et al 1996*).

It should be noted that these time savings may only be realized if environmental, real estate, and permitting are well defined before proposals are made, and also if the agency and reviewers understand the different nature of Design-Build contracts.

Evidence of initial cost savings with Design-Build delivery is not as clear as the schedule savings described above, but there is evidence of lower initial costs on some projects. Making accurate estimates of cost before bidding on Design-Bid-Build projects is difficult even when the design is 100 percent complete. The fact that Design-Build projects are estimated and bid when the design is approximately 25% complete makes this task even more difficult. To compound the issue, it is difficult to find comparable projects in terms of cost due to differences in time, project size, market conditions, and material availability. Given these difficulties in measuring cost performance, numerous studies have attempted to measure initial cost performance and found that Design-Build had no significant cost increases or minimal cost savings.

- The University of Colorado study for the FHWA found an average 2.6 percent cost savings over estimates by project managers on 48 Design-Build projects analyzed (*University of Colorado, 2005*).

[1] www.wsdot.wa.gov/Projects/delivery/designbuild/

- The Construction Industry Institute and Penn State University attributed a 6 percent project cost savings to Design-Build (*Sanvido and Konchar 1999*).
- The University of Reading in the UK attributed a 13 percent cost savings to Design-Build (*Bennett et al 1996*).

Design-Build projects show less exposure to cost growth, after contract award, from change orders and claims. The Transportation Corridor Agency of Southern California (TCA) Study of California Road Projects found that the Design-Build projects studied were completed on average +3% above bid award vs. 13% for Design-Bid-Build in that study. A Construction Industry Institute Research study found cost growth of +2.17% for Design-Build vs. +4.83% for Design-Bid-Build. WSDOT has also seen a reduced rate of cost growth on their Design Build Projects, compared to Design-Bid Build. The Tacoma Narrows Bridge project experienced less than 2% growth over the bid award. The I-5 Everett , SR 526 to US 2 HOV project was delivered for less than the original budget, excluding the addition of the 41st Street Interchange. Both of these projects were also able to deliver project management oversight for approximately 4% of overall costs, which is much less than the typical D-B-B project.

What is Best Value procurement, and why is it used with Design-Build?

Best-Value procurement is a process in which price is not the only factor considered when selecting a contractor. In addition to price, other key factors are considered, such as traffic impacts, environmental protection, schedule duration, public information, and quality. There is an increasing trend towards the use of best-value procurement at the federal, state and local levels (*NCHRP 10-61, 2005*). Best-value procurement is not exclusive to Design-Build. In fact, it is a preferred method of procurement for many federal agencies on projects with separate design and construction contracts. However, in highway construction, it has only been used so far (with a few exceptions) for Design-Build projects.

Best-value procurement is essential in Design-Build projects where a low level of design is developed at the time the Design-Builder is hired. If low bid procurement were used, there would likely be a trend toward extreme cost cutting and risk of compromises in final design. The Federal Acquisitions Regulations (FAR) explicitly allow for best-value contracting (*FAR, 2004*), and include commentary regarding how the low-bid method can fail to serve the public interest because the lowest offer may not result in the lowest overall cost to the public. A Navy study comparing best-value procurement with traditional methods points to a reduction in cost growth from 5.7% to 2.5% and a reduction in claims and litigation by 86% (*NAVFAC, 1996*). The U.S. General Services Administration Public Building Services procures 100% of its new buildings and renovations through best-value procurement.

The National Cooperative Highway Research Program recently completed a research study on best-value contracting for highway construction (*NCHRP 10-61 2005*). The best-value parameters identified in the study include aspects of cost, schedule, qualifications, quality, and design alternatives. From these five general parameters, the NCHRP report recommends 14 specific evaluation criteria for highway agencies to apply. The study identified these non-price factors as critical to delivering value to the public. From more than 50 case studies, the report categorized seven generic algorithms for combining cost and non-cost factors. It then went on to suggest three methods for best-value procurement in highway construction:

- Meets Technical Criteria – Low Cost
- Value Unit Price
- Qualitative Cost-Technical Tradeoff

All three of these methods are allowed by current legislation. To date, WSDOT has used what the report refers to as the “Value Unit Price” method for design-builder selection. With this method, price is considered

along with the relative strengths and weakness of elements of the proposal that provide value to the project, as measured on a defined scale. This method has been used in an effort to encourage industry to be innovative by rewarding those proposers with better ways of doing things. In the future, for projects with less latitude for innovation in meeting project needs, WSDOT will also use the "Meets Technical Criteria – Low Cost" method of design-builder selection.

GENERAL CONTRACTOR/CONSTRUCTION MANAGER (GC/CM)

General Contractor/Construction Manager (also known as GC/CM, CM/GC, and Construction Manager at Risk), is a procurement method in which the design work is begun, either by the owner or by a consultant architect or engineer, and a general contractor is hired to work with the owner and designer to develop and deliver the project. The general contractor is hired based upon a combination of experience and price, and may or may not be the contractor actually hired to build the work but may be responsible for delivery of the project at a guaranteed maximum price (hence the term "at risk"). However, in most cases, this general contractor will continue to work for the owner as a construction manager.

GC/CM is the subject of a report "*An Assessment of General Contractor / Construction Manager Contracting Procedures*", Report 05-9, June 22, 2005 by the Washington State Joint Legislative Review and review committee (JLARC).

Key points in the JLARC report :

- Results of the case studies, owner surveys, and participant interviews suggest that GC/CM projects in Washington generally experience lower levels of schedule and cost growth than D-B-B projects of similar size. However, survey results indicated that GC/CM projects came in slightly over their planned schedules and budgets.
- Owners and contractors feel GC/CM fosters more collaborative working relationships between owners and contractors. In some cases the owners believed that it was this collaborative relationship that helped keep a project progressing through obstacles and challenges.
- One of the frequently cited reasons for adopting GC/CM in Washington is the goal of reducing change orders, litigation and end-of-project claims sometimes found in Design-Bid-Build projects. However, without comparable claims data for GC/CM projects, it is not possible to conclusively determine whether the GC/CM contracting method results in reduced costs associated with change orders, claims and litigation.

GC/CM has been used for a number of public works buildings in Washington State, but was not authorized for use in highway construction (other than ferry terminals) until 2007, when 2SHB-1506 became the current law. In order for WSDOT to use GC/CM, the law requires the Department to obtain approval from the Capital Project Review Committee as either a certified public body, or on an individual project basis. As of this writing, the Department has begun procurement for one ferry terminal project.

The Department is evaluating the procedures outlined in current Washington law regarding GC/CM to determine if it is suitable for highway projects. One problem identified so far is that Washington State law for GC/CM allows the General Contractor to self-perform a maximum of 30% of the construction. This limit is likely to be too low for highway construction. FHWA requires a minimum of 30% self-performance[2], and WSDOT and other state DOT's has followed FHWA's lead.

Relevant application of GC/CM

[2] 23 CFR Section 635.116

The following is a relevant example of GC/CM application for a major, complex project in the Pacific Northwest which shows positive results, as reported by the agency.

Portland BES, West Side and East Side Combined Sewer Overflow (CSO) program

This is a complex infrastructure tunneling and underground construction project and is described in the Rapid Excavation and Tunneling (RETC) Conference 2005 and 2007 proceedings (*Gribbon et. al. 2005, 2007*). A general summary is as follows:

1. The basis for using the GC/CM approach was the desire of the City of Portland to construct the project efficiently and effectively, avoiding the adversarial nature and the disputes, claims and litigation they had experienced in previous conventional design-bid-build contracts.
2. Experience with design-bid-build on previous contracts - even using recommended techniques such as partnering, geotechnical baseline reports, dispute review boards and escrow bid documents - had not been satisfactory.
3. The City wanted the project participants, including contractor, to focus on solving problems constructively to add value to the project and not to waste time in adversarial contractual claims management or posturing for litigation.
4. The form of contract was open book cost reimbursement plus fixed fee to cover contractor overheads and profit. Fee was paid commensurate with percent complete of work.
5. The owner's representatives are closely involved in the day-to-day work and decisions.

Risk Mitigation for identified risks is included in the project. The contract total was $293 million. For risks that could not be mitigated, a $17 million contingency was recommended for the West Side CSO Project and accepted by the City Council. There were problems that might have required use of about 3/4 of this amount, but the project was able to avoid use of the contingency through the collaborative process - a benefit of this contracting approach.

Benefits noted by the owner included:

1. Having the contractor on board during design gave valuable input on construction, innovation suggestions, and permitted contractor buy-in to the design and construction contract.
2. Changes were handled quickly and in the best interest of the job – no major paper work or delay for changes, and no claims. In general, there was no markup on extra work, unless it was at the owner's direction and affected the critical path.
3. Owner and contractor did not have to "take a position" or be adversarial, and therefore could resolve issues in the best interest of the work, which meant better objectivity and team alignment.
4. Owner was directly involved on site, understood the work, was part of the process, and staffed the work appropriately.
5. Bi-annual audits were done. Audit findings were very complementary to the work and process.
6. Time to decision was reported quick and efficient.

ALLIANCING

Alliancing is a relatively new departure from either of the methods above, and from Design-Bid Build. Alliancing has been successful in several countries outside of the U.S., and has worked with some success in private ventures in the U.S. It is not currently authorized for WSDOT use.

Alliancing is a very different form of designer-contractor-owner relationship than the conventional low bid, Design-Bid-Build relationship currently in practice in most U.S. public sector contracts. Alliance partners are chosen very early in the project development process on the basis of quality, past experience, and price, using a pre-determined formula. The Alliancing process requires that the owner, designers, contractors and suppliers work together as a single team, with contractually defined risk-reward (pain-gain) provisions. The owner(s) and the service providers (contractors) assume collective responsibility for delivering the project against pre-agreed performance target outcomes.

Alliancing is described by the following general principles:

1. Parties are bound by one (relatively brief) agreement related to the prime goals of the procurement.
2. Obligations are stated collectively ("We shall…").
3. Reimbursement involves meeting performance goals (pain-gain structure).
4. There is an express commitment to resolve issues within the alliance without undue reliance on outside parties, allowing disputes to escalate or to use litigation.
5. The agreement requires 100 percent open-book accounting for all parties, which requires development of trust, commitment and understanding.
6. Decisions of the alliance board are binding and must be unanimous.
7. The project is managed by an integrated management team, members of which are chosen on the basis of "best person for the responsibility" from any of the alliance partners.
8. Participants develop and commit to a set of "Alliance Principles," related to the key goals of the project.

After the contractual agreement is executed, all parties work together to develop a joint target cost estimate and schedule for the project, and then work together in an open-book environment to design and construct the project. An important part of Alliancing is that all outcomes - risks and benefits (pain and gain) - are shared based upon the agreement – there are no claims for delays or litigation within the alliance. Alliancing is also called Relationship Contracting and is very similar to a concept used by the British Highways Agency, Early Contractor Involvement (*British Highways Agency 2004*). Alliancing is not known to be in use in the public sector in the United States at the time of this report. It has been used significantly for public works in Australia, New Zealand, and the U. K., as noted in the examples that follow. There is a significant body of literature on the process, mostly from these countries (see references).

Examples of Alliancing include highway and infrastructure projects in Australia, the U. K. Channel Tunnel Rail Link, Naval ship procurement in Australia and the U. K. (new carrier procurement) and offshore oil platforms. Of relevance to this report, the Western Australia Commissioner of Main Roads advocates the Alliancing process (*Henneveld 2005*). In Australia, from 1994-2005 $A4.7 billion of a total of $A37 billion in capital projects were Alliancing projects.

Significant benefits have been reported, including reduced cost, added value, improved schedule, higher levels of innovation, reduced (or eliminated) adversarial environment and the practical elimination of disputes, claims and litigation between owner, designer and contractor.

Generally results have been very promising with some notable exceptions. Owners report significantly reduced cost and schedule, increased innovation and accelerated problem solving. Some examples follow:

- The first alliance projects are reputedly the British Petroleum Hyde Andrew Projects – offshore oil and gas platforms constructed in the early 1990's. First estimate was £450 million, and at the point of approval to proceed with the alliance, the estimate was £370 million. The projects were completed 6 months ahead of schedule, with a final cost of £290 million.

- Four U.K. offshore oil platforms were built later, with an aggregated savings of £550 million or 20% (*NCE, 2000*)
- In Australia, the Queensland Department of Main Roads, Port of Brisbane Motorway Alliance project established a Target Cost Estimate (TCE) of $A112 million. The final result was 7.5% less than the TCE even including an increase of scope of approximately $A7m – representing a total saving of 13.6% (*Evans & Peck, 2003*). The report notes additional value obtained through innovation, better design options and outcomes, better aesthetics, better "fit for purpose", better quality of workmanship, and a focus on innovation and improvement rather than pursuit of claims.
- The U.K. Channel Tunnel Rail Link project reported results better than established targets for safety (18% better), process defects (45% better), waste management (75% better) complaints (63% fewer), and staff costs (26% lower). Finally, the project achieved a 5 month reduction in schedule. (*Halcrow, 2005*)
- Sydney (Australia) Water reported, from a survey of 48 projects, (*Currie & Brown, 2004*) that:
  - 61% of Alliance projects exceeded expectations vs. 17% of non-Alliance projects.
  - 72% of Alliance projects achieved lower cost than initial target/budget, compared with 43% of non-Alliance projects.
  - 36% of Alliance projects were ahead of schedule compared to 10% for non-Alliance projects.
  - The best Alliance was 35% ahead of schedule while the best non-Alliance was 10% ahead of schedule.
- Sydney Water prepared, for the Northside Tunnel Project (*Evans & Peck, 2004*), an analysis that compared the independent Target Cost Estimate (TCE) to the projected cost for design & construction using a Non-Alliance process. They concluded that the cost profile under Alliancing was, in summary:
  - Budget $A451m
  - Final cost $A466m (+3.3%)

  If the project had been constructed using a standard Design-Bid-Build process, the estimated cost to complete was $A567 - $A573 million. This analysis is retrospective and not absolute - however, even if the assumptions are overly optimistic for Alliancing and pessimistic for Design-Bid-Build, the conclusion is that the Alliance process did deliver significant value in these circumstances.

Because the alliance includes the owner, designer and contractor, concerns have been expressed about the lack of a contractual "arms-length" determination of cost and cost changes. Current legislation in the U.S. generally requires a fully-independent "low-bid" or "best value" determination. Alliancing therefore requires an independent validation of the contractual target cost, since Alliancing establishes the target cost only after selection of the contractor. The cost of setting up the alliance is a factor – this is more efficient for larger projects and the incurred cost needs to be balanced against the potential benefits.

Other Alliancing Initiatives

Naval / Ship procurements are extremely complex, especially where defense vessels are concerned. For this and other reasons, the U.K. and Australian Navies have moved to procure new vessels using the alliance delivery method. For example, in 2003 the UK Defense Secretary announced that the Royal Navy's new generation of aircraft carriers will be designed and built by an Alliance between the Ministry of Defense and industry, "bringing together the UK's best design capability and project management expertise."

MEGA CONTRACTS AND BONDING

Current Washington State law requires the contractor to post a performance and payment bond equal to 100% of the contract amount[3]. This is a potential problem for "mega" projects. Recent conversations with the surety industry indicate that it may be impossible to obtain bonds for a penal sum greater than approximately $350 million. WSDOT has several upcoming "mega" projects that are expected to have individual contracts exceeding this amount. WSDOT will be proposing changes to the law in the 2009 legislative session that will allow for bonding "mega" projects at less than 100% of the contract amount, while still protecting the interest of taxpayers (performance bond) and subcontractors (payment bond).

SUMMARY

WSDOT needs a toolbox of contracting methods and the ability to select the best method to effectively deliver the wide variety of contracts under WSDOT responsibility. Currently, WSDOT has authority for and uses Design-Bid-Build as the standard, tried-and-true method that works best for typical contracts. WSDOT also has authority to use Design-Build, and has developed expertise with this method for successfully delivering complex projects in an expedited manner. WSDOT also has authority to use GC/CM, but thus far has only used it on one ferry terminal project, and needs to explore this further for use on highway projects. WSDOT does not currently have authority for Alliancing, but may need this method in the future for the most complex projects where the greatest amount of collaboration is needed among the Department, designer, and contractor.

RECOMMENDATIONS

The following steps are recommended to improve the delivery of WSDOT's large, complex capital projects:

1. Continue the appropriate use of D-B-B and D-B for project delivery.
2. Determine what projects, if any, would be best delivered by either GC/CM or Alliancing.
3. Evaluate the current law regarding GC/CM for its suitability for WSDOT highway projects. Work with CPARB to propose changes to the legislature if required for success.
4. Evaluate and, if appropriate, implement testing of the GC/CM contracting and delivery method.
5. If appropriate, develop enabling legislation and pilot project for Alliancing, including consideration for SR-520, Alaska Way Viaduct, and Columbia River Crossing.

LEGISLATION NEEDED

1. Follow-through with proposed bonding legislation to enable bonding of projects over $350 million.
2. Propose revisions to current legislation regarding GC/CM so WSDOT projects can have the general contractor self-perform more than 30% of the construction.
3. Develop enabling legislation for Alliancing.

[3] RCW 39.08.030. Exceptions are contracts less than $100k, and ferry vessel procurement.

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APPENDIX A – DEFINITION OF TERMS

Alliancing – a procurement method in which the owner, designer, and contractor work together in an integrated team from a very early stage in the project, based upon selection of best team for the project, ability to work cooperatively together, prior working experience, reputation and, abilities. After the contractual agreement is executed, all parties work together to develop a joint target cost estimate and schedule for the project, and then work together in an open-book environment to design and construct the project. An important part of alliancing is that result of all outcomes - risks and benefits (pain and gain) - are shared based upon the agreement – there are no claims for delays or litigation within the alliance. Also called, or related to, Relationship Contracting or Early Contractor Involvement.

Alternative contracting – Any contract which utilizes a method of award other than the lowest responsive bid (or force account as defined in 23 CFR 635 Subpart B) is considered alternative contracting. Alternative contracting techniques may also be referred to as innovative contracting techniques
Alternative contracting techniques are intended to improve construction quality, speed project delivery, and improve the administration of highway construction projects. The primary goal is to improve project delivery without compromising safety or quality while providing cost effective solutions.

Contracting – the process of negotiating and executing a formal contractual agreement between the owner and the party that will design, or construct, or design and construct an infrastructure facility.

Delivery – The overall process to define, plan, design, procure, contract, build, accept – and in some cases to own, operate and maintain an infrastructure facility. In this report, "Procurement" can be read also as "Delivery".

Design-Bid-Build (D-B-B) – the traditional method of public works procurement, in which the owner contracts for design by an independent architect or engineer (or in some cases accomplishes the work in-house) for a set of design drawings and specifications that are the basis of the contractor's bid. The architect or engineer (or the owner) certifies that the drawings and specifications meet all applicable requirements of building codes, engineering standards, and other design and safety standards. This bid package is then made available for all qualified bidders to analyze and provide a bid to the owner for construction of the work. Design of the work and construction of the work are accomplished by two independent, unrelated parties, contracted separately to the owner.

Design-Build (DB) – The owner working with a consultant defines the basic project requirements and advances the initial design to a point where one entity, the design-builder, can competitively bid on the project and, if selected, complete both the design and construction of the work. With DB, some or all of the responsibility to meet building and safety codes rests contractually with the design-builder. DB may be conducted with several variations, including design-build-operate-maintain (DBOM).

General Contractor/Construction Manager (GC/CM) – also known as Construction Manager at Risk, is a procurement method in which the design work is begun, either by the owner or by a consultant architect or engineer, and a general contractor is hired to work with the owner and designer to develop and deliver the project. This general contractor is hired based upon a combination of experience and price, and may or may not be the contractor actually hired to build the work but may be responsible for delivery of the project at a guaranteed maximum price (hence the term "at risk"). However, in most cases, this general contractor will continue to work for the owner as a construction manager.

Innovative project delivery – New and/or different methods that hold promise to add value such as lower cost, better function, quicker schedule for the delivery of an infrastructure facility, compared to existing methods.

Procurement – the process used by an owner to find, select and enter in to a contract with the party that will design and/or build and/or design and build the infrastructure facility.

APPENDIX B – PROCUREMENT METHODS CONSIDERED IN THIS REPORT

The methods are listed in descending order from the highest to the least integrated / collaborative approach.

Alternative or Supplemental Method	Relevant to, Recent Applications	Summary of Method	Federal & WA Statutes Allow?	WSDOT Using or Testing?	Where Used	Results – found or expected
Alliancing / Relationship Contracting	Infrastructure, Ships & Vehicles	Owner, designer, contractors and suppliers work as a single team; contractually defined risk-reward (pain-gain) provisions; collective responsibility to meet pre-agreed performance targets	Fed: SEP-15 WA: No (PPP?)	No	U.K., Australia, New Zealand, Other	Cost and schedule improvements, increased innovation and improved work process reported on most projects
General Contractor / Construction Manager (GCCM) - also known as Construction Manager At Risk (CM@Risk)	Infrastructure, Buildings	Owner selects design and construction management consultant on the basis of qualifications, experience, fees for services, price for target cost and estimated ceiling price. At about 60-90% of design a guaranteed maximum price is contractually agreed.	Fed: SEP-15 WA: Highways No, Ferries Yes	No for Highways Yes for Ferries	U.S., Int'l	Several other states have used this method with generally good results. This has been successful at the local level, and with relative success in Washington State building projects. Ferries procurement is not complete.
Design-Bid-Build (D-B-B)	Infrastructure, Buildings,	Owner contracts for design by an independent architect or engineer for design drawings and specifications that are the basis of the contractor's bid – usually a firm fixed price for the work defined in the bid documents..	Fed: Yes WA: Yes	Yes	U.S., Int'l	Traditional method in WSDOT. Very successful - but can always make improvements.
Design-Build (DB)	Infrastructure	The owner, sometimes working with a consultant, defines the basic project requirements and advances the initial design to a point where a design-build contractor can make a proposal (both price and technical) on the project and, if selected, complete both the design and construction of the work.	Fed: Yes WA: over $10 million	Yes	U.S., Int'l	Four highway projects complete, three underway. Several ferries procurements complete. Low cost growth under contract.

Appendix C

Construction Strategies Workshop Panelists Agenda

Appendix C

Construction Strategies Workshop
March 9-11, 2009[1]

Tunnel Industry Panel

Name	Expertise, Input
1. Brenda Bohlke	CHAIR. PhD. Geological, Tunnels, Management, current UCA President, SR 520 Tunnel Panel member; tunnel design for rock and soft ground tunnels, including EPB in DC
2. Jan Keiser	Engineer, Attorney, former Construction Counsel for Sound Transit, SR 520 Panel Member (Contracting)
3. Ed Plotkin	Former Engineer, Contractor, Owner – Consulting on underground construction and contracting, New York, Toronto
4. Jo Bhore	Extensive construction experience across US; presently consultant on San Francisco Central Subway for Construction Strategies and DRB in New York
5. Walter Mergelsberg	Former Director of Construction, Washington Metro System (26 years); Philippines Construction Manager, Independent Consultant; currently with Dr-Sauer Corporation
6. Otto Braach	Former Hochief + Weiss and Freitag Chief Tunnel Engineer, TBM Expert, Consultant to Lake Mead Tunnel Project
7. Gianni Arrigoni	Extensive construction, plus international tunneling experience, author regarding contracting and delivery (see Annex, Mechanized Tunneling Book)
8. Richard Sage	Construction Manager for Sound Transit (10 years); extensive construction management experience with pressure face machine; over 25 years tunnel construction; CMAA, TRB Tunnel Committee

Other Workshop Attendees[2]

Group 1 (essentially full time depending on other obligations):

WSDOT: Alec Williamson, Bob Dyer
PMAC: John Townsend, Alastair Biggart, Don Phelps (with Alec Williamson)
PB: Tom Peyton, Joe O'Carroll (as needed for risk)
Sound Transit: Dick Sage (Day 1, other time as requested by Chair. Report out Day 3)

Group 2 (part-time as scheduled or needed. See assignments in the agenda)

Dave Dye, Jerry Lenzi, Craig Stone, Ron Paananen, John White, Dan Galvin, Linea Laird, Matt Preedy, Theresa Greco, Rick Smith, John Reilly, Harvey Parker, Red Robinson, Mike Morrison, Harry Jarnagan, Vic Oblas, Chris Ludington, Mike Rigsby, Rick Conte, Gordon Clark

[1] Some issues may continue to be worked out on the following days, if and as necessary, consistent with travel arrangements and who is available.
[2] It is expected that project personnel will be working on their areas of responsibility as appropriate when not required to be at the workshop.

(**Appendix C, cont'd)**

Construction Strategies Workshop
March 9-11, 2009

Detailed Agenda

DAY 1 Monday, March 9, 2009, 8:30 a.m. (Gathering) to 6:00 p.m. (Closing)
Floor 23 Training Room (morning), Floor 32 Conference Area (afternoon)

Project Overview/Experience/Context/Objectives/Key Issues/Identify Alternatives

Time	Topic	Presenters	In Attendance
8:30	**Welcome and Introductions** • Introductions • Review workshop objectives • Agenda overview – adjustments and modifications	Paananen/Dye Panel White+Bohlke Bohlke	Groups 1 & 2
9:00	**Project Overview and Understanding** • Project background, tunnel decision • Project organization, review • Project configuration, interrelationships • Environmental process, Record of Decision • Alignment alternatives, affected facilities • Fire life safety, ventilation • Geologic-hydrology • Proposed project schedule & cost • Construction logic related to schedule & cost	Paananen White Preedy Greco Williamson Clark Robinson Williamson+ Morrison Vic Oblas	Groups 1 & 2
12:00	**Working Lunch** *Seattle TBM Tunneling History*	Parker	White, Preedy, Greco, Reilly
12:30	**Project Site Tour, Questions, Discussion**	Panel+Guides (Preedy, Rigsby, Williamson)	
2:15	**WSDOT Contracting / Previous Recommendations** • History, recent experience, achievements • Methods used/considered, A+B, Value determination • Bonding/Insurance/Alternative Delivery, recent Design-Build Experience • SR 520 panel recommendations	Laird Dyer Reilly	Group 1
3:00	**Panelist Presentations: Lesson Learned and Issues Related to This Task** (approximately 20 mins. each) • Washington, DC Metro Tunnels - Lessons Learned • Toronto and New York – Lessons Learned • TBM applications, related to contract strategies • SF Central Subway construction strategies • Sound Transit Procurement Experience: - International contracting and delivery – overview - Washington State - contracting possibilities	Mergelsberg Plotkin Braach Bhore Sage Arrigoni Keiser	Group 1+ White, Greco, Preedy, Reilly, Parker, Oblas, Rigsby

Time	Topic	Presenters	In Attendance
5:00	**Break and Discussion**		
5:15	**Panel Discussion: Alternatives to be Considered:** Pros and cons, key issues, initially preferred alternatives, gaps, data required (action items)	Panel	Group 1[1]
6:00	**Adjourn**		

[1]Depending on Panel's need for input – to be determined by Chair.

DAY 2 Tuesday, March 10, 2009

Develop and characterize alternatives, compare to objectives, identify issues affecting construction strategies (Panel with specific persons attending or called as necessary)

Time	Topic	Presenters	In Attendance
8:00	• Re—Cap Day 1 • Agenda review – adjustments and modifications	Bohlke	White, Preedy, Greco, Reilly
9:30	**Evaluate Issues Affecting Construction and Contracting Strategies, Packaging, Sequence** • Key Risks, Risk Management Strategies • Cost Estimating/Project Budgeting/Cash Flow • Project Schedule: Critical Milestones • TBM Manufacture, Delivery, Setup, Tunneling • Portal Construction, Key Issues, Opportunities • Site Characteristics, Adjacent Structures, Access Points, Construction Logistics • Industry Capacity/Competition/Participation • Other Considerations: Contract Interface Nodes • Summary and Afternoon Agenda	Panel	Group 1 + Project staff as needed and called for depending on the topic
12:00	**Working Lunch and Discussion**	Panel	White, Preedy, Greco, Reilly
12:30	**Identify Preferred Project Delivery Alternatives for consideration in this workshop** Identify Fatal Flaws or Constraints or Institutional Barriers/EIS process and schedule	Panel	Group 1 + Project staff as needed and called for depending on the topic

Time	Topic	Presenters	In Attendance
1:15	**Evaluation of Contracting and Delivery Alternatives and related issues** • TBM Procurement Strategies/Requirements • Tunnel Construction, Internal Facility, Systems Installation, Site Logistics, Schedule Compression • Bid Process: Early Contractor Involvement; Competition; Capacity, Bonding, Insurance • Partnering and Collaborative Processes; Risk Management / Risk Allocation Incentives (pain-gain) • Outline Contract Packages + Bid and Selection Processes Related to Above	Panel	Group 1 + Project staff as needed and called for depending on the topic
3:15	**Break**		
3:30	**Identify and narrow** recommendation set for further consideration	Panel	
5:30	**Review Day 2 and Plan for Day 3** Draft outline for report, discussion, actions required	Panel	
6:00	**Adjourn**		

DAY 3 Wednesday, March 11, 2009

Recommendations and Reporting

Time	Topic	Presenters	In Attendance
8:00	**Recap Days 1 and 2, Considerations for Day 3** Agenda review – adjustments and modifications	Bohlke, Panel	White, Preedy, Greco, Reilly
8:30	**Review Project Organization and implementation planning -** with respect to potential or recommended Project Delivery Strategies	Panel	White, Preedy, Greco, Reilly
9:30	**Discuss and agree on** contracting strategies to be addressed in report. • Discuss / outline of report (v.1) with recommendations • ID key issues and concerns, opportunities, specifics of contracting strategies, considerations and cautions • Develop recommendations finalize key issues, barriers, implementation	Panel	Group 1 + Project staff as needed and called for depending on the topic
12:00	**Working Lunch and Discussion**	Panel	White, Preedy, Greco, Reilly

Time	Topic	Presenters	In Attendance
12:30	**Continue to detail recommendations with** • Outline Report (v.2) • Elements of report, outcomes and actions required • Preparation for the Report out/Briefing	Panel	Group 1 + Project staff as needed and called for depending on the topic
2:30	• Report out / Briefing to WSDOT Exec and Staff: • Review workshop deliberations, contracting strategies, recommendations and report content • Questions & discussion	Panel	Group 1 + Group 2
4:30	• Next Steps • Assignments for completion of report • Schedule for completion, production requirements • Other considerations to be communicated to the project	Panel (Could be a smaller group)	White, Preedy, Greco, Reilly
5:00+	**Adjourn**		

Note: On Thursday, March 12, 2009, Panel members who are available will present technical details and considerations in their specialty to the Project Team, with discussion related to the project. An informal lunch presentation with questions and discussion is planned as a "brown-bag" lunch for interested staff.