Portland / Vancouver I-5 Transportation and Trade Partnership

Bridge Influence Area Summary
Draft

April 19, 2002

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Bridge Influence Area: Executive Summary

I. INTRODUCTION

In January 2002, the I-5 Partnership Task Force adopted draft recommendations addressing "River Crossing Capacity" and the "Bridge Influence Area." The draft recommendations are:

A. River Crossing Capacity:

1. New transit and vehicle capacity should be constructed across the Columbia River in the I-5 Corridor.

2. For vehicles, there should be no more than 3 through lanes in each direction and up to two supplemental lanes (auxiliary or local access) in each direction across the Columbia River (total 5 lanes in each direction). For transit, there should be two light rail tracks across the Columbia River in the I-5 Corridor.

3. In adding River Crossing Capacity, every effort should be made to avoid displacements and encroachments.

4. The proposed design should include safety considerations.

B. Bridge Influence Area:

1. Between the SR 500 and Columbia Blvd. interchanges, the freeway needs to be designed to balance all of the on and off traffic, consistent with 3 through lane Corridor capacity and 5 lanes of bridge capacity, in each direction.

In adopting the draft recommendations, the Task Force asked the Project Team to conduct additional work in the Bridge Influence Area (BIA) between SR 500 in Washington and Columbia Blvd. in Oregon. Specifically, the Task Force requested the Project Team to:

- Present a solution or solutions that balance the following: minimize the disruption to neighborhoods and the environment while matching bridge and freeway lane configurations; address merging and weaving problems; and safely and efficiently move traffic on and off the freeway.

- Work collaboratively with the community to identify and develop new conceptual designs for the interchanges.

II. SUMMARY AND FINDINGS

The following section summarizes findings about the overall benefits, costs, and impacts of improvements in the Bridge Influence Area. Additional information can be found in the main body of this report.

A. River Crossing Capacity/BIA

1. By 2020, if we do nothing in the I-5 corridor, users of the freeway system will experience a substantial increase in congestion and delay.

2. In the absence of investment in the Corridor, congestion and delay will grow steadily resulting in the AM and PM periods of congestion spreading into the early morning, mid-day, and evening hours.

3. In order to maintain or improve today's level of performance, up to two additional lanes of freeway capacity in each direction across the Columbia River are needed.

4. Overall the BIA concepts show an improvement in freeway traffic speeds during the peak periods compared Existing Conditions and Baseline 2020. Within the range of concepts considered, however, there are some important differences:

    - Concept 4, the replacement bridge, provides the best performance in both the morning and the afternoon peak period.

    - Concept 7, the 8-lane system plus the arterial connection, performs better in the afternoon than in the morning. The morning problems with this concept are primarily a function of design. The Concept places the HOV lane on a separate bridge. Because access to the separate bridge is limited in the BIA, many of the HOV trips return to the mainline just as they approach the existing bridge. This is occurring in about the same location as where the SR 14 on - ramp merges onto I-5 south. In combination, the two merges in the same location create congestion on the freeway. Additional engineering work may be able to solve the problems we observe for this Concept.

    - Concept 6, the collector/distributor system, shows the least improvement in performance. In the morning it provides some improvement over Existing conditions and Baseline 2020, however, in the afternoon it provides little benefit. The design problems associated with this system are the least "fixable" due to its configuration.

5. An arterial bridge linked with additional freeway lanes across the river, could benefit the overall performance of the freeway system. It would provide a separate local connection across the river, reducing the need to use the mainline freeway system. The 2020 analysis shows that an arterial roadway would be heavily used primarily by localized trips.

6. A two lane arterial-only bridge (no increase in freeway lanes) will not address the problems on the freeway. The arterial-only connection would only slightly improve freeway performance by removing local trips. Users of the freeway system would continue to experience a significant increase in congestion and delay throughout the I-5 corridor.

7. BIA improvements are likely to result in minimal traffic increases on I-5 outside the Bridge Influence Area. Traffic, however, will increase on roadways with direct access to the BIA. Traffic increases are different between Portland and Vancouver. Portland would see increases on arterial streets near the BIA, while Vancouver's impacts would be on state freeways.

B. Costs

1. Potential highway and transit costs in the BIA are all in the range of $1.2 billion (in 2002 dollars). This estimate includes major maintenance and seismic retrofit costs for the existing bridges.

2. There is not a significant enough cost differential to eliminate any of the options based on cost alone. A full exploration of life cycle costs of the existing bridges and seismic retrofit costs should be completed during the EIS.

C. Property Impacts

1. Potential property impacts vary depending on the Concept. Potential impacts range between 6-23 displacements and 9-43 encroachments for the full bridge influence area (SR 500 to Columbia Blvd.). Generally, for all Concepts, the greatest number of potential displacements and encroachments would be to non-residential properties.

2. The replacement bridge Concept has the least number of likely property impacts due to the fact that the structure would follow near the existing bridge and freeway alignment.

3. The majority of impacts would occur in Portland where improvements cross Hayden Island.

4. Additional survey, engineering and design work in the EIS process is needed before the actual number and extent of the displacements and encroachments is known.

D. Environmental Impacts

1. Since all Concepts included additional crossings of the Columbia River and North Portland Harbor, there may be potential impacts to fish habitat associated with bridge construction.

2. Three of the four Concepts encroach into the Delta Park green space area (60-120 feet depending on concept).

3. Three of the four Concepts have encroachments onto the radio tower wetlands site (100-240 feet depending on concept).

4. All concepts have encroachments onto the Ft. Vancouver Historical Site (60-120 feet depending on concept). An encroachment over 60' would impact the FHWA building located near the SR14 ramp to I-5 northbound. However, no historic buildings would be impacted.

5. All concepts would impact the Historic I-5 Columbia River Bridge with the full replacement bridge, providing the most impact to the historic structure. The existing northbound bridge is registered on the National Register of Historic Places and the southbound bridge is eligible for registration.

6. The EIS process will allow a full exploration of impacts to natural, cultural, historic, fish and park resources to determine the best balance for the environment and the community. Additionally, potential impacts to the radio tower wetland and Delta Park vary by design concept and would under go a detailed evaluation in an EIS process.

F. Implementation Issues

1. Concepts with 10 freeway lanes, and concepts with 8 freeway plus arterial lanes, appear promising.

2. Collector-distributor bridge systems have design problems and therefore provide little transportation benefit; such design problems will be difficult to overcome.

3. A joint use (HWY/LRT) bridge could be cost effective, but needs further study in an EIS. Constructing both LRT and freeway improvements on a single bridge could potentially result in some cost compared to building separate bridges. However, many other factors should also be considered, including right-of-way impacts, whether the existing bridges will be maintained or replaced, implications for siting the LRT station on Hayden Island, and construction staging.

4. Supplemental Or Replacement Bridge: The existing bridges provide three lanes of traffic in each direction. They cannot economically be widened. To provide an addition two lanes of traffic in each direction (for a total of up to five lanes), the bridges will either have to be replaced with a wider bridge, or a supplemental bridge will need to be constructed adjacent to the existing bridges. While further study is needed to conclude whether a new bridge should be supplemental to the existing

bridges or should replace them, the analyses have identified several factors that will influence that decision:

a. Traffic Operations: With a supplemental bridge, freeway traffic in one or both directions would be split into two traffic streams across the river. With two separate traffic streams, along with many closely spaced interchanges near the river, it is difficult to balance traffic flows, and the analyses indicated that congestion would be significant on the bridge serving the near-by interchanges. By comparison, a replacement bridge would keep all directional traffic on one bridge, resulting in more balanced traffic flow.

b. Cost: Current cost estimates indicate that there is little cost differential between a supplemental and a replacement bridge. Further exploration of cost issues will need to continue in an EIS.

c. Right-of-way impacts: Replacing the existing bridges with a new bridge would focus the new construction within the existing right-of-way, thus minimizing impacts to adjacent parcels on Hayden Island and in downtown Vancouver.

d. Impacts to Property and Natural, Cultural and Historic Resources: All concepts are likely to have an impact on one or more of the key resources in the BIA. Concepts that build a new bridge (either supplemental or replacement) east of the existing bridges (upstream) have a higher probability of impacting the Fort Vancouver National Historic Site than those that replace the existing bridges in place, or those that build a new supplemental bridge to the west (downstream).

5. Some River Crossing concepts include the conversion of one of the existing freeway bridges for LRT use. While that is technically feasible, the cost of retrofitting the bridges to include the modified decking, electric systems, cathodic protection, and other conversion costs would be significant. If upgrading the bridge to meet current seismic standards is required, the retrofit costs could easily exceed the costs of a new LRT bridge. Further study of this concept would require a detailed investigation of the retrofit costs, and a comparison of those costs to a new bridge.

6. Concepts that provide for separate LRT and freeway bridges could potentially allow the LRT and highway projects to move forward independently of each other. However, further analyses are required to address the joint or separate bridge decision. Such a decision is likely to be based on LRT and highway alignment design requirements, right-of-way and environmental impacts, land use opportunities and constraints relative to siting an LRT station on Hayden Island, construction costs, traffic staging, operating concerns, and potentially other concerns as well.

7. If subsequent studies indicate that the two modes can and should be considered separately, there are potential timesaving for LRT, which may be implemented in a shorter time period given that substantial environmental and design work has already been completed in the South/North EIS.

G. HOV

1. All conceptual designs for the BIA and modeling assume that a high occupancy vehicle (HOV) lane will operate on I-5 from 134th St. to Going St. during the peak hours, in the peak direction. Provision of new river crossing capacity makes this continuous HOV system a possibility.

2. HOV performance is highly dependent upon the design of the new freeway system. Current design concepts require changes to better accommodate the HOV system. In some cases the bridge design affects HOV performance, for example, multiple bridges split freeway traffic and would limit HOV access. In addition, direct access ramps will need to be considered at key locations such as SR 500.

3. Further exploration of HOV in the EIS is required to optimize the design of the system and to determine its overall effectiveness.

H. Safety

Safety issues in the BIA were considered from three perspectives: vehicular traffic safety; impacts to air and marine navigation; and the potential catastrophic failure of the transportation system in the event of a major earthquake.

1. BIA improvements address traffic safety concerns that result from the high number of closely spaced entrances and exits. Improvement concepts would significantly reduce the number of entrances and exits, by utilizing collector-distributor lanes adjacent to the freeway lanes. In addition, for those locations where ramps remained closely spaced bridges would typically be used to separate the entering and exiting traffic.

2. None of the concepts considered would encroach on the restricted air space for the Pearson Air Park.

3. Impacts to marine navigation would be highest for those concepts that build a supplemental bridge. Multiple bridges with low-level lift span bridges would be built in close proximity to one another. Marine navigation hazards in the shipping channel would increase. The replacement bridge concept designed a high level-fixed span bridge that would encourage the navigational channel from the north shore to the center of the Columbia River. (improvement to the rail bridge would also occur) This concept would virtually eliminate the need to for barge operators to navigate a curved path between the bridges.

4. Life-safety and emergency response to a catastrophic event is also a safety concern. The existing bridges do not meet current seismic standards and in the event of a major earthquake, they could fail. New bridges would be built to current standards and would have a higher probability of withstanding a major earthquake.

I. Freight Mobility and the Economy

1. By 2020, if we make no improvements in both our freeway and transit system, we can expect to delay to double from about 18,000 hours today to about 32,000 hours in 2020. This delay and the resulting congestion and loss of reliability has an economic cost to our community. Not only will the cost of doing business increase, but a poor quality transportation system to key employment and industrial centers threatens our long-term ability to attract and retain living wage employment in the region.

2. The BIA improvements will:
   - Reduce bottlenecks on the freeway and balance traffic flow
   - Improve key freight interchanges including Columbia Blvd., Marine Drive, and Mill Plain Blvd.
   - Increase reliability and predictability on I-5
   - Improve bi-state transit service

3. The benefits for the economy and freight include:
   - Improved access to and from key industrial destinations such as Port of Vancouver, and Rivergate, Columbia Corridor
   - Improved access to and from key employment centers such as downtown Portland and downtown Vancouver, Columbia Corridor, Swan Island, Lloyd Center
   - Improved travel times and reduced congestion on I-5
   - Increased reliability and predictability in transit service

4. The benefits of BIA improvements help to create a positive business climate and helps make the region an attractive place to locate and expand business.

III. PROJECT TEAM RECOMMENDATIONS

A. Based on the findings from the Bridge Influence Area evaluation that was undertaken from January – March 2002, the Project Team recommends that the Task Force re-affirm its draft River Crossing Capacity and Bridge Influence Area recommendations.

B. Because the River Crossing and the Bridge Influence Area are integrally linked, Task Force recommendations in these two areas should be combined.

C. The Project Team recommends that the Task Force re-affirm, combine and expand its recommendations as follows:

DRAFT Task Force River Crossing Capacity and Bridge Influence Area Recommendations:

1. New transit and vehicle capacity should be constructed across the Columbia River in the I-5 Corridor.

2. <u>For vehicles</u>, there should be no more than 3 through lanes in each direction and up to two supplemental lanes (auxiliary or local access) in each direction across

the Columbia River (total 5 lanes in each direction). For transit, there should be two light rail tracks across the Columbia River in the I-5 Corridor.

3. In the Bridge Influence area, SR 500 to Columbia Blvd., the freeway needs to be designed to balance all of the on and off traffic, consistent with 3 through lane Corridor capacity and up to 5 lanes of bridge capacity, in each direction.

4. In adding river-crossing capacity and making improvements in the Bridge Influence Area, every effort should be made to avoid displacements and encroachments.

5. The proposed design should include safety considerations.

6. As a first step towards making improvements, the bi-state region should undertake an Environmental Impact Study for a new River Crossing and potential improvements in the Bridge Influence Area.

7. In the EIS, the following BIA elements should be studied:
   - 8-lane bridge concepts
   - 10-lane bridge concepts
   - Tunnel concepts
   - Replacement bridge
   - Supplemental Bridge
   - Joint use: Freeway/LRT
   - Freeway/Arterial
   - HOV throughout the I-5 corridor

8. The following concepts do not show promise for addressing the corridor's problems and should not be considered in an EIS:
   - Collector-Distributor bridge concepts
   - Arterial-only bridge concepts

Bridge Influence Area: Detailed Report

I. INTRODUCTION

In January 2002, the I-5 Partnership Task Force adopted draft recommendations addressing "River Crossing Capacity" and the "Bridge Influence Area." The draft recommendations are:

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4. The proposed design should include safety considerations.

B. Bridge Influence Area:

1. Between the SR 500 and Columbia Blvd. interchanges, the freeway needs to be designed to balance all of the on and off traffic, consistent with 3 through lane Corridor capacity and 5 lanes of bridge capacity, in each direction.

In adopting the draft recommendations, the Task Force asked the Project Team to conduct additional work in the Bridge Influence Area (BIA) between SR 500 in Washington and Columbia Blvd. in Oregon. Specifically, the Task Force requested the Project Team to:

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- Work collaboratively with the community to identify and develop new conceptual designs for the interchanges.

II. BIA RE-DESIGN: PROCESS AND CONCEPTS

A. Process

The BIA re-design process was organized around a series of meetings with the community. Three meetings each were held in Vancouver and Portland to solicit ideas and identify concerns and impacts. Neighborhood representatives, concerned property owners, and business representatives were invited to review and comment on corridor improvement Concepts as they were developed, revised and finalized.

The objective of the re-design process was to develop designs in the Bridge Influence Area to:

- Accommodate 2020 traffic volumes as efficiently and effectively as possible;
- Transition from up to 5 lanes in each direction crossing the Columbia River to three through lanes north and south of the BIA;
- Reduce the number of traffic conflict points where on and off movements and lane changes occur on the mainline;
- Design the freeway and adjoining collector/distributor roadways to minimize potential displacements of homes and businesses and to minimize where additional right-of-way needs encroach on private property;
- Provide for efficient movement of freight;
- Avoid where possible impacts to cultural and historic resources and environmental impacts including: noise, air quality and wetlands; and
- Provide for adequate connectivity between major land uses in the corridor.

B. River Crossing Concepts

Eight Columbia River Crossing Capacity concepts were developed representing a range of possible combinations of new and existing bridges crossing the Columbia River (Figure 1 – pages 3 and 4).

Figure 1: Crossing Concepts

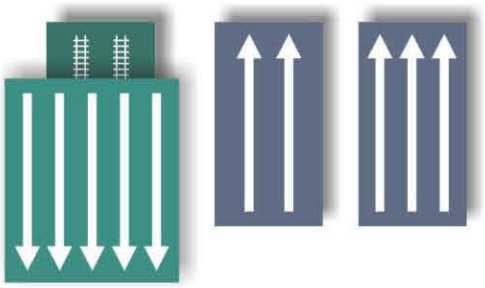
Columbia River Crossing Concepts

I-5 Transportation & Trade Partnership

CATEGORY 1

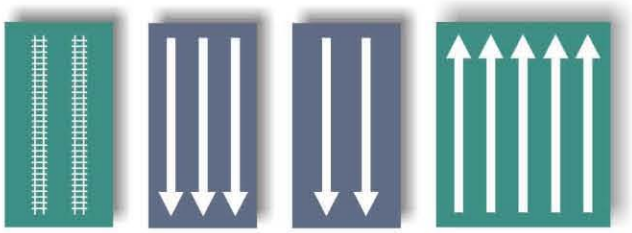
Concept #1

- 5 northbound lanes on existing bridges
- 5 southbound lanes on new double-deck bridge, LRT on lower deck, west of existing bridges



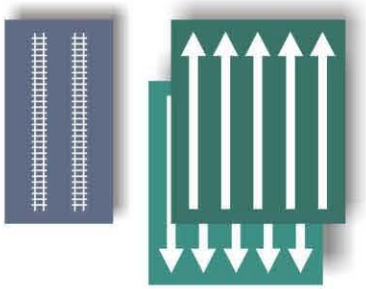
Concept #2

- 5 northbound lanes on new bridge east of existing bridges
- 5 southbound lanes on existing bridges
- New LRT bridge west of existing bridges



Concept #3

- New 5-lane double-deck bridge, northbound upper deck, southbound lower deck
- LRT on existing west bridge



Concept #4

- New 5-lane double-deck bridge, northbound upper deck, southbound lower deck
- LRT on new bridge west of existing bridges
- *Only option to shift navigational channel*

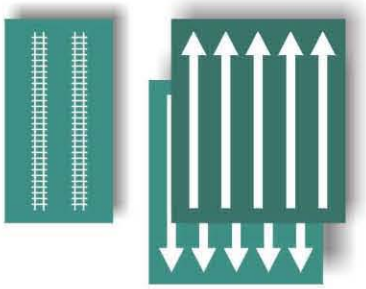


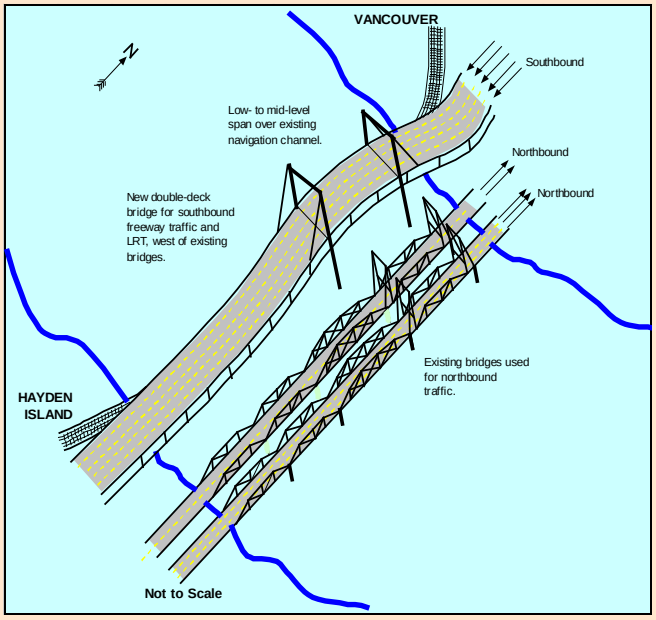
Figure 1: Crossing Concepts - Continued

The eight Concepts can be thought of as falling into one of three categories:

River Crossing Concepts		
Category 1	Category 2	Category 3
River crossings that provide five freeway lanes in each direction (Concepts 1,2,3,4)	A freeway and river crossing system that provides three mainline freeway lanes in each direction, plus a four lane collector-distributor bridge/roadway west of the freeway (Concepts 5,6)	Four through freeway lanes in each direction plus a two-lane arterial system connecting Hayden Island to Marine Drive and downtown Vancouver (Concepts 7,8)

Concepts 1, 4, 6, and 7 were selected for detailed design and evaluation. Analysis of these concepts provides insight into issues of supplemental and replacement bridges, joint use (LRT-highway) and separate bridges, alignments east and west of existing bridges, freeway lanes and arterial lanes across the Columbia River, and a comparison between high-level, fixed span bridges to low-level movable span bridges. See Figures 2-5 on the following pages.

Figure 2: Bridge Concept 1



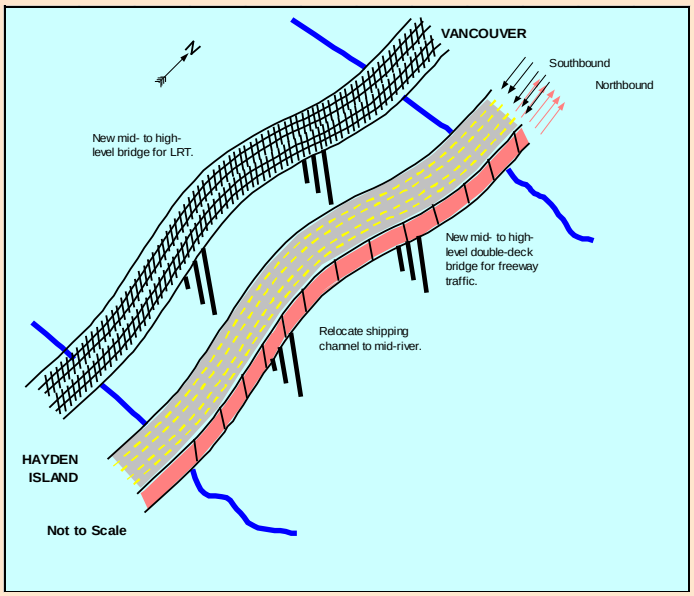
Concept 1:
5-lane southbound supplemental bridge for freeway traffic w/LRT

1. Southbound traffic on new five-lane bridge, LRT on lower deck -- west of existing bridges

2. Low- to mid-level bridge, with lift span over existing navigation channel

3. Northbound traffic would be split between the two existing bridges

Figure 3: Bridge Concept 4

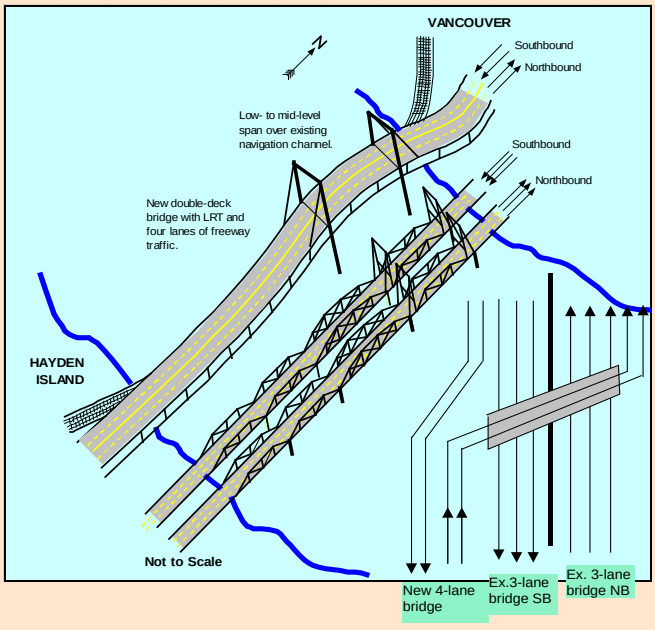


Concept 4:
10-lane double deck, replacement bridge, plus LRT on separate new bridge

1. Mid- to high-level bridges. Navigation channel relocated to center of river

2. Potential fixed spans for highway and LRT (with Coast Guard reduction of existing lift requirements), or lift spans

Figure 4: Bridge Concept 6



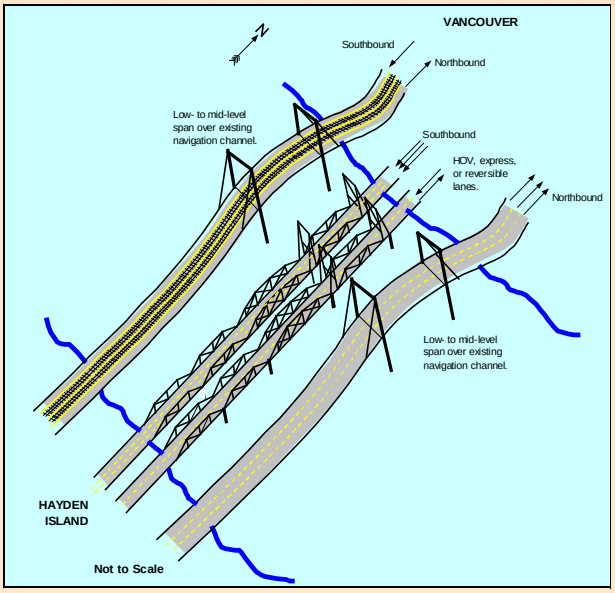
Concept 6:
4-lane supplemental collector-distributor bridge w/LRT, plus 6 lane freeway

1. Provides for new four-lane bridge with LRT west of the existing bridges

2. Low- to mid-level bridge with lift span over current navigation channel

3. Use four-lane bridge as collector-distributor (i.e., ramp access for Hayden Island, etc.). Requires fly-over ramps north and south, as shown in the schematic on the left

Figure 5: Bridge Concept 7



Concept 7:
8-lane freeway concept plus new LRT bridge with two-lane arterial

1. Provides for new four-lane bridge with LRT

2. Low- to mid-level bridges with lift spans over current navigation channel

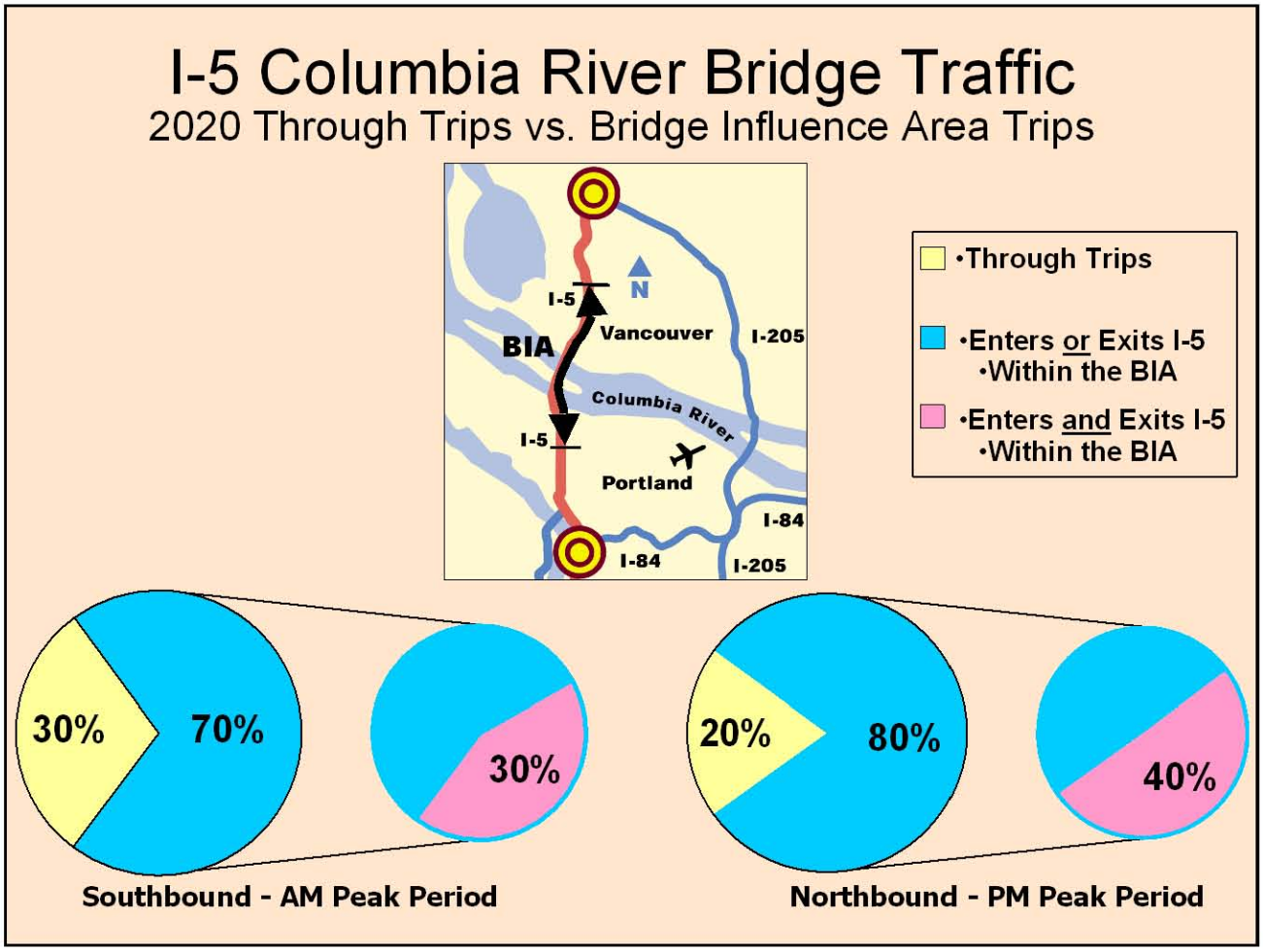
3. Two lanes on existing northbound bridge could be used for HOV, express lanes, or (potentially) reversible lanes

C. Bridge Influence Area Concepts

With the selection of the four bridge Concepts for detailed analysis, a design process was initiated to develop overall designs for the Bridge Influence Area from SR 500 in Vancouver to Columbia Blvd in Oregon. Most of the users of the bridge are entering and/or exiting the freeway on one of the interchanges within the bridge influence area. As traffic volumes increase with future growth, the closely spaced interchanges coupled with the heavy volumes of entering and exiting traffic create congestion and safety concerns for all freeway users. Designs were developed to address these problems. See Figure 6.

A detailed description of BIA designs and conceptual diagrams are provided in Appendix A. Public comment from the design meetings held in Vancouver and Portland are provided in Appendices B and C.

Figure 6: Traffic in the Bridge Influence Area



III. ANALYSIS OF BIA CONCEPTS

Each of the Concepts were evaluated based on five factors; transportation performance, costs, property impacts, environmental concerns, and implementation issues. The following sections present information for each of the factors. A separate paper will describe the benefits and impacts of improvements in the BIA on local and regional land use goals.

A. Transportation Performance

Methodology

Transportation performance was evaluated using two principal analysis tools; Metro's travel demand forecasting models and a traffic simulation model. Metro's models were used to estimate future traffic levels throughout the corridor in year 2020. The models also predicted regional travel patterns and other measures, such as the amount of vehicular delay each Concept would contribute to the study area. The traffic simulation model assessed freeway-operating conditions for each Concept including the effects of bottlenecks. The model also estimated vehicular travel characteristics such as speed, merging and diverging, and weaving along freeway segments.

Recall that while four BIA concepts were designed, two of those designs were for "Category 1" bridges. Because these two are likely to have similar transportation performance benefits, only one design was tested with the operations model and therefore performance results are provided for three crossing types.

Evaluation Results

Overall, improvements in the BIA significantly enhance system performance compared to today and 2020 Baseline. Highway and transit improvements in the BIA will improve speed and travel time, reduce congestion and delay, and serve more demand. Concepts with 10 freeway lanes and concepts with 8 freeway plus arterial lanes, appear promising.

Figures 7-11 below demonstrate the anticipated benefits of improvements in the BIA.

Figures 7 and 8 show travel volumes on I-5 during the a.m. and p.m. peak periods, in the peak direction. Improvements in the BIA will accommodate a greater number of vehicles across the Columbia River and in the BIA compared to Existing conditions and Baseline 2020. The traffic increase occurs primarily in the BIA. Increases in traffic on the freeway outside the BIA are minimal, except in Washington from 134th to SR 500 where a 3rd lane is added throughout much of the corridor under Baseline 2020 conditions.

Roadways that provide direct access to the freeway in the BIA will see an increase in traffic. In Vancouver, traffic increases as a result of BIA improvements will be most significant on SR 14 and SR 500. There will be minimal increases in traffic, due to BIA improvements, on Vancouver arterials such as Mill Plain Blvd., Fourth Plain Blvd., and Columbia/Washington Streets compared to Baseline 2020.

In Portland, increases in traffic will be experienced on Denver/Interstate Avenue and on Martin Luther King Blvd. The increases are significant near the BIA, however the impact tends to dissipate as you move away from the BIA.

Figure 7: Northbound Travel Volumes

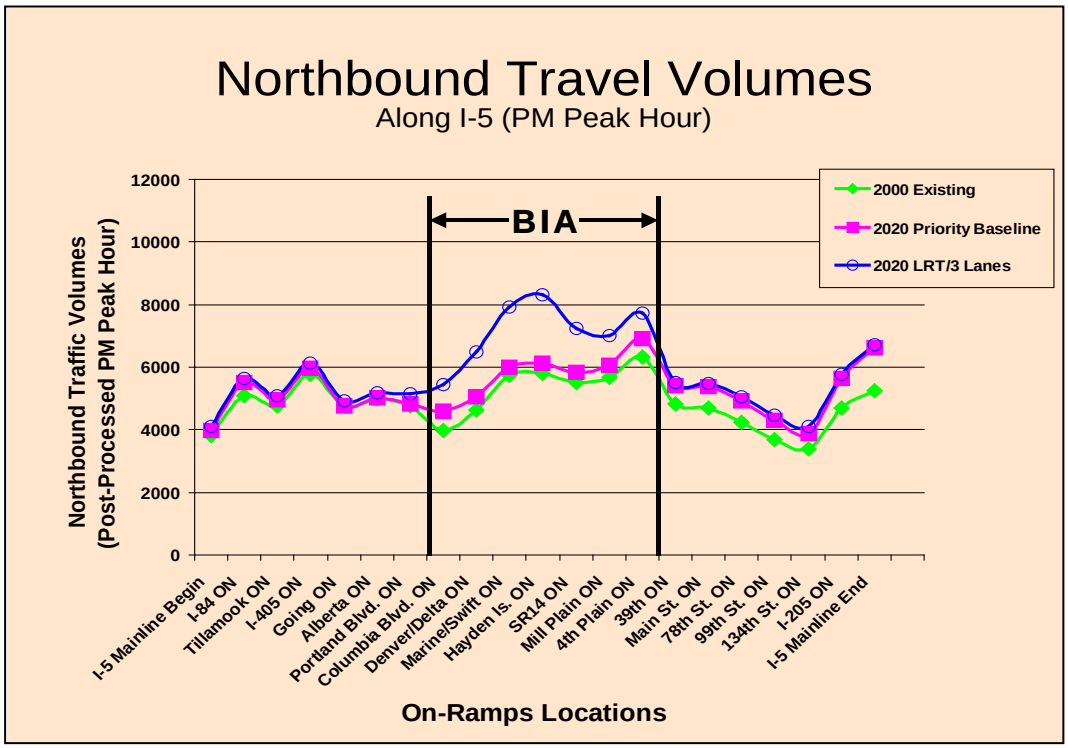
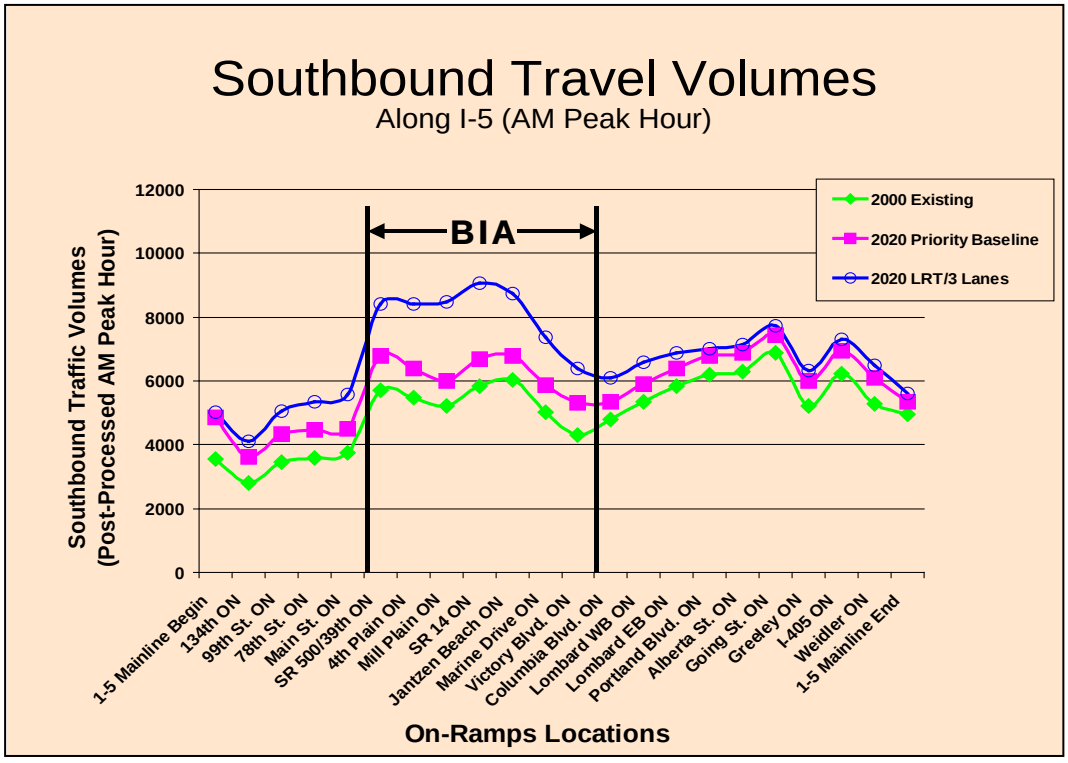


Figure 8: Southbound Travel Volumes



Figures 9 and 10 show average speeds in the BIA. Speed is an indicator of overall travel time; faster freeway speeds result in improved travel time. Improved travel times are also an important measure of the operating efficiency of the freeway.

Figure 9: Northbound Average Speed

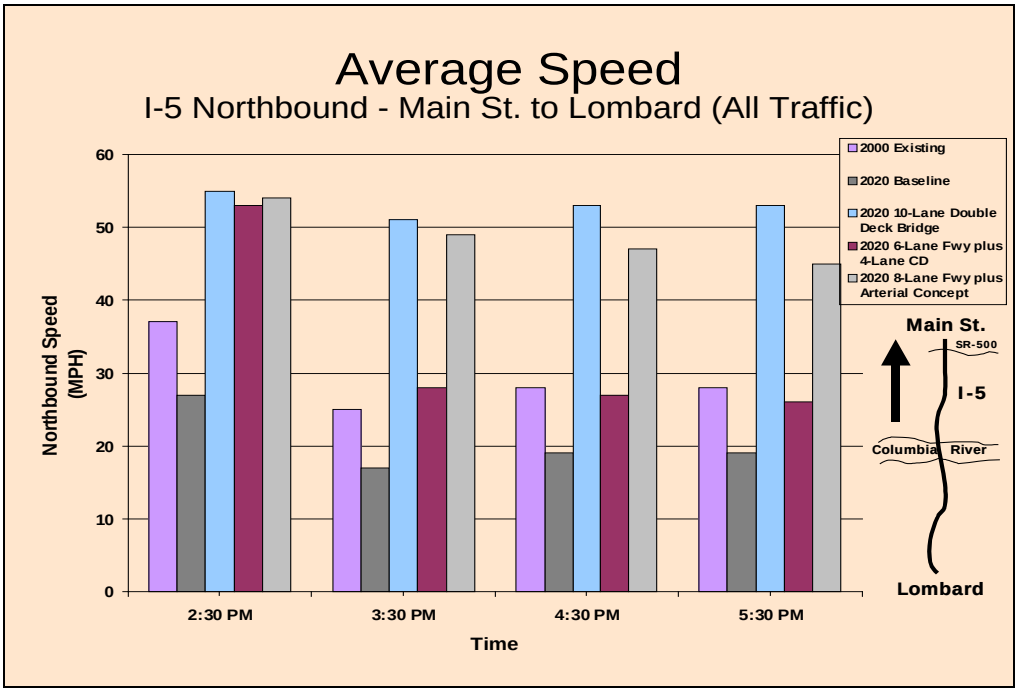
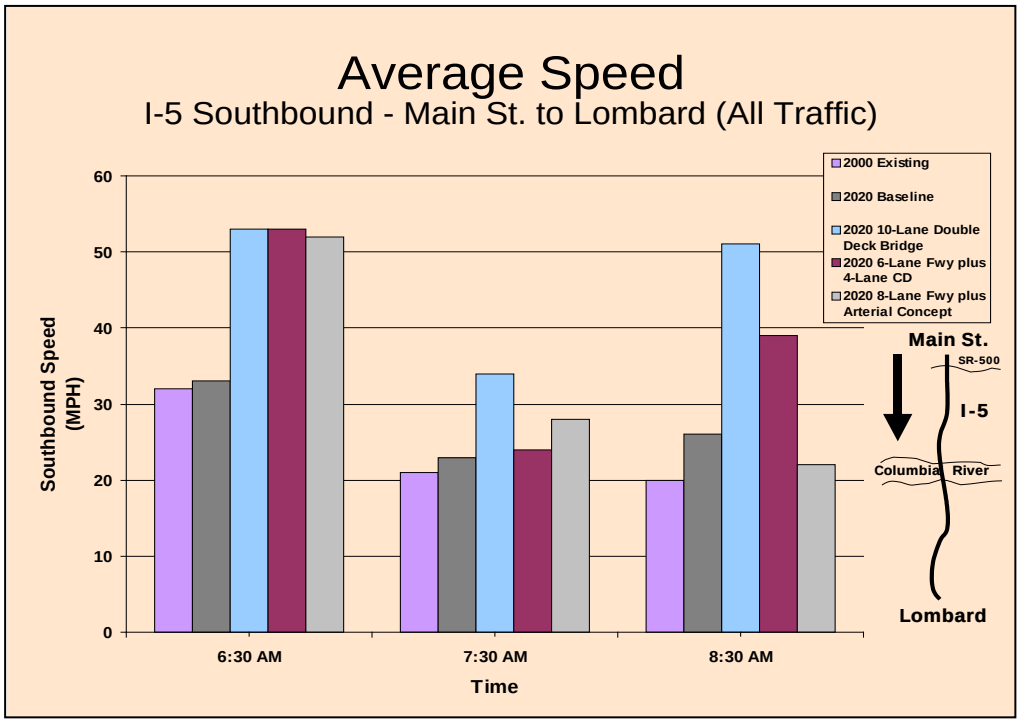


Figure 10: Southbound Average Speed



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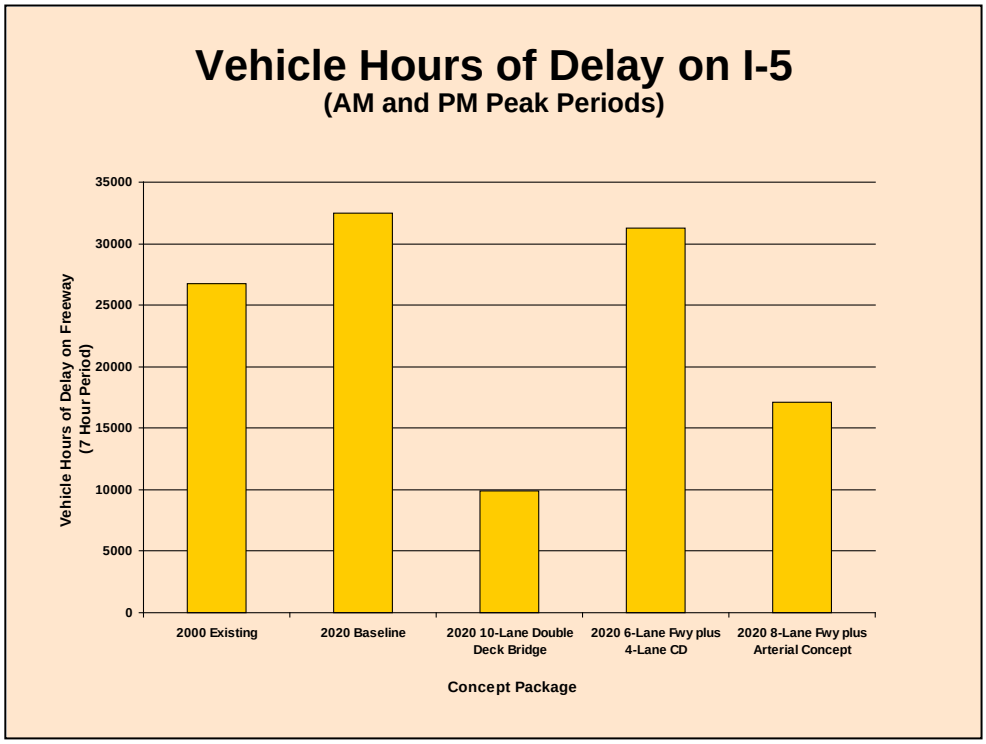
- Concept 7, the 8-lane system plus the arterial connection, performs better in the afternoon than in the morning. The morning problems with this concept are primarily a function of design. The Concept places the HOV lane on a separate bridge. Because access to the separate bridge is limited in the BIA, many of the HOV trips return to the mainline just as they approach the existing southbound bridge. This is occurring in about the same location as where the SR 14 on - ramp merges onto I-5 south. In combination, the two merges in the same location create congestion on the freeway. Additional engineering work may be able to solve the problems we observe for this Concept.

- Concept 6, the collector/distributor bridge system, shows the least improvement in performance. In the morning, it provides some improvement over Existing conditions and Baseline 2020. However, in the afternoon, it provides little benefit. The design problems associated with this system are the least "fixable" due to its configuration.

Figure 11 shows vehicle hours of delay on the freeway in the morning and afternoon peak periods. Concept 4, the 10-lane replacement bridge, and Concept 7, the 8-lane freeway system, show the most improvement. Concept 6, the collector/distributor bridge system, has about the same amount of delay as today.

Figure 11: Vehicle Hours of Delay on I-5



As a part of discussions about the Bridge Influence Area, the Task Force has also asked a series of additional questions. The following section responds to key questions:

How much additional capacity is needed in the BIA?
By 2020, if we do nothing in the I-5 corridor users of the freeway system will experience a substantial increase in congestion and delay. In order to maintain or improve today's level of performance, up to 2 additional lanes of freeway capacity in each direction across the Columbia River are needed.

Adding one lane of freeway capacity in each direction, combined with a two lane arterial roadway spanning the river would also improve conditions, but to a lesser degree. Delay at interchange ramps and along arterials approaching I-5 is expected to be greater with an eight lane River Crossing than with a ten lane system.

Could an arterial roadway bridge provide transportation benefits?
Analysis shows that if combined with additional freeway lanes across the river, an arterial bridge could benefit the freeway system. It would provide a separate local connection across the river, providing a linkage for short trips that would be able to avoid the freeway and its ramps. The 2020 analysis shows that an arterial roadway would be heavily used primarily by localized trips.

What would happen if only a two-lane arterial roadway bridge was built?
A two lane arterial-only bridge will not address the problems on the freeway. It would only slightly improve freeway performance compared to Baseline 2020. Users of the freeway system will continue to experience a significant increase in congestion and delay in the I-5 corridor compared to today or Baseline 2020.

There are several reasons why an arterial only connection does not address the corridor's problems. First, a two-lane arterial will not provide sufficient capacity in the BIA to address the congestion and delay problems. Arterial roadways generally offer about one-half as much capacity per lane as freeways. Second, the majority of trips across the Columbia River are not local in nature. The average trip length of vehicles using the I-5 bridge is 16 miles. Compared to the average trip length in the region of 6 miles, most Columbia River Crossing trips are regional in nature. Finally, without additional freeway capacity, the arterial would become very congested as motorists who would like to travel on I-5 would instead divert along the parallel arterial for a portion of their trip. This would also increase vehicle trips and congestion in downtown Vancouver and on Marine Drive in Portland.

How would high occupancy vehicles (HOVs) perform in the corridor?
Provision of new river crossing capacity makes this continuous HOV system a possibility. All conceptual designs for the BIA and modeling assume that an HOV lane will operate on I-5 from 134th to Going St. during the peak hours, in the peak direction. HOV performance would be highly dependent upon how the system is designed, particularly within the Bridge Influence Area. First, HOV lanes cannot be extended across the river without adding freeway lanes. Second, if a supplemental bridge(s) is provided, traffic stream imbalances would result and many HOVs would be forced to use heavily congested general purpose lanes because they would have few opportunities to access

divided HOV lanes. Lastly, HOV use would be enhanced with the provision of special ramps to directly access the freeway's HOV lanes, (e.g., at SR 500).

How do BIA improvement address safety problems?
Safety issues in the BIA were considered from three perspectives: vehicular traffic safety; impacts to air and marine navigation; and the potential catastrophic failure of the transportation system in the event of a major earthquake.

Improvements in the BIA would provide facilities that meet current design standards for all or part of the freeway elements within the BIA. Concepts that would construct a replacement bridge would be built to current safety standards, providing for standard width travel lanes and shoulders. Concepts that rely on continued use of the existing bridges would not be able to meet those standards.

One of the principal traffic safety concerns in the freeway corridor is the high number of closely spaced entrances and exits. BIA improvement concepts would significantly reduce the number of entrances and exits, by utilizing collector-distributor lanes adjacent to the freeway lanes. In addition, for those locations where ramps remained closely spaced, bridges would typically be used to separate the entering and exiting traffic.

The safety of air and marine navigation is also an important consideration. The I-5 Columbia River bridges cross over a major shipping channel and are adjacent to the Pearson Air Park. None of the concepts considered would encroach on the restricted air space for the Pearson Air Park. Impacts to marine navigation would be highest for those concepts that build a supplemental bridge, resulting in three or four low-level, lift span bridges in close proximity to one another as they cross the shipping channel. The high level, fixed span replacement bridge concept provides the opportunity to increase the width of the clearance under the bridges, compared to the existing bridges, and if built in conjunction with improvements to the downstream rail bridge would reduce or eliminate the need to for tug and barge operators to follow a curved path between the bridges.

Life safety and emergency response to a catastrophic event is also a safety concern. The existing bridges do not meet current seismic standards. In the event of a major earthquake, they could fail. New bridges would be built to current standards and would have a higher probability of withstanding a major earthquake.

By 2020, if we make no improvements in both our freeway and transit system, we can expect to delay to double from about 18,000 hours today to about 32,000 hours in 2020. This delay and the resulting congestion and loss of reliability has an economic cost to our community. Not only will the cost of doing business increase, but a poor quality transportation system to key employment and industrial centers threatens our long-term ability to attract and retain living wage employment in the region.

What will BIA improvements do for freight mobility and the economy?
The draft recommendations will:

- Reduce bottlenecks on the freeway and balance traffic flow
- Improve key freight interchanges including Columbia Blvd., Marine Drive, and Mill Plain Blvd.
- Increase reliability and predictability on I-5
- Improve bi-state and overall transit service

The benefits for the economy and freight are:

- Improved access to and from key industrial destinations such as Port of Vancouver, and Rivergate, Columbia Corridor
- Improved access to and from key employment centers such as downtown Portland and downtown Vancouver, Columbia Corridor, Swan Island, Lloyd Center
- Improved travel times and reduced congestion on I-5
- Increased reliability and predictability in transit service

Each of these benefits helps to create a positive business climate and helps make the region an attractive place to locate and expand business.

B. Costs

Methodology

Costs for the Concepts are estimated in order-of-magnitude based on a review of major construction items (bridges, earthwork, drainage, etc.). Costs are expressed in 2002 dollars. Estimate costs can be found in Table 1.

Note that light rail costs were allocated as follows:

- Concept 1 includes LRT on the lower deck of a new freeway bridge, therefore the estimated cost of the light rail structure is included in the freeway costs column. The light rail column includes cost for: transit vehicles, operations facilities, electrical systems, fare collection, non-bridge construction costs, right-of-way, etc.

- Concept 4 includes LRT on a separate LRT bridge, therefore the estimated cost for this structure is included entirely in the LRT cost column.

- Concept 7 includes a combined LRT/arterial bridge, the cost of the light rail structure is included in the arterial column. The light rail column includes costs for: transit vehicles, operations facilities, electrical systems, fare collection, non-bridge construction costs, right-of-way, etc.

Evaluation Results

Refined conceptual design and estimated costs were not developed for Concept 6, the 4-lane collector-distributor bridge/system. Because this option includes a parallel freeway system and many of the connections to east/west arterials would be duplicated, it can be expected that costs for the freeway elements would be greater than any other Concept. LRT costs would be similar to Concept 1.

Table 1: Estimated BIA Costs

Concept	BIA Estimated Costs $2002 dollars - in millions*				
	LRT	Arterial	Freeway	Maintenance Seismic	Total
Ten- lane Freeway Concepts					
Concept 1: 5-lane southbound supplemental bridge for freeway traffic w/LRT	$82	$0	$969	$150**	$1,200
Concept 4: 10-lane double deck, replacement bridge, plus LRT on separate new bridge	$186	$0	$989	$0	$1,175
Eight freeway lanes plus two-lane arterial					
Concept 7: 8-lane freeway concept, plus new LRT bridge with two-lane arterial	$82	$137	$793	$150**	$1,161

**Includes costs for the entire BIA from SR 500 in Vancouver to Columbia Blvd. in Portland. Costs also include the widening of I-5 between Delta Park and Lombard.*
***Estimated costs for continued use of existing bridges*

Potential highway and transit costs in the BIA are all in the range of $1.2 billion (in 2002 dollars). This estimate does exclude major maintenance and seismic retrofit costs for the existing bridges. Concept 7 is the least costly of the BIA improvement packages. This concept, like Concept 1 leaves the existing bridges in operation. The capital maintenance and seismic retrofit needs of these bridges over the next 20 years are estimated at $150 million in 2002 dollars of costs. When considering this additional expense of continued use of the existing bridges, there is not a significant enough cost differential to eliminate any of the options based on cost alone. A full exploration of life cycle costs of the existing bridges and seismic retrofit costs should be completed during the EIS.

C. Property Impacts

Methodology

Potential displacements and encroachments that could result from the BIA improvements were determined by reviewing aerial photographs of the BIA with the right-of-way and property lines overlaid from regional GIS mapping sources. It is important to keep in mind that substantial additional work through the EIS process will need to occur before the actual number and extent of the displacements and encroachments is known. The actual property impacts, after further engineering, survey, design, and environmental work will very likely differ from those reported in the table below.

The following definitions were used to determine potential property impacts:

- Displacements – The proposed Concept would impact the entire parcel and/or part of a structure.

- Encroachments --The proposed Concept would affect a portion of a parcel and the remaining property is likely to continue to be usable by the property owner.

Evaluation Results.

The overall impact for each Concept varies considerably throughout the BIA corridor. The majority of impacts would occur in Portland where improvements cross Hayden Island. Generally, for all Concepts, the greatest number of potential displacements and encroachments would be to non-residential properties. The replacement bridge concept has the least number of likely property impacts due to the fact that the structure would follow the existing bridge and freeway alignment.

Table 2: Potential Displacements and Encroachments

	Concept #1: 5-lane southbound supplemental bridge for freeway traffic w/LRT		Concept #4: 10-lane double deck, replacement bridge, plus LRT on separate new bridge		Concept #6: 4-lane supplemental collector-distributor bridge w/LRT, plus 6 lane freeway		Concept #7: 8-lane freeway concept plus new LRT bridge with two-lane arterial	
	Residential	Non-Residential	Residential	Non-Residential	Residential	Non-Residential	Residential	Non-Residential
Displacements								
Vancouver	0	0	0	1	0	2	0	0
Portland	8	16	6	8	20	21	6	17
Total	*8*	*16*	*6*	*9*	*20*	*23*	*6*	*17*
Encroachments								
Vancouver	21	15	9	8	15	26	13	10
Portland	0	17	0	27	1	17	0	19
Total	*21*	*32*	*9*	*35*	*16*	*43*	*13*	*29*

Should improvements be made in the BIA, it is unlikely that property impacts can be avoided altogether. There are design concepts that can minimize property impacts. Even so, the need for additional right-of-way will likely require the purchase of homes and businesses, primarily on Hayden Island.

D. Environmental Impacts

Methodology

Capacity improvements in the Bridge Influence Area will be carefully analyzed to evaluate potential impacts to cultural and natural resources. A detailed analysis was not undertaken at this time; however, a limited screening of Concepts was conducted, focusing on potential impacts to fish habitat and wetlands along the Columbia River, North Portland Harbor, Columbia Slough, and the wetland mitigation site known as the former radio towers site (south of Marine Drive and west of I-5). In addition, a screening of potential impacts to historic resources was limited to consideration of the Fort

Vancouver National Historic Site, the Columbia Cemetery located north of Columbia Blvd and east of I-5, and the existing I-5 Columbia River bridges. The existing northbound bridge is registered on the National Register of Historic Places and the southbound bridge is eligible for registration. The impacts of BIA improvements to natural and cultural resources will need further evaluation in an EIS.

Evaluation Results

All studied Concepts included additional crossings of the Columbia River and North Portland Harbor. There are potential moderate impacts fish habitat associated with bridge construction. Moderate impact means that there could be new bridges with in-stream piers potentially affecting rearing or migration habitat; or the option could require new culverts in fish bearing streams, or remove riparian vegetation of moderate quality. Impacts will be dependent upon the final bridge type, size, location, and amount of additional bridges.

As designed, the following impacts to key resources in the I-5 corridor were observed:

- All concepts have the potential for moderate impacts to fish habitat. Concept 4, the replacement bridge has the most crossings, while Concept 1 has the fewest.

- All concepts, except Concept 1, have encroachments onto Delta Park (60-120 feet depending on concept).

- All concepts, except Concept 4, have encroachments onto the radio tower wetlands site (100-240 feet depending on concept).

- All concepts have encroachments onto the Ft. Vancouver Historical Site (60-120 feet depending on concept). An encroachment over 60' would impact the FHWA building, however no historic buildings would be impacted.

- Concept 4, a replacement bridge, would involve a full impact to the Columbia River Bridge. The existing northbound bridge is registered on the National Register of Historic Places and the southbound bridge is eligible for registration.

There are several important natural and historic resources in the BIA. In making improvements to the BIA, it will be difficult to entirely avoid impacts to all key resources in the corridor. Actual impacts to natural, cultural and historic resources will need to be determined in an EIS process. If a park, historic, or cultural resource is impacted, federal regulations would require that a EIS process determine that there are no feasible or prudent alternatives before mitigation could be determined. While this standard is quite high, it is balanced with the overall needs of the community.

F. Implementation Issues

In the course of conducting the BIA analysis and redesigning potential improvements, several observations can be made about bridge types and concept designs.

Joint Use Or Separate Bridge(s)
Constructing both LRT and freeway improvements on a single bridge could potentially result in some cost savings compared to building separate bridges. However, many other factors should also be considered, including right-of-way impacts, whether the existing bridges will be maintained or replaced, implications for siting the LRT station on Hayden Island, and construction staging.

Supplemental Or Replacement Bridge
The existing bridges provide three lanes of traffic in each direction. They cannot economically be widened. To provide an addition two lanes of traffic in each direction (for a total of up to five lanes), the bridges will either have to be replaced with a wider bridge, or a supplemental bridge will need to be constructed adjacent to the existing bridges. While further study is needed to conclude whether a new bridge should be supplemental to the existing bridges or should replace them, the analyses have identified several factors that will influence that decision:

- Traffic Operations
  With a supplemental bridge freeway traffic in one or both directions would be split into two traffic streams across the river. With two separate traffic streams, along with many closely spaced interchanges near the river, it is difficult to balance traffic flows, and the analyses indicated that congestion would be significant on the bridge serving the near-by interchanges. By comparison, a replacement bridge would keep all directional traffic on one bridge, resulting in more balanced traffic flow.

- Cost
  Current cost estimates indicate that there is little cost differential between a supplemental and a replacement bridge. Further exploration of cost issues will need to continue in an EIS.

- Right-of-way impacts
  Replacing the existing bridges with a new bridge would focus the new construction within the existing right-of-way, thus minimizing impacts to adjacent parcels on Hayden Island and in downtown Vancouver.

- Impacts to Property and Natural, Cultural and Historic Resources
  All concepts are likely to have an impact on one or more of the key resources in the BIA. Concepts that build a new bridge (either supplemental or replacement) east of the existing bridges (upstream) have a higher probability of impacting the Fort Vancouver National Historic Site than those that replace the existing bridges in place, or those that build a new supplemental bridge to the west (downstream).

  The existing northbound bridge is listed on the National Register of Historic Places, and the southbound bridge is eligible for listing. Concepts that remove one or both of the bridges will be subject to federal regulations that require a determination that there is no feasible or prudent alternative. Furthermore, Concepts that build a new bridge (or bridges) adjacent to the historic bridges will be evaluated to determine if the new bridge(s) substantially impair the historic integrity of the historic bridges (i.e., significantly change the visual setting of the historic bridges).

Conversion Of One Of The Existing Freeway Bridges For LRT Use

Some River Crossing concepts include the conversion of one of the existing freeway bridges for LRT use. While that is technically feasible, the cost of retro-fitting the bridges to include the modified decking, electric systems, cathodic protection, and other conversion costs would be significant. If upgrading the bridge to meet current seismic standards is required, the retro-fit costs could easily exceed the costs of a new LRT bridge. Further study of this concept would require a detailed investigation of the retro-fit costs, and a comparison of those costs to a new bridge.

Ability to Move Forward

Concepts that provide for separate LRT and freeway bridges could potentially allow the LRT and highway projects to move forward independently of each other. However, further analyses are required to address the joint or separate bridge decision. Such a decision is likely to be based on LRT and highway alignment design requirements, right-of-way and environmental impacts, land use opportunities and constraints relative to siting an LRT station on Hayden Island, construction costs, traffic staging, operating concerns, and potentially other concerns as well.

If subsequent studies indicate that the two modes can and should be considered separately there are potential time savings for LRT. LRT may be implemented in a shorter time period given that substantial environmental and design work has already been completed in the South/North EIS.

Appendix A – BIA Design Concepts

Maps of existing conditions in the Bridge Influence Area, and the 4 improvement concepts can be found at the end of this appendix.

Features Common to All Improvement Concepts

Interchange improvements were applied to each of the River Crossing Concepts. While some of the improvements are dependent on one specific bridge Concept, in general the individual improvements for each interchange concept can be largely interchangeable between concepts.

Vancouver Interchange Improvements

As traffic volumes increase with future growth, the close proximity of the SR 14, Mill Plain Boulevard, Fourth Plain Boulevard, and SR 500/39th Street, interchange ramps will become increasingly problematic. Closely spaced, the heavy volumes of entering and exiting traffic create congestion and safety concerns for all freeway users. To address the projected weaving and merging concerns, each of the improvement Concepts employed bridges to separate high volume on and off movements. In addition, collector-distributor lanes provided adjacent to the freeway lanes both northbound and southbound through Vancouver, reduced the number of freeway entrances and exits. Merging and weaving on the mainline would be significantly reduced and access to and from I-5 through Vancouver would be improved under all Concepts considered.

The Concepts also included new ramps to and from SR 500 and I-5 north, improving ease of movement between the two freeways. Because most of the current traffic using the 39th Street interchange ramps is traveling between I-5 and SR 500, each of the Concepts eliminated the southbound off-ramp from I-5 to 39th Street.

Portland Interchange Improvements

Each Concept included new ramps to be added at Columbia Boulevard to provide access to/from I-5 north.

Light Rail Improvements

Each of the Concepts assumed that light rail would be extended north from the North Expo Station to downtown Vancouver. Design variations were only carried as far north as C-TRAN's 7th Street Transit Center located in Downtown Vancouver at Washington Street. The alignment north of the transit center was consistent for all Concepts and mirroring the South/North Transit Corridor Study.

Concept Descriptions

Concept 1: 5-Lane southbound supplemental bridge for freeway traffic with LRT
See Maps 2A and 2B

Under this Concept, a new low-level to mid-level double-deck bridge would be constructed west of the existing freeway bridges. The top deck would include five freeway lanes for southbound

traffic and the lower deck would provide the River Crossing for LRT. The two existing I-5 bridges would be used for northbound freeway traffic. Because the two existing bridges would remain in place, the primary river navigation channel would continue to be located near the Vancouver shore of the Columbia River. The new bridge, along with the existing bridges, would have lift spans over the navigation channel.

Vancouver Interchange Improvements

All existing movements would be provided on existing or improved ramps; coupled with the northbound and southbound collector-distributor lanes as noted above. However, under this Concept, the northbound travel lanes would be split between the two existing bridges and northbound motorists destined for SR 14, Vancouver City Center, or Mill Plain Boulevard would need to determine which bridge to take in the vicinity of the Marine Drive interchange.

Portland Interchange Improvements

The new southbound lanes would extend south to the vicinity of the Victory/Delta Park interchange. In general, ramp improvements would be incorporated at each interchange (Hayden Island, Marine Drive, Denver, Victory, and Columbia Boulevard) to eliminate short distance weave sections.

Light Rail Improvements

As noted above, LRT would be extended to Vancouver using the lower deck of the new southbound bridge over both the Columbia River and North Portland Harbor. On Hayden Island, the LRT alignment would be largely at-grade, including the LRT station.

Concept 4: 10-Lane double-deck, replacement bridge plus LRT on a separate new bridge
See Maps 3A and 3B

This Concept features replacement of the existing Columbia River Interstate (I-5) bridges with a double-deck freeway bridge in conjunction with the construction of a new, separate LRT bridge. For this Concept, it was assumed that the top deck would be for northbound traffic and the lower deck for southbound traffic. The Concept assumes that both the freeway and LRT bridges would be high-level bridges.

This assumption is based upon two key factors: 1) the existing bridges would be removed, thus allowing the shipping channel to be moved to mid-stream in the river and 2) the downstream railroad bridge would be reconstructed such that the swing span would be relocated toward the middle of the river. For study purposes, the freeway and LRT bridges were designed in concept as fixed span bridges. However, if Coast Guard clearance requirements cannot be met using fixed span bridges, this Concept would then include lift spans over the navigation channel for both the freeway and LRT bridges. By removing the existing bridges, this Concept also was developed to maximize use of existing freeway right-of-way, thereby minimizing property impacts in Vancouver and on Hayden Island (see discussion under section III, Displacements and Encroachments).

Vancouver Interchange Improvements

All existing movements would be provided on existing or improved ramps; coupled with the northbound and southbound collector-distributor lanes as noted above.

Portland Interchange Improvements

In locations where there is a short distance between ramps coupled with high ramp traffic (such as the Marine Drive-Hayden Island section), on- and off-ramp traffic would be separated using bridges. With a high-level bridge, the Hayden Island northbound on-ramp would become a climbing lane, thus creating six lanes on the top deck of the bridge.

Light Rail Improvements

As noted above, this Concept would include separate light rail bridges across the Columbia River and the North Portland Harbor. However, construction of the LRT and freeway improvements would be linked because the light rail bridge would be used for a temporary traffic detour while the existing northbound bridge was demolished and replaced with the new double-deck, high-level bridge.

Concept 6: 4-lane collector-distributor bridge with LRT
See Maps 4A and 4B

This Concept would maintain the freeway as three lanes in each direction on the existing bridges and would supplement the River Crossing capacity by providing a four lane, two-way collector-distributor west of the existing bridges. The collector-distributor would serve ramp traffic to/from Hayden Island as well as other interchanges in Vancouver and Portland.

The collector-distributor would cross the Columbia River on the top deck of a new low- to mid-level double-deck bridge west of the existing bridges, with LRT on the lower deck. A lift span would be needed at the river navigation channel.

This Concept creates two parallel freeway systems (mainline and collector-distributor). A principal feature of this Concept would be to separate some of the interchanges with some access provided by one system and some by the other (for example, Hayden Island access would be via the collector-distributor while Marine Drive access would be via the I-5 mainline). This improves the separation distances between interchanges, but increases the complexity of the interchanges where the collector-distributor and mainline come together in Oregon and Washington.

Vancouver Interchange Improvements

As noted in the preceding paragraph, the parallel systems (mainline and collector-distributor) require additional ramp connections to ensure that all traffic movements are accommodated.

Portland Interchange Improvements

Access to Hayden Island would be shifted from the I-5 mainline to the collector-distributor. In addition, access to/from I-5 north for the Denver and Victory interchanges would be via the collector-distributor.

Light Rail Improvements

As noted above, LRT would be extended to Vancouver using the lower deck of the new collector-distributor bridge over both the Columbia River and North Portland Harbor. On Hayden Island, the LRT alignment would be largely at-grade, including the LRT station.

Concept 7: 8-lane freeway concept, plus new LRT bridge with 2-lane arterial
See Maps 5A and 5B

Under this Concept a new bridge would be constructed west of the existing bridges for LRT and a two lane arterial. In addition, a new three-lane bridge would be constructed east of the existing bridges for northbound freeway traffic. The existing northbound bridge would be used for northbound and southbound HOV lanes while the existing southbound bridge would continue to be used for southbound traffic.

Both new bridges would be low-level to mid-level in height and include lift spans over the navigation channel.

The two lane arterial crossing would link Hayden Island to downtown Vancouver and Marine Drive; parallel to and near the southbound bridge. Possible variations include the separation of the joint LRT/arterial connection on Hayden Island to separate placement of LRT near the mall or placement of both the arterial and LRT near the mall and toward the west.

Vancouver Interchange Improvements

Access to the northbound collector-distributor system would be provided near SR-14 and Mill Plain Boulevard. No direct northbound access from the collector-distributor system would exist from Fourth Plain to SR-500. Access to the southbound collector-distributor system would be provided near SR-500, Fourth Plain and Mill Plain. The southbound collector-distributor system would diverge to I-5 and SR-14.

Portland Interchange Improvements

Southbound access from Marine Drive to I-5 and Columbia would be via a two lane ramp that enters I-5 near Victory. Northbound access from I-5 to Marine Drive would egress near the Columbia Slough and parallel I-5. In general, ramp improvements would be incorporated at each interchange (Hayden Island, Marine Drive, Denver, Victory, and Columbia Boulevard) to eliminate short distance weave sections.

Light Rail Improvements

As noted above, LRT would be extended to Vancouver sharing the structure with the new two lane arterial over both the Columbia River and North Portland Harbor. On Hayden Island, the LRT alignment would be largely at-grade, including the LRT station. Possible variations include placement of LRT closer to the east side of the mall or placement of LRT to the west of the mall.

Appendix B – Public Comment Vancouver

The I-5 Project Team developed eight river crossing concepts that represented a range of possible crossing combinations of new and existing bridges crossing the Columbia River. The eight concepts were then divided into one of three categories for further study. The bridge concepts under study were then integrated into interchange improvements within the Bridge Influence Area. In tandem with developing design concepts, a public participation process was engaged. The process incorporated soliciting of ideas, concerns, and impacts unique to Vancouver and Portland. Three Public Working Group Meetings were held in Vancouver on February 5th, February 25th, and March 18th, that focused on Vancouver's section of the Bridge Influence Area. The following comments from the first and second meetings, where possible, were incorporated into the conceptual designs. Overall comments received at the third meeting were not incorporated and will remain documented for consideration or refinement in the future.

Comments
February 5, 2002

Southbound I-5 SR 500 to Bridge

- Eliminate westbound exit to 39th Street.
- Divide traffic on SR 500 to line up with I-5 exits.
- Impacts? Houses west of I-5 and 39th Street.
- Move I-5 off-ramps to middle.
- Trucks are too close to neighborhood.
- Between 29th Street and 33rd Street lower I-5 below grade.
- Look at mix of traffic.
- Include good signage.
- Install signs at 78th Street to have trucks take Lakeshore to the Port of Vancouver.
- Alternative Fourth Plain Boulevard interchange design may have sound impact on park.
- Look at closing the Fourth Plain interchange.
- Provide cross sections showing elevations.
- Add I-5 southbound to SR 500 eastbound ramp.
- SR 500 ramp to I-5 southbound may meet up with inside HOV lane.
- Do we need eight lanes between 39th Street and 33rd Street?
- Avoid impacts to the west of I-5.
- Will 39th Street and Main Street handle new volumes.
- What will be the total number of lanes of freeway through Portland?

Northbound I-5 Bridge to SR 500

- Avoid impacts to houses east of freeway.
- Need to rebuild bridges at 33rd Street and 29th Street.
- Need two ways to get to 39th Street.
- Tighten up the space between the I-5 through lanes and the off-ramps to minimize overall footprint.
- How high will freeway be?
- New Fourth Plain Blvd. northbound ramp going under Fourth Plain bridge.
- From I-5 consider last minute access to SR 500.
- What is the transition between number of lanes to three through lanes?

Comments
February 25, 2002

Working Group Comments

- *Why were these four concepts selected for analysis? They represent the range of design features.*
- *Designing the highway in this location is a very complex task involving the interstate and collector/distributor systems in the same corridor.*
- *If we solve the traffic bottleneck at the bridges, the congestion problem moves upstream to the SR 500 area. Currently, the bridge meters the volume of traffic. The effect is to reduce the amount of congestion at the Fourth Plain Blvd. and Mill Plain Blvd. interchanges.*
- *There is a need through signing in Oregon to alert northbound travelers early enough so they can merge into the appropriate lanes to access interchanges in central Vancouver. A similar need occurs north of SR 500 to alert southbound travelers through signing to merge into the collector/distributor system to access interchanges in central Vancouver and north Portland.*
- *Truck access to and from the Ports will be considered in designing highway accesses and the collector/distributor system.*
- *Homes impacted by the various concepts will be identified at the next meeting with the horizontal alignment information.*
- *Residential displacements have been eliminated by the four concept designs discussed today. Some encroachments remain however.*
- *Encroachments could represent a serious problem too if residents' quality of life is impacted.*
- *An effective sound wall is needed where noise impacts occur.*
- *To reduce property and noise impacts in neighborhoods, and reduce the "footprint" of the highway, we should consider double-decking the highway, similar to the double-deck bridge, and lowering the facility below ground level.*
- *The project team will prepare a conceptual cost-per-mile of a buried or stacked highway for discussion at the next meeting.*

Concept 1:

- *Five northbound lanes on the existing bridges, a new 5-lane south bound freeway bridge west of the existing bridges with LRT on the bottom deck.*
- *To access Mill Plain Blvd., Fourth Plain Blvd., and SR 500 northbound requires signing in Oregon and traveling on the eastern bridge.*
- *There are some impacts to the Fort Vancouver Historic Reserve but the design team has worked hard to reduce the significance of those impacts.*
- *There is highway access between the Fourth Plain Blvd. interchange and SR 500.*
- *The easterly ROW line does not impact "K" Street.*
- *The existing wall, located on the easterly side of the highway between Fourth Plain Blvd. and SR 500, may be encroached upon by a few feet in some locations.*
- *Can one of the three auxiliary lanes southbound (SB), south of 39th Street be eliminated so that the SB lanes only total seven? The three auxiliary lanes are needed to distribute traffic from I-5 and SR 500 to Fourth Plain Blvd., Mill Plain Blvd., downtown Vancouver and SR 14.*
- *The project should reconsider the need to have more than seven lanes at this location.*
- *To eliminate one of the worst weave sections, between SR 500 and Fourth Plain Blvd., one ramp lane from SR 500 accesses the collector/distributor system while the second ramp lane accesses I-5 as an add lane.*
- *Southbound travel lanes are located closer to Shumway Neighborhood and may encroach on residential properties.*

- *The Fourth Plain Blvd. ramp designs look much better than the existing configuration.*
- *The last meeting of the group will discuss highway geometry that will illustrate better where there may be neighborhood impacts.*
- *Working Group members can stay involved as the project proceeds through the Task Force recommendation and into the environmental impact analysis.*

Concept 4:

- *Replaces the existing bridges with a new 5-lane double-deck bridge (northbound on the top deck), LRT on a separate bridge west of the highway bridge, and with the navigation channel moved to the center span.*
- *There is a direct connection from SR 14 to downtown Vancouver with this design.*
- *The new ramp from SR 14 to I-5 impacts the U.S. Army facility, but the concept was redesigned to avoid impacting as much of the facility.*
- *There are four levels of ramps at the bridge with this concept.*
- *This concept northbound is very similar to Concept 1.*
- *The design southbound is different in that traffic from SR 500 stays on the collector/distributor system and enters I-5 further south. This configuration may direct too much traffic onto the collector/distributor roadway with resulting congested conditions.*
- *The Fourth Plain Blvd. loop ramp onto I-5 has been eliminated from this concept.*
- *We should try and shift the highway lanes to reduce neighborhood impacts on the west side.*
- *Is the southbound ramp to I-5 from 39th Street needed? Traffic could easily access the Mill Plain Blvd. or Main Street southbound ramps to I-5.*
- *Residents and businesses in the Fruit Valley area use 39th Street to access I-5 so the interchange should remain.*
- *Can we develop a new truck access by extending SR 14 to the west of I-5? We will record this concept variation and refer it to the Task Force to include in their discussions.*
- *The Fourth Plain Blvd. northbound ramp has a choice of accessing I-5 or SR 500.*

Concept 6:

- *Three lanes northbound and southbound on the existing bridges, a new 4-lane collector/distributor double-deck bridge west of the existing bridge, with LRT on the lower deck.*
- *This design has dual, parallel freeway and arterial systems crossing the river. This situation would crate problems to bring the two traffic systems together north and south of the bridge. It is also problematic in determining which interchanges should access either system.*
- *Fourth Plain Blvd. accesses I-5 but does not access SR 500. This would result in less impacts to neighborhoods. Traffic to SR 500 would seek access via other routes.*
- *There are some "free" right turns onto highway ramps that have been eliminated from this design that could create problems.*
- *The design of this concept southbound is very similar to Concept 4, but the northbound facilities have different design features.*
- *Too many ramp movements, including two SR 500 ramps and a 39th Street ramp, result in neighborhood impacts. If the southbound ramp from 39th Street to I-5 can be eliminated, this space can be utilized for the SR 500 southbound loop and neighborhood impacts could be reduced.*
- *Truck noise could be a problem with the SR 500 ramps moved closer to homes.*

Concept 7:

- *Three southbound lanes on the existing westerly bridge, north and south bound HOV lanes on the existing easterly bridge, a new 3-lane freeway bridge east of the existing bridges, and a new 2-lane arterial bridge with LRT west of the existing bridges.*
- *There would be no direct connection from Fourth Plain Blvd. northbound to SR 500.*
- *SR 500 southbound ramp has one lane accessing the collector/distributor system and one lane accessing I-5.*

Comments
March 18, 2002

Concept 1:

- **Traffic flow from Fourth Plain requires signalized intersection to I-5 South. Concerned about backups onto Fourth Plain to West. Still weaving movement on/off Fourth Plain/Mill Plain.**
- **Effectively moves much of the through traffic away from entering/exiting traffic. Maintains traffic from Fourth Plain to SR 500.**
- **Extreme care should be given to eliminate any encroachment on Historical Reserve. While residences can be rebuilt and relocated, it is not possible to rewrite history.**
- **Signage should minimize any confusion by drivers and traffic.**
- **I would question impacting The Inn at the Quay.**
- **Look at encroachments on 37th Street (west of I-5) south of Fourth Plain (2nd block south).**
- **Reconfigure curve in I-5 just south of Fourth Plain to curve to the east to avoid encroachment on west side houses in Arnada Neighborhood.**
- **Historic Reserve east side, look at possible stack ramps so there will not be encroachments.**
- **The option is good. It incorporates the SR 500 merge, thank you. It is important to maintain Fourth Plain and Mill Plain for trucks. Need Fourth Plain direct access to freeway.**
- **More noise both in traffic and construction.**
- **Consideration to stacking was avoided.**
- **Suggestions to avoid impact on the high cost condominiums, but no consideration to normal neighborhoods except give them a wall. Aren't we all equal?**
- **I'm still disappointed to see a total of 13 – 14 lanes across.**
- **I would like to see the southbound land configuration from Option 6 (between SR 500 – McLoughlin) because it provides less encroachment of the house at 20th Street.**
- **I would like to see the radius/turn south of Fourth Plain enlarged to shift the entire freeway east into the unpopulated area east of I-5.**
- **Concerned about encroachment into Historic Reserve.**
- **There is a need to adequately and completely sign this concept. It is paramount.**
- **Afraid that this makes Vancouver a "pass through" even more than it already is. How does this fit with all the proposed development?**
- **Tear down the Quay.**
- **Moving a lot of traffic in a tight spot.**
- **Doing well with objectives, considering the challenge.**
- **Truck Traffic is closer to homes.**
- **Signing is of significant importance.**
- **There are impacts to the Historic Reserve.**
- **Shift I-5 east or west to reduce areas of impact to 37th, 20th, and 12th Streets.**

- **Impact to newly constructed bank building at 6th Street. Consider southbound off ramp under "C" street.**

Concept 4

- **Signal from I-5 south to Fourth Plain. Signal on Fourth Plain under overpass – is bad.**
- **Free movements from Fourth Plain/Mill Plain to I-5 South.**
- **Southside portion with new bridges is smoother solution than Concept 1 – at least up to Mill Plain.**
- **No encroachment on K Street north of Fourth Plain.**
- **Fourth Plain overpass with right turn to go west good idea – discourage trucks on Fourth Plain.**
- **Historic Reserve should not be disturbed.**
- **Eliminate merging onto I-5 at Fourth Plain and extend C/D to enter I-5 closer to 39th Street.**
- **39th Street entrance to I-5 much better than Concept 1.**
- **Move curve lanes to the east to avoid encroachment south of Fourth Plain.**
- **Do not want the existing bridge to be destroyed – it is important.**
- **I like the bridge design of this concept with the freeway/highway layout of concept 7.**
- **Fourth Plain is difficult with this because of light. I think this would be difficult for freight.**
- **Mill Plain is better.**
- **Once again the addition of 4 lanes for a total of 14 is just ridiculous.**
- **I would like to see the radius/turn south of Fourth Plain enlarged to shift the entire freeway east into the unpopulated area east of I-5.**
- **Better access into CBD.**
- **Concern about double deck structures in active seismic area.**
- **Cost will most likely be too high for actual concept when running alternatives through EIS.**
- **Historic Reserve, can this impact be avoided? Long-term life of Pearson Air Park?**
- **Good effort at reducing highway footprint.**
- **Looks good on paper, but in reality, probably too expensive to do.**
- **Again, what is the overall vision for Vancouver? How does this fit in? If the vision is strong enough; then maybe tunneling is effective. Vancouver as a pass through.**
- **Suggest that the Fourth Plain to I-5 ramp be moved north towards 37th Street.**
- **Shift I-5 east or west to reduce areas of right-of way impacts.**
- **The concept #4 with the new 2-level bridge appears to offer many advantages. It is unclear to me, however, why a new LRT bridge would be required. With the new road bridge to the east of the 2 existing spans, it would seem one of the old road bridges could be re-used for light-rail. In addition to cost savings, this would help avoid the political debate over a significantly expensive structure being constructed for 100% dedicated to light rail.**

Concept 6

- **Fourth Plain eastbound onto I-5 south. No free movement will result, congested intersection backing up onto Fourth Plain.**
- **From Mill Plain north, this is superior to other option.**
- **This one is very good from SR 500 to McLoughlin concerning neighborhood encroachments.**
- **The 29th and 33rd Street overpasses (east-west) need to be figured for encroachment.**
- **Again the Historic Reserve must not be encroached.**

- **Too many ramps, circles, etc. just off of the bridge.**
- **I would like to see the radius/turn south of Fourth Plain enlarged to shift the entire freeway east into the unpopulated area east of I-5.**
- **I like that the SR-500 on ramp merges from four lanes to three lanes further north on I-5 - near Fourth Plain.**
- **Mill Plain on-ramp to I-5 north - - move toward west.**
- **Look at cross sections of 29th and 33rd Streets in relation to new over crossings.**
- **Shift I-5 east or west to reduce areas of right-of-way impacts.**

Concept 7

- **Westbound Fourth Plain can't get to SR 500 without going through neighborhoods.**
- **Less impact to properties between Fourth Plain and Mill Plain.**
- **Least attractive option, with north end impacts.**
- **Fourth Plain overpass has no entrance to SR 500 (eastside) going north which would divert traffic onto St. John's to SR 500 and would go directly through Rosemere neighborhood – not acceptable.**
- **I really like the clover-leafs at Fourth Plain but I'd prefer to see the bridge layout used in concept 4 (double-decker, with light rail separate).**
- **Please look at direct southbound access from Fourth Plain. Extra lane on bridge is great.**
- **The elimination of access from Fourth Plain to SR 500 northbound is unacceptable. It will push cut through traffic through Rosemere to eastbound SR 500 via St. Johns Blvd.**
- **I would really like to see the radius/turn south of Fourth Plain enlarged to shift the entire freeway east into the unpopulated area east of I-5.**
- **Traffic moving from Fourth Plain to SR-500 will travel through neighborhoods - Main Street and/or St. Johns.**

General Comments: Stacked Option

- **Cost is significantly beyond benefits.**
- **Totally unacceptable and not only from a cost standpoint. The impact to the community during and after construction would be considerable. The noise would not be significantly reduced to make this option worth considering for five minutes.**
- **Last concept would be the absolute best for all things being considered. Unfortunately, it would be far more expensive, but should not be negated right up front. Since this is a 20-year plan, it may be the best for the future.**
- **Please continue with the study of stacking the north and south lanes. The first estimate of 9 to 1 cost could be inaccurate when you get to the bridges and can reclaim land width used in other concepts.**
- **This is still amazingly attractive. Look how much land could be reclaimed to be used for development.**
- **This could be tied together with a tunnel under the river for the through traffic.**

Appendix C – Public Comment Portland

Three Public Review Meeting were held for the Oregon Interchange portion of the Bridge Influence Area.

February 7th and 28th Comments

At the February 7th and February 28th workshops, initial schematic concept layouts were presented meeting attendees. Comments (verbatim) received at these workshops are documented below. Comments from February 28th are identified in **bold**. Where possible, the design team has incorporated the comments into the design. Comments not incorporated into the design will remain documented and may be considered or refined in the future.

Locations:

Columbia Blvd. Interchange and adding access to and from the North –

- ✓ Absolutely a must to make I-5 ramp improvements. Truck traffic and TOD development don't mix. Density and redevelopment must be done correctly.
- ✓ Good concept as seen.
- ✓ Closer to I-5 much simpler than long northbound on-ramp option.
- ✓ **Options 1, 4 and 6 too long to get to I-5 with new northbound ramp**
- ✓ **Option 1: need to have vehicles merge more quickly onto I-5 north.**

Victory Blvd. Interchange (Expo Center, Portland International Raceway, etc.) –

- ✓ I am always concerned about the congestion created by the Light Rail – the park and ride and the problem that could develop up the pipeline – particularly Kenton.
- ✓ Would like to see more arterial (local) approach to.
- ✓ Need very serious look at northbound Columbia Blvd. traffic stopping at Victory signal. I think this has to be an overpass and exit to Victory.
- ✓ **Light at Victory needs to have overpass option so traffic is not forced to go through the intersection – braid Columbia Blvd. And Victory traffic.**
- ✓ **Signals at Victory can't be only TCD for this intersection; signals for local – ramps for I-5?**
- ✓ **Option 1: – too much southbound structure**

Marine Drive/Martin Luther King Blvd. –

- ✓ Really don't know the answer but feel the traffic needs to be reapportioned on MKL.
- ✓ MLK/Columbia/Marine improved for truck traffic if accesses of MKL/Columbia are limited.
- ✓ Could go in space on each side by rebuilding interchange – costly though.
- ✓ **Option 7:use this to route northbound trucks from the east (Columbia Blvd.)**
- ✓ **Option #1 not sure this will relieve peak hour demand snarls.**
- ✓ **Consider redesign as significant opportunities (space and flow) exist – similar to I-5/217.**

Hayden Island –

- ✓ The bigger you make the I-5 right –of-way the more you create the hostile DMZ atmosphere. Efforts should be made to create an arterial from Expo to the Island and on to Vancouver, LRT also.
- ✓ Would like to see more arterial (local) approach to Hayden Island/Jantzen Beach.

- ✓ A couple of the concepts would destroy the livability on Hayden Island especially if the arterials on the west side of the existing I-5 destroys the mall and the impact is severe.
- ✓ Neighborhood Access and Traffic Impacts – take into consideration the large retirement community on Hayden Island in the mobile home parks.
- ✓ If LRT/local access pulled west of main mall, have LRT up high above auto lanes.
- ✓ **The Jantzen Beach moorage is owned by 176 families. Condemning a partial portion affects 176 people. Compensation will need to be made to 176 families.**
- ✓ **Sound walls need to be considered on new river crossing structures**
- ✓ **Like option 4's interchange – Safeway needs to take K-Mart's place though.**
- ✓ **Go for option #4 double deck bridge has lesser impact to Island.**
- ✓ **Option 4 – OK; Option 6 – good access but too spread out creates larger "dead" zones; Option 7 – not fleshed out but with arterial deserves further development consideration**.
- ✓ **Option 7: – bring LRT/arterial bridge farther west to center of shopping center.**

Issues:

Truck Freight Access and Circulation –

- ✓ Absolutely critical for truck traffic access from I-5 southbound to directly access the Columbia Blvd. truck route. Also that in reverse northbound.
- ✓ **Arterial road locate west of Railroad Bridge. (West Arterial Road)**
- ✓ **Minimize truck and freight access on Denver and Lombard**

Neighborhood Access and Traffic Impacts –

- ✓ There needs to be a honest effort to separate interstate (high speed) highway needs with the arterial connection similar to the bridge the city is famous for.
- ✓ Study more arterial alternatives.
- ✓ Could take more traffic off of Denver Avenue by completing Lombard/I-5 interchange – stretches out access points.
- ✓ **Options 1 and 6 create lots of neighborhood impacts**
- ✓ **Northbound I-5 weaving conflicts between Marine Drive and Hayden Island.**
- ✓ **Option 7 best serves to connect the adjacent neighborhoods of downtown Vancouver and Hayden Island.**

Right-of-Way Impacts and Displacements – Commercial properties:

- ✓ Displacement is an evil word. Must be very selective and necessary examining all of time.
- ✓ Idea floated to have southbound and northbound new ramps to Lombard from I-5; this would have too adverse an impact on residential and commercial properties.
- ✓ **#4 is lesser impacts to business**

Right-of-Way Impacts and Displacements – Residential properties:

- ✓ Same as Commercial.
- ✓ Residential properties; by going on the west side of I-5 destroys 20% of a floating home community
- ✓ Idea floated to have southbound and northbound new ramps to Lombard from I-5; this would have too adverse an impact on residential and commercial properties.
- ✓ **All options impact floating homes. How can this be minimized?**
- ✓ **All these potential improvements prohibit selling our homes and we are unable to relocate to another site. Available floating home slips are very limited, hard to find. No new moorages are allowed. This creates a <u>huge</u> cloud over our heads for the next 10 years with few if any options to relocate and get on with our lives. The homeowners made a considerable investment to purchase the moorage but now the future is clouded with the possibility of losing a portion of the investment.**
- ✓ **Options 1 and 6 heavy impact; option 4 lesser impact.**

Other Impacts and Issues –

- ✓ Take this process seriously. If you are asking for community support please no smoke and mirrors.
- ✓ Need traffic trip info, rough % of trips ending at Columbia, Victory, Marine Drive, Hayden Island and through trips to gauge number of lanes needed for local access. For next meeting if possible.

Comments:
Very informative meeting! Some good ideas but still many unanswered questions.

Concepts #2 and #4 are the best of the eight, but # 3 would be my choice and have the <u>least impact</u> to the community and island living!!

Bridge options – Consider double decking option 8 to 2 4-lane bridges. Concept 5 – double deck to 2 3-lane bridges.

Option 4 overall tightest alignment with least impacts – but must have light rail in place – could have alignment separate from I-5 landing just to the east of the main mall – or arterial bridge/light rail to east side of mall on Hayden Island from Marine Drive. Option 1 a fairly good choice – Force Avenue is a natural intersection.

Very uncomfortable having only one meeting on 3/21; believe at least 2 more are needed.

Concept 5 and 6 General Comments

- Kenton neighborhood truck traffic impacts (undesirable).
- Protection of commercial use on Hayden Island (is important).
- How much traffic uses Hayden Island and how much is through on I-5?
- How does this connect to Vancouver?

- Lombard needs northern ramps.

- **Options 4 and 6 would destroy Hayden Island and proposes the <u>worst</u> impact.**

Concept 1,2,3, and 4 General Comments

- Where is LRT with this option?

- New facility would have less impact on east side of existing bridges.

- **Options 4 and 6 would destroy Hayden Island and proposes the <u>worst</u> impact.**

- **Option 1 has 2 new bridge crossings through a moorage – see note (above). Consider moving all improvements to the east side of the existing freeway.**

Concept 7 General Comments

- Will one lane, each direction, effect traffic on I-5?

- How about 4-lane arterial double decked?

- Arterial bridge with LRT further to the west, to backside of mall; closer to retired housing.

- Can LRT be on top?

- Shuttle bus.

- **Option 7 has 1 crossing through our moorage of 4 lanes.**

<u>March 21st Comments</u>

The last public review meeting was held on March 21, 2002. Conceptual plans were displayed. The comments received are listed below.

<u>Concept 1</u>
- I like the improved access on/off of MLK.
- There are medium to heavy impacts to Jansen Beach Moorage – 18 to 20 homes plus businesses.
- This is a better design than others because there are smoother curves and the flow is better.

<u>Concept 4</u>
- The local bridge between Marine Drive and Hayden Island – If necessary, please move it to the west side of the railroad bridge.
- This concept is a better deal for river traffic.
- This is the best concept tonight. It has the least footprint effecting Jantzen Beach Moorage.
- Safeway would need to relocate

Concept 6

- The curves are smooth and the flow is good.
- There are heavy impacts to Jantzen Beach Moorage – 20 to 25 homes. There is a lot of land used.

Concept 7

- Easier staging for construction but covers more real estate
- Safeway would need to be relocated.
- Can roads be squeezed together to make a smaller footprint?
- The arterial bridge wipes out a row of homes at Jantzen Beach Moorage.
- Please move the arterial bridge to the west of the railroad bridge. People in auto and truck traffic would have better access to St. Johns and would not mind a slightly longer drive.
- There are lesser impacts to Jantzen Beach Moorage – 1 row perhaps.
- Looks like a good flow and curves.