

## **2. SUMMARY PROJECT DIGEST**

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The exhibit presented in this chapter provides an executive summary of the project in the form of the final project newsletter, published in January 1996.





## WSDOT PROJECT PROPOSES MAJOR ENHANCEMENTS TO THE PUGET SOUND HOV SYSTEM

The Washington State Department of Transportation (WSDOT) has just completed defining and evaluating potential new projects to improve the HOV lane system in Puget Sound. These projects will allow the HOV lanes to function as an integrated system, to better meet the needs of both carpools and transit. The results are summarized in this booklet.

The primary focus of WSDOT's Puget Sound HOV Pre-Design Studies project has been on improving access into and out of HOV lanes, and providing connections between HOV lanes on intersecting freeways. Because transit and carpools tend to make longer trips, HOV lanes should ideally be in the left-hand lane, closest to the freeway median, but that can make them difficult to get to. As freeway congestion worsens, it becomes increasingly difficult to cross three or four lanes of traffic to get into and out of the HOV lane, especially for 60-foot-long articulated (bending) buses. Right-side HOV lanes are easier to get into and out of, but are compromised by general purpose traffic crossing them to enter and exit the freeway.

Having buses and carpools weave across traffic not only causes them delays, it also can reduce high-

way safety and increase general congestion. As the HOV system matures, it's desirable for HOV and general purpose traffic to be increasingly separated from each other to improve safety and reduce delays for everyone.

### DIRECT ACCESS EXPLORED

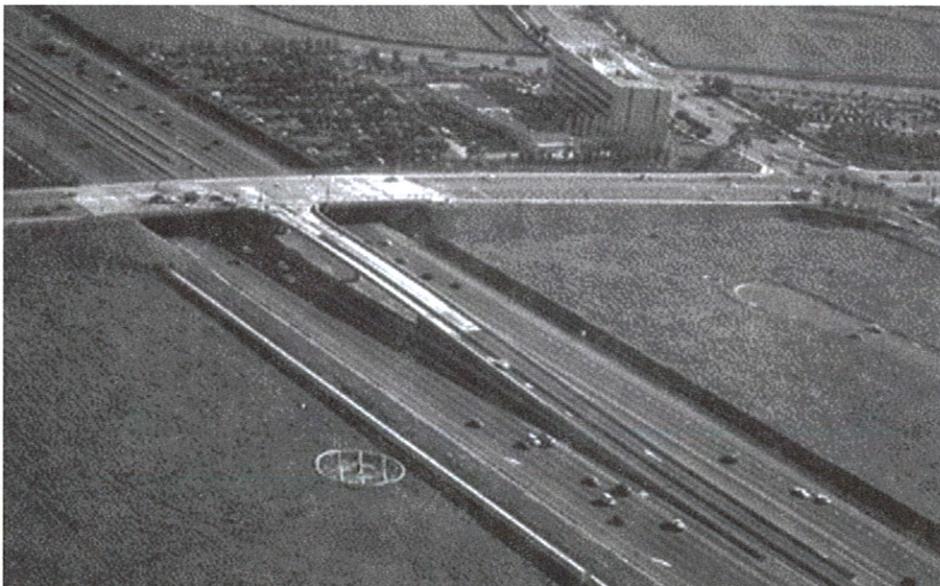
One way to do this is to build "direct access" ramps straight into median-side HOV lanes, like the ramp shown below. Similarly, ramps can be constructed at major interchanges to let buses and carpools go directly from an HOV lane on one freeway to an HOV lane on another. These improvements will go a long way towards letting carpools and buses get where they need to go more efficiently. This will provide better performance, increase the people-carrying capacity of the freeway system, and ultimately provide a better incentive to use transit or carpools.

New direct access will be key to shifting HOV lanes on I-405 to the left-side of the highway (see "Making Ends Meet on I-405" on page 15). Direct access is also key to providing a new kind of transit service envisioned by the Central Puget Sound Regional Transit Authority (See "Riding the HOV Expressway" on page 4).

In addition to improving access to the HOV lanes, the study:

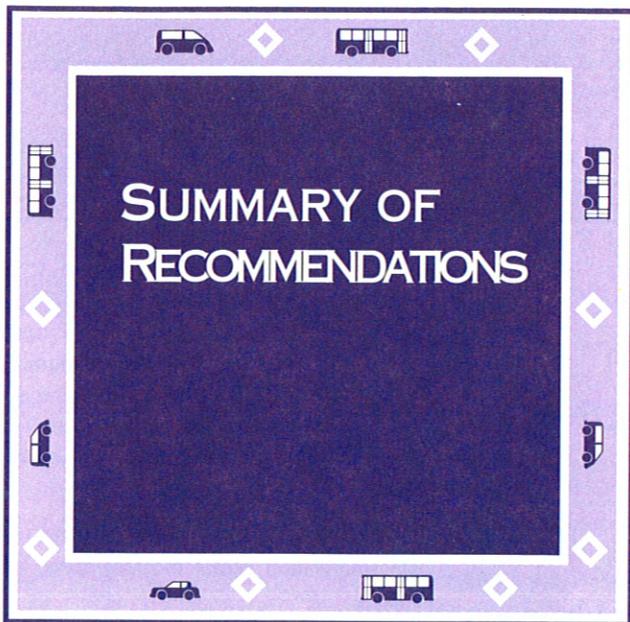
- Explored how to accommodate HOV lanes on I-5 southbound across the Ship Canal in Seattle
- Considered where the HOV lane system might be extended to serve more people
- Evaluated safety improvements and located new enforcement areas to allow the State Patrol to safely enforce traffic laws along HOV lanes
- Considered the conditions where converting an existing traffic lane to HOV use may be an acceptable alternative to building a new lane
- Evaluated proposals to get buses through the SR 522 corridor

*For information on the SR 522 and Lane Conversion tasks, or for more complete information on any topic in this booklet, please refer to the project final report. A project bibliography is shown on the back cover of this booklet.*



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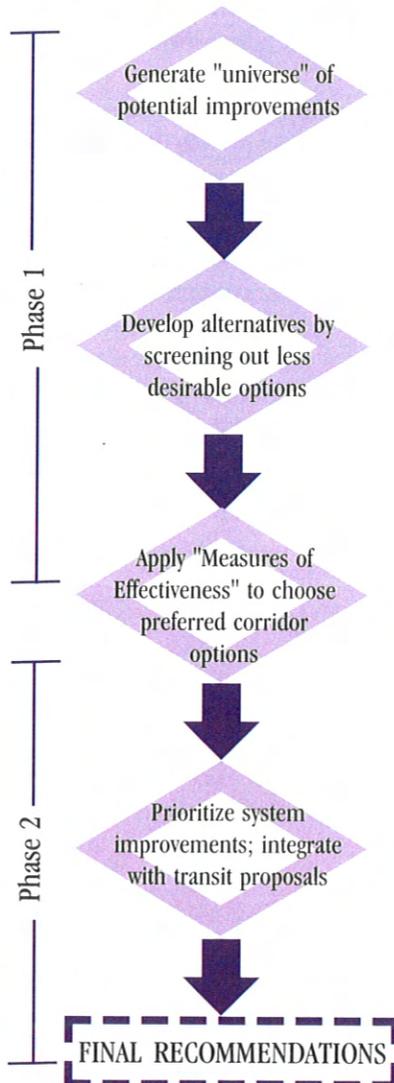
## HOV SAFETY AND ENFORCEMENT IMPROVEMENTS

Sometimes HOV lanes have been built at the expense of wide shoulders and medians to squeeze new HOV lanes into tight places, or to deliver HOV lanes quickly and inexpensively. Because of these constraints, it is occasionally difficult for the State Patrol to safely enforce the use of the HOV lanes.

One of the Pre-Design Studies' phase 1 tasks listed opportunities to add enforcement areas along freeway HOV lanes. The system map on page 3 shows where enforcement areas are proposed with red stars.

Opportunities to improve safety were also evaluated. In addition to reviewing safety records to find locations with higher than the average number of accidents, interviews were conducted with bus drivers and State Patrol officers to find out where they felt that changes to the freeway could reduce accidents or the perception of a safety problem, from their experience. In some cases, minor changes to signing or striping were proposed, and these will be evaluated by the WSDOT traffic offices.

### STUDY PROCESS



### COLLABORATIVE PROCESS CREATES "HOLISTIC" APPROACH

Changes to the freeway HOV system impact everyone. More than 100 city, county, transit and federal and state agency staff were involved in the HOV Pre-Design project from the beginning. A core group of representatives served on a Project Advisory Committee to follow "big picture" progress of the project. Each individual task had its own advisory committee as well. The project's consultant team included several prominent engineering firms. By including a large number of people in this process, a high level of awareness and concurrence helped shape the recommendations.

#### TWO PHASE PROJECT

The project was divided into two phases. During the first phase, eleven separate "tasks" examined access needs in specific corridors, design alternatives at specific interchanges, and other specific questions. For each of these tasks, a separate inter-agency advisory group was formed to involve staff from cities, transit agencies, the Washington State Patrol, WSDOT, and others interested in the question or geographic area being studied. The results of each of these phase 1 tasks were presented in a 16 page edition of the project newsletter, the "Digest," in May 1995.

Each of the tasks examining direct access needs used a three-step process. First, a "universe" of alternatives was developed to consider all potential locations for direct access ramps. The second step reduced this "universe" to a manageable number by screening out flawed locations. Finally, the remaining alternatives were subject to an evaluation of "measures of effectiveness," and a recommended set of facilities was chosen. Each task advisory group was involved in all of these steps.

The project's second phase put all the pieces together and evaluated them as a complete system. For each of the projects recommended during phase 1, the cost and travel time benefits were recalculated and revised. Another "measures of effectiveness" evaluation was used to determine which projects would add the most to a complete HOV system, and which should be built first. This booklet primarily reports on the results of the phase 2 work.

# THE SYSTEM MAP: A SUMMARY OF RECOMMENDATIONS

The map on this page summarizes all of the HOV improvements recommended by the HOV Pre-Design Studies project. Everything shown here is explained in more detail throughout this booklet. The pages immediately following explain how recommended projects were evaluated and selected. Separate sections describing the recommendations within Pierce County, East King County, South King County, Seattle/North King County and Snohomish County are also included.

HOV lanes are shown as colored lines. Green lines are HOV lanes that either exist, are under construction, or are funded for construction. Many of the gaps in the HOV system will already be connected when current construction projects are finished. Blue lines show the remainder of the defined WSDOT HOV Freeway Core Lane program. Note that dashed blue lines represent Core HOV projects that are only "conditionally" recommended in each case, something else needs to occur for these projects to make sense. Purple lines represent potential extensions to the HOV lane system.

Direct access points and freeway-to-freeway connectors are shown as red symbols. Places where carpools and buses can enter and exit the HOV lanes are shown as arrowhead symbols. Places where a bus can exit, make a passenger stop and re-enter the HOV lanes are shown as circled T symbols. And arrows at freeway interchanges show the recommended freeway-to-freeway connector ramps that tie the HOV lane system together.

## Legend

- Completed or Funded HOV Core
- Unfunded HOV Core - Recommended
- - - Unfunded HOV Core - Conditionally Recommended
- Potential HOV Core Extensions
- Subject to Voter Approval
- ▶ Proposed Direct Access Facility
- ↪ Proposed Freeway-to-Freeway Connection
- T Proposed Transit Freeway Stop
- ★ Proposed Enforcement Facility
- PER Planned or Existing Park & Ride



# HOV DIRECT ACCESS: REMOVING THE WEAVE

HOV direct access ramps are simply ramps that connect directly to an HOV lane, avoiding the need for vehicles to cross traffic to get into and out of the lane. An example of a direct access ramp is shown on the front cover of this booklet — it's called a "drop ramp" because the ramps "drop" down from the middle of an overpass. Another type is called a "T-ramp," shown at the right. A T-ramp is a separate bridge that passes over one side of the freeway to get to the median, then drops down to meet the HOV lane.

A transit stop — a place where buses can get out of traffic, pick up and drop off passengers, then return to the HOV lane with little delay — is another type of direct access. Since buses do not have to leave the freeway with these facilities, they allow a transit service that functions somewhere between light rail service and traditional express bus service (see "Riding the HOV Expressway"). Like rail stations, these stops need to be comfortable for pedestrians — including protection from the noise and exhaust of the freeway environment.

Direct access ramps and stations each cost about \$20 million on average to design and build. In most cases there is no more room for construction in the freeway median, and in many cases the freeway will need to be realigned, overpasses reconstructed, and existing ramps moved to provide room in the middle of an interchange to fit the new ramps.

The evaluation results of the Direct Access Alternatives are listed on the next page. During phase 1 of the project, all of the projects shown in the matrix survived a screening process and were recommended as a result of the initial evaluation. Consequently, it was expected that most of the proposals would continue to be recommended. (For an explanation of the individual measures of effectiveness, see "Rating and Ranking the Ramps" on page 5.)

One objective of this project was to come up with a set of proposals that work together as a coordinated system, so in addition to the technical evaluation, some judgment has been applied.

Consider this catch-22, for example: the only technical basis to evaluate how well these projects will benefit transit service is to measure how they would affect existing or planned transit routes. However, current transit routes do not take advantage of direct access improvements, and transit agencies do not have firm plans beyond a six-year horizon. As a result, in many cases technical ratings alone do not reflect the potential benefits of direct access ramps to tran-



sit, and the collective judgement of the project team therefore became a critical factor in the recommendations.

The Central Puget Sound Regional Transit Authority (RTA) is proposing a set of regional express bus routes that would primarily use the HOV system. But, it is premature to know the specifics of these routes. Working with the RTA and transit agencies, the Pre-Design project has anticipated, as best as possible, which direct access proposals would have the greatest impact on the proposed RTA "HOV expressway" routes. Once an RTA system proposal becomes more clearly defined, these proposals may require fine tuning.

If you would like information on how individual projects were selected and why, please refer to the specific descriptions later in this booklet.

## RIDING THE "HOV EXPRESSWAY"

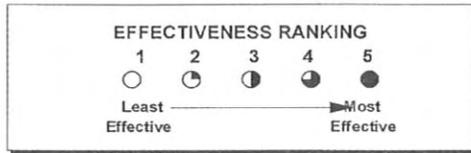
Some people suggest that buses should be operated more like a rail system — making infrequent stops and running at full speed between them. Pittsburgh operates buses that way, as does Ottawa, Canada, using "busways" with stations along the route. While this approach lacks the "sex-appeal" of a rail system, it combines rail-like stations and service with the ability for buses to continue their route on regular streets.

This kind of service can be provided using HOV lanes, so long as ramps and stations are in place to allow buses

to make station stops along the route. Under one RTA concept currently being considered, a set of regional express routes would operate between major centers, using the "HOV Expressway," a term that describes an HOV lane that has been enhanced by adding direct access ramps and stations.

Depending on usage, some stations could be protected from the freeway environment, including escalators and covered walkways. Other stations could be more like existing freeway "flyer stops."





Location	Improvement Type	Travel Time Savings		Cost		Facilitates Regional Transit Service	Safety	Land Use	Environmental	General System Enhancement	Recommended with Regional Bus	Recommended without Regional Bus	Cost (\$ in Mill)
		Transit	3+ HOV	Cost (\$ Mill)	Cost Effectiveness (\$/Per-min Saved)								
I-5/Ft. Lewis	Direct Access NB & SB	○	○	●	○	○	○	○	○	○	✓	✓	\$ 7.35
I-5/SR 512	Direct Access NB & SB	○	○	○	○	○	○	○	○	○	✓	✓	\$ 25.65
I-5/S. 48th St	Direct Access NB & SB	○	○	○	○	○	○	○	○	○	✓	✓	\$ 13.33
I-5/Tacoma Dome	Direct Access, NB & SB	○	○	○	○	○	○	○	○	○	✓	✓	\$ 35.00
I-5/SR 516	Direct Access NB & SB	○	○	○	○	○	○	○	○	○	✓	✓	\$ 24.39
I-5/S 272nd St	Direct Access NB & SB	○	○	○	○	○	○	○	○	○	✓	✓	\$ 26.98
I-5/S 320th St	Direct Access NB & SB	○	○	○	○	○	○	○	○	○	✓	✓	\$ 23.71
I-5/E-3 Busway	Transit Ramp to/from South	○	○	○	○	○	○	○	○	○	✓	✓	\$ 46.09
SR 167/SW27th St	Direct Access NB & SB	○	○	○	○	○	○	○	○	○	✓	✓	\$ 26.11
I-405/Between I-5 & SR 181(S Cntr)	In Line Transit Stop	○	○	○	○	○	○	○	○	○	✓	✓	\$ 18.17
I-405/Lind Avenue	Direct Access to/from South	○	○	○	○	○	○	○	○	○	✓	✓	\$ 20.29
I-405/Talbot Road S/SW Grady Way	Direct Access to/from South	○	○	○	○	○	○	○	○	○	✓	✓	\$ 30.89
I-405/SR 900 (Park Avenue)	Direct Access, NB & SB	○	○	○	○	○	○	○	○	○	✓	✓	\$ 32.42
I-405/112th SE	In Line Transit Stop	○	○	○	○	○	○	○	○	○	✓	✓	\$ 25.38
I-405/SE 8th	Direct Access, NB & SB	○	○	○	○	○	○	○	○	○	✓	✓	\$ 41.86
I-405/Bellevue CBD	Direct Access, NB & SB	○	○	○	○	○	○	○	○	○	✓	✓	\$ 65.95
I-405/NE 70th	Direct Access, NB & SB	○	○	○	○	○	○	○	○	○	✓	✓	\$ 33.91
I-405/NE 132nd	Direct Access, NB & SB	○	○	○	○	○	○	○	○	○	✓	✓	\$ 24.01
I-405/NE 160th	Direct Access to/from South	○	○	○	○	○	○	○	○	○	✓	✓	\$ 26.72
I-90/Eastgate P&R	Direct Access EB & WB	○	○	○	○	○	○	○	○	○	✓	✓	\$ 28.90
I-5/NE 145th St	Direct Access to/from South	○	○	○	○	○	○	○	○	○	✓	✓	\$ 8.83
I-5 Ex/NE 42nd Street	Ramp to SB Contra flow lane**	○	○	○	○	○	○	○	○	○	✓	✓	\$ 25.90
I-5 Ex/NE 50th Street HOV Ramp	Direct Access to/from North	○	○	○	○	○	○	○	○	○	✓	✓	\$ 6.04
I-5/Mountlake Terrace P&R	In Line Transit Stop	○	○	○	○	○	○	○	○	○	✓	✓	\$ 2.82
I-5/Lynnwood P&R access	Direct Access to/from South	○	○	○	○	○	○	○	○	○	✓	✓	\$ 18.36
I-5/Lynnwood P&R access	Direct Access from P&R, NB & SB										✓	✓	\$ 29.38
SR 525/164th Street SW	Interchange to/from South	○	○	○	○	○	○	○	○	○	✓	✓	\$ 1.98
I-5/164th/ Ashway	Direct Access to/from South	○	○	○	○	○	○	○	○	○	✓	✓	\$ 10.85
I-5/164th/ Ashway	Direct Access from P&R, NB & SB										✓	✓	\$ 14.02
I-5/SW 128th Street	Direct Access to/from South*	○	○	○	○	○	○	○	○	○	✓	✓	\$ 6.86
I-405/Canyon Park P&R / 228th	Direct Access NB & SB	○	○	○	○	○	○	○	○	○	✓	✓	\$ 35.95

Total Recommended with Regional Bus \$ 619.38  
 Total Recommended without Regional Bus \$ 553.31

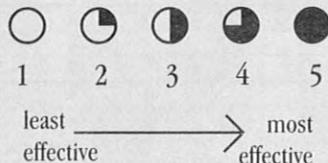
Notes:  
 \* This option assumes general purpose interchange improvement to add a WB to SB loop ramp.  
 Cost for this improvement are not included in estimated costs for this alternative.  
 \*\*Alternative only recommended in conjunction with SB transit only contraflow lane recommendation.

## RATING AND RANKING THE RAMPS

On the next few pages, you'll notice a striking similarity between this booklet and a "Consumer Reports" publication. This likeness is due to the method used to rate and rank the alternatives developed over the last two years. To narrow down the variety of alternatives, "Measures of Effectiveness" (MOE) were used to evaluate and screen the direct access alternatives, HOV Lanes and the freeway-to-freeway connection alternatives. The MOEs were broadly defined at the initial screening during phase 1 and defined in more detail during phase 2.

The "Consumer Reports" style symbols are

used to compare and rate the alternatives. A five-point scale from least effective to most effective corresponds to the five symbols shown here. Least effective is a blank circle and most effective is a solid circle.



The primary MOEs used in the final analyses measured travel time savings for transit and 3+ carpools, as well as cost, and cost-effectiveness. Detailed analysis quantified these values and then they were represented with simplified bullets to aid in presentation and comprehension. A qualitative assessment was made of the benefit to implementing regional transit service and to improving the operation of the freeway system.

## WHY EVALUATE 3+ CARPOOLS?

Traffic studies used for the HOV Pre-Design Studies projected traffic for 10 to 15 years from today. Those forecasts show that the HOV lanes will slow to a crawl during peak travel periods if 2-person carpools are still allowed in the future.

WSDOT has a policy on speed and reliability that seeks to achieve 45 mph in HOV lanes during 90% of peak commute periods. This policy guarantees that HOV lanes will continue to accommodate growth in travel by encouraging higher utilization of vehicles using the freeway. If HOV lanes become congested, they will no longer serve their purpose -- to provide an incentive to use transit and carpools, and to increase the people-carrying capacity of the freeway system.