Columbia River CROSSING

DRAFT Memorandum

November 21, 2006

TO: Task Force

FROM: CRC Project Team

SUBJECT: **UPDATE:** Considerations for Replacing Versus Reusing the Existing Interstate 5 Bridges

1. Introduction

1.1 What is the purpose of this memo?

This memo describes key considerations associated with replacing versus reusing the existing I-5 Columbia River bridges. Over the next few of months, the decisions on which alternatives to carry forward into the Draft Environmental Impact Statement (DEIS) will include narrowing the river crossing options. A key choice is whether to remove or keep the existing bridges over the Columbia River. The "replacement" alternatives would remove the existing I-5 bridges and build new structures. The "reuse" alternatives would keep one or both of the existing bridges in addition to building a new supplemental crossing.

The primary purpose of this memo is to provide a summary of the key trade-offs associated with replacing versus reusing the existing bridges, to inform the upcoming recommendations from the Task Force and other advisory, decision-making and stakeholder groups.

1.2 What issues should the Task Force consider before deciding to reuse or replace the existing bridges?

The river crossing alternatives have been evaluated on how well they meet the adopted project Values and Criteria. The key issues to consider in the decision to remove or reuse the existing bridges are:

- Traffic and transit operations and safety;
- Navigation operations and safety;
- Community and economic impacts;
- Natural environment impacts;
- Costs; and
- Other considerations, including Ownership.

1.3 Are there other considerations that will affect the decision?

If the bridges were no longer used for transportation purposes, US Coast Guard policy related to their jurisdiction over navigable waterways would require that the bridges be removed. This eliminates pure "preservation" options that would keep the structures in place but not provide any transportation function on them. Therefore, this memo focuses only on reusing the existing bridges for one or more transportation functions.

In addition to considering how well the various alternatives meet the project's Vision and Values, the USDOT will need to ensure that the alternatives carried into the DEIS will be consistent with specific requirements of federal environmental law. Because the northbound I-5 bridge is listed on the National Register of Historic Places (NRHP), it is afforded special protection under Section 4(f) of the Department

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of Transportation Act. This law prohibits the USDOT from funding any project that would have an adverse impact on significant historic resources (as well as public park lands), unless it can be demonstrated that there are no prudent and feasible alternatives that would avoid that impact. An alternative is feasible if it is technically possible to design and build. An alternative may be feasible but imprudent for several reasons, such as: it adds costs of an extraordinary magnitude; it does not meet the project purpose and need; or, it would have an accumulation of factors that collectively have adverse impacts of a unique or extraordinary nature. The formal Section 4(f) analysis and documentation cannot be completed prior to the Final EIS phase in 2008. However, the project team is pursuing input from the USDOT to determine which, if any, of the alternatives that avoid or minimize impact to the existing bridges (e.g. those that reuse the bridge) would be considered prudent and feasible. The USDOT is expected to provide that input by January or early February 2007.

The Task Force and other local advisory and decision-making bodies can make their recommendations prior to the USDOT input. If the USDOT determines that any of the avoidance alternatives are prudent and feasible, then these will be included in the final range of alternatives carried into the DEIS.

2. Key Findings and Next Steps

On nearly all the Values, alternatives that replace the existing bridges perform better than alternatives that supplement and reuse the existing bridges. Replacement options perform better for transit, traffic, navigation, community resources, natural resources, transportation equity and seismic safety. The only key advantage of the reuse options is that they would have less impact on the historic bridge. The following are the current key findings related to the reuse options:

- Keeping Interstate traffic on the existing bridges (package 3) would not meet the project's purpose and need related to traffic safety.
- Arterial traffic could function with adequate safety on the existing bridge (packages 4, 5, 6 and 7). However, that traffic would be affected by frequent (including peak period) bridge lifts that would result in through-traffic intrusion, queuing, and other impacts on Hayden Island and in downtown Vancouver. The options that put arterial traffic on the existing bridge and include an I-5 interchange on Hayden Island (packages 6 and 7) would have substantially greater property acquisitions and business displacements, compared to replacement bridge options. All of these reuse options may also require a major seismic upgrade to the existing bridge. Cost estimates are needed to understand the cost implications of arterial reuse for the existing bridges.
- Light Rail Transit (LRT) on the existing bridge would likely include major seismic retrofits and design upgrades to the existing bridge. The existing bridge, due to unrestricted bridge lifts interrupting service and reliability, would have substantial operational disadvantages for LRT, doubling travel times between downtown Vancouver and Rose Quarter and causing ripple effects through other parts of the region's LRT system. There are also important equity considerations that arise if the region places transit service on the lift span bridge that is subject to random service interruptions, delays and added operational costs, while autos and freight are placed on the new fixed span crossing that is immune from bridge lift interruptions. This option also reduces transit cost-effectiveness and therefore jeopardizes the region's ability to secure federal funding for the transit portion of the project. Cost estimates are needed to fully understand the cost implications of LRT on the existing bridges.
- Bus Rapid Transit (BRT) on the existing bridge would likely include major seismic retrofits. The existing bridge, due to unrestricted bridge lifts interrupting service and reliability, would have substantial operational disadvantages for BRT, although the impacts would not be as regionally disruptive as with LRT. A bridge lift would increase travel times between downtown Vancouver and Rose Quarter. There are also important equity considerations that arise if the region puts transit service on the lift span bridge that is subject to random service interruptions, delays and added operational costs, while autos and freight are placed on the new fixed span crossing that is immune from bridge lift interruptions. This option also jeopardizes the region's ability to secure federal funding for the transit portion of the project. Cost estimates are needed to fully understand the cost implications of BRT on the existing bridges.

- Using an existing bridge for bicycles and pedestrians only would require some seismic upgrades. The lower elevation of the existing bridge makes it easier to access than a new bridge, although that advantage is contradicted by the interruptions due to bridge lifts. The lifecycle cost of this option would likely be substantially higher than the cost of accommodating bikes and pedestrians on a new highway and transit bridge (replacement alternatives). Cost estimates are needed to fully understand the cost implications of providing a bike\ped facility on the existing bridge.

Other factors differentiating all of the reuse options from the replacement options are:

- The river navigation problems associated with the existing bridges would be largely fixed if they were replaced by a new bridge. These problems would be exacerbated by supplementing and reusing the existing bridges. While this is clearly a disadvantage for reuse options, the US Coast Guard has not yet provided a definitive, official opinion or determination on the severity or permittability of a bridge that would degrade navigation. However, Coast Guard officials have informally stated their preference for a replacement bridge. In addition to the bridge lift impacts on navigation, the reuse options would result in nearly 3 times as many piers in the water, compared to the replacement options. The Coast Guard's concern over the reuse options will be an important consideration for the river crossing decision.
- Adverse land use and right-of-way (ROW) impacts are greater for alternatives that reuse and supplement the existing bridges versus alternatives that use a replacement bridge. This is especially true on Hayden Island where the Supplemental Bridge options require an interchange design with a much larger footprint.
- Natural resource impacts are greater for supplemental versus replacement alternatives, especially from a long-term perspective.
- Ownership is a significant consideration for any reuse option other than interstate traffic use. This may be a fatal flaw if WSDOT and ODOT are not willing and not required to maintain ownership and no alternative owner can be found. Answering these questions requires additional research.

3. Operations and Safety of Reuse Options

3.1 How well would *interstate* traffic operate on the existing bridges?

The existing bridges do not meet current interstate highway standards. Sub-standard design features reduce traffic speeds and capacity and increase accident rates for interstate traffic using the bridges. Furthermore, bridge lifts occur during off-peak periods, causing accidents and increasing the chance of congestion throughout the day. Given their through-truss design, it is prohibitively expensive to widen the existing structures to meet current interstate highway design standards. Therefore, alternatives that keep interstate traffic on the existing bridges would not meet the project's purpose and need.

The existing bridges have steep vertical grades approaching the crest of the structures (the "hump"). Because the crest limits sight distance, the bridge does not meet stopping sight distance standards for speeds greater than about 35 mph. This contributes to increased accident rates on the bridges. Cars approaching the hump cannot see traffic on the downward slope, causing rear-end collisions if traffic has stopped on the other side of the hump.

The shoulders on the bridges are approximately 1 foot wide, well below the standard 10 – 12 feet. This is inadequate as a storage location for disabled vehicles and forces drivers on the outside lanes to be undesirably close to the physical barriers that border the bridges. The lack of safe areas for incident response, disabled vehicle pullout, and driver recovery impairs the ability to manage highway operations and recover from events that interrupt traffic flow. As a result, accidents occur more frequently and even minor accidents can cause severe delay crossing the bridges.

Upgrading the existing bridges to reduce vertical grades and provide sufficient shoulder widths is prohibitively expensive. Reducing the vertical grades would require significant modifications to piers and reconstruction of selected truss spans. Though technically feasible, this would be prohibitively expensive and would impact river navigation by lowering vertical clearance under the high span channel. The existing bridges are not wide enough to retain three lanes of interstate traffic and provide at least a 10-foot-wide shoulder. Removing one lane of traffic in each direction would provide enough room for one standard width shoulder but would further limit the capacity of the bridges, which are undersized to meet demand even with three lanes in each direction. It would not be technically feasible to widen the existing bridges to provide enough width for a standard shoulder without virtually rebuilding the structures. The existing truss members would have to be removed and replaced with new, wider through truss members, which would be prohibitively expensive, close the bridges during construction, and change the visual character of the existing structures.

Currently, the Coast Guard permits the DOTs to prohibit bridge lifts during peak periods, restricting lifts to off-peak periods. Bridge lifts create congestion because they require traffic to wait for as much as 20 minutes. This is often long enough to create long lines of traffic waiting to cross the bridge, which can take up to 1 hour or more to clear. Bridge lifts also can cause collisions as drivers do not expect to stop as they approach the bridge. Bridge lifts would likely continue to be limited to off-peak traffic periods if the existing bridges remain in use for interstate traffic. However, lift restrictions might be removed if the Coast Guard were to determine that a supplemental bridge created safety concerns for river navigation.

The substandard features on the existing bridges increase accident rates and cause even minor accidents to create congestion. Furthermore, bridge lifts would continue to create operational problems for interstate traffic during off-peak periods. Since the existing substandard design features cannot practicably be corrected, continuing to route interstate traffic on these bridges would not meet the project's purpose and need.

3.2 How well would *arterial* traffic operate on the existing bridges?

Reusing the existing bridges for arterial traffic would encounter some of the same problems as reusing them for interstate traffic and introduce some additional difficulties. Providing a crossing devoted to arterial traffic would not reduce or eliminate any of the necessary functions of a new crossing (i.e. it would not make the new bridge need fewer lanes). Retaining the existing bridges for automotive use would result in complex intersection arrangements due to the proximity of a new interstate crossing. Substantial increases in cut-through traffic in downtown Vancouver and Hayden Island would disrupt livability and hinder growth in these areas. Furthermore, while traffic impacts to local streets would be substantial, overall usage of an arterial crossing would be very low, making such a bridge difficult to justify.

Because arterial traffic would have lower speeds and volumes than interstate traffic, it would not be as adversely affected by sub-standard design features, such as the steep grades approaching the "hump" of the bridges. The currently narrow shoulders that do not allow vehicle storage and can cause even minor accidents to create congestion could be widened by converting the six lanes to just four lanes (two lanes per bridge) into an 8-foot-wide outside and 4-foot-wide inside shoulder. An arterial could potentially be posted for travel speeds of 35 mph, which would meet the existing limitations on stopping sight distance.

One significant concern for reusing the existing bridges for arterial traffic is the effect of bridge lifts. Currently, the Coast Guard restricts lifts to off-peak periods. If the bridges are used for non-interstate purposes, discussions with Coast Guard officials have indicated that the lift restrictions would likely be removed. This would permit lifts on-demand throughout the day. Lifts during peak periods would disrupt arterial traffic and increase congestion, travel time, and accidents during these times.

An arterial crossing's connections in downtown Vancouver, on Hayden Island, and near Marine Drive could also create operational and safety concerns because the supplemental highway bridge and its ramp connections would be immediately adjacent. The interface between the arterial's intersections and the new highway ramps cause complex intersection arrangements and potentially prohibit some turning movements from the arterial or require circuitous routing.

Perhaps most importantly, an arterial crossing would increase cut-through traffic in downtown Vancouver and on Hayden Island. Initial traffic forecasts indicate that there would be few close-in or short trips that would use an arterial crossing (only 3.5% of the vehicle-trips currently using the existing bridges travel five miles or less). Some motorists taking longer trips would divert to an arterial crossing, especially during congested periods on I-5, and increase traffic intrusion in downtown Vancouver (e.g., along Columbia, Washington, Main, and Broadway Streets), and on Hayden Island streets (e.g., along Center Avenue, Jantzen Drive, and Hayden Island Drive). This would impact intersection service levels, interactions with other modes (e.g., pedestrians and bicyclists), and may introduce safety concerns on local streets.

Diversion of interstate traffic to local streets because of an arterial bridge is especially concerning for downtown Vancouver. Downtown Vancouver is undergoing rapid revitalization, continuing to attract new residential and business development. As the downtown grows, so will traffic destinations and origins. This traffic growth is indicative of a thriving downtown and is desirable. However, traffic diversions from the Interstate crossing would increase traffic traveling *through*, not *to*, the downtown area. This would increase traffic congestion on these streets without increasing the commerce and enjoyment of downtown Vancouver.

Preliminary traffic modeling results indicate different supplemental bridge options produce substantially different arterial traffic impacts on downtown Vancouver. Constructing a new supplemental arterial bridge (keeping interstate traffic on the existing bridges) would increase traffic in downtown Vancouver by about 60% to 70% more than if a replacement bridge were built. If the existing bridges were used as an arterial crossing and an interchange on Hayden Island were not constructed (instead relying on a new downstream bridge over the Oregon Slough), arterial traffic in downtown would increase about 50% more than with a replacement bridge. If the existing bridges were used as an arterial bridge and an interchange on Hayden Island were constructed for the supplemental interstate crossing, arterial traffic in downtown would increase by about 15% to 20%. Under the latter scenario (new supplemental interstate crossing with a Hayden Island interchange), traffic impacts in the downtown are much less because total usage of the arterial crossing would be very low – only about 400 to 500 total vehicles per hour during the PM peak period.

Operating arterial traffic over the existing bridges proves very problematic. While some of the safety concerns that exist for interstate traffic could be alleviated, new problems arise. Retaining the bridges as a second vehicular crossing requires complex interchange configurations that consume highly desirable land on Hayden Island and in downtown Vancouver. Furthermore, these areas would both be burdened by cut-through traffic diverting from the new interstate crossing to the arterial bridge, clogging local streets. Added to these problems is the fact that a separate arterial crossing does nothing to address the project's Purpose and Need.

3.3 How well would *transit* operate on the existing bridges?

Reusing the existing bridges for LRT or BRT would require substantial upgrades and would still limit transit operations when compared to using LRT or BRT on a new bridge.

Operating LRT on the existing bridges would require adding an electric power system, rail tracks, and potentially complete deck reconstruction and substantial structural improvements to ensure sufficient load capacity. More importantly, major seismic upgrades (see Section 3.5) would be required to the bridge's substructure and superstructure and the lift towers and bearings would need to be replaced.

Furthermore, since a new supplemental bridge would be located west of the existing bridges, LRT would need to cross under I-5 at both ends of the bridge in order to access Hayden Island and downtown Vancouver. Such crossings would consume more property and require tight radius curves which would slow LRT operations.

One advantage of operating LRT on the existing structures would be the lower elevation of those bridges on Hayden Island and at the south end of downtown Vancouver. Being closer to ground level allows easier access to the LRT stations by pedestrians, buses, and autos. However, this advantage would be contradicted by the slower LRT speeds and longer LRT route that would result from the two additional I-5 crossings and tight radius curves mentioned above.

Bridge lifts would cause severe limitations on LRT or BRT operations by delaying trains or buses for extended periods of time and decreasing transit travel times, reliability, and ridership. These delays, particularly during peak period when such delays are most harmful, disrupt schedules and limit the travel time benefits that a major transit project is expected to deliver. For LRT, this would also impair signal prioritization — requiring train operators to manually override automated operation — and impede operators' ability to coordinate signalization at the Steel Bridge in Portland. If the Coast Guard were to allow bridge lifts throughout the day (which is likely), transit operations would be severely impeded because lifts during peak periods may result in up to four trains waiting at both ends of the bridges. This would substantially reduce capacity during times of peak demand. Delays of this magnitude would also impact all other trains operating through the Rose Quarter and across the Steel Bridge and disrupt schedules along the entire Portland Mall because service in these areas is provided by weaving two or more train lines together. Preliminary data suggest bridge lifts would add at least 17 minutes of delay, effectively doubling travel time between downtown Vancouver and Rose Quarter Transit Center. This does not include the effect of train queues that would accumulate during peak periods and the resultant system-wide disruption that would increase delay for many more trains than those directly stopped by a bridge lift.

Reusing the existing bridges for BRT would require the same seismic upgrades (major retrofit of substructure and superstructure and replacement of lift towers and bearings) as for other reuse options. However, unlike LRT, it would not require reconstructing the deck or adding rail and an electric traction power system. The only deck improvements required would be roadway restriping and resurfacing.

There are no meaningful operational advantages to running BRT on the existing bridges versus a new bridge, but there are clear disadvantages. While the operational limitations would not be as severe to BRT as to LRT, they would still be substantial. Bridge lifts would not be as disruptive to system-wide performance compared to LRT, but they would result in holding up to three buses at each end of the bridge during the peak periods, thus increasing travel times and decreasing reliability and passenger-carrying capacity.

The existing bridges can be retrofitted to meet design standards for LRT and BRT use. However, these retrofits would be substantial for LRT and would still result in much lower operational efficiency and reliability compared with transit operation on a new structure. Seismic safety would require major seismic upgrades to nearly all bridge elements, whether used for LRT or BRT. If the Coast Guard were to allow bridge lifts during peak periods, which appears likely, the negative impact on either LRT or BRT reliability, travel time, and ridership would likely fall short of meeting the project's purpose and need.

Transportation equity is another important issue when considering operating transit on the existing bridges. Transit, especially LRT, would benefit from the advantages of a new fixed span bridge as much as vehicular and freight traffic. Burdening transit riders with delays and reliability problems associated with the lift span makes a clear and undesirable statement about the project's, and the region's, priorities. Ultimately, if the project were to pursue relegating transit to the existing bridges, it is likely that there would be substantial community discontent that autos and freight were given priority over transit.

The increased cost and reduced performance of BRT or LRT on the existing bridges raises significant concern about the ability of the transit project to secure federal funds. This project must compete nationwide for a limited funding pool, and any options that add costs and decrease transit rider benefits decrease the competitiveness of the project.

3.4 How would the existing bridges work for *pedestrians and bicyclists*?

Existing bicycle and pedestrian facilities across the existing bridges are 4 feet narrower than the 10-foot minimum standard and are located extremely close to traffic lanes, impacting safety for pedestrians and bicyclists. Furthermore, connectivity between the bridges and adjacent areas is poor; bicycle and pedestrian connections between Marine Drive, Hayden Island, and Vancouver require out-of-direction travel.

Options for reusing the existing bridges for bicycles and pedestrians range from retaining the current conditions to devoting one of the existing bridges entirely for these users. The former option would not address the project's purpose and need, while the latter could improve capacity and safety for bicycles and pedestrians comparable to a facility on a new bridge. Minimal upgrades would be required to convert one of the existing bridges for bicycle/pedestrian use.

However, seismic safety may still require substantial seismic upgrades as discussed in Section 2.5, thus adding substantial cost to this bike/ped option, compared to accommodating pedestrians and bicycles on a new multi-use bridge. In addition, the lift span would be allowed to open at any time and would require 24-hour staffing. This could make the bridge a very expensive bicycle/pedestrian facility and it is doubtful that there is a public entity that would be willing and able to assume ownership. Although lifts would likely occur even during peak periods, they would not be expected to substantially impact bicycle or pedestrian safety, though they would introduce delays and uncertainty.

The existing bridges can be retrofitted to meet design standards for bicycle/pedestrian use. Reusing one of the bridges exclusively for bicycles and pedestrians would perform nearly as well as a facility on a new structure as long as the connections at each end were improved. However, the cost of seismic upgrades and the cost of long-term lift span operations make it unlikely that any public entity would be willing and able to own and operate one of the existing bridges exclusively for bicycles and pedestrians.

3.5 Can the existing bridges be seismically upgraded to current standards?

The project convened an "Expert Seismic Panel" of structural engineering and geotechnical engineering experts for a two-day workshop on August 28 and 29, 2006 to discuss the seismic vulnerabilities and retrofit strategies of the existing bridges. Based on the age and design of the bridges, the soils in which the bridge piers are located, and the seismic vulnerability of this region, the Seismic Panel considered the existing bridges to be highly vulnerable to significant damage and/or collapse from a seismic event. Key findings from this panel included:

- Soil will liquefy to a significant depth, requiring a full foundation seismic retrofit to avoid foundation failure;
- The rebar in the pier columns lacks adequate confinement and could be severely damaged;
- The bridge bearings would be significantly overstressed in a major seismic event and would fail;
- The movement of the unrestrained bridge counterweights during a seismic event could severely damage the bridges; and
- The tower and truss span members and connections are vulnerable to overstress and damage during a seismic event.

The bridges currently do not meet basic "no collapse" criteria for safety in the occurrence of a major seismic event. The panel determined that it is technically feasible to retrofit the existing bridges to a level of service that would meet "no collapse" criteria, though the expense could be equal to a substantial portion of the cost of a new structure. The panel discussed the structural elements that were considered to be most vulnerable to severe damage or failure in a seismic event and retrofit strategies that addressed these vulnerable elements. The panel recommended that any alternative that reuses the existing bridges should, at a minimum, have a seismic retrofit strategy that protects against collapse (rather than maintain an operational level of service) in a 500-year event. Such a decision would likely rest with the entity owning the bridge.

Seismic retrofits would change the visual character of the existing bridges due to added and strengthened structural members and rebuilt towers. Changes to the structural members would likely not be apparent to traffic traveling over the bridges, but would be visible to viewers on Hayden Island and in downtown Vancouver. Rebuilding the lift towers would substantially change the visual character of the bridges for travelers on the bridges and viewers on Hayden Island and in downtown Vancouver.

Seismic retrofits would include encasing the existing foundations, adding 20 to 80 feet to the width of each of the foundations. This would extend the current foundation limits and reduce the horizontal clearance between piers, worsening the already restricted navigation route (see section 4.1) that many vessels must traverse between the existing bridges and the downstream railroad bridge. Increasing the width of the existing bridge foundations and adding a supplemental new bridge would combine to further tighten the horizontal navigation clearances.

The existing bridges are clearly vulnerable to seismic events and major seismic retrofits are necessary to safely reuse the bridges. These retrofits are expensive, potentially change the visual character of the bridges, and reduce the safety of marine traffic traveling between the piers.

4. Navigation Considerations

4.1 How would river navigation be affected by reusing versus replacing the existing bridges?

Vessels traveling under the existing I-5 bridges and through the swingspan of the Burlington Northern Santa Fe (BNSF) railroad bridge often choose a less direct route between the bridge piers to avoid delay. The most direct navigation channel through this river section is through the lift spans of the I-5 bridges and the BNSF bridge swing span. This route is relatively straight and is preferred during times of high velocity river flow. However, it is subject to lift span restriction periods that can delay vessels. As vertical clearance allows, vessel operators can avoid delays during lift span restriction periods by traveling through the I-5 bridges' wide or high spans. Since the wide and high spans are south of the BNSF bridge swing span, this path dictates a more complex maneuver than the route through the I-5 lift spans. Vessels using the wide or high spans must navigate an "S" curve path between the I-5 bridges and the BNSF bridge.

Alternatives that reuse and supplement the existing bridges complicate river navigation by placing additional piers between the existing bridges and the BNSF bridge. There are two options that have been analyzed for pier locations — one with 600-foot spacing and another with 800-foot spacing. Both spacing options impact river navigation for the high span channel and the 800-foot span length impacts the lift span channel. Additional piers from supplemental bridges make navigation routes through the high span more difficult. Recreational vessels that typically use the high span may be forced to use the lift span if a supplemental bridge is constructed. In general, additional piers will decrease vessel safety, particularly along routes using the wide and high spans. This may cause more vessels to use the lift span, increasing the impact that the lift has on traffic using the existing bridges.

Replacing the existing bridges would remove the piers currently in the river and provide a fixed span that would accommodate nearly all vessels that currently navigate through this portion of the river. This would eliminate the current conflict between navigation operations under the existing bridges and traffic operations over them. A new bridge could also be built to current seismic standards without seismic retrofits that would narrow navigation channels (see section 3.3). Furthermore, the crest of a replacement bridge, and thus the channel with the highest clearance, could be better aligned with the swing span of the BNSF railroad bridge and simplify the route for vessel operators. A replacement bridge would allow river traffic and bridge traffic to traverse without conflict.

The existing bridges create a navigational hazard and restricted bridge lifts impact navigation operations. Seismically upgrading the existing bridge foundations and adding a new supplemental bridge would increase the navigational hazards and the conflict between river vessels and bridge users. This hazard could be eliminated and the operational restrictions avoided by removing the existing bridges and replacing them with a new bridge. Supplemental options that reuse the existing bridges for non-interstate uses might slightly improve navigation conditions by allowing more frequent bridge lifts.

4.2 How will restrictions on bridge lifts affect river navigation?

Currently, the Coast Guard allows ODOT and WSDOT to restrict bridge lifts during peak traffic periods. However, the Coast Guard would likely require bridge lifts to be allowed throughout the day if the existing bridges are reused for non-interstate uses (i.e., arterial traffic, transit, or bike/ped) or if a supplemental bridge were to exacerbate existing impacts on marine safety and operational efficiency. Current restrictions on bridge lifts cause some marine traffic to take the safety risk of making the "S" curve to avoid the delay of waiting to use the lift span, while other vessels that do not want to risk this maneuver must wait to use the lift span during off-peak periods. Thus, alternatives that reuse the existing bridges for non-interstate traffic could have a beneficial effect on river navigation since they might cause the Coast Guard to allow lifts on demand throughout the day.

Continued use of the existing bridges for interstate traffic will maintain, and probably worsen, navigational operation and safety problems that could be eliminated with a replacement bridge. Navigational operations might be improved with supplemental bridge alternatives that shift all interstate traffic to a new bridge because these alternatives may prompt the Coast Guard to allow bridge lifts on demand throughout the day.

4.3 How would river navigation be affected by a major earthquake?

Without significant seismic upgrades, a major earthquake would likely cause bridge piers to topple in liquefied soils, bridge spans to shake off of their piers, and lift towers to topple or be severely damaged. This damage would have a severe impact on river navigation by closing the lift span and potentially reducing vertical and horizontal clearances in other spans. Severe damage or collapse of these spans would reduce or completely remove the ability for vessels to safely travel through this section of the Columbia River.

Major seismic upgrades to the bridge, as discussed above, would likely prevent bridge collapse and thus avoid major navigation impacts.

The existing bridges are vulnerable to seismic events, but could be retrofitted to withstand a 500 or even 2500-year seismic event. However, these retrofits, despite their high cost, would still constrain the existing navigation channels by adding cladding to piers and make the “S” curve maneuver more dangerous.

5. Community and Economic Considerations

5.1 How does the historic status of the bridge affect decision-making?

The northbound bridge was constructed in 1917 and is on the NRHP, which gives the bridge special federal regulatory status. The southbound bridge was constructed in 1958 and was previously determined not to be eligible for listing on the NRHP. The 1958 bridge has no regulatory status as a historic resource. Any significant alteration or demolition of the 1917 bridge will likely be considered an “adverse effect” under the federal Historic Preservation Act. The most restrictive regulatory protection is afforded by Section 4(f) of the US Department of Transportation Act. Relevant to the CRC project, this law states that the US Secretary of Transportation cannot approve funding for any transportation project that would adversely affect a significant historic resource (such as the 1917 bridge) unless it can be shown that there are no prudent and feasible alternatives that would avoid impacting the bridge. The law and subsequent amendments and regulations describe the analyses required to determine whether or not there are any such prudent and feasible alternatives that would avoid the impact.

While the official federal regulatory evaluation of Section 4(f) compliance cannot be concluded until the Final EIS phase, it is important that the project understand the ramifications of either dropping or advancing “reuse” alternatives into the DEIS. The primary purpose of this memo is to test the “prudence and feasibility” of avoidance alternatives that might be dropped at this stage in order to decrease the risk that future regulatory evaluations might find that such alternatives should have been carried forward. Non-compliance with Section 4(f) requirements would make the project ineligible to receive federal funds from USDOT.

Removal of the northbound bridge would be considered a “4(f) use” and would thus trigger the need to conduct a robust analysis of avoidance alternatives. Seismic retrofits or design upgrades to the northbound bridge could constitute a significant alteration and thus could also trigger Section 4(f). However, such retrofits and upgrades might be accomplished in a manner that adequately preserves the historic character and look of the bridge. Conceptual descriptions of possible seismic retrofits indicate they might have a minimal impact to the steel trusses which make up the most prominent and identifiable part of the bridges, even though they would significantly alter the piers and foundations and replace the lift towers. If the trusses were only minimally altered (maintaining the integrity of materials, design, and scale of the bridge superstructure) the bridge would likely maintain its eligibility for and listing on the NRHP.

The historic status of the northbound bridge places substantial protection on it. USDOT can only fund a replacement bridge if none of the alternatives that reuse the northbound bridge are prudent and feasible. The formal analysis that determines whether USDOT can fund a replacement bridge cannot be approved until 2008 or 2009. Therefore, the project sponsors are conducting a preliminary "prudent and feasible" test at this time in order to reduce the risk that alternatives eliminated prior to the DEIS will comply with Section 4(f) evaluation to be completed at the FEIS phase.

5.2 What is the importance of the bridges as a local cultural resource?

Both of the existing bridges have played a transportation role in the region and have become cultural and community resources. The northbound I-5 bridge is the second largest (in size) historic resource in Vancouver and the largest on Hayden Island. As a result of their historic nature, size, use, and location as a gateway between Washington and Oregon, the I-5 bridges have become a part of Vancouver and Hayden Island's sense of place. Any new supplemental and replacement alternatives would also function as a gateway and contribute to a sense of place.

The existing bridges also have negative impacts on some aspects of the community and other historic resources. The bridge lift towers negatively impact views from the Vancouver National Historic Reserve and the Fort Vancouver National Historic Site. The upland ends of the bridges are a physical barrier that divides the eastern neighborhood areas of Hayden Island from the western commercial areas, and traffic from I-5 generates substantial noise and affects noise-sensitive uses along the central corridor. Replacement alternatives would remove both the positive and negative visual effects of the existing bridges, and add the visual element of a new bridge and approaches. Supplemental alternatives would combine the visual and physical impacts of the old bridge with those of the new one. The new bridge (with both supplemental and replacement alternatives) would be considerably lower than the existing bridge lift towers but higher than the existing truss structures. They would also be higher across Hayden Island and in southern Vancouver compared to the existing bridges and approaches.

The CRC project's outreach and communication efforts have described replacement and reuse options to the public and received oral and written comments related to the existing bridges. A few recent comments have mentioned the historic nature of the bridge as a reason to retain them. Some residents on Hayden Island and in downtown Vancouver also value the bridges as a visual resource and as a potential transportation alternative to I-5. Other comments indicated a preference for the operational advantages and reduced land requirements of a replacement crossing. However, no formal survey has been used to scientifically assess the public's preferences on this question.

5.3 Would replacing the existing bridges be consistent with locally adopted plans?

The existing and proposed new bridges are included in local plans mostly in terms of the functions they currently or potentially could provide. The plans discuss congestion management, freight mobility, mass transit, pedestrian connectivity, etc. For each of these sets of plan policies, the supplemental and replacement options have little difference. For example, both replacement and supplemental bridge packages are able to provide similar levels of vehicular capacity, can provide a high capacity transit link, and will include pedestrian/bicycle improvements. However, those options that keep the existing bridges as an arterial bridge, and thus direct more through-traffic onto local Vancouver streets, would be less consistent with local plans, as discussed in Section 4.4.

In nearly every local land use plan there is a set of policies that call for the preservation of historically significant places and structures. These policies tie historic preservation goals to broader goals for the community, including cultural tourism and protecting a sense of place. Such policies exist in the plans of the Cities of Vancouver and Portland, Multnomah and Clark Counties, and in many sub-area plans. The historic built environments of the Kenton neighborhood, downtown Vancouver, and in the Vancouver National Historic Reserve are all near the existing bridges, include the bridges, or include a view of the bridges. These areas tie their economic success and community livability to the general protection of historic resources. Alternatives that reuse the existing bridges are generally more consistent with the policy direction of preserving historic resources, although there is no specific mention of the I-5 bridges in these documents. Furthermore, the existing bridges are considered to be intrusive on the views from the Vancouver National Historic Reserve and the Fort Vancouver National Historic Site. A new bridge would further intrude on those views, although not likely as much as the combined effects of keeping the existing bridges and adding new ones.

5.4 Will impacts to land use and neighborhoods differ if the bridges are reused or replaced?

There are two primary differences in how supplemental and replacement alternatives are likely to impact land use and neighborhoods: 1) greater ROW requirements from reuse alternatives will consume more community resources and create a more substantial barrier through Hayden Island and downtown Vancouver and 2) reusing the existing bridges for arterial traffic could cause traffic problems on Hayden Island and in downtown Vancouver.

Comparing ROW requirements between reuse and replacement alternatives is difficult to describe succinctly because there are numerous alternative packages for replacement and supplemental bridge options, each of which has different impacts on different areas. Furthermore, ROW acquisitions have not been fully developed for each alternative. However, initial assessments of ROW requirements indicate that reuse alternatives consume more land than replacement alternatives. Not only does reusing the bridges require more ROW, these alternatives will oblige the project to maintain ownership of all the existing land that is currently occupied by elements of the existing bridges and roadways. In contrast, replacement alternatives entail a new bridge that is either east or west of existing structures and could allow some of the area used by the existing bridges and interstate roadway to be sold to new owners and converted to other uses. Therefore, it is reasonable to assume that reuse alternatives generally consume considerably more land compared to replacement options. This will cause reuse alternatives to have greater impacts to existing land use and neighborhood resources such as commercial amenities at Jantzen beach or riverfront property that is valuable to Vancouver's revitalizing downtown that faces the Columbia River.

Alternatives that reuse the existing bridges as an arterial crossing could substantially increase through-traffic in downtown Vancouver and Hayden Island. Especially during congested periods on I-5, traffic would likely divert from the new bridge to the arterial crossing and increase traffic intrusion along local streets. This could deteriorate the social cohesion that downtown Vancouver is developing and disrupt neighborhoods on Hayden Island.

Reuse alternatives require more ROW than replacement options, potentially causing greater disruption and creating a larger barrier to social cohesion on Hayden Island and downtown Vancouver. Alternatives that reuse the existing bridges for arterial traffic exacerbate this by adding through-traffic in these areas at all times and especially during periods when I-5 is congested.

5.5 How would development and economic opportunities be affected?

A qualitative comparison of development/redevelopment impacts of supplementing versus replacing the existing bridges indicates that the extra land requirements of building a supplemental crossing would consume additional valuable land in downtown Vancouver and add constraints to redevelopment opportunities along the Vancouver waterfront and Hayden Island waterfront. Overall, supplemental alternatives appear to reduce, or at least increase to a lesser degree, redevelopment potential in the project area compared to replacement alternatives.

6. Natural Environment Considerations

Supplemental bridge alternatives would create more substantial short-term and permanent impacts to the natural environment than a replacement bridge option. Seismic retrofits to the existing bridges, coupled with construction of a new supplemental bridge, would cause more temporary disruption to stream flow and aquatic species than the deconstruction and construction associated with a replacement bridge. A replacement bridge would also have less long-term effects because it allows more thorough and efficient treatment of stormwater, and would create substantially less in-water structure.

The temporary impacts from a supplemental bridge option would be greater than from a replacement bridge. Constructing seismic retrofits on the piers and towers of the existing bridges would entail extensive in-water work and require cofferdams around each pier to allow new piles to be driven around them. This work would disrupt stream flows and potentially impact water quality through increased sediment and turbidity from debris and dust falling into the river. The deconstruction of the existing bridges associated with replacement bridge options poses a similar potential to impact water quality and aquatic species' habitat, but to a much lesser extent due to lesser duration and physical intrusion.

Replacement alternatives would have less long-term impacts on fish habitat and passage because they would have less structure over the water and substantially less structure in the water compared to alternatives that reuse the existing bridges. A supplemental bridge, paired with the existing bridges, would cover more of the river. Adding a new bridge while retaining the current bridges also entails more in-water structure than replacing the existing bridges. Furthermore, seismic retrofits to the current bridges require encasing the piers, widening each 20 to 80 feet. Compared to a replacement bridge, supplemental bridge alternatives entail far more permanent structure in the river, threatening ESA protected fish by disrupting stream flows and providing predator habitat.

Long-term stormwater impacts on water quality are likely to be worse for alternatives that reuse the existing bridges than alternatives that replace them, though both would improve upon current conditions. Currently, stormwater from the existing bridges flows untreated into the Columbia River. Reusing the existing bridges could include retrofitting parts of them with stormwater retention and conveyance facilities. However, stormwater and pollutants on the lift spans of the existing bridges would likely flow untreated into the river because the movement of these spans makes retrofits much more difficult. Furthermore, the increased deck area of supplemental bridge options increases stormwater volumes, requiring greater retention and treatment facilities. Given the constrained urban environment of the project area, this added facility requirement is likely an important distinction between supplemental and replacement bridge alternatives. Replacement bridge alternatives more easily allow the complete retention, conveyance, and treatment of stormwater and thus improve water quality conditions vital to the health of aquatic species in the river better than allowed by supplemental bridge alternatives.

7. Cost Considerations

Cost estimates of alternatives are not yet available. Once estimated, the project team will compare the total estimated cost of constructing and operating a supplemental alternative versus a replacement alternative. Key cost considerations include:

- Cost to demolish and remove the existing bridges
- Cost to seismically retrofit the existing bridges
- Cost to upgrade design features of the existing bridges for different reuses
- ROW costs for supplemental and replacement alternatives
- Capital cost to construct a supplemental versus replacement bridge
- Operation and maintenance costs of a replacement bridge versus a supplemental bridge (which includes O&M of the existing bridges).

Once each of these costs is estimated, the project team will compare lifecycle costs of the supplemental versus replacement bridges.

8. Other Considerations

ODOT and WSDOT have indicated they would choose to not retain ownership of the existing bridges if they are not used for interstate traffic. Currently, no other entity has expressed interest in assuming ownership of the existing bridges. However, there has been no formal solicitation from ODOT or WSDOT, and such a determination would likely require extensive negotiations. Any prospective owner would need to be willing to assume the operation and maintenance costs, and perhaps substantial capital expenses for seismic safety upgrades and design retrofit for the new transportation mode (e.g., arterial traffic, transit or bicycle/pedestrian). Such costs would be part of ownership transfer negotiations. None of these issues have been explored extensively by the project team, but may be assessed during later phases of the project if alternatives that reuse the existing bridges advance for further consideration