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Draft Technical Memorandum

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To: Jay Lyman, David Evans and Associates

From: Connie Kratovil

Subject: ODOT Contract No. 16902- I-5 Trade Corridor Study Phase II
Conceptual Engineering for Option Package 7: LRT with Corridor-Wide Capacity Increase

GENERAL FUNCTIONAL DESCRIPTION

Option Package 7 involves investment in an LRT loop system, as well as a corridor-wide highway capacity increase in the form of a two-lane reversible express lane facility on I-5 between 134th Street and I-405.

Key features of this package include:

- Provides the only option package resulting in five lanes of peak direction roadway capacity, including HOV, and provides the maximum person-carrying capacity among all of the alternatives being considered
- Includes an LRT loop system with the following segments:
  - Expo P&R to Clark College
  - Clark College to 83rd P&R lot with service to Vancouver Mall
  - 83rd P&R to Parkrose transit center with service to Vancouver Mall
- Includes limited express lane access at 134th Street, SR 500, SR 14, Columbia Blvd., and I-405/I-5
- Compatible with 4-lane, 6-lane, and 10-lane Columbia River Bridge concepts and with Columbia River tunnel concepts

River crossing options for Option Package 7 are similar to those described under Option Package 6. The LRT loop system is technically described in the Technical Memorandum for Option Package 3.

Conceptual design of Option Package 7 has not been performed at this time. However potential cross sections of the 6-lane and 10-lane bridge sections with LRT can be found on **Figures 7-1 and 7-2.** In the event that Option Package 7 is carried forward, there are issues that would need addressing. They are as follows

For Light Rail on one of the existing I-5 Columbia River Bridges, a number of studies will have to be conducted to assess the cost. These studies should include:

- Cost to modify one of the bridges for LRT
- Cost to seismically upgrade one of the bridges

- ❖ Future programmed maintenance work (i.e. painting, scour etc.)

ODOT Bridge Department, in 1995 did perform a conceptual seismic study of portions of the I-5 Columbia River Bridges. The resulting cost was considered so high, that it deemed not to be economically justifiable, therefore no total cost to seismically upgrade has been compiled to date.

Fixed span bridges. Option Package 6 identifies the 10-lane bridge as fixed span. Clearance over the Columbia River is approximately 178 vertical feet. The profile on the 10 lane fixed span bridge option is 4% or less, which can accommodate LRT operations. This would result in requiring elevated LRT stations at Hayden Island and Vancouver (near Evergreen). To accommodate at-grade stations, the grade would require lowering the profile of the bridge approximately 35 feet.

Alignment of the 6-lane bridge. Option package 6 identifies the alignment of the 6-lane structure to the east of the existing structures. The alignment of the 6-lane structure with Light rail would need further evaluation as the LRT stations are currently on the west side of I-5.

Cost differential between a new LRT bridge and a new vehicular bridge with a combined use bridge
Parsons Brinckerhoff prepared a conceptual level study for Tri-Met in August of 1996. The combined bridge verses individual bridges was carried out for a new bridge over the Willamette River near Ross Island. The percent factors determined in that study would be consistent with percentage factors applied to Columbia River Crossing. The following assumptions were used in comparing conceptual cost estimates for two independent structures and a combined LRT/auto bridge over the Willamette River at the Ross Island Crossing:

- All costs are for bridge structure only. No allowances have been made for cathodic protection, track, ballast, electrification, or other related elements.
- Independent bridges could be constructed using single or multiple column piers; therefore, substructure costs do not differ significantly for independent or combined bridges.
- A combined LRT/auto bridge would require twin superstructure decks to accommodate the different deck widths of more than approximately 70 feet.

Evaluation

Table 1 is the summary of the cost comparison for independent and combined LRT/auto bridges.

Table 1
Cost Comparison for Independent and Combined LRT/Auto Bridges over the Willamette River at the Ross Island Crossing

Parameters	LRT Only	Auto Only	LRT/Auto Combined
Width	32 feet	70 feet	102 feet
Bridge Cost	$21.5 million	$26.4 million	$47.9 million
Mobilization	$ 2.9 million	$ 2.6 million	$ 3.8 million
Total Cost	$ 24 million	$ 29 million	$ 51.7 million

The results of the four studies discussed in the "Tri-Met, South-North Transit Corridor Study, Cost Comparison for Independent and Combined LRT/Auto Bridges, August 8, 1996", and the cost comparison presented in Table 1, indicate that cost differences could range from 3 to 18 percent between independent

and combined structures. The percentage of the cost difference is a function of many factors that are dependent on the base cost estimated for the auto and LRT options. For example, on smaller auto bridges (less than 40 foot width), the impact of including LRT is significant, while adding LRT to a larger bridge (e.g., eight-lane) results in a smaller increase.

COSTS

Conceptual cost analysis for option package 7 has been performed for combined use bridges. All estimates are based on 2001 unit costs: These estimates do NOT include the cost to purchase any businesses on Hayden Island. The names of those businesses can be found under the ROW section of Technical memorandum 6. Commercial land value has been included in this estimate.

Segment estimates can be found in the following tables.

6-lane bridge with LRT (Victory to Mill Plain)	
Right of Way	$ 8,564,677
Utility Relocations	13,500,000
Excavation	844,480
Surfacing	7,166,965
Roadside Development	9,102,000
Traffic Services	3,263,950
Structures	521,667,810
Mobilization	44,443,616
Contingencies	191,996,423
Engineering and Administration	197,996,311
Total	$998,546,232

10-lane bridge with LRT (Victory to Mill Plain)	
Right of Way	$ 7,099,070
Utility Relocations	15,750,000
Excavation	5,383,840
Surfacing	11,811,930
Roadside Development	10,500,000
Traffic Services	4,967,750
Structures	587,062,086
Mobilization	50,838,048
Contingencies	219,620,369
Engineering and Administration	226,483,506
Total	$ 1,139,516,600

FIGURES

Note to reviewers: Figure 7-1 would be similar to figure 5-7 of the graphics package.
Figure 7-2 would be similar to figure 5-11 of the graphics package.

I-5 Transportation and Trade corridor Partnership
Draft Costs by Option Package
October 16, 2001

Costs by Option Package	Unique Costs	Park and Ride Lots	Baseline Road Costs	Baseline Transit Costs	Rose Quarter Widening	Delta Park to Lombard	Vancouver Interchange Modifications	Add North Ramps to Columbia	No Bridge - Access to Hayden island through Marine Drive	LRT only Columbia River Bridge	4-lane supplemental Bridge	6-lane supplemental Bridge	10-lane supplemental Bridge	4-lane supplemental Tunnel	Total
Baseline					$300	$41	$93								$434
West Arterial	$947				$300	$41	$93								$1,381
3 Lanes (with a 4-lane Bridge)		$52			$300	$41	$93				$596				$1,083
Add a 4th Lane (with 6 lane bridge)	$465	$52			$300							$940			$1,757
Add a 4th Lane (with 10 lane bridge)	$465	$52			$300								$1,117		$1,933
Add a 4th Lane (with 4 lane tunnel)	$465	$52			$300									$807	$1,624
Light Rail Loop/3 lane [1, 2]	$1,082				$300	$41	$93			$140	$596				$2,252
Light Rail Loop/add a 4th lane [1,2]	$1,546				$300					$140		$940			$2,926

notes: 1. Assume separate LRT bridge
2. Park and Ride facilities inclused in "Unique costs"

I-5 Transportation and Trade corridor Partnership
Draft Costs by Decision Point
October 16, 2001

Costs by Decision Point	Unique Costs	Park and Ride	Baseline Road Costs	Baseline Transit Costs	Rose Quarter Widening	Delta Park to Lombard	Vancouver Interchange Modifications	Add North Ramps to Columbia	No Bridge - Access to Hayden island through Marine Drive	Total
Baseline					$300	$41	$93	$111	$76	$621
West Arterial	$947									$947
3 Lanes (with a 4-lane Bridge)	$596	$52			$300	$41	$93	$111		$1,193
Add a 4th Lane (with 6 lane bridge)	$1,405	$52			$300					$1,757
Light Rail Loop [1]	$1,222									$1,222
Express Bus - Short [2]	$199	$52				$41				$292
Express Bus- long [3]	$351	$52								$403
LRT only Columbia River Bridge	$140									$140
4-lane Supplemental Bridge (Victory to Mill Plain)	$596									$596
6-lane Supplemental Bridge (Victory to Mill Plain)	$940									$940
10-lane Supplemental Bridge (Victory to Mill Plain)	$1,117									$1,117
4-lane Supplemental Tunnel (Victory to Mill Plain)	$807									$807

Notes: 1. Park and Ride facilities included in "Unique costs"
2. Assume cost is 1/3 of 3-lane option
3. Assume cost is 1/4 of 4-lane option