

October 31, 2006

Governor Chris Gregoire
Office of the Governor
P.O. Box 40002
Olympia, WA 98504-0002

Re: Response to Your Letter Dated September 1, 2006
Regarding Alaskan Way Viaduct and Seawall Replacement Project and
SR 520 Bridge Replacement and HOV Project

Dear Governor Gregoire:

As you requested, the Expert Review Panel (Panel) has remained involved in both the Alaskan Way Viaduct and SR 520 Bridge Replacement projects over the last two months. In mid September, a subset of the Panel worked intensively with WSDOT staff, and outside cost estimating consultants, to ensure that Panel observations and recommendations were reflected in the revised estimates that you requested from WSDOT. We have also had the opportunity to discuss your letter of September 1, 2006, requesting additional feedback from the Panel. We have spent a considerable amount of time researching these issues. Below we summarized our responses, and in the enclosed Summary Attachment provide additional detail related to your questions.

In your letter, you asked us five questions:

1. How do we mitigate the impact on access and ingress to the waterfront from construction of the Alaskan Way Viaduct or tunnel?

The Panel feels that access to the waterfront businesses for emergency vehicles, deliveries, and the general public during construction is very important for the economic health of the area. We fully realize that construction of either alternative will be disruptive. We have several suggestions to help mitigate the inconvenience to local businesses, the public, and the tourist industry:

- a. Begin construction of certain elements early. Replacement parking can be built prior to the start of major construction, and seawall construction can be sequenced during the winter off-peak tourist season.
- b. Maintain access to as many of the current facilities as possible. The focus should be on maintaining transverse access across a cut-and-cover tunnel, keeping traffic moving on the existing viaduct for as long as possible until the new structure is open, and sequencing construction of the interchange near the stadium so that access is maintained to the Port.
- c. Expedite the schedule to complete the work in as short a time as possible. The project team should investigate potential staging areas to accelerate construction. WSDOT should consider certain legal and administrative suggestions that would speed up construction, and minimize the risk of unanticipated delays. These suggestions could include the use of rolling 4x10 hour work shifts, and the implementation of a project labor agreement.

The enclosed Summary Attachment to this letter further details these suggestions as well as other ideas that the Panel discussed over the summer and in September and October.

2. *Regarding the concept of financing through the use of public/private partnerships, could you provide us with options lessons learned, and processes you would recommend?*

There are many different kinds of Public-Private Partnerships (P3) with varying levels of private sector involvement. Emerging trends that may have relevance to the Alaskan Way Viaduct and SR 520 projects include "Alliancing" and "Concessionaires." Alliancing is a variation of design/build that seeks a contractual partnership with a contractor at the onset of the design phase. Under a concessionaire process, the private-sector partner designs, builds, and maintains a facility. The concessionaire self-finances a portion or all of the capital investment and is paid through the revenue stream generated by the project. Either of these concepts will generally take 12 to 18 months to implement after rule-making and processes are in place.

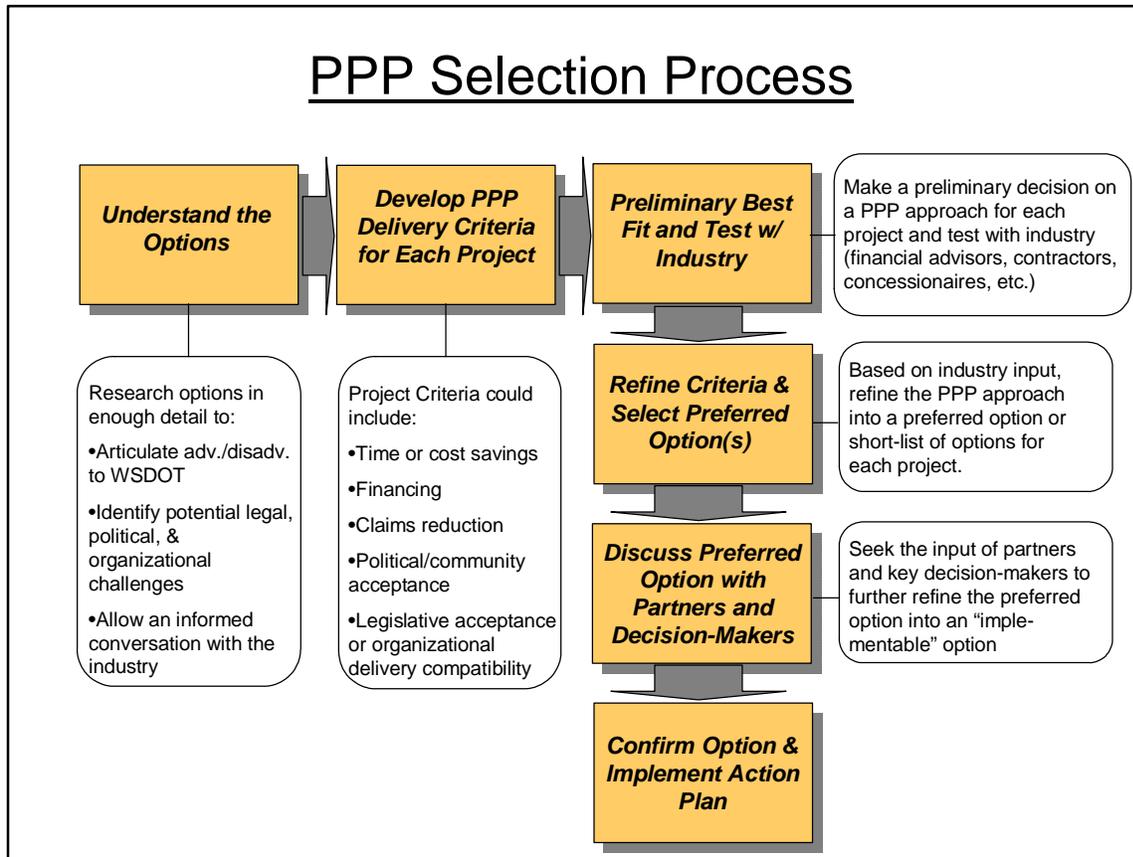
The primary reasons for entering into a P3 include:

- a. Access to new sources of private capital.
- b. Expedited completion of a project (compared to conventional project delivery).
- c. Savings on maintenance costs by including operations and maintenance in a concessionaire agreement.
- d. Substitution of private resources and personnel for limited public resources.
- e. Private ventures can share some risk, while making a profit appropriate to that risk. By shifting risks, WSDOT may reduce construction related claims.
- f. In a standard agency led development that includes the issuance of government bonds, taxpayers bear all risks for delays and cost over-runs. With a private sector concessionaire, the private sector bears these risks.

Lessons learned from other P3 projects include:

- a. The more serious political issues typically involve the potential use of private equity, the initial establishment of toll rates, and the escalation of toll rates.
- b. In order to reduce the timeline to stakeholder/community acceptance, it is important to get key stakeholders involved from the very beginning.
- c. Private sector outreach should begin immediately. The private sector needs to know two things. First, the state has "real" project opportunities. Second, the state is capable of managing a P3 program. More states are getting involved in P3 and private capital can only go so many places, so this early contact and confidence building is critical.
- d. Consider long-term transportation planning and the potential for additional capital improvements in the corridor and include such possibilities as a part of the concessionaire agreement.

Given the urgency of replacing AWV and SR 520 as well as the complexity of these projects, selecting the “correct” form of P3 will be challenging. The following selection process is one approach to P3 selection:



We understand that WSDOT is actively reviewing the options available to the State given current legislative direction. The Panel would be open to participating in any upcoming sessions or reviewing the reports, if that would be useful.

3. *How could we mitigate the adverse impact of construction?*

Mitigating impacts during construction is largely driven by policy directives at the federal and state levels. There is no silver bullet or one way to address these issues. The mitigation considered inevitably depends upon the project, its location, and the amount and length of disruption being proposed.

However, based upon the information we received from businesses in and using the corridor, and considering our experience on other projects, we have identified some of the areas you might want to consider:

- a. Truck Traffic – Consider how excavation spoils will be hauled and how Ballard/Interbay businesses could gain better access to I-5.
- b. General Purpose Traffic – Consider ways to reduce the number of vehicles in the area and develop extensive communication strategies to keep the public and businesses informed.

- c. Minimize Public Disruption – Consider initiating early constructability reviews, evaluate contract phasing and packaging methods, consider alternate project delivery methods, and doing as much as possible to maintain the public’s mobility during construction.
 - d. Avoid Delays – Develop a project labor agreement and pursue a robust environmental and permitting strategy at higher levels of agency management, and develop action plans for possible events during construction.
4. ***With respect to design tools that might decrease the cost of the projects, would you please provide me with specific suggestions on design options that WSDOT should explore with the Federal Highway Administration?***

The Panel recommends that “affordable context sensitive design” be used as the basis for both the AWW replacement and the SR 520 floating bridge replacement. This could include reducing design speed or shoulder and lane widths to fit within the space available.

For AWW, reduced design speeds would keep the tunnel out of the water at the curve near Yesler Way. This would result in avoiding potential permitting delays. Reduced lane and shoulder widths would narrow the structure and may allow reconsideration of a potentially lower cost side-by-side tunnel configuration. We discuss some of the advantages of this in our Summary Attachment.

For SR 520, reduced shoulder and lane widths could reduce the footprint over the water or on private right-of-way, thus addressing sensitive environmental and costly right-of-way issues.

We understand that the project design teams may currently be evaluating some of these changes. It is important to initiate high level interaction between FHWA and WSDOT early to resolve these deviations.

In addition, the Panel also extensively discussed design options that could impact the overall costs. These options are not specifically under the purview of FHWA, but could result in significant cost reductions for both projects. These ideas include re-evaluating the depth of tunnel construction on the Alaskan Way Viaduct and considering a staged construction option for SR 520. These ideas are again discussed in more detail in the Summary Attachment enclosed with this letter.

5. ***I would like you to review WSDOT’s new cost estimates for accuracy and determine whether your conclusions regarding the finance assumptions change with new cost estimates.***

We have reviewed WSDOT’s new estimates, and we think they are sound. We were impressed by the professional teams that WSDOT has assembled to work on these projects. As mentioned in our report, the CEVP process that WSDOT uses for these projects provides a good framework for tracking estimated costs as the designs develop, and identifying project design opportunities and risks at an early stage. This provides for a more complete understanding so that issues can be managed and mitigated to the maximum extent possible. In short, we believe that WSDOT is using the right process and the right people to estimate the costs of these projects.

In September, selected panel members (Baker, Edgerton, McCracken, and Brown), supplemented by technical advisors with construction and cost estimating experience, spent four days reviewing the WSDOT updated cost estimates for both projects. In meetings with each design team, our emphasis was on verifying the unit costs for the major bid items and verifying the range of quantity and price uncertainty used in the base cost estimate. We also spent time reviewing the risks and opportunities that had been identified for each project. Proposed changes were then taken by WSDOT’s consultant, Golder Associates, to re-run the cost models for the Alaskan Way tunnel and elevated alternatives and for the six-lane SR 520 Pacific Interchange option. The

revised probable cost range results are those presented by WSDOT in their September 20, 2006, press conference.

We believe these new cost ranges more accurately reflect the uncertainty associated with both projects at this early stage of design. Our prior concerns about the narrowness of the range and potential over-optimism have been addressed, and we believe that future cost escalation projections are more realistic.

In terms of funding, these revised estimates do not change the panel's conclusions. As we stated in the report, WSDOT should use a different funding target to compare to these more accurate estimates. The WSDOT's revised target at the 60% confidence level seems reasonable. Considering the revised estimates and revised targets together, our conclusions are as follows:

- a. There is not enough funding identified for either alternative for SR 520 and,
- b. The Alaskan Way Viaduct's overall financial plan provides a reasonable framework for funding the core project for either the elevated or tunnel alternatives.

In conclusion, we recognize that this is a critical time for decision making on both projects and that we have encouraged decision makers to identify preferred alternatives in an environment where there is still much uncertainty. Locally there are many strongly held opinions and differing points of view about what is the best solution for each corridor.

While we understand the desire for certainty when making these types of decisions, we also know that there is still much planning to be done on both projects. We continue to believe, as we said in our report, that delay is the greatest risk to both projects, not only in terms of dollars but also in terms of safety. We understand that funding for both projects is still in flux. Our experience is that funding uncertainty is not unusual for mega-projects at this stage of development. The important point is that funding options have been identified, and with targeted engineering and continued work on funding possibilities these projects can move forward.

We hope this information is helpful in your upcoming deliberations. We have reviewed the initial WSDOT action plan and look forward to seeing the results of their work over the next few months. We will be meeting again as a panel in January to review WSDOT implementation of our recommendations and look forward to providing you additional information at that time.

I would be pleased to answer any further questions that you or your staff might have or discuss any of the information we have provided in this report.

Sincerely,

Jane Garvey, Chair
Expert Review Panel

Enclosure: Summary Attachment

SUMMARY ATTACHMENT

Expert Review Panel

Response to September 1, 2006, Letter from the Governor

1. *You emphasize that WSDOT should find a way to construct the Alaska Way Viaduct project without closing access to the waterfront. How do we mitigate the impact on access and ingress to the waterfront from construction of the Alaska Way Viaduct or tunnel?*
 - a. The elimination of parking on Alaska Way is necessary for construction of either alternative, and is of the great concern for the tourist oriented businesses along the waterfront. Replacement of this parking should be a high priority, and we therefore recommend that the design and construction of the WSDOT's planned parking structure be started as a first order of work and that this be complete and open to the public prior to eliminating on-street parking.
 - b. Re-construction of the seawall in conjunction with the Alaskan Way Viaduct has the potential to seriously affect the waterfront business community. However, by packaging the work separately from the highway construction contracts, it could be sequenced during the off-season, thus allowing it to be completed prior to the most economically important summer months. We estimate that if started in October, construction in the central area could be complete by June of the following year. Restrictions to public and emergency vehicle traffic can be kept to a minimum during this period, as the longitudinal workspace envelope in each direction will be contained to a moving +/- 300 feet. Once completed, access will be restored to the waterfront during the peak tourist season.
 - c. During the construction of the tunnel alternative, it is important to maintain as much transverse access across Alaskan Way as possible to allow continued public use of the waterfront. This can be done by using precast concrete decking or "lids" to cover the excavated work area in key areas. Construction work would continue under the lids, while traffic is maintained on top. This is a relatively common construction procedure utilized in urban areas for underground construction. Pictures depicting this type of construction are also attached.
 - d. It will be important to maintain traffic along SR 99 for as long as possible during construction. The Panel believes that in order to maximize this traffic capacity, while constructing the cut-and-cover tunnel, the project team should reconsider the side-by-side tunnel configuration in addition to the stacked configuration currently being shown. This option provides for more efficient handling of north-south through traffic, in the following manner:
 - 1) It allows maintenance of traffic on the existing viaduct during construction of the southbound roadway.
 - 2) Once completed, southbound traffic can be allowed to travel in the new facility while the existing viaduct is demolished and the northbound roadway is constructed. During this phase, northbound traffic may have to utilize the city street grid; however, the grid may be able to be re-configured to allow for more efficient traffic movement in the northbound direction.

The Panel feels that this alternative should receive further consideration as it also eliminates the very complex and expensive construction required for the "unbraiding" of the stacked tunnel under consideration.

- e. The Port of Seattle is an important part of the Seattle economy. The Port's access to and from I-5 must be maintained during construction. Options could include planned improvements to the Spokane Street Viaduct, and detailed construction staging and traffic maintenance requirements at the new south interchange to provide access for the Port during active ship loading and unloading activities.
- f. Impacts to the waterfront will be minimized if the construction is sequenced to be done quickly, while maintaining as much public access as possible. We have several recommendations for expediting the schedule:
 - 1) The availability of contractor staging areas is important not only for expediting the work but also for obtaining economic bid prices. To facilitate the securing of such temporary staging areas, the Panel recommends that the project team investigate storage and staging areas prior to advertising, make lease or purchase arrangements, and identify these arrangements in the bid documents.
 - 2) In order to optimize the construction schedule and thereby minimize disruption to the waterfront, work must proceed in multiple shifts. The Panel believes that the use of rolling 4x10 hour work shifts would be the most effective, in terms of cost and time. This format has been used very successfully on other large projects. The use of such shifts may require legislation to avoid the additional costs associated with premium time.
 - 3) In order to avoid labor unrest during the project, we recommend that a project labor agreement with a no strike clause be negotiated with the construction trade unions.

2. Regarding the concept of financing through the use of public/private partnerships, could you provide us with options, lessons learned, and processes you would recommend?

Our information on to this topic comes from a variety of sources including FHWA, Goldman Sachs, KPMG, and notes from conversations with TTC (Trans Texas Corridor) and ODOT (Oregon Department of Transportation) staff. We have included much of this information below.

What is a Public-Private Partnership?

A Public-Private Partnership is a long-term contractual agreement between a government agency and a private partner for the delivery of goods or services. As partners, each party shares in the potential risks and rewards inherent in the delivery of goods and services including financial risks and responsibilities as well as quality assurances for users and investors.

There are many different kinds of Public-Private Partnerships with varying levels of private sector involvement. Design/Build has been used in the transportation industry for sometime. An emerging trend is toward the "Concessionaire" or Design-Build-Finance-Operate (DBFO) transaction, where the government grants a private sector partner the right to develop a new piece of public infrastructure. The private partner takes on full responsibility and risk for delivery and operation of the public project against pre-determined standards of performance established by government. The private-sector partner self-finances a portion or all of the capital investment. The private sector is paid through the revenue stream generated by the project, which could take the form of a user charge (such as a highway toll) or, in some cases, an annual government payment for performance (often called a "shadow toll" or "availability charge"). Any increases in the user charge or payment for performance are typically set out in advance and regulated by a binding contract.

- 4) Complete standardized P3 “contract books.” Typically P3 procurements include three documents or “books”:
 - Book A: Contract Terms and Conditions.
 - Book B: Technical provisions-project specific requirements.
 - Book C: Library of standards for design, construction, maintenance, and operations.
- 5) Develop a community and industry outreach program to build public awareness and industry confidence so the state can manage a successful P3.

Typical P3 Partnership Approach/Timeline

- a. Draft pre-qualification requirements.
- b. Draft RFP for industry review and comment.
- c. Create specs and 10% drawings.
- d. Receive industry comments.
- e. Revise and issue RFP.
- f. Receive and evaluate proposals.
- g. Award the contract.
- h. The entire effort will take 12 to 18 months after rulemaking and processes are in place.

Concessions – A Growing Trend

Under the concessionaire concept, the private partner (concessionaire) takes on full responsibility and risk for delivery and operation of the public project. The concessionaire also self-finances a portion or all of the capital investment and is paid back through the revenue stream generated by the project through tolls or “shadow tolls.”

Under a concessionaire contract, the public agency has an opportunity to customize project financing and revenue generation as well as the use and development of the infrastructure. Three general approaches are:

- a. Long-term lease and operation of existing assets.
- b. Construction and operation of new facilities.
- c. Reconstruction, expansion, and operation of existing facilities.

Key Concessionaire Questions

As an agency develops a concessionaire program, they must answer the following questions?

- a. Who operates the facility?
- b. Who collects the money?
- c. Who brings the equity?
- d. Who enforces toll operations/violations?
- e. Who enforces HOV compliance?
- f. Where does “excess” revenue go?
- g. Who maintains the non-tolled portions of the facility?
- h. Who has decision authority over which issues?
- i. How to handle potential conflicts of interest?
- j. How to handle payment of work products (stipends)?
- k. Where is it possible and allowable to combine public sector and private sector funding?
- l. How to balance revenue with project definition?
- m. How to structure the selection process?
- n. Low bid versus best value.
- o. What might be included in the best value criteria?
- p. Variations on Toll Feasibility and Selecting a Concessionaire
- q. Two of the key issues related to financing include:
 - 1) Is the facility “toll feasible”? That is, will the expected revenues from the project fully compensate the concessionaire for their investment? Or must the public agency provide initial equity to “buy down” the capital requirements for the private sector investor?
 - 2) What happens with potential “excess” toll revenues?

Projects that are not completely toll feasible may require an initial payment from government to the concessionaire, but the return on investment for the agency can be substantial.

Additional P3 Considerations

An Alternate Approach to Project Funding: 63-20 Financing

The primary reason that relatively few real toll projects have been procured using the DBFO concession model in the United States is the fact that public agencies are able to obtain cheaper, tax-exempt debt. Using this type of debt keeps interest costs low and generates attractive opportunities for both private and corporate investors. Recently, a number of highway and transit projects have been funded by debt issued by non-profit corporations, which, pursuant to Internal Revenue Service (IRS) Revenue Ruling 63-20, are able to issue tax-exempt debt on behalf of private project developers.

In order to meet their financing needs, state and local governments can issue tax exempt toll revenue bonds through either established conduit issuers or creation of not-for-profit corporations pursuant to IRS Revenue Ruling 63-20. While governments normally prefer to utilize an established entity for conduit issues, IRS Revenue Ruling 63-20 provides a viable alternative and has been used to finance a number of major projects around the country. Examples include toll roads in Virginia and South Carolina, Massachusetts Route 3 North, and the Las Vegas Monorail.

Two primary models have emerged for using 63-20 tax-exempt debt to finance transportation projects procured as public-private partnerships. For revenue generating projects, the 63-20 corporation can issue debt by leveraging future toll or farebox revenues, with the public benefit corporation entering into a DBOM agreement with a private contractor to design, build, operate, and maintain the project for a pre-determined franchise period. In these cases, the private partner usually assumes responsibility for arranging financing as well, but does not actually issue the debt. The financing package would be submitted to the board of the 63-20 corporation for approval and then issued on its behalf by a brokerage agency.

Lease back arrangements can also be used as a revenue source to back 63-20 debt. In this case, a department of transportation or a transit agency would agree to lease the transportation asset to be developed by the 63-20 corporation for a designated period of time. The 63-20 corporation would then leverage the future lease payments to issue its debt. As with toll-backed 63-20 financings, the private DBOM partner would likely play an important role in assembling the financing package for this type of lease-back transaction. This model is similar in certain ways to shadow tolling.

Lessons Learned from Other P3 Implementations

- a. P3 is a new way of doing business for most departments of transportation (DOTs). Historical approaches to design, specifications, construction inspection, and maintenance will have to be adjusted. These adjustments are not always easy. Visible leadership from the top of the agency is critical for efficiently moving forward.
- b. The more serious political issues typically involve the potential use of private equity, the initial establishment of toll rates, and the escalation of toll rates. These issues can be managed politically and contractually.
- c. Organizational models for managing toll operations vary, but most DOTs seem to set up an internal toll division within the agency.
- d. Legislative and transportation commission advocacy is crucial. Otherwise the agency has no “political cover” and must manage all of the controversy itself.

- e. Because of the embedded legal issues, it is wise to have a “gatekeeper” at the state attorney’s office that can route issues and get answers on behalf of the DOT.
- f. In order to reduce the timeline to stakeholder/community acceptance, it is important to get key stakeholders involved from the very beginning.
- g. Additionally, private sector outreach should begin immediately. The private sector needs to know two things. First, the state has “real” project opportunities. Second, the state is capable of managing a P3 program. More states are getting involved in P3, and private capital can only go so many places, so this early contact and confidence building is critical.
- h. The “conventional” U.S. approach to toll feasibility and bonding requirements is frequently more conservative than what a P3 concessionaire will view as toll feasible.
- i. A P3 concessionaire agreement should include a section on “hand back” requirements and standards. That is, an agency should establish standards for how the concessionaire should maintain and reconstruct a facility, as well as define its condition when it is handed back to the agency at the end of the agreement.
- j. Completing a 20% to 30% design before entering a P3 design/build or concessionaire agreement is generally unnecessary and a waste of public money.
- k. Full toll financing seldom works. Most projects require a public sector “buy down” on capital to attract private sector financing.
- l. TexDOT estimates that 30-year maintenance of a facility can be as high as 1-1/2 times the original capital cost, so the impact of maintenance costs and whether these costs should be included in the P3 agreement is important.
- m. TexDOT goals for the Trans-Texas Corridor included:
 - 1) Identify a long-term strategic partner.
 - 2) Minimize the use of public funds.
 - 3) Maximize the use of private funds.

3. *I am interested in the broader economic impacts of construction. How could we mitigate the adverse impacts of construction?*

- a. During construction of the tunnel alternative for the Alaska Way Viaduct, the disposal of 2.3 million cubic yards of excavated material will have significant impacts on downtown traffic and business access. We recommend that disposal sites be evaluated during final design, and identified in the bid documents. In addition, a plan should be developed for transporting this material. Truck hauling of the material should be limited to nighttime off-peak hours. Given the proximity of the rail system at the south end of the project, rail transportation is also an option, especially given the existing trolley track. Thirdly, barge transportation is an alternative if a cost effective disposal sight could be located.
- b. Truck traffic from the Ballard/Interbay Industrial Manufacturing area must be addressed as part of the traffic mitigation plan. East/west improvements to and from I-5 should be evaluated during

final design, and scheduled to be constructed prior to work along the Alaskan Way corridor. Such improvements could include restricted parking, improved intersections, and signalization changes.

- c. Anything that can be done to eliminate single occupancy vehicles through the corridor would help alleviate congestion. To this end, we recommend that transit service from both West Seattle and North Seattle to the downtown core be increased, and that this be initiated as soon as possible to establish new transportation habits and work out the best system.
- d. We recommend that WSDOT provide a full-time media communication person to keep the traveling public informed of closures and detours on a daily basis. This was utilized in Denver on the T-rex project very successfully.
- e. Disruption to the public can be minimized through the use of effective contract packaging strategies. We recommend that these strategies be developed early in the planning process and include the following considerations:
 - 1) Project Size/Scope: Larger contract values tend to limit competition and increase bid prices, but smaller contract values result in additional contract interfaces and the risk of contractor interference.
 - 2) Bonding – Surety Capacity: With the changes in the insurance market resulting from September 11, 2001, consideration should be given to initiating legislation to provide for bonding of the AWV and SR 520 contracts at an amount less than 100% of the bid amount.
 - 3) Delivery Methods: In addition to standard Design Bid Build methods, WSDOT should consider Design Build and Alliance contracting methods.
 - 4) Contractor Management: Schedule contract advertising and interim milestone dates to eliminate or minimize conflicts at contract interfaces.
- f. There are many environmental issues associated with the construction of the SR 520 corridor. The Panel suggests that the mitigation and permitting for environmental issues be elevated to the highest possible level, both within WSDOT and within the permitting agencies, in order to obtain the minimum possible timeframe for this very important task. These high-level contacts should be maintained throughout construction to allow for prompt resolution of any issues that arise as construction proceeds.
- g. In order to avoid delays to the start of construction, the costs and environmental risks of the currently proposed graving dock site must be mitigated. While work continues on the currently planned site, other sites out of state and/or out of the U.S. should be investigated. We note that the orthotropic deck sections for the Tacoma Narrows Bridge are being fabricated outside of the U.S.
- h. Adverse impacts relating to construction are typically identified during the design stage by means of a detailed constructability review. Such a review can determine whether specified requirements are reasonable and/or alternate construction approaches feasible; and in addition can help the design team identify cost effective solutions and a realistic construction schedule. The Panel recommends that workshops be convened, for both projects, as soon as practicable to develop a plan for construction methods and staging, traffic phasing, and a construction estimate and schedule. Participants should include key agency designers and decision makers, as well as

individuals with independent, extensive management experience and knowledge of the construction of mega projects throughout the United States.

4. You suggested that there were design tools available that might decrease the cost of the projects. Would you please provide me with specific suggestions on design options that WSDOT should explore with the Federal Highway Administration?

In addition to the “context sensitive design,” including reduced design speeds or reduced shoulder and lane widths discussed in the body of our letter, we have the following cost reduction thoughts for the AWV project:

- a. If acceptable context sensitive design does not reduce costs sufficiently, WSDOT may need to reconsider the bypass tunnel with two through lanes in either direction. One possibility would be to size the tunnel for two full 12-foot-wide lanes with a full 10-foot shoulder on one side and an 8-foot shoulder on the other. This 42-foot-wide section could be re-striped for three 11-foot-4-inch lanes with 4-foot shoulders on either side. With this tunnel section, the full capacity could be maintained with 4-foot shoulders, or if it is ever decided that having a full width shoulder is required for safety or to minimize disruption in the event of breakdown, the tunnel could be re-striped and still have significant through capacity.
- b. We have several thoughts related to comparisons between the side-by-side and the stacked tunnel configurations:
 - 1) The stacked tunnel is of necessity much deeper than the side-by-side configuration. Contractor panel members and technical advisors have been concerned with the depth of excavation adjacent to the waterfront and the complicated geometry and forming required in the long transition sections before the tunnel becomes vertically stacked. (Note that as currently designed, these complex transition sections are longer than the stacked tunnel section.) Going deeper not only increases the risk of water leaks and bottom blowout, but also requires more cross bracing of the excavation, which makes construction more difficult.
 - 2) If additional base slab thickness is used to provide dead load to offset the buoyancy (the tunnel needs additional weight to prevent it from floating), then the deeper below the water level, the thicker the base slab has to be. Each additional foot deeper below the water level requires approximately an additional 1/2 foot of concrete in the base slab. If the stacked tunnel is selected, the Panel recommends investigating tie-downs to reduce the amount of concrete required to offset buoyancy.
 - 3) The side-by-side tunnel reduces these construction problems, but requires more attention during design as portions of the bottom of the tunnel excavation would be located in the harbor fill and the tunnel would have to be designed as a long beam on a flexible foundation (which is common for tunnels in soft ground). More subsurface information will be required to determine variability of materials and to account for this variability in the design, but this information will be valuable to the contractors bidding the project. These comments apply primarily to the stacked tunnel section since the transition sections will have to pass through the fill material to get to the glacial till.
 - 4) An additional advantage of the side-by-side tunnel is that tie-downs (or slab thickening to offset buoyancy) may not be needed since the tunnel displaces less water per foot of tunnel.
 - 5) The panel understands that one of the reasons for going to the stacked tunnel was that an additional line of shoring would be required to pour the side-by-side tunnel in halves. Recent constructibility reviews have suggested that a row of “king” piles will be required for the

stacked tunnel to keep the size of the cross bracing down, so the extra shoring for the side-by-side tunnel might not be a significant difference..

- c. If, in the final analysis, the cost of the tunnel is projected to be above the affordable target cost, there is always the possibility of further reducing the geographical scope by retrofitting the northern section of the existing viaduct as it approaches the Battery Street Tunnel and to defer improvements to the Battery Street Tunnel. The new waterfront tunnel section, whether stacked or side-by-side, would connect to the retrofitted existing viaduct as it approaches the Battery Street Tunnel. While this option may not be the most desirable, it would provide a way to get the major benefits of the viaduct replacement at a lower cost.

For SR 520, most of the cost reductions we considered are already being evaluated by WSDOT. The only additional cost reduction suggestion some panel members discussed was to place a new floating bridge to the south of the existing floating bridge to protect the existing bridge from storms from that direction. As a smaller structure, the pontoons could be sized appropriately so that an existing casting basin could be used. This is probably what would be done if a severe storm or earthquake rendered the existing bridge unusable prematurely. The existing pontoon bridge could continue to be used as long as it is considered to be safe. Ultimately the existing pontoon bridge would need to be replaced. One problem with this scenario is that the new pontoon bridge would not have the moveable section, so other arrangements would have to be made for the one or two ships that use the existing movable span. We understand that this is a complicated issue and will have other environmental impacts that would need to be considered. We therefore cannot say whether this idea would be feasible.

Another potential SR 520 cost savings discussed by the Panel was the possible elimination of the temporary construction trestle. This \$100 million expense may be reduced or eliminated with alternative construction approaches. The Panel plans to discuss this further and to review other potential savings for SR 520 at our January meeting.