



**Sound Transit Long-Range Plan Update  
Issue Paper E.1.S: Hybrid Scenarios Supplement  
to Issue Paper E.1: I-90/East King County HCT  
Analysis**

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**Final**

May 2005

## Foreword

This issue paper is part of a series of reports designed to inform the Sound Transit Board in its decision-making on the Regional Transit Long-Range Plan update for the Sound Transit service area. Each issue paper provides information about a specific element or area of the Long-Range Plan and potential options. These reports focus on issues such as costs, ridership, engineering feasibility and operations.

The environmental impacts of the updated Long-Range Plan and Options, as well as potential mitigation measures, are examined in the Draft Supplemental EIS for the Regional Transit Long-Range Plan (December 2004). The Draft SEIS supplements the 1993 EIS prepared on the Regional Transit System Plan, and it generally updates that information and analysis through the year 2030. Public and agency comments on the 2004 Draft Supplemental EIS have been received and will be responded to in a final SEIS to be issued in June 2005.

The Sound Transit Board identified a draft updated Long-Range Plan in April 2005. There will be an opportunity for public review and comment on the draft Plan. The Board will adopt a final updated Long-Range Plan after public comments are received on the draft plan and the final SEIS is issued.

References in these reports to Sound Transit's existing Long-Range Plan are to the 1996 Regional Transit Long-Range Vision, which functions as the agency's Long-Range Plan. Discussion of the updated Long-Range Plan refers to the Plan being developed by Sound Transit over the coming months.

The following issue papers are being prepared:

### East Corridor

*E.1 – I-90 Corridor / East King County High Capacity Transit Analysis – March 2005*

*E.1.S – I-90 Corridor / East King County High Capacity Transit Analysis Supplement – May 2005*

### North Corridor

*N.1 – BRT in SR 99 Corridor*

*N.2 – I-5 Corridor Northgate to Everett HCT Assessment*

*N.2.S – Light Rail on SR99, Supplement to Issue Paper N.2: I-5 Corridor Northgate to Everett HCT Assessment*

*N.3 – Seattle Streetcar Options*

*N.4 – SR 522 Corridor HCT Assessment*

*N.5 – Convertibility of BRT to Light Rail*

South Corridor

*S.1 – Tacoma Link Integration with Central Link*

*S.2 – Potential Rail Extensions to Frederickson and Orting*

*S.3 – HCT System Development Issues in the South Corridor*

*S.4 – Potential Tacoma Link Extension – West*

*S.5 – Rail between Burien and Renton*

*S.6 – Potential Tacoma Link Extension – East*

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# 1. Introduction and Summary

## 1.1. Purpose of this Paper

Sound Transit's current Long-Range plan includes additional High-Capacity Transit (HCT) development along the I-90 corridor, between downtown Seattle and the Eastside. In March 2005, Sound Transit prepared an issue paper titled "Issue Paper E.1: *I-90 Corridor/East King County High Capacity Transit Analysis*" that evaluated different High-Capacity Transit technologies to address the long-term mobility needs in the I-90 corridor between Seattle and Bellevue. This analysis also included an assessment of HCT along three branches from Bellevue extending to Kirkland, Redmond, and Issaquah. As part of this initial paper, the following different technologies were assessed: HOV/Bus Rapid Transit (BRT), Busway/BRT, Light Rail, Monorail and Rail Convertible BRT (RCBRT).

The outcome of the Sound Transit Board review of Issue Paper E.1 was direction to develop various hybrid scenarios that combined the best features of the most promising technologies (HOV/BRT and Light Rail), and to carry out an objective comparison between the new hybrid scenarios.

In addition, the Sound Transit Board asked that staff work with WSDOT to evaluate ways to reduce the capital cost required to provide freeway to freeway HOV direct connections at the I-405/I-90 and I-405/SR520 interchanges.

This paper summarizes the additional analysis that has been completed following the Sound Transit Board review and forms a supplement to Issue Paper E.1. *I-90 Corridor/East King County HCT Transit Analysis*.

Further analysis was undertaken for the following HCT hybrid scenarios:

- HOV/BRT scenario with modified HOV freeway to freeway connections proposal and costs;
- BRT/Busway with and without a transfer station in the Seattle CBD;
- LRT/HOV Hybrid scenario considering LRT to Overlake and/or Redmond and bus transit on the existing HOV system for the branches to Totem Lake and Issaquah;

For the purpose of comparison between the HCT mode options, bus and light rail and monorail, the supplementary study examined:

- Capital costs
- Operation/maintenance costs
- Ridership
- Traffic impacts
- Additional policy or technical issues

## 1.2. Key Findings

Table 1 presents a summary of findings for the hybrid scenarios evaluated in this supplementary analysis. The general methodology used in the development of the conceptual cost estimates was as per the *Issue Paper E.1: I-90 East King County High Capacity Transit Analysis*. The incremental year 2030 annual operating and maintenance (O&M) costs were compared to the Future Baseline scenario and percentage increase from the future baseline also reported. The O&M costs for each scenario include costs for both the bus services and the fixed guideway as required.

**Table 1. Hybrid Scenarios Summary**

Scenario	Daily Ridership Volume *	Capital Cost Range	Change from Future Baseline O&M Costs
HOV/BRT	30,000	\$2.5-\$3.5 billion (Total Capital Cost incl. HOV ramps) \$0.9-\$1.2 billion (Cost for remaining interchange ramps) \$1.4-\$1.9 billion (Bus-only ramps)	+\$5.6 million/yr (+0.8%)
Busway/BRT (with Transfer Station)	29,000	\$3.1 - \$4.2 billion	-\$5.5 million/year (-0.8%)
Busway/BRT (without Transfer Station)	30,000	\$3.1 - \$4.2 billion	+\$6.3 million/year (+0.9%)
Light Rail/HOV Hybrid (LRT to Overlake)	42,000	\$2.7 - \$3.7 billion (tunnel) \$2.3 - \$3.2 billion (aerial)	+\$12.3 million/year (+1.7%)
Light Rail/HOV Hybrid (LRT to Redmond)	44,000	\$3.2 - \$4.4 billion (tunnel) \$2.8 - \$3.9 billion (aerial)	+\$17.3 million/year (+2.4%)

\*I-90 Cross Lake Bellevue to Seattle ridership

Table 2 indicates the total number of buses expected in each of the scenarios to travel in the peak hour through downtown Seattle and through the Bellevue Transit Center, and also indicates the variation in expected number of buses from the Future Baseline scenario as considered in Issue Paper E.1.

**Table 2. Summary Bus Trips to Downtown Streets**

Scenario	Downtown Seattle <sup>1</sup>	Variation from Future Baseline	Downtown Bellevue <sup>2</sup>	Variation from Future Baseline
Future Baseline	531	-	125	-
HOV/BRT	556	+25	158	+33
Busway/BRT(no terminal)	556	+25	154	+29
Busway/BRT(with terminal)	458	-73	154	+29
LRT (full system)	436	-95	107	-18
LRT/HOV hybrid (Overlake)	485	-46	111	-14
LRT/HOV hybrid (Redmond)	485	-46	111	-14
Monorail	439	-92	109	-16
Rail Convertible BRT	437	-94	109	-16

<sup>1</sup> Peak hour two direction bus trip across Columbia Street (1<sup>st</sup> Avenue to 5<sup>th</sup> Avenue)

<sup>2</sup> Peak hour bus trips to and through the Bellevue Transit Center

## **2. HOV / BRT Scenario**

### **2.1. Routing**

The HOV/BRT scenario was investigated in the original report *Issue Paper E.1: I-90/East King County High Capacity Transit Analysis*. The goal was to create a low-cost bus-focused scenario utilizing the existing and planned HOV lane system on the major freeways, augmented by direct access ramps and freeway to freeway connections that provide transit speed and reliability. The HOV/BRT scenario assumes on-street operations in both the Bellevue and Seattle CBDs.

Following the Sound Transit Board review, analysis was undertaken into the HOV/BRT scenario to determine if HOV connections could be reduced to only those which mimic the LRT/HOV hybrid scenario's movements. As a result of this review, the number of freeway to freeway connections was reduced to the northwest quadrant of the I-405/I-90 interchange and the southeast quadrant of the I-405/SR520 interchange. Figure 1 illustrates the revised freeway to freeway connections and the possible BRT facilities associated with this scenario. It should be noted that the other five HOV connections are still needed, and are part of the I-405 Record of Decision (ROD), but are presented separately for the purpose of this analysis.

# I-90 Corridor / East King County HOV/BRT Hybrid Scenario

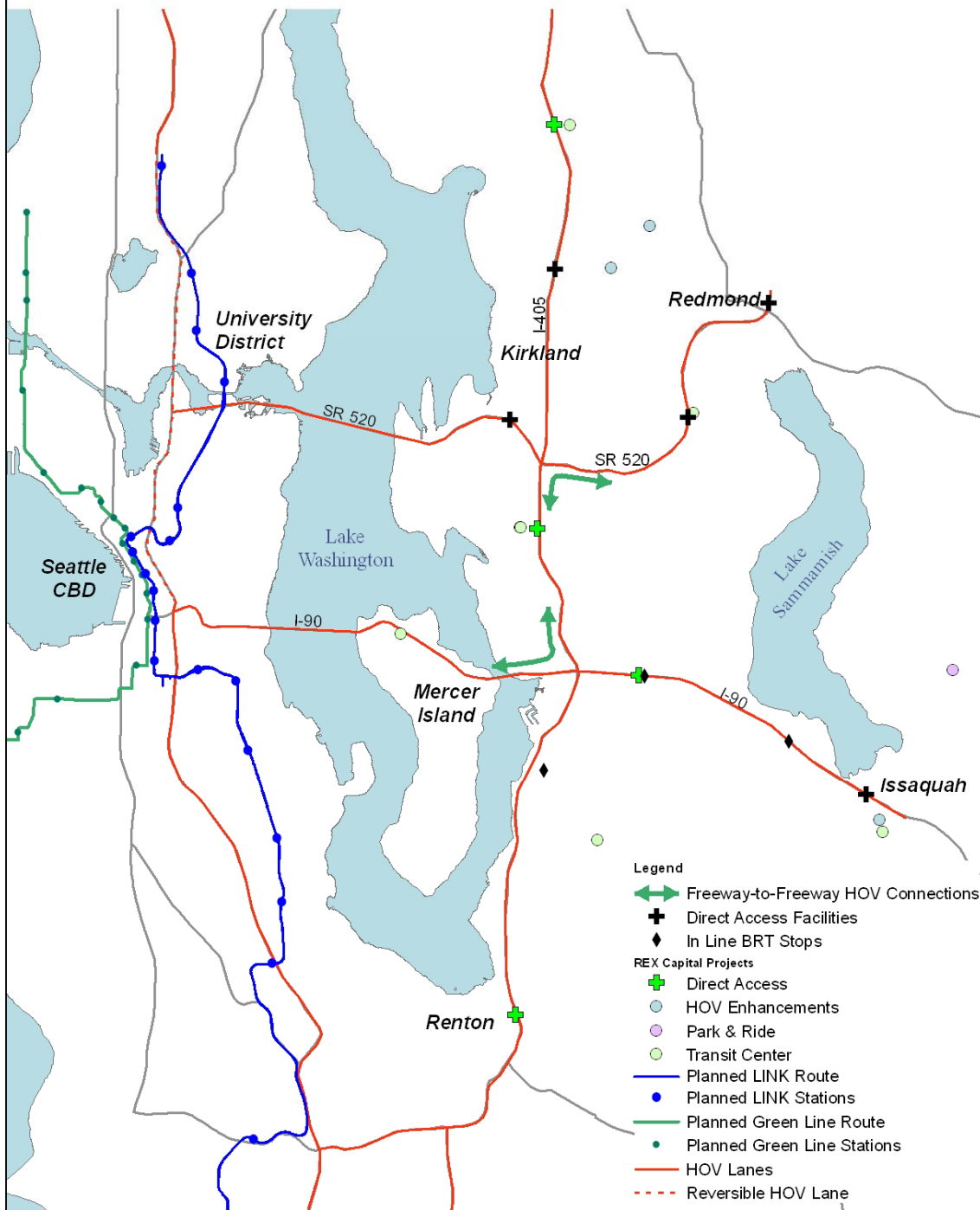


Figure 1 East King County HCT HOV / BRT Scenario

## 2.2. Supplementary Analysis

After Issue Paper E.1 review, Sound Transit met with the Washington State Department of Transportation (WSDOT) to evaluate ways to reduce the capital costs of rebuilding the freeway interchanges to provide direct HOV to HOV connections at I-405/I-90 and I-405/SR520 interchanges.

Sound Transit and WSDOT explored different cost sharing scenarios for the interchange rebuilds and freeway-to-freeway HOV connections based on a 0%, 50% and 100% funding scenarios between the two agencies. In addition to the funding split scenarios, the number of freeway to freeway connections was reduced to the two most critical connections—the northwest quadrant of I-405/I-90 and the southeast quadrant of I-405/SR 520 that mimic the LRT movements.

## 2.3. Cost Estimate

Capital costs and Operation and Maintenance (O&M) costs were developed using the same methodology as described in Issue Paper E.1, unless information was provided by another source. All costs reported are in 2005 dollars.

This analysis assumed the implementation of a six-lane (four general purpose and two HOV) facility on the SR 520 bridge, as currently being evaluated for the WSDOT *SR 520 Bridge Replacement and HOV Project*. This project finishes to the west of the SR520 /I-405 interchange. The cost estimate detailed below for the HOV freeway to freeway connection for the SR 520/I-405 interchange assumes the current configuration of the SR 520/I-405 interchange. This estimate covers the modification required to provide the HOV freeway to freeway connections (northbound I-405 to eastbound SR 520 and westbound SR 520 to southbound I-405).

### 2.3.1. Capital Costs

The revised total capital cost range of the HOV/BRT Hybrid is \$2.5-\$3.5 billion. This capital cost range incorporates the following costs of the I-405/I-90 and I-405/SR 520 interchanges which were based on cost estimates provided by WSDOT that were updated since the issuance of the original issue paper. As part of this updated estimate, WSDOT provided information on what elements of the interchanges would need to be reconstructed first before the HOV/transit, freeway to freeway connections can be built. In order to build the remaining five HOV connections, the costs would be \$0.9-\$1.2 billion.

**Table 3. NW Quadrant of I-90/I-405 Interchange Capital Costs**

<b>I-90 / I-405 Interchange (Factoria)</b>	<b>Capital Cost Range</b>
I-90 Interchange - SB Crossing	\$76 - \$104 million*
I-90 Interchange - HOV NW Quadrant	\$237.5 - \$325 million**
<b>Total</b>	<b>\$314 - \$429 million</b>

\* Based on WSDOT estimate of \$80 million

\*\* Based on WSDOT estimate of \$250 million

**Table 4. SE Quadrant of SR 520/I-405 Interchange Capital Costs**

<b>SR520 / I-405 (Northup)</b>	<b>Total</b>
SR520 Interchange – GP* SE Quad.	\$199.5 - \$273 million**
SR520 Interchange - GP Re-align 520	\$199.5 - \$273 million**
SR520 Interchange - GP Reconstr. 405	\$142.5 - \$195 million***
SR520 Interchange - GP SW Quad.	\$199.5 - \$273 million**
SR520 Interchange - GP NW Quad.	\$199.5 - \$273 million**
SR520 Interchange - GP NE Quad.	\$199.5 - \$273 million**
SR520 Interchange - HOV SE Quad.	\$142.5 - \$195 million***
Right of Way Acquisition (Suburban)	\$3.0 - \$4.1million
<b>Total</b>	<b>\$1.3 - \$1.8 billion</b>

\* GP: General Purpose

\*\* Based on WSDOT estimate of \$210 million

\*\*\* Based on WSDOT estimate of \$150 million

**Table 5. Summary of Capital Cost Development for the HOV/BRT Scenario**

<b>HOV/BRT Scenario</b>	<b>Capital Cost Range</b>
HOV/BRT Alignment Costs	\$0.9 - \$1.3 billion
I-90/I-405 Interchange Costs	\$0.3 - \$0.4 billion*
SR 520/I-405 Interchange Costs	\$1.3 - \$1.8 billion**
<b>Total Capital Cost Range for HOV/BRT Scenario</b>	<b>\$2.5 - \$3.5 billion</b>

\* Total Capital Cost required for the NW Quadrant of I-90/I-405 supplied by WSDOT

\*\* Total Capital Cost required for the SE Quadrant of SR 520/I-405 supplied by WSDOT

### 2.3.2. Operating/Maintenance Costs

The HOV/BRT scenario operating and maintenance costs is expected to be \$5.6 million/yr greater than the projected total operating and maintenance costs for the Future Baseline Scenario as discussed in Issue Paper E.1. This is equivalent to a 0.8% increase.

## 2.4. Key Findings

The following identifies the key findings of the supplementary analysis undertaken for the HOV/BRT scenario:

- *I-90 traffic impacts:* For this scenario, buses would operate in the center HOV lanes. There would be no change to I-90 center roadway operations or usage. Mercer Island single occupancy vehicles (SOV) traffic could continue to use the center roadway.
- *Seattle street impacts:* For the HOV/BRT scenario it is expected that the total number of peak hour two direction bus trips across Columbia Street will be 556; this is an increase of approximately 25 buses/hour in the peak period which equates to a 4.7% increase in bus volumes from the Future Baseline condition.
- *Bellevue street impacts:* A total of 158 bus trips through the Bellevue Transit Center is expected. This is an increase of 33 buses/hour in the peak period operating on the downtown Bellevue street system and equates to a 26.4% increase in bus volumes, over Future Baseline conditions.

- The HOV/BRT transit scenario is reliant on WSDOT to manage the HOV system to provide fast and reliable travel times. All other scenarios have exclusive rights-of-way affording speed and reliability.
- This scenario is vulnerable to legislative decisions allowing single occupant vehicle (SOV) use of HOV system.
- Implementation of this scenario is dependent on WSDOT's ability to rebuild critical interchanges and complete freeway reconstruction before HOV connections can be built.
- This analysis has raised significant policy and financial responsibility questions of whether ST should fund the construction of freeway interchanges and HOV connections, when historically this has been a WSDOT funding responsibility. As stated to the Sound Transit Board by the WSDOT representative, the issue of "who pays" is a difficult question to answer and may depend on who is first to the table with funding.
- The HOV/BRT scenario is the only option that continues to allow Mercer Island SOV access to the I-90 center roadway lanes.
- This scenario is independent of the Burlington Northern Santa Fe (BNSF) rail road HOV right-of-way.

### **3. BRT/Busway Scenario**

The original Busway / BRT scenario's goal was to create a bus-focused transit system that used a completely separate facility where appropriate but also took advantage of existing roadway and HOV facilities. The routing for this scenario uses exclusive busway rights-of-way made up of the I-90 center roadway, the existing BNSF railroad right-of-way from approximately Coal Creek Parkway to Totem Lake and new rights-of-way to be developed by the cities of Bellevue and Redmond between the BNSF right-of-way near Overlake Hospital and the Microsoft Campus/Overlake area. The exclusive busway system would then transition to the freeway HOV system at Overlake to the northeast, Totem Lake to the north, Eastgate to the east, and Newport Hills to the south. Figure 2 illustrates the BRT/Busway scenario investigated.

#### **3.1. Supplementary Analysis**

The original BRT/Busway scenario used a transfer station near the International District in downtown Seattle to disperse riders to their final destinations using Central Link, Monorail, downtown buses, walking or biking. Following the initial report, supplementary analysis considering the Busway/BRT scenario without a transfer station in the International District area was investigated. Impacts of removing this transfer station were compared to the original BRT/Busway option.

# I-90 Corridor / East King County Busway/BRT Hybrid Scenario

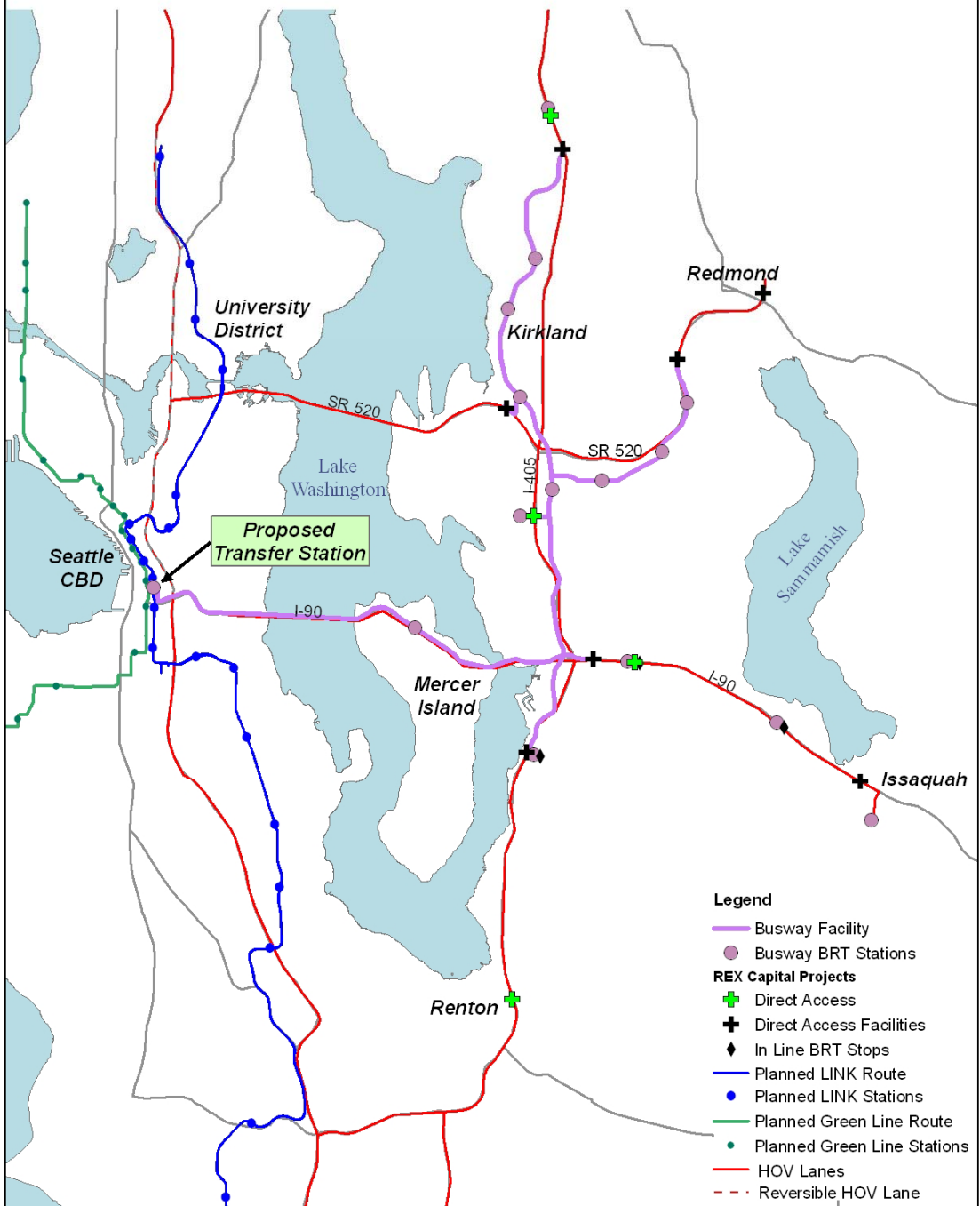


Figure 2 East King County HCT Busway / BRT Scenario

## 3.2. Cost Estimate

Capital costs and Operation and Maintenance (O&M) costs were developed using the same methodology as described in Issue Paper E.1. All costs reported are in 2005 dollars.

### 3.2.1. Capital Costs

The total capital cost of the Busway/BRT scenario was \$3.1 - \$4.2 billion including the cost of a transfer facility in the International District.

Without the transfer facility in the International District and with buses operating on local streets through downtown Seattle, the cost remains within the range of \$3.1 - \$4.2 billion, as more buses would need to be purchased. With more buses operating there is an increase in the maintenance facility costs. These increased costs were almost exactly offset by savings from not constructing the transfer facility.

### 3.2.2. Operating/Maintenance Costs

The Busway/BRT scenario with a transfer facility has an operating and maintenance cost that is expected to be \$5.5 million/year less than the projected total O&M cost for the Future Baseline scenario as discussed in Issue Paper E.1. This is equivalent to a savings of 0.8%.

However without the transfer facility, the O&M costs of the Busway/BRT scenario is expected to be \$6.3 million/year more than the Future Baseline scenario, which is equivalent to an increase of 0.9%.

## 3.3. Key Findings

The following identifies the key findings of the supplementary analysis undertaken for the Busway/BRT scenario:

- *I-90 traffic impacts:* The reversible lanes would be converted to a two-way bus-only system, displacing HOV's and Mercer Island traffic to the outer roadway.
- *Seattle street impacts:* With the transfer facility there would be 458 peak hour bus trips through downtown Seattle which is a decrease of approximately 73 buses/hour (-13.7%) from the predicted number of trips for the Future Baseline. Without the transfer facility 556 buses would continue through downtown using the local street network, which would result in an increase of approximately 25 buses per hour (+4.7%) when compared to the Future Baseline scenario.
- *Bellevue street impacts.* The Busway/BRT option with and without the transfer station results in an increase of approximately 29 buses/hour (+23.2%) using the local Bellevue streets compared to the Future Baseline scenario.
- The Busway/BRT scenario is most reliant on the acquisition of the BNSF right-of-way.
- Requires rebuilding of the Wilburton Trestle.

- The Busway/BRT scenario adds a direct access eastern leg to the NE 6<sup>th</sup> Street/I-405 interchange to provide bus access from the BNSF ROW to the downtown Bellevue transfer station.
- Requires the modification of the Bellevue Transit Center to include an underground turn around and access facility.

## 4. Light Rail/HOV Hybrid

The original light rail scenario discussed in Issue Paper E.1 considered a completely separate facility across I-90 and throughout the core of the East King County sub-area. The original analysis found that the ridership between the Seattle CBD, and the Bellevue CBD was significantly higher than on the outer extents of the proposed system (north of Bellevue CBD, east of Eastgate and east of NE 40<sup>th</sup> Street). Based on this finding and the Sound Transit Board review, two variations of a hybrid light rail / HOV scenario were analyzed:

- Light Rail from Seattle to the Overlake Transit Center via Bellevue CBD combined with HOV/BRT from Overlake Transit Center to Redmond, HOV/BRT from Bellevue to Totem Lake and HOV/BRT from South Bellevue to Issaquah;
- Light Rail from Seattle to Redmond via Bellevue combined with HOV/BRT from Bellevue to Totem Lake and HOV/BRT from South Bellevue to Issaquah.

Figure 3 illustrates the Rail/HOV Hybrid scenario.

### 4.1. Supplementary Analysis

Investigation into the hybrid light rail / HOV scenario was carried out such that a comparative analysis of the variations could be completed. This analysis assumed the implementation of a six-lane (four general purpose and two HOV) facility on the SR 520 bridge, as currently being evaluated for the WSDOT *SR 520 Bridge Replacement and HOV Project*. This project finishes to the west of the SR520 /I-405 interchange. If this does not occur transit ridership on I-90 will increase.

As per the original analysis of the Fixed Guideway scenario, light rail would operate in a tunnel through downtown Bellevue. As an option, an aerial configuration was also evaluated for this section of the alignment.

# I-90 Corridor/East King County LRT & HOV Hybrid Scenario

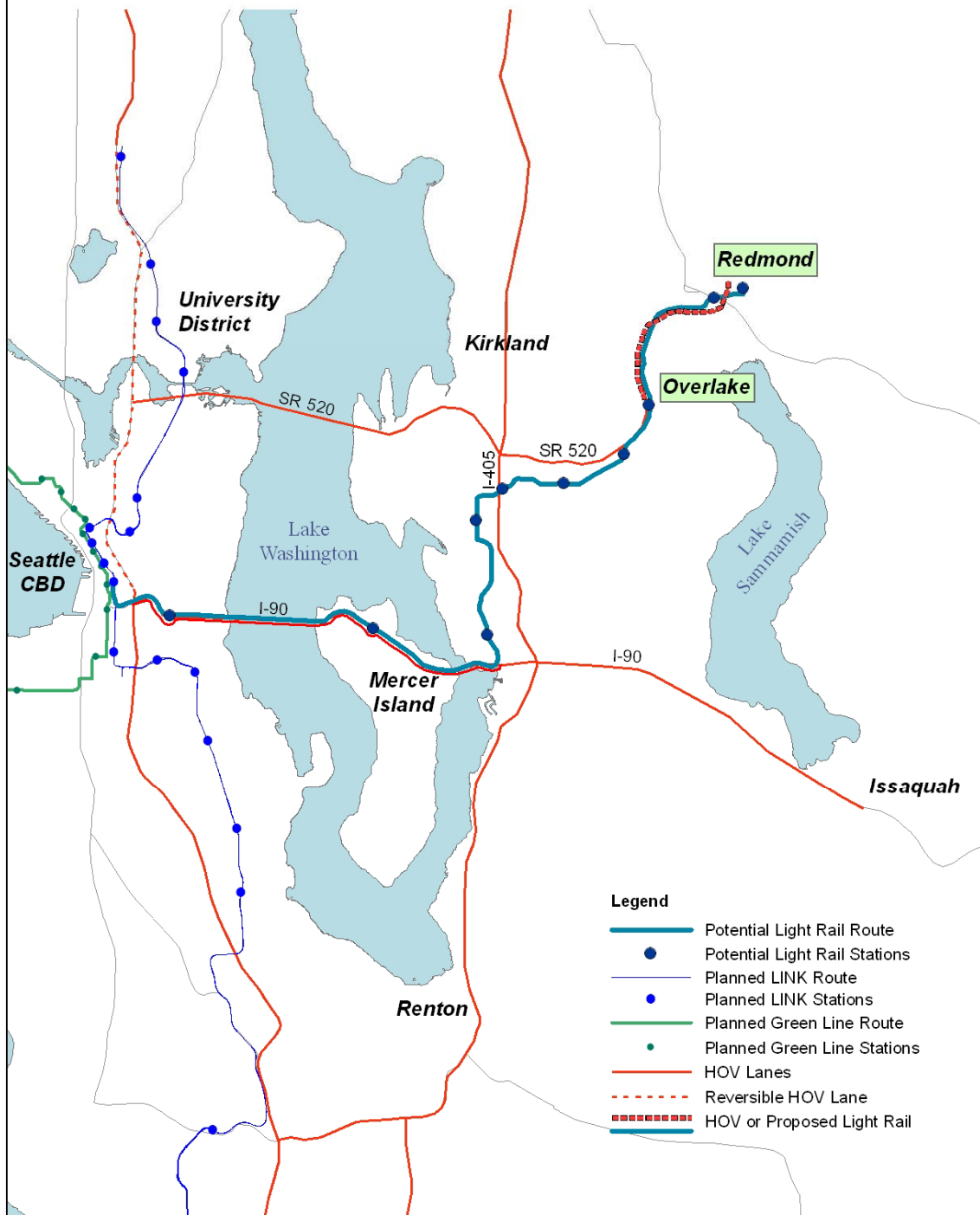


Figure 3: East King County Light Rail / HOV Hybrid Scenario

## 4.2. Cost Estimate

Capital costs and Operation and Maintenance (O&M) costs were developed using the same methodology as described in Issue Paper E.1. All costs reported are in 2005 dollars.

### 4.2.1. Capital Costs

The following summaries the costs developed for the LRT/HOV Hybrids:

**Table 6. Summary of Capital Costs for the LRT/HOV Scenario**

Scenario	Cost Range	Details
LRT / HOV Hybrid (LRT to Overlake)	\$2.7 - \$3.7 billion	Tunnel section through Bellevue
	\$2.3 - \$3.2 billion	Aerial section through Bellevue
LRT / HOV Hybrid (LRT to Redmond)	\$3.2 - \$4.4 billion	Tunnel section through Bellevue
	\$2.8 - \$3.9 billion	Aerial section through Bellevue

### 4.2.2. Operating/Maintenance Costs

For the LRT/HOV Hybrid (LRT to Overlake) an increase of \$12.3 million per year (equivalent increase of +1.7%) is expected from the Future Baseline scenario. Similarly for the LRT/HOV Hybrid (LRT to Redmond) an increase of \$17.3 million per year (equivalent to +2.4%) is estimated.

## 4.3. Key Findings

- *I-90 traffic impacts:* As per the original option, the reversible lanes would be converted to a transit-only two-way system, displacing HOV and the Mercer Island traffic to the outer roadway.
- *Seattle street impacts:* For both options there would be a decrease of approximately 46 buses/hour (-8.7%) from the future baseline condition using the local street network. A total of 485 peak hour two-direction bus trips are expected to downtown Seattle.
- *Bellevue street impact:* For both options there would be a decrease of approximately 14 buses/hour (-11.2%) from the future baseline condition using the local street network. A total of 111 peak hour trips thorough the Bellevue Transit Center are expected.
- Extending light rail to Redmond adds about 2,000 riders to the rail system while drawing about 1,000 from the Kirkland-Bellevue bus line.

- The LRT/HOV scenario is projected to have high ridership on the I-90 Bridge, between downtown Bellevue and downtown Seattle.
- I-90 light rail is integrated with Central Link and interlined through the downtown Seattle tunnel with Central Link operations and therefore does not require a transfer station in the International District area for destinations north of downtown on North Link.
- Highest cost element for this option is the tunnel in the Bellevue CBD. The total capital cost could be reduced if the tunnel were replaced with aerial guideway in this area.
- The LRT/HOV hybrid scenario does not require BNSF right of way.

## 5. Travel Times

Table 7. Summary of Sample Travel times for 2030 (mins)

Alignment	Future Baseline	HOV/BRT	Busway/BRT	Light Rail	Light Rail/HOV Hybrid	Monorail	RCBRT*
Seattle to Bellevue	39	36	32-35	23	26	26	32
Bellevue to Redmond	45	29	29	23	23-28	23	25
Issaquah to Seattle	55	54	48-51	44	55	47	48
Kirkland to Bellevue	44	33	32	32	32	32	32
Mercer Island to Bellevue	19	15	14	12	14	12	14

\*RCBRT: Rail Convertible Bus Rapid Transit

## 6. Summary Ridership Forecasts

Table 8 presents the estimated 2030 daily ridership volumes for each of the scenarios considered within this supplementary issue paper. Ridership volumes were calculated as per the methodology discussed in Issue Paper E.1.

Table 8. 2030 Ridership - I-90 Cross Lake (Bellevue to Seattle) – Scenario Summary

Scenario	I-90 Cross Lake 2030 Daily Ridership Volume
HOV/BRT	30,000
Busway/BRT (with Transfer Station)	29,000
Busway/BRT (without Transfer Station)	30,000
Light Rail (three branches)	48,000
Light Rail/HOV Hybrid (LRT to Overlake)	42,000
Light Rail/HOV Hybrid (LRT to Redmond)	44,000

Scenario	I-90 Cross Lake 2030 Daily Ridership Volume
Monorail	31,000
RCBRT	36,000

\*RCBRT: Rail Convertible Bus Rapid Transit

## 7. Effect of Transit Scenarios on I-90 Traffic Operations

The HOV/BRT Scenario would utilize the “R-8A” lane configuration on I-90, as defined in the I-90 Two-Way Transit and HOV Operations Final Environmental Impact Statement, May 2004. This configuration includes three single occupancy vehicle or general purpose lanes and one high occupancy vehicle (HOV) lane in each direction on the I-90 outer roadways and retains the existing configuration of the I-90 center roadway, with reversible operation (westbound in the morning, eastbound in the evening) serving transit, HOV’s and single occupancy vehicles between the Island Crest Way on/off ramps and Seattle and serving high occupancy vehicles east of Island Crest Way.

The Fixed Guideway Transit (light rail, monorail and rail-convertible BRT) and Busway/BRT Scenarios would utilize the I-90 center roadway for exclusive transit use. All other traffic, including single occupancy vehicles and high occupancy vehicles, would be restricted to the I-90 outer roadways. The I-90 outer roadways would include three lanes for single occupancy vehicles and one lane for high occupancy vehicles in each direction, consistent with the R-8A configuration.

The removal of non-transit traffic from the I-90 center roadway would have effects on traffic operations on the I-90 outer roadways. These effects have not been analyzed in detail as part of work reported in Issue Paper E.1. Indications of the likely effects can be drawn from the I-90 Two-Way Transit and HOV Operations Final Environmental Impact Statement, May 2004. This EIS examined several lane configurations to provide reliable two-way transit operations on I-90. In addition to the R-8A configuration, the EIS examined a configuration designated as “R-2B,” which included three lanes for single occupancy vehicles and one lane for high occupancy vehicles in each direction, the same numbers of lanes as would be in place for the Fixed Guideway Transit and Busway/BRT scenarios, not counting the transit use of the center lanes. R-2B was configured with the three general purpose lanes in the outer roadways and the HOV lanes in the center roadway (one lane in each direction) rather than having all lanes in the outer roadways.

The following table presents data drawn from the *I-90 Two-Way Transit and HOV Operations Final Environmental Impact Statement, May 2004 (Table 3.1-2)*, showing expected peak hour travel times for high occupancy vehicles and single occupancy vehicles traveling in the general purpose lanes on I-90 between Rainier Avenue South and the East Channel Bridge. The table shows three lane configurations on I-90, the existing configuration (Alternative R-1: No Build in the EIS); the configuration for the Fixed Guideway Transit and Busway/BRT Scenarios (Alternative R-2B in the EIS), and

the configuration for the HOV/BRT Scenario (Alternative R-8A in the EIS). It should be noted that the travel time estimates from the EIS are for year 2025. Other forecast data presented in Issue Paper E.1 is for year 2030.

**Table 9. I-90 Estimated Vehicular Travel Times**

I-90 Lane Configuration	High Occupancy Lanes				Single Occupancy Lanes			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	WB	EB	WB	EB	WB	EB	WB	EB
<b>Existing Configuration</b> <i>(Reversible center roadway for Transit, HOV, Mercer Island GP)</i>	5.8	9.3	12.4	5.8	11.5	9.3	12.4	9.5
<b>HOV/BRT Scenario</b> <i>(Transit in the HOV Lanes, reversible center roadway retained)</i>	6.0	6.5	7.2	5.9	7.2	7.6	10.5	6.9
<b>Fixed Guideway Transit and Busway/BRT Scenarios</b> <i>(Transit only in the center roadway)</i>	7.3	7.1	7.4	7.9	12.9	9.4	9.3	9.5

Note: 2025 Travel Time in minutes on I-90 between Rainier Avenue South and East Channel Bridge

From the table it can be seen that I-90 under the Fixed Guideway Transit and Busway/BRT Scenarios would, for most movements and times of day, operate similar to or better than the existing configuration (i.e., if R-8A weren't implemented). Compared to the other transit scenario, for high occupancy vehicles, travel times with the Fixed Guideway Transit and Busway/BRT Scenarios would be slightly (up to 2 minutes) longer than with the HOV/BRT Scenario. For single occupancy vehicles, eastbound travel times with the Fixed Guideway Transit and Busway/BRT Scenarios would also be (up to 2.6 minutes) longer than with the HOV/BRT Scenario. AM westbound travel times would be noticeably longer (5.7 minutes), but PM westbound travel times would be slightly (1.2 minutes) shorter than with the HOV/BRT Scenario.

Implementation of the fixed guideway transit and Busway/BRT scenarios would increase the people-moving capacity of the center roadway. It will result in travel times of 9-13 minutes between the East Channel Bridge on Mercer Island and Rainier Avenue South in Seattle for general purpose traffic, which is similar to current conditions. In addition, a HOV lane will be in place in both directions on the outer roadways.