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**Date:** September 28, 2001  
**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 1: Baseline**

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## **GENERAL FUNCTIONAL DESCRIPTION**

Four 2020 Baseline variations have been developed which will be modeled and evaluated. These variations are to test the corridor performance and impacts that result from different levels of transit and highway investment as described in regional transportation plans. Each Baseline variation includes projects identified in Metro's adopted 2020 Regional Transportation Plan (RTP) and in the Southwest Regional Transportation Council's (RTC) Metropolitan Transportation Plan (MTP). In particular, proposed highway improvements in the Delta Park/Lombard and Rose Quarter areas will be assessed.

Two variations that are not included in the regional transportation plans have been included in this technical memorandum. Both variations focus on spot improvement that could be made to address weaving, merging, and diverging issues.

The key features of this technical memorandum include:

- Widening of I-5 to add a third southbound travel lane through the Delta Park/Lombard area for morning peak period HOV use, and the northbound shoulders would be improved in this area.
- Rose Quarter ramp improvements (only) would be made to address specific weaving, merging, and diverging problems due to the existing close ramp spacing.
- Addition of a third travel lane to I-5 in each direction for general-purpose traffic through the Rose Quarter area (I-84 to I-405). This variation also includes ramp improvements to address specific weaving, merging, and diverging problems due to the existing close interchange ramp spacing.
- Spot Improvement to the existing Columbia Blvd. Add northbound ramps from Columbia Blvd. onto I-5 to complete the partial existing interchange and provide for all north and south movements.
- Spot Improvement to the existing Marine Drive and Hayden Island interchanges by building a four-lane bridge and widening the northbound side of the existing Portland Harbor Bridge.

Schematic drawings and typical sections of Option Package 1 is shown in **Figures 1-1, 1-2, 1-3, and 1-4** at the end of this memo.



## TECHNICAL DESCRIPTION OF OPTION (Delta Park to Lombard:Widen to 3-lane SB)

### *General Description*

The general description of I-5 widening to three lanes through Delta Park - Lombard is schematically depicted in **Figure 1-1**. The southbound I-5 roadway would be widened from 2 lanes to 3 lanes beginning at the Victory Blvd. structure to just south of the Columbia Blvd. structure. The median would be widened to 18', matching the existing sections to the north and south. The right side shoulders would be widened to standard width throughout this section except for a portion of the southbound Columbia Blvd. structure (see 'Deviation From Standards' for additional discussion).

In the southbound direction, the entrance ramp from Victory Blvd. would be modified to connect into the additional lane on the freeway. The grades would be flattened slightly and the acceleration lane would be the standard length. The modified ramp acceleration lane would extend onto the Columbia Slough structure. The southbound entrance ramp from Columbia Blvd. would be modified to connect into the freeway south of the existing structure. The grades would be flattened and the acceleration lane would be longer than standard to facilitate truck acceleration and merging. A ramp meter bypass for trucks could be included as part of this ramp modification. The roadway widening would require retaining walls on the west side of the freeway to minimize R/W impacts (see 'Structures' discussion). The extension of the third lane on I-5 from Victory Blvd. would match into the existing third lane south of Columbia Blvd.

In the northbound direction, the exit ramp to Columbia Blvd. would be modified and extended to provide standard exit geometry and to flatten profile grades. The modified exit ramp would extend onto the Columbia Blvd. structure. The exit ramp to Victory Blvd. would be slightly modified to connect into the widened section of I-5 and would match into the existing ramp terminal. Barrier and steeper slopes would be considered to minimize R/W and environmental impacts.

### *Structures*

The proposed additional southbound lane, 18' median and standard shoulder widths would require widening of the Columbia Slough and the Columbia Blvd. structures. The Columbia Slough structure is proposed to be widened symmetrically (west and east) about the roadway centerline. The southbound entrance ramp from Columbia Blvd. is proposed as a separate structure, extending over Columbia Blvd. and the railroad. This is proposed to avoid widening conflicts with the railroad and to help improve profile grades on the entrance ramp. The west side of the Columbia Blvd. structure would not be widened – it would use the width of the existing entrance ramp for the new southbound lane. The east side of the Columbia Blvd. structure would be widened to provide for the 18' median and standard right side shoulder widths.

Retaining walls are anticipated along the west side of the southbound entrance ramp to retain cut and fill and sections and to minimize R/W impacts. The existing soundwalls on the west side of the freeway would be impacted and would likely be reconstructed on top of the proposed retaining walls. Retaining walls are proposed in the northbound direction along the east side of the exit ramp to Columbia Blvd. to avoid impacts to the cemetery.

### *Deviations from Standards*

The proposed median width for this section is 18', and the standard width for a multi-lane freeway section is 26'. The existing median width for several miles both north and south of this section is also 18'. It has been proposed, for the purpose of continuity and reduced impacts, that this section match the adjacent sections and be constructed with an 18' width.

The southbound shoulder width on the Columbia Blvd. structure would vary from approximately 12' to 6' at the south end. The standard shoulder width for this section would be 12'. The allowable shoulder width for a long (200' or more) structure on the Interstate system is 3.5'. To minimize impacts to the railroad, it is proposed that the existing shoulder widths remain in place in the southbound direction.

***Right of Way***

R/W impacts are anticipated on the west side of the freeway along the proposed southbound entrance ramp from Columbia Blvd. The widened section appears to impact property only, with no built improvements being impacted. An access road to one property may need to be modified to allow passage behind the proposed relocated soundwalls.

Approximately 1.2 acres would be required to widen I-5 to 3 lanes southbound from Delta Park to Lombard and broken down as follows:

Commercial	1.1 Acres
Residential	0.1 Acres

## **TECHNICAL DESCRIPTION OF OPTION (ROSE QUARTER Ramp revisions) – Mark J. to revise**

### ***General Description***

ramp revisions would be made along I-5 between the Broadway/Weidler corridor and I-84. In the southbound direction, the off-ramp to eastbound I-84 would be relocated in advance of the southbound on-ramp to I-5 from Williams, thereby eliminating the existing short southbound weaving area. The relocated off-ramp to I-84 would be “braided” over or under the on-ramp from Williams. A short ramp would connect the Williams on-ramp and the I-84 off-ramp (eastbound).

In the northbound direction, the off-ramp to Weidler would be relocated in advance of the northbound on-ramp to I-5 from I-84, thereby eliminating the existing short northbound weaving area. As above, the relocated off-ramp would be “braided” over or under the on-ramp from I-84. A short ramp would connect the westbound I-84 on-ramp and the Weidler off-ramp. Under Option Package 1c, there would be no mainline widening along I-5.



## TECHNICAL DESCRIPTION OF OPTION (ROSE QUARTER Widening) – Mark J. to revise

### *General Description*

The general description of I-5 widening to three lanes through the Rose Quarter is schematically depicted in **Figure 1-2**. Provide a new third mainline travel lane in each direction between I-405 and the ramps to and from I-84. In addition, ramp revisions would be made along I-5 between I-405 and I-84. In the southbound direction, the ramps south of Broadway-Weidler would be braided and a new on-ramp serving Weidler traffic only would connect with the new off-ramp to eastbound I-84

The southbound off-ramp from I-5 to Broadway/Weidler would be relocated further to the north. About midway between the relocated ramp's exit from I-5 and the traffic signal with Broadway, a relocated Vancouver Avenue would connect with the roadway, providing a modified access route for southbound travelers on the local street system north of Weidler.

## TECHNICAL DESCRIPTION OF OPTION (Northbound Ramps from Columbia Blvd.)

### *General Description*

The general description of adding northern ramps at Columbia is schematically depicted in **Figure 1-3**. The existing Columbia Blvd. interchange currently only provides a northbound I-5 exit and southbound entrance. The proposed northbound ramps from Columbia Blvd. onto I-5 would complete the partial existing interchange and provide for all north and south movements. The existing Columbia Blvd. interchange is in very close proximity to the Victory Blvd./I-5 interchange. This option would create a 'split diamond' configuration between Columbia Blvd. and Victory Blvd. The southbound entrance ramp from Victory Blvd. would be modified to extend across the Columbia Slough to merge into the southbound entrance ramp from Columbia Blvd., with the combined traffic merging onto I-5. The length of this ramp would require two lanes from Victory Blvd. for basic operations and to provide passing opportunities. A southbound exit to Columbia Blvd. could then be created and brought down below the extended ramp with a direct connection to Columbia Blvd. The proposed modification of the existing Columbia Blvd. interchange (see general description under Delta Park to Lombard ) would be necessary as part of this proposal. A northbound ramp from Columbia Blvd. would be constructed across the Columbia Slough and merged into a modified exit ramp to Victory Blvd. Northbound traffic could then continue through the intersection and onto the northbound I-5 entrance ramp. Minimal elevation and opening above the Columbia Slough would be required.

### *Structures*

The proposed southbound leg of the 'split diamond' would require a wall between the freeway and the ramp. The ramp structure for this leg would be similar in length to the existing Columbia Slough structure on I-5, spanning the slough and Schmeer Rd. The southbound exit to Columbia Blvd. would exit from the freeway somewhere above the slough on the freeway structure, requiring widening of the freeway structure. Retaining walls would be necessary along the west side of the southbound ramp and between the southbound exit and the southbound entrance ramps.

The northbound ramp from Columbia would begin east of the freeway and curve over the Columbia Slough and extend over Schmeer Rd. The northbound exit to Victory Blvd. would begin on the slough structure and would require additional widening.

### *Deviations from Standards*

The proposed median width for this section is 18', and the standard width for a multi-lane freeway section is 26'. The existing median width for several miles both north and south of this section is also 18'. It has been proposed, for the purpose of continuity and reduced impacts, that this section match the adjacent sections and be constructed with an 18' width.

The southbound shoulder width on the Columbia Blvd. structure would vary from approximately 12' to 6' at the south end. The standard shoulder width for this section would be 12'. The allowable shoulder width for a long (200' or more) structure on the Interstate system is 3.5'. To minimize impacts to the railroad, it is proposed that the existing shoulder widths remain in place in the southbound direction

***Right of Way***

R/W impacts are anticipated on the west and east side of the freeway along the proposed legs of the 'split diamond' ramps. The ramp structures would be above the impacted properties. Therefore it is difficult to determine what built improvements may be impacted from the data currently available. There may be one complete industrial property displacement on the west side of the freeway, north of the Columbia Slough.

Approximately 1.2 acres would be required by adding northern ramps at Columbia and is broken down as follows:

Commercial	1.1 Acres
Residential	0.1 Acres



## TECHNICAL DESCRIPTION OF OPTION (Marine Drive to Hayden Island)

### *General Description*

The general description of Marine Drive/Hayden Island Interchange Modifications is schematically depicted in **Figure 1-4**. This option includes the reconfiguration of Marine Drive and Hayden Island connections by building a four-lane bridge and widening the northbound side of the existing Portland Harbor Bridge.

At Marine Drive, the northbound entrance ramp is designed for two lanes to serve I-5 northbound commuters from Marine Drive and Hayden Island. In order to eliminate weaving on the bridge, the Portland Harbor Bridge would be widened to accommodate the new two lanes and the existing three northbound lanes. The said two lanes are gradually dropped one at a time starting from the north end of the Portland Harbor Bridge to the approach of the Interstate Bridge where the number of lanes are reduced to match the existing three-lane configuration.

A traffic signal is proposed at the intersection of Marine Drive and the new bridge to control traffic movements to/from I-5 northbound, Hayden Island and Marine Drive.

The proposed bridge is designed with two general purpose (GP) lanes in each direction, 6' shoulders for both sides and 6' center median for a total width of 66 feet. It would cross the Columbia Slough about 500' east of the Portland Harbor Bridge with an elevation matching the existing navigational clearance of the existing I-5 Bridge. The new bridge is designed to provide the required vertical clearance at Jantzen Drive, touch down just north of Tomahawk Drive and connect to Marine Drive.

On Hayden Island, the existing northbound exit and entrance ramps would be removed. Tomahawk Drive would be terminated at Jantzen Drive at a T-intersection. This is to allow for the construction of the proposed bridge that would serve as main connector between Hayden Island and Marine Drive.

### *Structures*

This option would add a new 4-lane bridge over Portland Harbor upstream (east) of the existing I-5 bridges and widen the existing I-5 Bridge over Portland Harbor. The widening would have new substructure and footings installed to match the existing spans and vertical clearances of the existing I-5 bridges. The new 4 lane bridge could be comprised of bridge elements similar to the existing I-5 Portland Harbor bridge. The presence of existing boat docking facilities at this location would require that additional studies be undertaken to determine horizontal and vertical clearance requirements. The bridge could be comprised of 14 spans, matching the existing pier spacing and utilizing the same precast concrete girders for the superstructure.

### *Construction Considerations*

- *Superstructure Type* - The superstructure section could match the type (precast girder) and depth of the existing I-5 Portland Harbor bridges. Navigation requirements could require larger spans, thus deeper superstructure.
- *Column Type* - The river pier columns could be similar to the existing piers carrying I-5 over Portland Harbor. The bents would most likely be a 2 to 3 column bent system.
- *Foundations* - The two end transition piers would be on land at the riverbanks, and the remaining interior piers would all be in the river. For the river piers, a footing size of approximately 25' by 25' could be required. Deep foundation elements could be either driven piles or drilled shafts. Larger diameter drilled shafts may be preferable to limit noise and vibration construction impacts.



- *Construction Procedures* - The river piers could be constructed by conventional methods using cofferdams. This features braced sheet piling walls, driven piles, underwater tremie concrete pours, and extensive pumping of the water inside the cofferdam to allow construction of the remainder of the pier footing and columns in the dry. This foundation type features footings that are founded below the river bottom. Because contractors assume significant risk with this type of foundation construction, costs are generally high.

The river piers could also be constructed as water level foundations. This foundation makes use of a precast concrete lost footing form. The form has a bottom and four sides approximately 15' high. The bottom has holes for piling or in this case, large diameter drilled shafts. The drilled shafts are installed with permanent casings from the water level down below the bottom of the river. The precast footing form is lifted and placed over the top of the shaft casings and supported by hangers from the casings. Underwater tremie concrete is placed in the bottom of the form to allow pumping out the water to construct the remainder of the footing in the dry. However, in this configuration, the bottom of the footing is at a much higher elevation, requiring a smaller tremie pour due to the reduced hydrostatic head. This type of foundation is generally less costly, because contractor risk is reduced.

***Right of Way***

Approximately 2 acres of commercial area would be affected by the proposed improvements between Marine Drive and Hayden Island. Impacts to the Portland Harbor dock are also likely; some units might need to be relocated to accommodate the proposed bridge structures.

**COST**

All estimates are based on 2001 unit costs: These estimates do NOT include the cost to purchase any businesses on Hayden Island. Commercial land value has been included in this estimate.

<b>Delta Park to Lombard Widen to 3-lane southbound</b>	
Right of Way	\$ 2,145,000
Utility Relocations	158,750
Excavation	546,000
Surfacing	2,532,804
Roadside Development	1,270,000
Traffic Services	464,693
Structures	31,745,000
Mobilization	2,937,380
Contingencies	12,689,481
Engineering and Administration	13,086,027
<b>Total</b>	<b>\$67,575,134</b>

<b>Rose Quarter Ramp improvements</b>	
Right of Way	
Utility Relocations	
Excavation	
Surfacing	
Roadside Development	
Traffic Services	
Structures	
Mobilization	
Contingencies	
Engineering and Administration	
<b>Total</b>	

<b>Rose Quarter Widen to 3-lane</b>	
Right of Way	
Utility Relocations	
Excavation	
Surfacing	
Roadside Development	
Traffic Services	
Structures	
Mobilization	
Contingencies	
Engineering and Administration	
<b>Total</b>	



<b>Northbound Ramps from Columbia Blvd.</b>		
Right of Way		\$ 2,145,000
Utility Relocations		158,750
Excavation		546,000
Surfacing		3,865,304
Roadside Development		1,270,000
Traffic Services		1,664,693
Structures		42,060,000
Mobilization		3,965,180
Contingencies		17,129,577
Engineering and Administration		17,664,876
	<b>Total</b>	<b>\$90,469,379</b>

<b>Marine Drive to Hayden Island</b>		
Right of Way		\$ 3,095,510
Utility Relocations		605,000
Excavation		113,568
Surfacing		668,037
Roadside Development		605,000
Traffic Services		518,163
Structures		37,523,225
Mobilization		3,202,639
Contingencies		13,835,402
Engineering and Administration		14,267,759
	<b>Total</b>	<b>\$74,434,304</b>

## Figures

Note to reviewers: Figure 1-1 would be similar to figure B-4 of the graphics package.  
 Figure 1-2 would be similar to figure B-5 of the graphics package.  
 Figure 1-3 would be similar to figure 4-4 of the graphics package.  
 Figure 1-4 would be similar to figure 4-5 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 <sup>1,2</sup>	\$1,082				\$300	\$41	\$93			\$140	\$596				\$2,252
Light Rail Loop/add a 4th lane <sup>1,2</sup>	\$1,546				\$300					\$140		\$940			\$2,926

notes: 1. Assume separate LRT bridge  
 2. Park and Ride facilities included 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 <sup>1</sup>	\$1,222									\$1,222
Express Bus - Short <sup>2</sup>	\$199	\$52				\$41				\$292
Express Bus- long <sup>3</sup>	\$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