U.S. Department
of Transportation

**Federal Highway
Administration**

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June 22, 2011

HDE-WA/560/WA 624

Ms. Paula J. Hammond
Secretary of Transportation
Department of Transportation
Olympia, Washington

Attention: Barb De Ste Croix

**Sound Transit – I-90 East Link Project
Final Interchange Justification Report**

Dear Ms. Hammond:

This letter is in response to your June 20, 2011, request for a finding of engineering and operational acceptability for the Sound Transit I-90 East Link Interchange Justification Report (IJR). The project, in part, incorporates interchange modifications and closures within the I-90 center roadway to allow Sound Transit's East Link light rail project to use the I-90 reversible express lanes from MP 1.99 to MP 9.44. In addition, part of this project, incorporates comprehensive changes to I-90, including HOV access and lane modifications resulting from the I-90 Two-Way Transit and HOV Operations Project that form the ultimate configuration of I-90 between the cities of Seattle and Bellevue. We have compared the final IJR to previous drafts and find that it satisfies the requirements of the FHWA Interstate Added Access Policy.

Based on an engineering and operations review, the access request is considered acceptable. However; the general purpose left-hand on ramp connecting Island Crest Way to the WB I-90 HOV lane is a safety issue. The AASHTO Greenbook, ***A Policy on Geometric Design of Highways and Streets,*** discourages the use of left-hand on and off ramps. This access point should be monitored and closed to single occupant vehicles use if significant collision frequency and severity begin to occur. In addition, ramp metering must continue at this location.

If there are no major changes in the design of the proposal, final approval may be given upon the completion of the environmental process. Please submit a request for final IJR approval at the completion of the NEPA process.

Sincerely,

DANIEL M. MATHIS, P.E.
Division Administrator

By: Donald A. Petersen
Division Safety/Design Engineer

Enclosure

cc: Ed Barry, MS TB-85, LeRoy Patterson, MS 47336

East Link Project

FINAL I-90 Interchange Justification Report

May 2011

SOUNDTRANSIT

EAST LINK PROJECT

Interstate 90 Interchange Justification Report Signature Sheet:

I-90 Reversible Express Lanes Mile Posts 1.99 to 9.44

This Interchange Justification Report (IJR) has been prepared under my direct supervision, in accordance with Chapter 18.43 of the revised Code of Washington and appropriate Washington State Department of Transportation manuals.

☑ **IJR Engineer of Record**

CRAIG J. GRANDSTROM
STATE OF WASHINGTON
41370
REGISTERED PROFESSIONAL ENGINEER
5/27/2011

By: ______________________, P.E.

CH2MHILL

Date: May 27th, 2011

☑ **Northwest Region Engineer Manager**

By: ______________________ Paul Bennett, P.E.

Date: 27 MAY 2011, 2011

☑ **Traffic Analysis Engineer**

By: ______________________, P.E.

Regional Traffic Engineer

Date: June 2, 2011

☑ **WSDOT Approval: Assistance State Design Engineer**

By: ______________________, P.E.

Date: May 31, 2011

☑ **WSDOT Approval: Development Services and Access Manager**

By: ______________________, P.E.

Date: ~~May 31~~ June 6, 2011

☑ **FHWA Approval: FHWA Safety and Design Engineer**

By: ______________________ ~~P.E.~~

Date: JUNE 22, 2011

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Introduction and Executive Summary

This Final Interchange Justification Report (IJR) was prepared to address the access modifications and removals needed to convert the Interstate 90 (I-90) center reversible roadway for exclusive light rail as part of the East Link Light Rail Transit Project (East Link Project or, simply, East Link). This IJR addresses the Federal Highway Administration (FHWA) and Washington State Department of Transportation (WSDOT) requirements associated with new and modified access to interstate facilities. This report addresses the elements required by the FHWA policy *Additional Interchanges to the Interstate System* (FHWA, 1998) and the WSDOT Design Manual, Chapter 550 (WSDOT, 2009).

ES.1 Background

Local, regional, and state agencies have been studying high-capacity transportation alternatives to connect Seattle with the Eastside of King County since the mid-1960s. Already in 1976, when expansion plans for I-90 were stalled, the affected entities of Seattle, Mercer Island, Bellevue, and the Washington State Highway Commission signed a Memorandum Agreement (MA) titled *Memorandum Agreement on the Design and Construction of the I-90 Bridge* (MA I-90) (City of Seattle et al, 1976), which called for converting the center roadway to dedicated transit usage in the future.

In 2004, Puget Sound Regional Council (PSRC) prepared the *Central Puget Sound Region High-Capacity Transit Corridor Assessment* (PSRC, 2004) to establish a basis for more detailed planning studies and environmental analysis. Applying the adopted land use and metropolitan transportation plan, the report found that the cross-lake corridor connecting the urban centers of Seattle, Bellevue, Overlake, and Redmond had the highest potential for near-term development of high-capacity transit (HCT). The Board of Directors of Central Puget Sound Regional Transit Authority (known as "Sound Transit") has adopted light rail as the mode for this corridor, now referred to as "the East Link Project."

The East Link Project builds on the conclusions of previous planning studies and public involvement processes dating back to the mid-1960s. Consistent with the memorandum titled *Integration of Planning and NEPA Processes* (Appendix A to Title 49, Part 613, Statewide Transportation Planning; Metropolitan Transportation Planning, 2-14-07, of the *Code of Federal Regulations* [CFR])(Federal Transit Administration [FTA] and FHWA, 2005), the decision process is based on comprehensive studies that were completed in cooperation with state and local agencies and broad public input. In particular, the Sound Transit Board made the following two major decisions after extensive evaluation and review with agencies and the public before beginning this environmental review:

- Regional HCT to the Eastside via I–90 is necessary.
- Light rail is the preferred HCT technology for the I–90/East Corridor connecting Seattle, Mercer Island, Bellevue, Overlake, and Redmond.

Policy Point 2 of this IJR further summarizes key milestones in the process of making these decisions and describes the process used to determine light rail as the HCT mode. Within the I-

90 corridor a separate *Access Point Decision Report* (APDR) (Sound Transit and WSDOT, 2005), was approved to provide new lanes for high-occupancy vehicle (HOV) traffic as part of the I-90 Two-Way Transit and HOV Operations Project. That APDR covered much of the same area as this IJR and addressed modified access as part of that action. The APDR made two-way HOV lane preferential travel possible, as opposed to the center roadway HOV facility that only accommodated one direction. Because these projects are within the same corridor, they have been closely coordinated. Another related WSDOT action included an IJR for the State Route (SR) 519 Intermodal Access Project Phase 2: Atlantic Corridor (IJR approval, May 2008).

Table ES-1 summarizes access revisions in the I-90 Two-Way Transit and HOV Operations Project that APDR approved in April 2005 and those proposed in this IJR. These revisions are also shown in Figure ES-1. The East Link Project proposes to eliminate seven connections between the center reversible roadway and either the local streets (77th Avenue SE and Island Crest Way) or the I-90 westbound and eastbound mainline roadways (near Rainier Avenue South and East Channel Bridge). In addition, a change in the use of the D2 Roadway to allow only joint bus and rail operations and relocate the proposed eastbound HOV direct-access off-ramp to Island Crest Way (instead of at 77th Avenue SE) is requested.

TABLE ES-1
Proposed I-90 Future Access Revisions

Interchange	I-90 Existing (2007) Interchange Access (with use and/or time restrictions)	I-90 Two-Way HOV and Transit Project Revisions	East Link Preferred Alternative Proposed Revisions[a]
SR 519 and Edgar Martinez Drive South	*Westbound off-ramp*	*No change*	*No change*
	Eastbound on-ramp	*No change*	*No change*
5th Avenue South and D2 Roadway	Westbound off-ramp : bus and HOV (AM only)	No change	Westbound off-ramp: bus only
	Eastbound on-ramp : bus and HOV (PM only)	No change	Eastbound on-ramp: bus only
I-5 Interchange	Westbound off- and on-ramps	No change	No change
	Eastbound off- and on-ramps	No change	No change
Rainier Avenue South	Westbound off- and on-ramps	No change	No change
	EB off- and on-ramps	No change	No change
	Westbound ramp from mainline to transit flyer stop	No change, bus only	No change, bus only
	Eastbound ramp from transit flyer stop to mainline	No change, bus only	No change, bus only
	Westbound exit from center roadway to mainline (AM only)	No change	Closed
	Eastbound entry to center roadway from mainline (PM only)	No change	Closed
West Mercer Way	Westbound on-ramp	No change	No change
	Eastbound off-ramp	No change	No change
76th Avenue	Westbound on-ramp	No change	No change

TABLE ES-1
Proposed I-90 Future Access Revisions

Interchange	I-90 Existing (2007) Interchange Access (with use and/or time restrictions)	I-90 Two-Way HOV and Transit Project Revisions	East Link Preferred Alternative Proposed Revisions[a]
SE			
77th Avenue SE	Eastbound off-ramp	No change	No change
	Westbound off/eastbound on-ramp with center roadway	No change	Closed
	Eastbound HOV off-ramp	Stage 3	Modified to Island Crest Way
80th Avenue SE	Westbound off/eastbound on-ramp with center roadway	Eliminated with Stages 1 and 2	No change
	Westbound HOV off-ramp	*Stage 1*	*No change*
	Eastbound HOV on-ramp	Stage 2	No change
Island Crest Way	Westbound off- and on-ramps	No change	No change
	Eastbound off- and on-ramps	No change	No change
	Westbound on-ramp to center roadway (AM only)	No change	Closed
	Eastbound off-ramp from center roadway (PM only)	No change	Closed
	Eastbound HOV off-ramp	N/A	Modified from 77th Avenue SE
East Mercer Way	Westbound off- and on-ramps	No change	No change
	Eastbound off- and on-ramps	No change	No change
	Westbound entry to center roadway (AM only)	No change	Closed
	Eastbound exit from center roadway (PM only)	No change	Closed
Bellevue Way[b]	Westbound off- and on-ramps	No change	No change
	Eastbound off- and on-ramps	No change	No change
	Westbound HOV on-ramp	*Modified ramps to create two-way HOV ramps (Stage 1)*	No change
	Eastbound HOV off-ramp		
I-405[b]	Westbound off- and on-ramps	No change	No change
	Eastbound off- and on-ramps	No change	No change
	Westbound HOV on-ramp	No change	No change
	Eastbound HOV off-ramp	No change	No change

Table reflects existing conditions year of 2007; italic text indicates the project has been constructed (as of 2011).
[a] East Link Project compared with I-90 Two-Way HOV and Transit Project.
[b] At some of the Bellevue Way and I-405 ramps, the I-90 Two-Way HOV and Transit Project modified their operations to improve flow but continue to provide the access; therefore, “No change” to access.
HOV high-occupancy vehicle

ES.2 Meeting the Eight Policy Points

This IJR responds to FHWA's eight policy points to support the finding of engineering and operational acceptability of the Proposal. Analysis of alternatives and options is included in Draft Environmental Impact Statement (EIS) (Sound Transit, 2008), and this document supports only the preferred alternative identified by the Sound Transit Board in June 2010. Detailed operations and safety analysis has been provided to support modified or removed access as part of the East Link Project. The analysis includes phased evaluation of the I-90 Two-Way HOV and Transit Project using analytical procedures (such as multihour simulation analysis of freeway elements) and preliminary engineering design. Electronic files of the analysis are included in Appendix 3F (provided on DVD), with results summarized in this report and further detailed in the other appendices. Pending engineering and environmental documentation is discussed in Policy Point 4 (Design) and Policy Point 8 (Environmental Process), respectively. Included in Policy Point 4 is documentation of anticipated design deviations with the I-90 Two-Way Transit and HOV Project and the East Link Project

The need for HCT, specifically light rail on the I-90 corridor to connect Seattle with urban communities, has been progressively established in documents dating back to 1976. Along with furthering the state growth policy (Washington State Growth Management Act of 1990 [GMA]) light rail has been supported in virtually every long-range transportation plan developed by the state, regional planning agencies (such as PSRC), regional transit providers (such as Sound Move and King County Metro), and local planning agencies (such as the Cities of Bellevue, Redmond, Seattle, and Mercer Island). The need for East Link, and the subsequent access modifications proposed for its implementation, is fully documented in Policy Point 1 (Need). Studies and plans also going back to 1976 and related to HCT have investigated numerous alignments, modes, and governance. Through documentation, close coordination with stakeholders, and a broad alternatives process including the East Link Draft EIS (Sound Transit, 2008) and Supplemental Draft EIS (Sound Transit, 2010a), Sound Transit's Board identified the locally preferred alternative (known as *Preferred Alternative A1* [and *Preferred Alternative B2M* near the Bellevue Way interchange]) on I-90 in June 2010. This alternative is the Proposal discussed in this IJR, and the alternative evaluation and decision-making process is documented in Policy Point 2 (Alternatives).

To address Policy Point 3 (Operational and Accident Analysis) an in-depth operations and safety analysis was initiated in 2006 and conducted to reflect a base year of 2007, a design horizon year of 2030, and a year of opening of 2020 that reflects effects of other (I-90) phased projects. The safety and operations analysis was conducted progressively over 3 years and included close coordination among WSDOT, FHWA, and Sound Transit. Key decision milestones in the analysis included agreement on the following:

- Methods and assumptions and performance measures
- Calibration of existing conditions
- Future-year operations and safety predictive analysis
- Design refinements and deviations

The operations and safety analysis reviewed safety, including countermeasures agreed to within the I-90 Two-Way Transit and HOV Project. The countermeasures are described in the I-90 Two-Way Transit and HOV Operations Project Final Environmental Impact Statement

(WSDOT and Sound Transit, 2004). Operations and safety analysis reflected measures of effectiveness ranging from systemwide demand to person throughput and vehicle travel time to intersection queuing.

Measures also addressed transit reliability and service. Policy Point 3 documents this extensive operations and safety analysis. The analyses documented in Policy Point 3 indicate that operations and safety of I-90 will not be adversely affected and, for many of the measures, indicates improved conditions as a result of the Proposal. Further analysis within this document reflects the benefit of the Proposal in terms of person throughput during peak periods because approximately 5,500 more people will be able to travel across Lake Washington on I-90 with the project compared with the no-build condition. Additionally, vehicle travel times are expected to remain similar or improve compared with no-build conditions, and the I-90 corridor's safety is predicted to not be compromised.

Not included in the Proposal is a change to the outer roadway HOV lane eligibility. Outer roadway HOV traffic will remain consistent with the I-90 Two-Way Transit and HOV Operations Project Record of Decision (ROD) (FHWA, 2004). HOV and transit will be authorized to use only the eastbound, left-side off-ramp at Island Crest Way, and Mercer Island traffic from the westbound, left-side on-ramp at Island Crest Way will be allowed only in the HOV lane for merge and acceleration purposes. With the East Link Project, access to and from reversible center roadway would be removed as well as its ramps connecting to Mercer Island (77th Avenue SE and Island Crest Way). With the access modifications from the I-90 Two-Way Transit and HOV Operations Project and the East Link Project, the traffic analysis assumed Mercer Island single-occupant vehicles (SOVs) would be able to use the HOV lanes in both directions of I-90 between Seattle and Island Crest Way. This was assumed to demonstrate that it does not affect the results of the analysis and represents a worst-case condition. This assumption does not represent approving SOVs using the outer roadway HOV lanes or the eastbound left-side off-ramp to Island Crest Way. Any changes to the HOV lane eligibility—such as tolling, managed lanes, or Mercer Island SOV use—would need to be addressed in a future analysis, approval, and agreement.

The Proposal has an acceptance base in regional and local policies and plans, as noted in Policy Point 5 (Consistency with Land Use and Transportation Plans). The Proposal is consistent with all local and regional plans and programs established by local and regional agencies, including the Metropolitan Planning Organization (MPO) comprehensive plans, *Vision 2020 1995 Update* (PSRC, 1995) (and, by extension, *VISION 2040*) and Destination 2030 (PSRC, 2007a) (and, by extension, *VISION 2040* and the plans of the Cities, Sound Transit, and King County). The Proposal has been closely coordinated with other future or anticipated projects, including I-90 interchange modifications, as described in Policy Point 6 (Future Interchanges). The Proposal does not depend on other actions, although it functions with other long-range regional investments such as the SR 519 South Seattle Intermodal Access Project, I-90 Two-Way Transit and HOV and I-405 Expansion (as described in Policy Point 7 [Coordination]). This IJR has also been closely coordinated, and analysis consistent with, the environmental document being prepared for East Link. Policy Point 8 identifies anticipated permit requirements consistent with the Final EIS (WSDOT and Sound Transit, 2011) and ROD.

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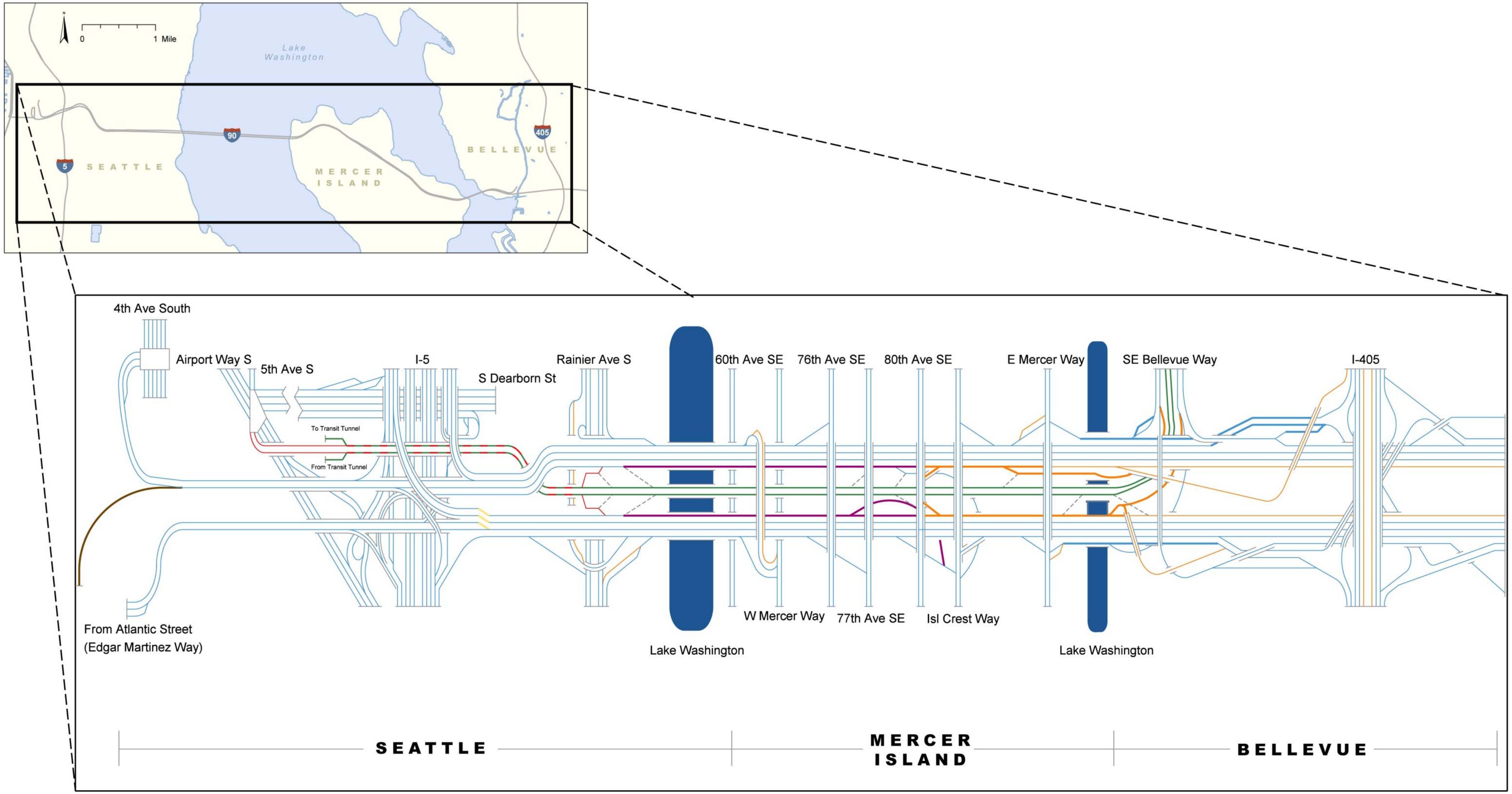


Bus Only Lane/Ramp
Light Rail
Joint Use Bus/Light Rail Lane
Existing HOV Lanes
Future HOV Lanes [1]
Future HOV Lanes [2]
Existing General Purpose Lanes
Future General Purpose Lanes [1]
Future General Purpose Lanes [2]
General Purpose Lanes constructed after 2007 [3]
Ramps Removed With East Link Project

Not To Scale

[1] I-90 Two-Way Transit and HOV Operations Project Stage 1 improvments to westbound GP and HOV facilities constructed after 2007. Eastbound GP and HOV facility improvements as part of Stage 2 are currently being constructed.

[2] Lanes constructed as Stage 3 of I-90 Two Way Transit and HOV Operations Project

[3] SR 519 Intermodal Access Project

Sources: http://www.wsdot.wa.gov/Projects/I90/TwoWayTransit/ and I-90 Two-Way Transit and HOV Operations Project

http://www.wsdot.wa.gov/Projects/SR519

393372.H3.02.04.01.06_EastLink_2_1apr11.ai_4/1/11_lw

FIGURE ES-1
I-90 Future Channelization and Ramps

ES.3 Project Description, Schedule, and Funding

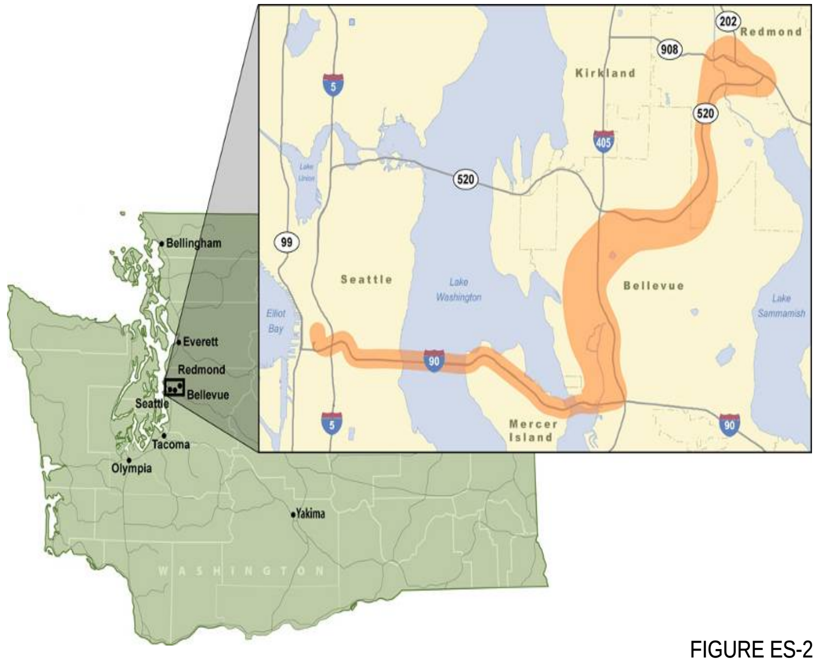


FIGURE ES-2
East Link Project Corridor

Current population and employment levels are causing longer hours of congestion for traffic crossing Lake Washington in both directions, and population and employment trends indicate that this situation will continue to worsen. On both sides of the lake, the cities of Seattle, Bellevue, and Redmond are rapidly meeting housing and employment density goals set by PSRC. PSRC's *VISION 2040* plan recognizes that these urban centers will require HCT options to meet their increasing transportation demands. Even with recent surges in transit ridership over the last few years as gas prices have dramatically increased in the Puget Sound region, current transit options are vulnerable to traffic congestion, which affects transit's on-time performance and reliability. In July 2006, as an outgrowth of nearly 40 years of extensive analyses and coordination among agencies and local jurisdictions, including public input, Sound Transit identified light rail as the preferred transportation mode for this corridor.

Sound Transit is proposing the East Link Project to address these growing transportation needs. The East Link Project would involve constructing an approximately 14- to 18-mile-long light rail transit system connecting the urban centers on both sides of Lake Washington in a dedicated right-of-way from Downtown Seattle to Mercer Island, Bellevue, Overlake, and Redmond by way of I-90. For the East Link Project, this IJR is for the Proposal between Seattle and the Bellevue Way interchange that crosses I-90 in the reversible center roadway; no other IJR is planned for the East Link Project because the project does not affect access to the rest of the Puget Sound freeway system. This system would benefit the region by providing frequent and reliable HCT service 20 hours each day in the Seattle-Bellevue-Redmond corridor (Figure ES-2). The light rail system would provide fast transit travel times and would increase transportation capacity in the corridor.

Daily ridership in the corridor is projected to be up to 52,500 boardings by 2030, and light rail service can be expanded to accommodate growth. Figure ES-3 shows project milestones that are anticipated for the East Link Project. The schedule for final design, construction, and operation will be refined as the project nears the end of environmental review and preliminary design.

The East Link Light Project is included in Sound Transit 2 (ST2), The Regional Transit System Plan for Central Puget Sound, also known as the "Mass Transit Expansion Proposal," which was approved by voters in November 2008. ST2 funds construction and operation of the portion of the East Link Project from Seattle to the Overlake Transit Center. The length and configuration of the constructed project would depend on project funding, final project design, track profiles, and project costs; the EIS, however, covers the whole corridor.

FIGURE ES-3
East Link Targeted Project Milestones

Preliminary Design and Environmental Review	
Draft EIS published	December 2008
Draft EIS comment period	75 days
Sound Transit Board identifies preferred alternative	Spring 2009/ Spring 2010
SDEIS published	Fall 2010
SDEIS comment period	60 days
Final EIS published	Spring 2011
Sound Transit Board selects project to be built	Summer 2011
Federal Record of Decision	Summer 2011
Final Design, Construction, and Operation — ST2 Targets	
Final Design	2011 - 2014
Construction	
• Seattle to Bellevue • Bellevue to Overlake	2013 - 2019 2014 - 2020
Start of Service	
• Seattle to Bellevue • Bellevue to Overlake	2020 2021

Policy Point 1: Need

What are the current and projected needs? Why are the existing access points and the existing or improved local system unable to meet the proposal needs? Is the anticipated demand short or long trip? (WSDOT Design Manual, Chapter 550.)

1.1 Summary

This Policy Point presents the existing and future needs on I-90 and discusses how the existing and future no-build transportation network is unable to meet these needs. This is addressed by analysis at the regional, corridor, and operational levels for the existing and future no-build (2030 design year) conditions.

The regional vision for the transportation system in the Puget Sound region has long identified I-90 as the preferred corridor for HCT across Lake Washington to connect the urban centers of Seattle and Bellevue. Since its construction, the center roadway of I-90 specifically has been designated for HCT. The 2004 amendment to the 1976 I-90 MA states that "Alternative R-8A with High Capacity Transit deployed in the center lanes is the ultimate configuration for I-90 in this segment" (the MA [City of Seattle et al, 1976] and its amendment [City of Seattle et al, 2004] are both provided in Appendix 1A).

In-depth studies of HCT modes for this corridor resulted in the Sound Transit Board selecting light rail as the preferred mode across Lake Washington, based on the following criteria (Sound Transit, 2006a):

- **Connectivity and system integration:** Light rail would use the same technology as Central Link.
- **Ridership:** Light rail was found to have the highest projected level of ridership and the shortest travel times of all technologies evaluated for the corridor.
- **Cost:** The long-term costs are lower for the light rail system than for the other evaluated modes (which included bus rapid transit [BRT]).
- **Risk:** Light rail would avoid any future closure for conversion (such as would be required with rail and/or convertible BRT) thereby avoiding the risk of lost ridership, lower reliability, increased travel times, and impacts on local communities.

Alternative R-8A, which is the preferred alternative of the I-90 Two-Way Transit and HOV Operations Project, would provide full-time HOV lanes in the westbound and eastbound outer roadways, with direct HOV access connections. This project has been separated into three stages, with the first stage recently completed and the second stage currently being constructed. Funding to complete construction of Stage 3 is included in ST2, which was approved in November 2008.

Sound Transit intends to work with WSDOT to complete Stage 3 by the end of 2014 and then close the center roadway for light rail conversion in early 2015. The center roadway would close for East Link construction immediately after the HOV lanes on the outer roadway are

completed. Therefore, it is planned that the new HOV lanes in the outer roadways would not operate in conjunction with the center roadway before East Link construction.

Regional forecasts indicate that auto travel demand during the peak periods on I-90 will grow by more than 50 percent and become balanced between the westbound and eastbound directions during the PM peak period. Even with the I-90 Two-Way Transit and HOV Operations Project, HOV mode share percentage across Lake Washington (combined SR 520 and I-90) is expected to stay relatively constant compared with existing conditions; however, the transit mode share percentage across lake Washington is expected to increase by 35 to 50 percent by 2030.

Overall, the substantial auto growth will continue to increase roadway congestion and hence create longer travel times in the AM and PM peak periods on I-90 in the Central Puget Sound region. Travel times on I-90 could more than double in some directions and reach almost 30 minutes on the I-90 corridor (between I-5 and I-405, a distance of approximately 8 miles) in the PM peak period.

Even with planned transportation investments in the region, an HCT solution is needed to provide a more reliable and efficient mode of transportation across Lake Washington to accommodate the regional vision to increase employment and residential growth in urban centers such as Bellevue and Seattle. Buses would continue in future conditions to be unreliable and a less desirable travel choice across Lake Washington between Seattle, Bellevue, and other Eastside communities because they would continue to operate poorly (existing condition's level of service [LOS] E and F).

Even though the I-90 Two-Way Transit and HOV Operations Project will improve speed for two-directional HOV and transit on I-90, the future transit reliability in terms of LOS, is still expected to fail the standards for bus routes on I-90 because of the heavily congested traffic on the highway system and congestion into and out of the urban centers on the arterial streets. This is highlighted by year 2030 forecasting of bus speeds between Seattle and Bellevue decreasing as much as 30 percent, even with improvements to I-90.

In addition, the directional lanes in the center roadway continue to be underused because the roadway is connected to freeway lanes and arterial streets (with traffic signals) that are heavily congested. Constructing Stage 3 of the I-90 Two-Way Transit and HOV Operations Project (providing HOV lanes west of the Mount Baker Tunnel) would create a poor westbound merging operation between the reversible center roadway and the westbound mainline in the morning commute, producing LOS F operations that would substantially slow travel speeds in the reversible center roadway through the Mount Baker Tunnel. This situation will affect morning bus operations in the center roadway, with slow speeds and lower reliability for routes heading into downtown Seattle.

1.2 Project Purpose

Using I-90 as the primary corridor for cross-Lake-Washington HCT in the Puget Sound region has been identified and evaluated for the last 40 years. Coupled with this was an understanding, dating back to the 1960s, that HCT would be the preferred transit service mode between Seattle and Bellevue. The 1976 I-90 Memorandum Agreement (City of Seattle et al, 1976), along with its amendment (City of Seattle et al, 2004), was one of the first documents that

specified that the I-90 reversible center roadway be designed for and permanently committed to future transit use, including the potential to convert all or part of the transit roadway to fixed guideway.

In the 1980s, the MPO conducted various studies that recommended rail service on I-90. In 1996, with voter approval of Sound Move (Sound Transit, 1996b) and with the formation of Sound Transit, the Long-Range Plan (Sound Transit, 1996a) identified developing HCT across I-90 with future rail.

The original 1996 Sound Move plan included frequent express bus service in King, Pierce, and Snohomish Counties to accommodate the anticipated growing ridership in the region. Since this plan was implemented, transit ridership (for instance, the Sound Transit 550 express route between Downtown Bellevue and Seattle) across Lake Washington has grown. In November 2008, voters passed ST2, with plans to expand light rail service south to Federal Way, north to Lynnwood, and east to Redmond. The research, joint planning efforts, and decision-making processes for identifying light rail as the preferred high-capacity mode for the I-90 corridor are recorded in *East Corridor High Capacity Transit Mode Analysis History* (Sound Transit, 2006a), which is provided in Appendix 2A of this IJR.

The GMA promotes an increase in urban density, resulting in higher population and employment growth in urban areas such as Bellevue and Seattle that were adopted by PSRC's *Destination 2030: Metropolitan Transportation Plan for the Central Puget Sound Region. (Destination 2030)* (PSRC, 2007a). Even higher densities in Bellevue and Seattle are included within PSRC's recently adopted *VISION 2040* (PSRC, 2009a), indicating the need for a highly efficient multimodal transportation system that promotes HCT. Because congestion is expected to increase and occur for more hours of the day, regional highways within the study area will not be able to continue to serve increasing travel demand. Future regional projects will continue to complete the HOV system, with the intent to encourage carpool trips ; however, these projects are limited since they do not directly connect high-capacity modes of travel to the region's urban centers.

To address the region's need to provide HCT that move more people, Sound Transit is proposing to construct and operate a 14- to 18-mile light rail system known as East Link. The East Link Project would improve the efficiency of I-90 by moving more people across Lake Washington between Seattle and the east Lake Washington communities without adding lanes on I-90. The East Link Project would meet the long-term objectives of moving people more efficiently across I-90 and would be consistent with the needs addressed in the region's Long-Range Plan (PSRC, 2009a).

The conclusions and findings from the history of high-capacity research and decision-making processes were used to develop the following project objectives for the East Link Project; these objectives are discussed in further detail in Chapter 1, Purpose and Need for East Link Project, of the Final EIS (WSDOT and Sound Transit, 2011) and are as follows:

- Improve speed and reliability and expand the region's transportation system capacity through an exclusive light rail transit right-of-way, while preserving the environment.
- Increase mobility and accessibility to and from the region's highest employment and housing concentrations.
- Support regional land use and transportation plans to direct growth into high-density urban

and manufacturing centers by providing an HCT connection between these centers, Seattle, and other regional destinations.

- Continue to implement the goals and objectives identified in Sound Transit's Long-Range Plan (Sound Transit, 2005b), which guides the development of the regional HCT system.
- Implement the HCT element of the *I-90 Two-Way Transit and HOV Operations Project Final Environmental Impact Statement* (WSDOT and Sound Transit, 2004), the FHWA ROD (September 8, 2004), and the amendment to the 1976 I-90 MA (WSDOT, 2004) between King County; the Cities of Bellevue, Seattle, and Mercer Island; the Washington State Transportation Commission; and Sound Transit.
- More fully develop a regional transit system that would integrate with the Central Link light rail line, providing direct connections among the largest urban centers in King County.
- Fulfill Sound Transit's legislative mandate to meet public transportation and mobility needs for HCT infrastructure in the central Puget Sound region, as established by the State High-Capacity Transportation Systems Act.

1.3 Project Need

This section discusses the regional and local needs for the East Link Project. Section 1.4 describes the analysis used to identify these needs as they relate to I-90. Congestion on I-90 is expected to worsen by 2030 as travel times become longer—in some cases, doubling what they are today. More congestion and longer travel times would further disconnect two of the largest employment and population centers (Bellevue and Seattle) in the central Puget Sound region. In addition to longer travel times, the duration of congestion on I-90 in 2030 is expected to extend for longer periods in both directions of I-90 as the peak periods potentially exceed 3 hours. Travel demand projections for 2030 show that most major roadway operations (Figure 1-1) in the study area will fail to effectively move vehicles, even with large investments in SR 520, I-90, and I-405.

Source: PSRC, 2007.

FIGURE 1-1
PSRC 2030 PM Roadway Volume-to-Capacity Ratios without East Link

Current and projected population and employment trends indicate a need to provide light rail transit between Seattle and the Bellevue and Redmond urban centers. This need for the East Link Project is further described in the East Link Final EIS (WSDOT and Sound Transit, 2011) and is summarized as follows:

- *"**Increased congestion on I-90** will hinder the performance of transit that is mixed with other vehicles as the I-90 corridor reaches maximum vehicle capacity during peak-hours as early as 2015 (WSDOT, 2006a).*
- ***Increased demand for transit services** across Lake Washington is expected to double in the*

next 30 years as a result of residential and employment growth on both sides of Lake Washington.

- ***Regional urban center growth plans supported by HCT investments*** *in accordance with Transportation 2040 (PSRC, 2010a).*
- ***Operating deficiencies in regional bus transit service*** *will continue to occur as a result of lower speeds and decreasing reliability.*
- ***Limited transit capacity and connectivity*** *between the areas of highest employment density in the region will occur as a result of constraints of the current road system."*

1.4 Analysis Parameters and Assumptions

To assess the regional and local needs for the project, a detailed operational analysis of existing and future conditions (a design horizon of 2030) was conducted for the I-90 freeway system and associated intersections between the western terminus of I-90 and east of I-405. The analysis assumed that the infrastructure investments associated with the region's Metropolitan Transportation Plan (MTP) (PSRC, 2010) and the local agencies' long-range planning documents would be made with the exception of the Proposal (the no-build condition). To assess if the Proposal would meet the needs stated in Section 1.3, the IJR Core Team (FHWA, WSDOT and Sound Transit staff) established methods and assumption parameters that include study area, analysis years, measures of effectiveness (MOEs), travel demand models, and future no-build project assumptions; these parameters are further discussed in this section.

1.4.1 Study Area

I-90 is a major east-west highway that extends from Boston through Chicago, terminating in Downtown Seattle. The study area for this IJR spans approximately 8 miles along I-90, between the western terminus of I-90 at SR 519 in Seattle and east of I-405 near the Eastgate direct-access HOV ramps. I-90 within the IJR study area is a multilane interstate providing connection between the region's urban centers of Seattle, Mercer Island, and Bellevue. I-90 is also a key freight route, connecting the Port of Seattle and surrounding industrial areas across Lake Washington and beyond. In relationship to the overall East Link Project, this IJR addresses the portion of the Proposal that affects the interstate; this is shown as Segment A and the south part of Segment B illustrated in Figure 1-2. The other segments (Segments C, D and, E) are analyzed in the East Link Final EIS (WSDOT and Sound Transit, 2011).

I-90 within the study area includes three general-purpose (GP) lanes in the westbound and eastbound directions. The Lake Washington Floating Bridge, the section of I-90 that crosses Lake Washington west of Mercer Island, includes two "outer" roadways that are the westbound and eastbound mainline lanes comprising GP lanes and a reversible center roadway that operates as a westbound directional expressway during the morning and as an eastbound expressway during the afternoon between the Mount Baker Tunnel in Seattle and the Bellevue Way SE interchange in Bellevue. The reversible center roadway lanes are restricted to HOV traffic between Mercer Island and Bellevue Way SE.

The East Link Project would connect with Sound Transit's Central Link light rail system at the International District/Chinatown Station in Seattle and then travel east across Lake Washington via I-90 to Mercer Island, Downtown Bellevue, and Bel-Red/Overlake, terminating in

Downtown Redmond. As part of the project evaluation, five segments were created, Segments A through E, as shown in Figure 1-2.

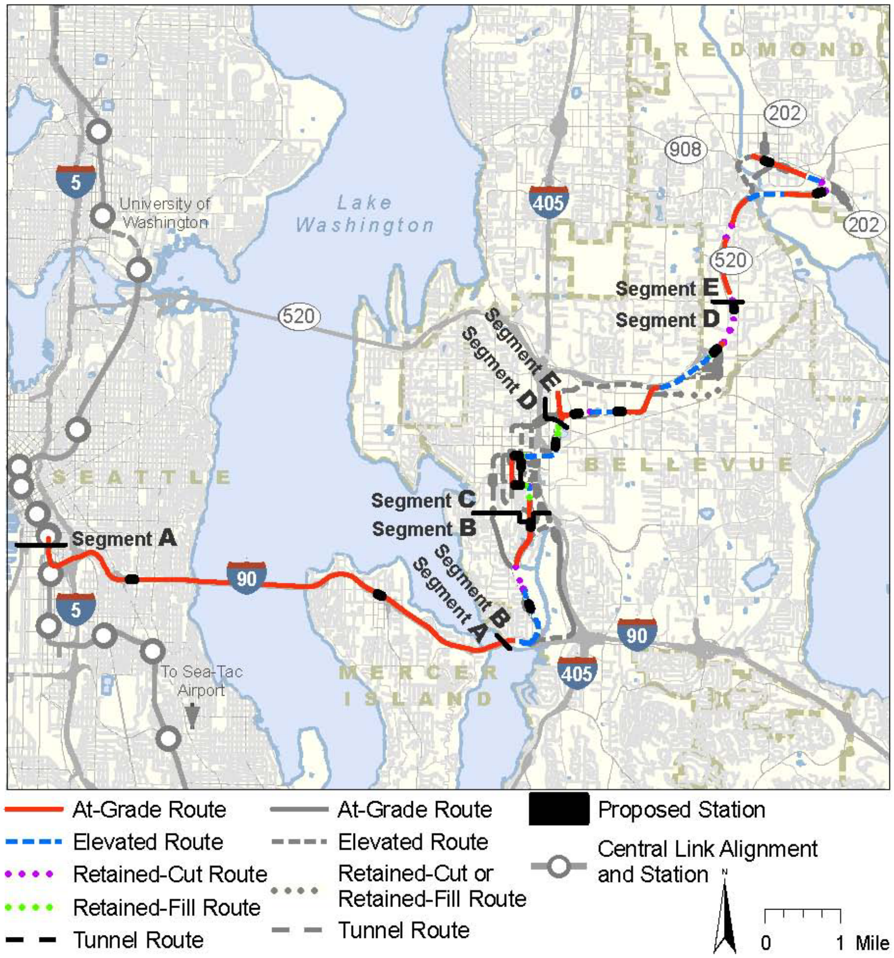


FIGURE 1-2
East Link Project Vicinity Map

1.4.2 Analysis Years

Existing conditions were evaluated to document current operations and to validate the operational tools and calibration process. Future operations and system conditions were addressed to compare existing conditions to a future 2030 design year. The set of land use and infrastructure assumptions used to create the future analysis is consistent with regional plans, but excludes the Proposal, which is part of East Link. The existing and the 2030 no-build conditions are discussed in this policy point to indicate how there is a need for the proposed action. Year 2020 was also analyzed as this project's year of opening to compare with the no-build condition; that analysis is documented in Policy Point 3. The analysis for the selected 2030 design year–while not a 20-year analysis beyond the project implementation—is consistent with the regional and local planning efforts by PSRC, WSDOT, and other agencies and was considered acceptable in assessing the Proposal's effects on the transportation system by the IJR Core Team. Year 2040 land use and travel demand forecasts were not available, nor endorsed, at the time of the analyses.

1.4.3 Measures of Effectiveness

MOEs were selected to help in assessing the Proposal in the context of the established project purpose and objectives. MOEs were created for three different levels: regional, corridor, and operational. Regional and corridor assessment levels were evaluated using travel demand data and provide an overarching assessment of the regional affects of the Proposal. The corridor-level data were applied at two screenlines: Screenline 2 (Lake Washington, including both I-90 and SR 520) and Screenline 3 (I-90 at Mercer Slough). Screenline 2 was established to provide a snapshot on how the Proposal would affect travel conditions across Lake Washington, and Screenline 3 is intended to be used to understand I-90 conditions east of the study area near I-405. Finally, MOEs were assessed at the operational level for freeway operations (throughput,

travel times, LOS, and intersection LOS and ramp vehicle queuing along I-90. Additional screenlines are used in the East Link Final EIS (WSDOT and Sound Transit, 2011); however, they do not cross I-90 and, therefore, are not included in this IJR. MOEs used to evaluate the Proposal's impact on the performance of the transportation system are listed in Table 1-1. The IJR study area, study intersections, and Screenlines 2 and 3 used in these assessments are shown in Figure 1-3.

TABLE 1-1
East Link Transportation Analysis Measures of Effectiveness

Assessment	Elements Analyzed	Measure of Effectiveness
Regional	Ridership	Projectwide East Link ridership
	VMT VHT	System VMT and VHT values
Corridor	Screenline analysis	V/C ratio
	(Note: IJR includes only Screenlines 2 and 3, as shown in Figure 1-3)	Mode share (by persons) Person and vehicle throughput and demand served
Operational	Freeway analysis	LOS and density Travel times (GP, HOV, and transit, rail, and freight) Access modifications
	Intersection analysis	LOS and delay Vehicle queue length
	Ridership	Station ridership patrons (along the I-90 IJR study area)
	Freeway safety	Predictive overall assessment with reversible center roadway conversion Interchange weaving volume assessment
	Transit	Service frequency, hours of service, and passenger Load and reliability LOS, travel times, and transfers

Note: Measures not addressed in this IJR include a safety evaluation of each alignment option, nonmotorized travel, and parking; however, they are included in the East Link Project Environmental Impact Statement.
GP general purpose
HOV high-occupancy vehicle
IJR Interchange Justification Report
LOS level of service
V/C volume-to-capacity ratio
VHT vehicle hours traveled
VMT vehicle miles traveled

The MOEs address the following operational characteristics:

- System efficiency
  - How efficient is the interstate in moving people, now and in the future?

  - In the future, are more people going to be traveling in higher occupant modes?

- Transit reliability
  - What are current and future anticipated travel speeds and travel times for transit, general-purpose, and HOVs, now and in the future?

- Effects on operations and safety
  - Relative to facility capacity, how will the freeway segments operate in the future as compared with now?
  - Will the projected auto demand exceed the I-90 roadway capacity?
  - Will intersection delays and high-demand volumes result in queues that block lanes, extend to adjacent intersections, or extend onto the freeway?

The resulting MOEs were compared with policy objectives; the results are provided in Appendix 3A. Detailed methodology, assumptions, and traffic analysis parameters are provided in the *East Link Project Transportation Methods and Assumptions Memorandum* (CH2M HILL, 2010b) (Appendix 3A) and *East Link Interchange Justification Report Methods and Assumptions* (CH2M HILL, 2010a) (Appendix 3B).

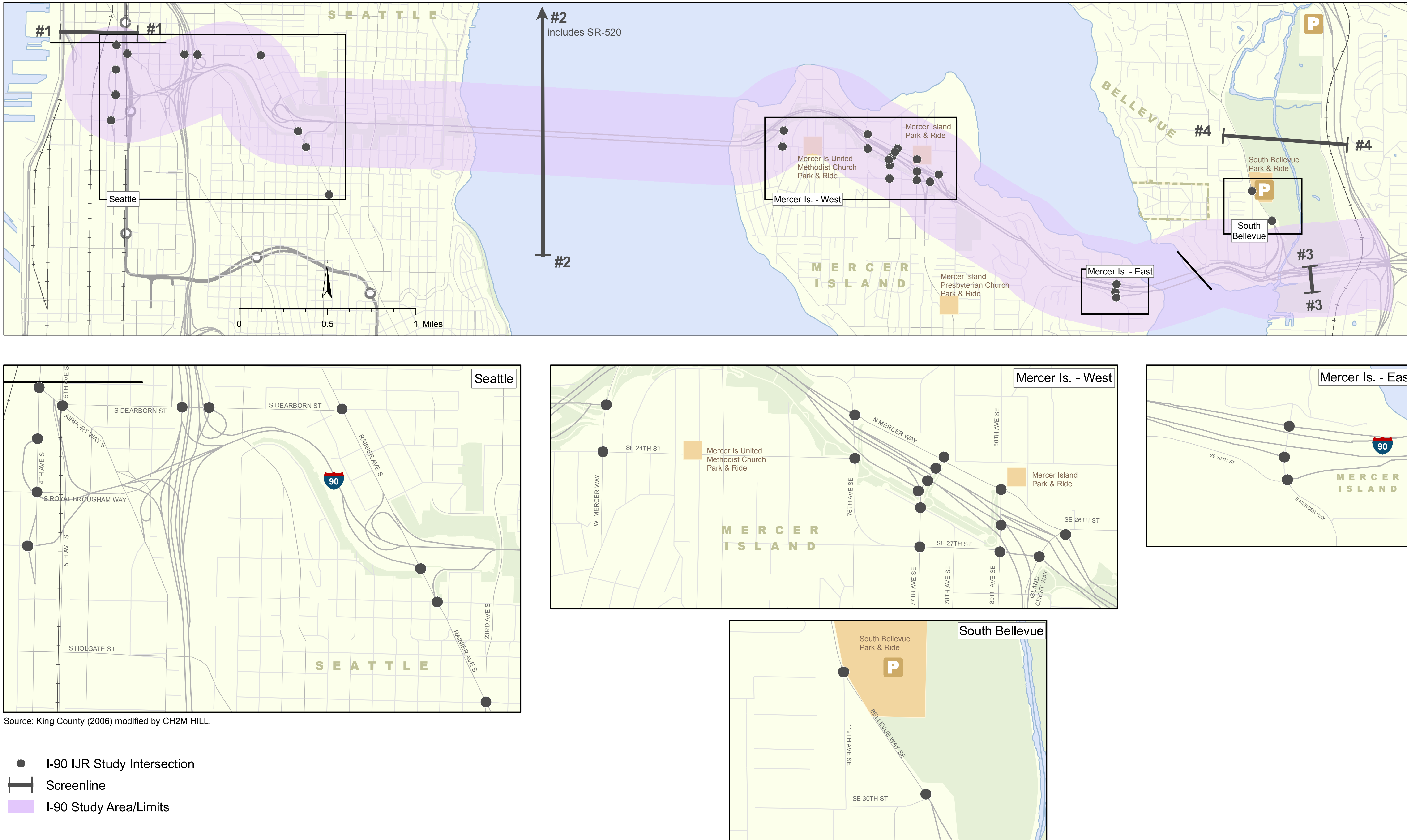
1.4.4 Future Travel Demand

Regional travel conditions and needs were evaluated using travel demand information obtained from the PSRC travel demand model and Sound Transit's transit ridership model, which includes King, Pierce, and Snohomish Counties. Future year analysis provided in this policy point was performed for the design year (2030), based on PSRC's current population and land use forecasts and regional model (spring 2009). For the future, a substantial number of highway and arterial improvements were assumed by 2030.

Table 1-2 lists the transportation programs and/or projects. The no-build project list included in the *East Link Project Transportation Methods and Assumptions Memorandum* (CH2M HILL, 2010b) (Appendix 3A) provides the complete list of future projects assumed by the design horizon (2030). In general, regional funding packages include expanding most of the region's interstate and freeway system (I-5, I-90, SR 520, and I-405) as well as incorporating system management strategies on those facilities. Because the existing conditions analysis was conducted in 2007, projects that were completed between 2007 and 2010 were not included in the existing conditions but were included in all future analysis scenarios.

From the 2030 PSRC forecasts for the no-build conditions, vehicle growth rates were calculated for the I-90 corridor. Table 1-3 presents the 3-hour I-90 vehicle forecasts for 2030. Although the I-90 capacity would be reached before the 2030 design year (as indicated later in this policy point), the demand in the corridor is expected to increase by more than 50 percent by 2030.

As shown in Table 1-3, the overall AM and PM peak-period growth rates the year 2030 are estimated to be between 1 to 2 percent with the higher growth forecasted in the nonpeak direction (eastbound in the morning and westbound in the afternoon). Because of this the directional demand in both peak periods would become more balanced as the population and employment density on the Eastside increases. This further highlights the need for reliable transportation options in both directions between Seattle and the Eastside.



Source: King County (2006) modified by CH2M HILL.

Figure 1-3
I-90 IJR Study Area,
Study Intersections,
and Screenlines
Sound Transit East Link Project

TABLE 1-2
2030 No-Build Condition Transportation Programs and Projects

Program/Project[a]	Comments
Roadway	
Nickel Package	Approved 2003
Transportation Partnership Account	Approved 2005
I-90 Two-Way Transit and HOV Operations Project	Two options considered (with Stages 1 and 2 only and with Stages 1 through 3)
Local Agencies	
CIPs and TFPs	Typically 6-year (or near-term) funding commitments
Comprehensive and transportation plans	Typically 15- to 20-year list of funded and unfunded projects; funded projects included as part of CIP/TFP lists
Puget Sound Regional Council	
Destination 2030[b]	Selected projects included (refer to Appendix 3A)
Transit	
Sound Transit:	
Sound Move Program	Approved 1996
ST2 Program (excluding the Proposal)	Approved 2008
King County Metro:	
Service implementation plans	
Transit service integration plan	Prepared for East Link Project
Transit Now Plan	Approved 2006

[a] Refer to the no-build project list in Appendix 3A for the project list by horizon year.
[b] PSRC's Destination 2030 was the regional planning document during the planning stages of the East Link Project. Since then, PSRC has released and published *VISION 2040 1995 Update* (PSRC, 1995).
CIP Capital improvement program
TFP Transportation facilities plan

TABLE 1-3
Peak-Period Vehicle Demand Forecasts for I-90

Direction	Existing 2007)	Directional Percentage	No-Build (2030)	Directional Percentage	Percent Annual Growth (2007-2030)
AM Peak Period					
Westbound	35,100	55	46,600	53	1.2
Eastbound	28,600	45	41,100	47	1.6
PM Peak Period					
Westbound	33,900	45	55,600	49	2.2
Eastbound	40,900	55	58,400	51	1.6

Source: PSRC (2010b)

1.4.5 Future I-90 Channelization and Ramps

The future I-90 no-build condition includes two variations for the I-90 Two-Way Transit and HOV Operations Project because the construction schedule for the period between the East Link Project and when Stage 3 (constructing HOV lanes in both directions between Seattle and Mercer Island) is completed is not finalized. It is likely that, in the near future, only Stages 1 and 2 will be constructed and operational for a substantial period of time before East Link construction begins. Although the two project schedule's are not finalized, Stage 3 would be constructed before light rail construction. Figure 1-4 provides a schematic of the three stages of this project.

FIGURE 1-4
I-90 Two-Way Transit and HOV Operations Project Stages

In one variation of the no-build condition, the outer roadway HOV lanes on I-90 are assumed to be are completed (to Rainier Avenue South) and associated access modifications built (Stages 1 through 3). This condition, Figure 1-5, would provide a total of ten lanes across the I-90 bridge (three GP and one HOV lane in each westbound and eastbound direction and two HOV lanes in the reversible center roadway). At any one time, six of the ten lanes would operate in one direction.

The other variation of the no-build condition assumed that the HOV lanes were only partially completed (Stages 1 and 2 only). This variation would include new HOV lanes in both directions west from the Bellevue Way interchange to Mercer Island; the floating bridge section of I-90 would remain unchanged. Figure 1-6 provides a schematic of the three stages of the project. Because Mercer Island traffic between Seattle and Mercer Island could be in the reversible center roadway along with HOV (2+-person vehicles), the I-90 outer roadway HOV lanes would be restricted to only 2+-person vehicles.

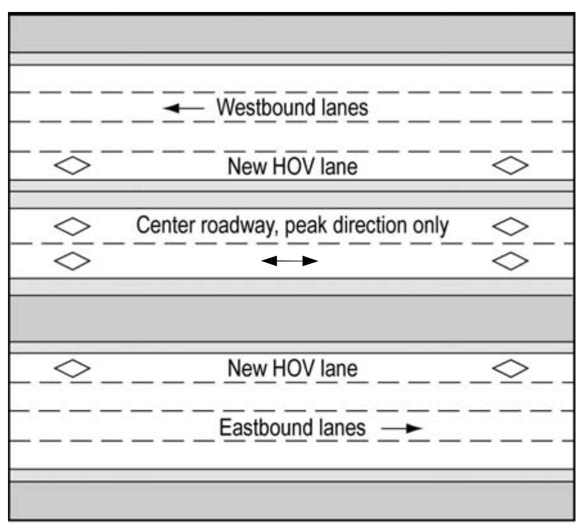


FIGURE 1-5
I-90 Two-Way Transit and HOV Operations Project

In addition to the I-90 Two-Way Transit and HOV Operations Project, the future analysis assumed that the SR 519 South Seattle Intermodal Access Project was completed. This project, which was completed in 2010, modified the I-90 connections with the south Seattle street system. Table 1-4 lists the access modifications for all three stages of the I-90 Two-Way Transit and HOV Operations Project and the SR 519 South Seattle Intermodal Access Project.

TABLE 1-4
I-90 Future Channelization and Access Modifications

	SR 519 Project	I-90 Two-Way Transit and HOV Project	
		Stages 1 and 2	Stage 3
Revise westbound access to Seattle via new ramp connection with Edgar Martinez Drive South, and maintain existing ramp to 4th Avenue South.	X		
Construct I-90 westbound and eastbound HOV lane to outer roadway from Bellevue Way to 80th Avenue SE.		X	
Construct an 80th Avenue SE westbound HOV direct-access off-ramp.		X	
Restripe the I-405 westbound on-ramp to provide an additional I-90 lane to the Bellevue Way westbound on-ramp, extending the auxiliary lane across the East Channel Bridge to the I-405 westbound on-ramp.		X	
Convert the HOV bypass lane on the Bellevue Way westbound on-ramp to a GP lane.		X	
Modify Bellevue Way interchange for two-way continuous HOV operations to and from the west.		X	
Modify the eastbound on-ramp at 80th Avenue SE to connect from the reversible center roadway to the new eastbound HOV lane in the outer roadway.		X	
Add an eastbound I-90 GP lane between East Mercer Way and I-405 interchanges.		X	
Add a westbound and eastbound HOV lane to the outer roadways between 80th Avenue SE and Rainier Avenue South.			X
Construct an eastbound HOV direct-access off-ramp at 77th Avenue SE (note: this location would change with the East Link Project).			X

Source: WSDOT (2011a; 2011b)
GP general purpose
HOV high-occupancy vehicle

As part of I-90 Two-Way Transit and HOV Operations Project, access modifications and improvements to the HOV direct access to and from Bellevue Way SE interchange have been constructed to provide direct access to and from both eastbound and westbound outer roadway HOV lanes throughout the day. Access to the reversible center roadway would continue to vary, depending on time of day. On Mercer Island, this project recently constructed access to the island via an 80th Avenue SE westbound HOV direct-access off-ramp and is currently constructing an eastbound HOV direct-access on-ramp at the same location. At 77th Avenue SE,

an eastbound HOV direct-access off-ramp would also be built, but an HOV connection from downtown Mercer Island to westbound I-90 in the PM peak period would not be provided. In conjunction with East Link, this location of the eastbound HOV direct-access off-ramp would be modified to Island Crest Way, as further described in Policy Points 3 and 4; these access modifications are illustrated in Figure 1-6. Policy Point 7 provides more information about the I-90 Two-Way Transit and HOV Operations Project.

1.5 Existing and Future No-Build Conditions

To determine whether the project need is long-term and would not be resolved by other planned and programmed investments, existing and future (2030) conditions were assessed for the freeway mainline, merge, diverge, and weave operations. The VISSIM microsimulation software was used to assess operations with systemwide MOEs (travel times and throughput) and operational MOEs (segment density and corresponding LOS). Intersection analysis for ramp terminals and adjacent surface street intersections was conducted using Synchro software. Freeway and intersection safety was assessed by comparing accident rates and reviewing accident statistical information (collision analysis corridor [CAC] and collision analysis location [CAL]) data developed by the state.

Future I-90 operations under the no-build condition include two variations of the I-90 Two-Way Transit and HOV Operations Project (Alternative R-8A) because the construction schedules for the period between the East Link Project and Stage 3 of this project are not finalized. Stage 3 is scheduled to be finalized at the end of 2014, and East Link construction on I-90 would begin in early 2015. Section 1.4.5 described in detail these variations.

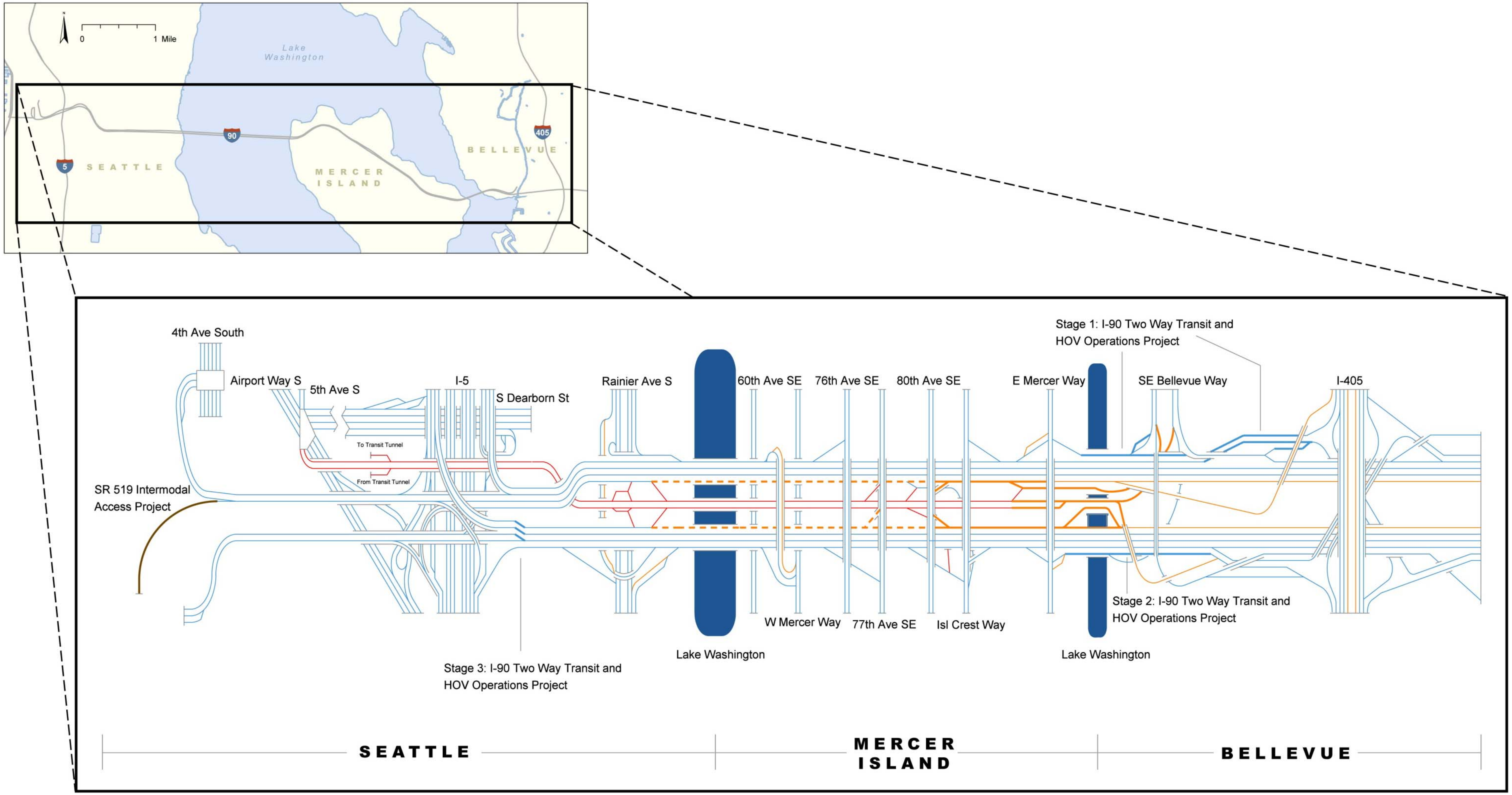
In this policy point, Sections 1.5.1, Regional Analysis Measures of Effectiveness, 1.5.3.4, Intersection Operations, and 1.5.3.5, Transit Performance, provide information only for the no-build condition with the I-90 Two-Way Transit and HOV Operations Project completed through Stage 3 because there would be limited differences between the two no-build conditions for these analyses.

1.5.1 Regional Analysis Measures of Effectiveness

Regional MOEs address needs on a larger scale, from the perspective of the regional trends, rather than an individual facility. Three regional measures consisting of vehicle hours traveled (VHT), vehicle miles traveled (VMT), and transit ridership were identified to address the objective of how effectively people and goods are moving within the region.

1.5.1.1 Vehicle Miles Traveled and Vehicle Hours Traveled

Table 1-5 presents the VHT and VMT for existing and 2030 no-build conditions for the AM and PM peak and nonpeak periods. Currently in the Puget Sound region, vehicles travel more than 70 million miles each day, and all transportation system users have a combined total travel time of close to 2 million hours throughout the day. About 37 percent of the miles traveled and a little more than 40 percent of the hours traveled in the region occur during the combined AM and PM peak periods. By 2030, the regional VMT is expected to increase by over 60 percent and VHT is expected to increase by more than 140 percent. When VHT increases at a higher rate than VMT increases, this suggests that the additional miles being traveled in the future are on congested roadways that are creating longer travel delays, producing higher emissions and resulting in a loss of productivity.



Existing General Purpose Lane/Ramp
General Purpose Lanes constructed after 2007[1]
Future General Purpose Lane/Ramp[2]
HOV - Reversible Direction
Existing HOV Lane/Ramp
Future HOV Lane/Ramp (Stages 1 & 2 of the I-90 Two Way Transit and HOV Operations Project)[2]
Future HOV Lane/Ramp (Stage 3 of the I-90 Two Way Transit and HOV Operations Project)

Sources: http://www.wsdot.wa.gov/Projects/I90/TwoWayTransit/ and I-90 Two-Way Transit and HOV Operations Project
http://www.wsdot.wa.gov/Projects/SR519

Not To Scale

[1]SR 519 Intermodal Access Project
[2]I-90 Two-Way Transit and HOV Operations Project Stage 1 improvments to westbound GP and HOV facilities constructed after 2007. Eastbound GP and HOV facility improvements as part of Stage 2 are currently being constructed.

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FIGURE 1-6
I-90 Future No-build Lane Channelization and Ramps

TABLE 1-5
Existing and 2030 Regional Travel Impact Comparison Summary

Daily Vehicle Miles Traveled			Daily Vehicle Hours Traveled		
Existing (2007)	2030 No-Build	Percent Increase (2007 to 2030)	Existing (2007)	2030 No-Build	Percent Increase (2007 to 2030)
71,760,700	116,690,200	63	1,826,100	4,463,000	144

Source: PSRC (2010b).

1.5.1.2 Transit Ridership

Sound Transit Regional Express buses provide most regional transit service to commuters in the study area. King County Metro provides express and local service throughout King County and most of the local service within the study area. Sound Transit and King County Metro bus services that cross Lake Washington and connect Downtown Seattle to Downtown Bellevue, Overlake, and Downtown Redmond currently serve more than 13,000 daily transit riders (King County Metro, 2008). By 2030, transit ridership to and from these areas (without the Proposal) is expected to grow by about 60 percent. This transit growth, in combination with the increases in VMT and VHT, indicates that there is a growing need for alternative travel choices across Lake Washington because congestion will continue to worsen in the future and people will look for a more efficient and reliable mode of travel.

1.5.2 Corridor Analysis Measures of Effectiveness

As described in Section 1.4, Analysis Parameters and Assumptions, two screenlines were created to identify trends in cross-lake travel between Seattle and the Eastside communities. These two screenlines—Screenline 2 (SR 520 and I-90 across Lake Washington) and Screenline 3 (I-90 at Mercer Slough)—can be viewed in Figure 1-3. Screenline 2 data in this section (1.5.2, Corridor Analysis Measures of Effectiveness) include both I-90 and SR-520, while Screenline 3 data include only I-90. To provide a snapshot of future PM peak-hour conditions at each screenline, volume-to-capacity (V/C) ratio and mode share data from the regional travel demand model are provided. Mode share information is provided for SOV, HOV, and transit travel.

1.5.2.1 Volume-to-Capacity Ratio

Screenline 2: Lake Washington (Includes I-90 and SR 520)

Under the existing conditions, the PM peak-hour V/C ratios across Lake Washington on I-90 are above 0.90 and near 1.0 and slightly less in the AM peak hour. This indicates that travel conditions across the lake during the PM peak hour are at capacity and that there is minimal capacity to accommodate future demand. In the future, the V/C ratios crossing Lake Washington (across Screenline 2) would increase in comparison with today's highly congested conditions (above 0.90), although some V/C ratio improvements are expected when the I-90 Two-Way Transit and HOV Operations Project and SR 520 Bridge Replacement and HOV Project are completed. Table 1-6 lists existing and future V/C ratios at Screenlines 2 and 3. Overall, future auto demand on I-90 is expected to continue to grow (as indicated in Table 1-3), but the ability to accommodate this demand is constrained by roadway capacity. This condition typically lengthens the peak period into additional hours, thereby spreading congestion.

TABLE 1-6
Existing and 2030 No-Build AM and PM Peak-Hour Screenline Volume-to-Capacity Ratios

Screenline	Direction	Existing		2030 No-Build[a]		2030 No-Build[b]	
		AM	PM	AM	PM	AM	PM
Screenline 2: Lake Washington (I-90 and SR 520)	Westbound	0.93	0.99	0.97	1.22	0.93	1.13
	Eastbound	0.81	0.91	1.01	1.09	0.96	1.02
Screenline 3: I-90 (at Mercer Slough)	Westbound	0.58	0.58	0.67	0.66	0.67	0.70
	Eastbound	0.37	0.62	0.49	0.83	0.51	0.82

[a] No-build condition with Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
[b] No-build condition with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
Source: PSRC (2010b); Sound Transit (2010b)

Screenline 3: Interstate 90 (at Mercer Slough)

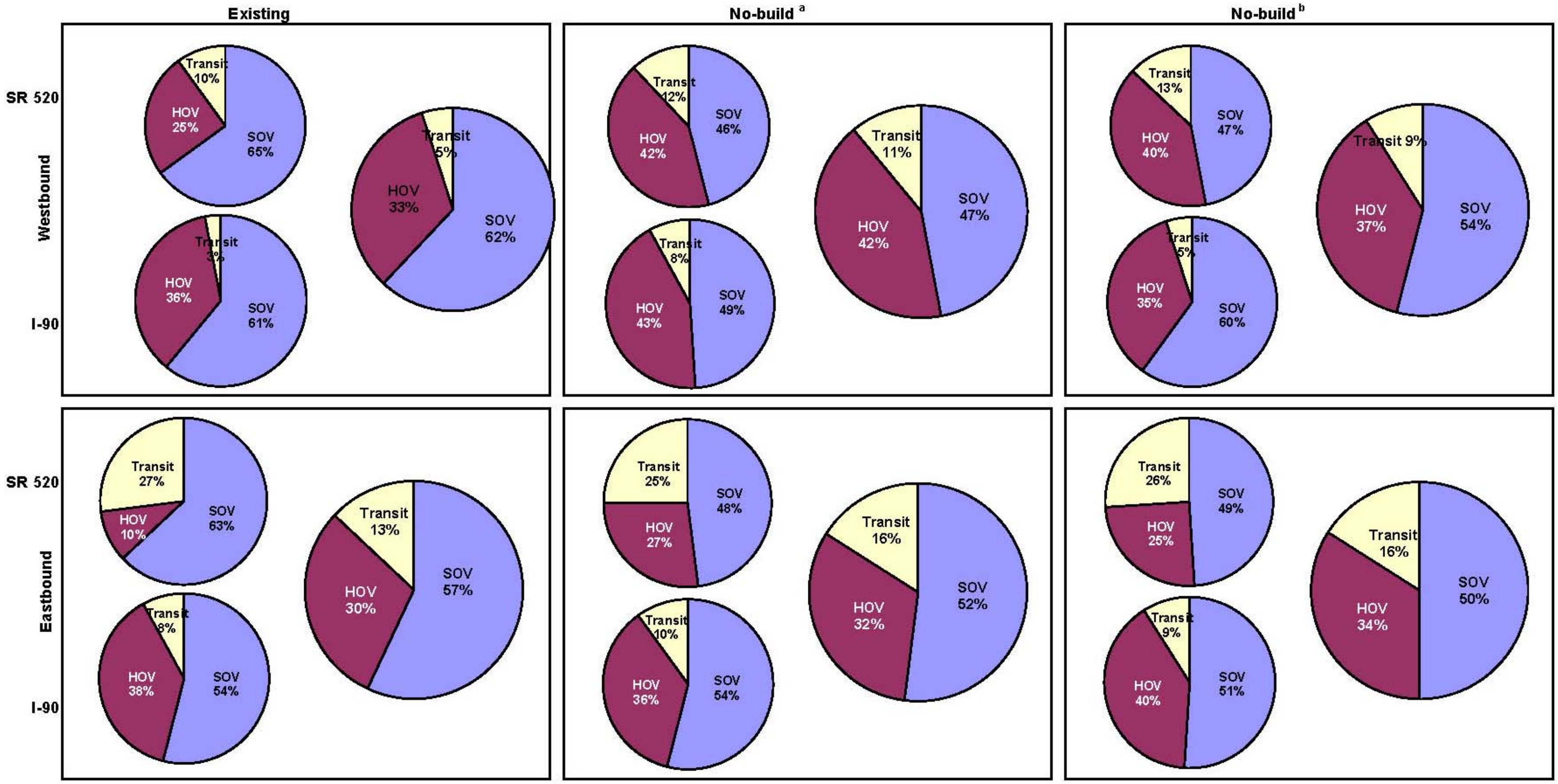
Future PM peak-hour congestion would remain similar to existing conditions, and future AM peak-hour congestion would increase by about 0.10 over existing conditions at Screenline 3. The V/C ratios at Screenline 3 do not indicate as much congestion as forecast at Screenline 2 because of the I-90 collector-distributor system between Bellevue Way and I-405 interchanges that provides additional capacity to facilitate weaving movements. No noticeable changes are expected in the V/C ratios between the two no-build conditions because HOV lanes already cross this screenline in both directions on I-90.

1.5.2.2 Mode Share (by persons)

Screenline 2: Lake Washington (Includes I-90 and SR 520)

As expected with more congestion in the future, the demand forecasts indicate a shift in mode share toward more people using HOV and transit modes in the no-build conditions. With the I-90 Two-Way Transit and HOV Operations Project completed, a similar HOV mode share on I-90 is predicted compared with the no-build condition, with only Stages 1 and 2 completed. Overall, the HOV mode share across Lake Washington (combined SR 520 and I-90) is expected to stay relatively constant compared with existing conditions, and the transit mode share across Lake Washington is expected to increase by 35 to 50 percent by 2030. The cause of the greater increase in transit mode share compared with that of HOV is the nature of the modes. HOV trips are an indicator of convenience rather than choice. This was indicated by the recent PSRC Regional Household Activity Survey, which indicated that the HOV mode share over the last 7 years has not increased, while the transit mode share has had noticeable growth (PSRC, 2007b). Overall, in the 2030 PM peak hour, less than 60 percent of the people crossing Lake Washington will be in an SOV.

Figure 1-7 shows the Screenline 2 mode share (including SR 520 and I-90 separated) for existing and 2030 no-build conditions. I-90 and SR 520 mode shares are separated in Figure 1-7 to highlight the slight increase in HOV usage on I-90 with the I-90 Two-Way Transit and HOV Operations Project completed. AM peak-hour mode share information is provided in Appendix 3D and indicate similar trends described in the PM peak hour.



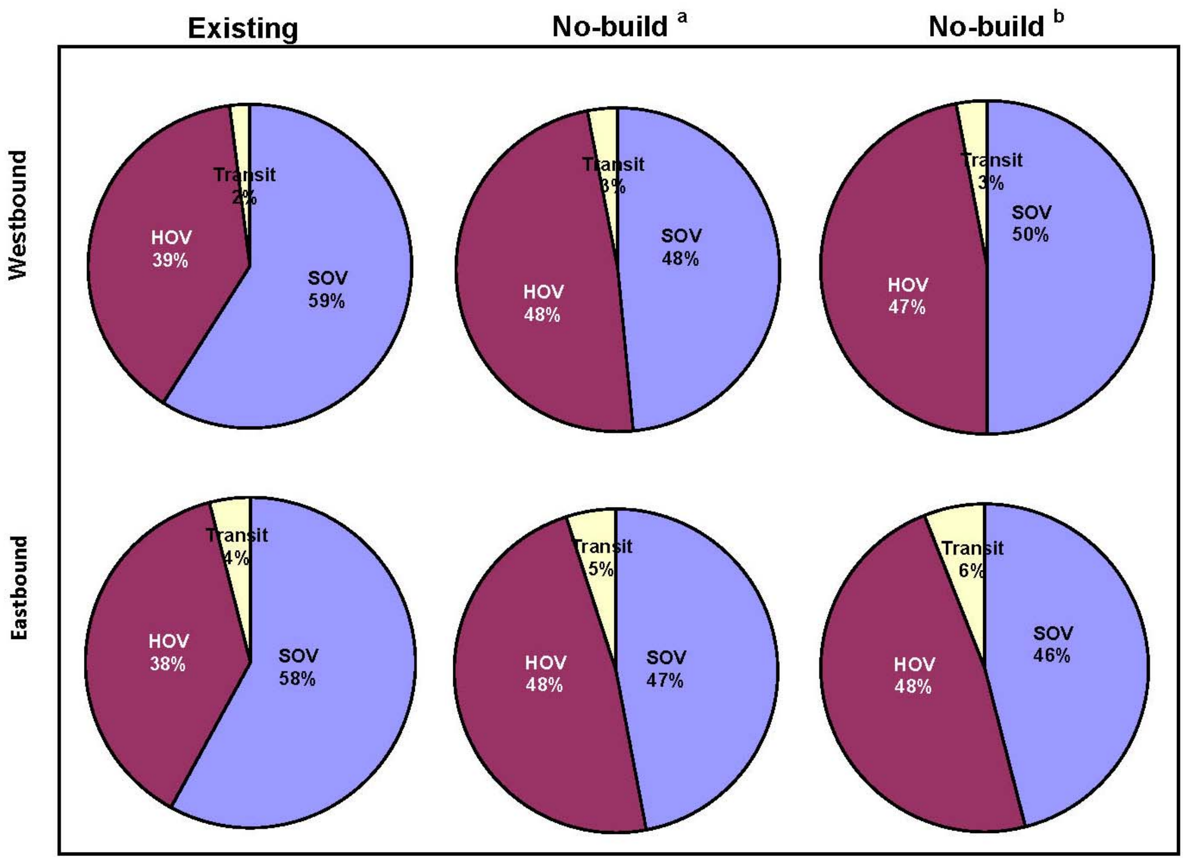
Notes:
[a] No-build condition with Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
[b] No-build condition with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
Larger pie chart provides mode share data for both I-90 and SR-520.
HOV high-occupancy vehicle
SOV single-occupant vehicle

FIGURE 1-7
Screenline 2 (Lake Washington) with I-90 and SR 520 Separated
Existing and 2030 No-Build PM Peak-Hour Mode Share (People)

Compared with existing conditions, the HOV percentages on SR 520 will increase in 2030 and become similar to the HOV usage on I-90 because SR 520 is planned to be rebuilt with HOV lanes in both directions. By 2030, the SOV mode share is expected to be 50 to 60 percent on I-90, and the SOV mode share on SR 520 is expected to be reduced by 45 to 50 percent.

Screenline 3: Interstate 90 (at Mercer Slough)

At Screenline 3 (Figure 1-8), HOV and transit mode share percentages will increase slightly in the future when compared with existing conditions. This is because with the I-90 Two-Way Transit and HOV Operations Project completed, more HOV vehicles will be drawn to the HOV system from the west than occurs under existing conditions. Overall, the SOV mode share slightly declines in the future conditions as people alter their mode choice and use either HOV or transit modes.



Notes:
[a] No-build condition with Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
[b] No-build condition with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
HOV high-occupancy vehicle
SOV single-occupant vehicle

FIGURE 1-8
Screenline 3 (I-90 at Mercer Slough) Existing and 2030 No-Build PM Peak-Hour Mode Share (People)

1.5.3 Operational Analysis Measures of Effectiveness

The operational analysis was conducted from the perspective of the individual facilities within the study area; these facilities are the three I-90 roadways (westbound outer roadway, eastbound outer roadway, and the reversible center roadway) and intersections. These

assessments compare the 2007 existing condition with the 2030 design year condition to determine the extent of operational deficiencies and confirm that deficiencies will not be resolved by other anticipated infrastructure investments. Freeway operations were analyzed in Sections 1.5.3.1 through 1.5.3.3 for three key MOEs:

- Vehicle and person throughput
- Density and its corresponding LOS
- Travel time or speed (as illustrated in speed temporal charts or congestion maps)

The intersection operations analysis (Section 1.5.3.4) focuses on the future intersection LOS. The transit analysis (Section 1.5.3.5) describes the future reliability of transit service on I-90.

1.5.3.1 Person and Vehicle Throughput

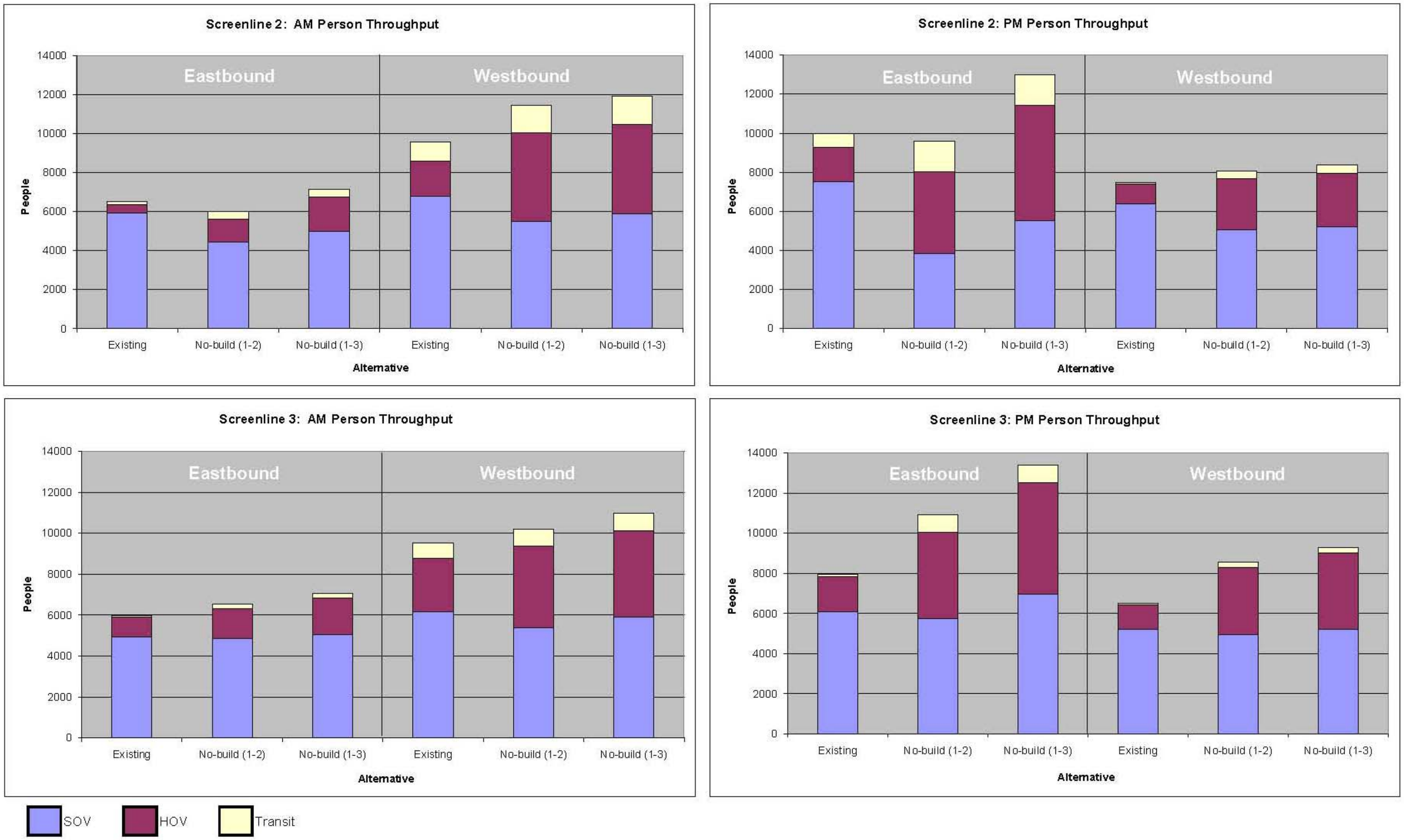
Person and vehicle throughput indicate the number of people and vehicles that cross a theoretical screenline. Although both were measured, the movement of people is a measure of the facility efficiency of I-90. Throughput information is described in this IJR for Screenline 2 (Lake Washington) and Screenline 3 (Mercer Slough) for the SOV, HOV, and transit modes. Person throughput was estimated by using the average I-90 automobile and transit occupancy statistics from available data from WSDOT and King County Metro. Appendix 3F provides detailed person and vehicle throughput statistics (by directional vehicle and lane type).

Although person and vehicle throughput across the lake will increase with the I-90 Two-Way Transit and HOV Operations Project completed, this project will not fully accommodate the predicted growth on I-90 in the future. By 2030, demand on I-90 will increase by more than 50 percent from today; however, this demand is constrained by the I-90 vehicle capacity because the person throughput across the lake is expected to increase by, at most, 10 percent under the future no-build condition. In the future, using the reversible center roadway will continue to operate under capacity because the limited access to the center roadway is constrained by the congested I-90 mainline roadways and arterial streets that include traffic signals. These constraints fail to move high volumes of people to and from key urban centers across the lake.

Person Throughput

Increasing person throughput is a function of increased demand that reflects growth in population and employment. In contrast to vehicle throughput (described later in this section), person throughput can continue to increase through higher-occupancy modes (such as transit) even if a facility is physically constrained. Nowhere is this better portrayed than in Figure 1-9, which shows limited growth in person-trips in the SOV mode. Most growth will occur in HOV person-trips where new capacity is provided, as well as with transit, which will become faster (especially in the traditional reverse peak direction) as a result of providing HOV lanes in each direction.

The HOV lanes in both directions on I-90 will improve transit service on this facility but will not resolve the failing (LOS F) transit reliability because the arterial streets to and from the urban centers and I-90 continue to be congested in the future. As shown in Figure 1-9, growth in person movement is greater in the traditional peak direction because a portion of the growing demand will take advantage of the HOV lanes. Figure 1-9 also shows an increase in person movements between Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project and the buildout with Stages 1 through 3; this is a result of improved access into and out of the new HOV lanes.



Note:
No-build condition with Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
No-build condition with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
Values represent the total number of vehicles for that mode crossing the screenline, not the amount in each lane.

FIGURE 1-9
Existing and 2030 I-90 Peak-Hour Person Throughput at Screenline 2 (Lake Washington) and Screenline 3 (I-90 at Mercer Slough)

Under the existing condition, close to 16,100 people travel across Lake Washington on I-90 in both directions during the AM peak hour, with 3,300 (about 20 percent) of these people in the reversible center roadway. In the PM peak hour, about 17,500 people travel I-90 in both directions, with about 3,500 (20 percent) of these people in the reversible center roadway. Figure 1-9 shows the existing and future no-build AM and PM peak-hour person throughput at Screenlines 2 and 3.

Screenline 2: Lake Washington (Includes I-90 only)

Not surprisingly, person throughput at Screenline 2 in the future only shows noticeable increases in HOV and transit modes; this is because SOV travel either stays similar to existing conditions or gets slightly lower in the future due to capacity already close to being reached and congestion worsening. Compared with existing conditions, person throughput would not increase substantially if only Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project were completed because there would be no operational change to the I-90 roadway across the lake under this condition. In 2030, the highest increase in throughput (AM westbound direction) is about 20 percent, with only Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project constructed. With the I-90 Two-Way Transit and HOV Operations Project completed (through Stage 3), person throughput is expected to increase by 10 to 30 percent in the future, mainly due to new capacity from an HOV lane provided in each direction across the lake, thereby increasing HOV throughput. Person throughput in the GP lanes is not expected to increase from existing conditions because congestion in these lanes will increase in the future, constraining travel across the lake.

Screenline 3: Interstate 90 (at Mercer Slough).

Compared with existing conditions, person throughput at Screenline 3 will increase with either of the two no-build conditions because there is an increase in the number of people traveling in HOVs and buses across Screenline 3 (Figure 1-9). In 2030, the highest person throughput is expected in the PM peak period, with a 30 to 70 percent increase predicted. Compared with Screenline 2, this is a substantial increase in throughput, with only a 12 percent increase expected in the westbound direction and a 30 percent increase in the eastbound direction. This further indicates that comparing travel patterns between Screenlines 2 and 3 is difficult, and Screenline 3 changes do not provide an accurate assessment of how well people are able to cross Lake Washington. Completing the I-90 Two-Way Transit and HOV Operations Project would provide an increase in person throughput as a result of the addition of HOV lanes in Stage 3. The largest growth would occur in the PM eastbound direction, in which an increase of more than 20 percent in person throughput would occur when Stage 3 is constructed.

Vehicle Throughput

Vehicle throughput is a function of increasing demand, consistent with population and employment growth and physical capacity or constraints. Where the existing roadway is already at or over capacity, there is little room for growth in vehicle throughput. In existing conditions, slightly more than 55 percent of the total vehicles on I-90 travel in the peak direction (westbound in the AM peak hour and eastbound in the PM peak hour). In the AM peak hour, slightly fewer than 13,000 vehicles travel on I-90; in the PM peak hour, slightly more than 13,500 vehicles travel on I-90. In both AM and PM peak hours, the center roadway accommodates less than 15 percent of the total vehicles on I-90 because of its limited access points that are connected to congested freeway lanes and arterial streets.

Screenline 2: Lake Washington (Includes I-90 only)

The total number of vehicles crossing Screenline 2 in the 2030 no-build condition with only Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project constructed would be similar in the AM peak period and would reduce by approximately 11 percent in the PM peak when compared with existing conditions (as indicated in Table 1-7). The lack of increase in vehicle throughput is to be expected because I-90 across the lake is already near capacity in both directions, and with this condition, there are no improvements to I-90 across Lake Washington. As congestion increases and additional capacity is not provided across the lake, SOV throughput would be the same or less than under existing conditions. This would occur in the eastbound direction during the PM peak hour as I-90 reaches capacity near the Mount Baker Tunnel and center roadway usage is constrained because of the arterial connections from South Seattle and the congestion in the GP lanes near Mount Baker Tunnel.

TABLE 1-7
Existing and 2030 No-Build I-90 Vehicle and Person Peak-Hour Throughput at Screenlines 2 and 3

	Screenline 2: Lake Washington					Screenline 3: I-90 at Mercer Slough				
	Vehicles					Vehicles				
Direction	SOV	HOV[c]	Transit	Total	Persons Total	SOV	HOV[c]	Transit	Total	Person Total
AM Westbound (outer mainline roadway)										
Existing	5,300	150	7	5,450	6,250	6,150	1,000	25	7,200	9,550
No-build[a]	4,750	750	0	5,500	6,300	5,400	1,900	33	7,300	10,200
No-build[b]	5,050	1,350	0	6,400	7,900	5,900	2,000	33	7,950	10,950
AM Westbound (reversible center roadway)										
Existing	650	1,050	26	1,750	3,350	N/A	N/A	N/A	N/A	N/A
No-build[a]	750	1,400	34	2,200	5,150	N/A	N/A	N/A	N/A	N/A
No-build[b]	850	850	35	1,700	4,050	N/A	N/A	N/A	N/A	N/A
AM Eastbound										
Existing	5,100	400	5	5,500	6,500	4,950	350	3	5,300	6,000
No-build[a]	4,400	550	12	4,950	6,000	4,850	650	12	5,500	6,550
No-build[b]	5,000	800	13	5,800	7,150	5,050	800	10	5,850	7,050
PM Westbound										
Existing	5,200	850	3	6,000	7,500	5,200	800	2	6,000	6,500
No-build[a]	5,050	1,150	13	6,200	8,050	4,950	1,450	13	6,400	8,550
No-build[b]	5,200	1,200	14	6,400	8,400	5,200	1,650	13	6,850	9,250
PM Eastbound (reversible center roadway)										
Existing	900	950	21	1,850	3,450	N/A	N/A	N/A	N/A	N/A
No-build[a]	300	1,100	37	1,450	3,900	N/A	N/A	N/A	N/A	N/A
No-build[b]	500	1,400	37	1,950	4,950	N/A	N/A	N/A	N/A	N/A

TABLE 1-7
Existing and 2030 No-Build I-90 Vehicle and Person Peak-Hour Throughput at Screenlines 2 and 3

Direction	Screenline 2: Lake Washington					Screenline 3: I-90 at Mercer Slough				
	Vehicles				Persons Total	Vehicles				Person Total
	SOV	HOV[c]	Transit	Total		SOV	HOV[c]	Transit	Total	
PM Eastbound (outer mainline roadway)										
Existing	5,400	250	2	5,650	6,500	6,100	1,150	4	7,250	7,950
No-build[a]	3,500	850	0	4,350	6,550	5,750	2,000	35	7,800	10,950
No-build[b]	4,800	1,350	0	6,100	8,000	6,950	2,600	35	9,600	13,400

Note: As a result of rounding, values might not sum correctly.
[a] No-build condition with Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
[b] No-build condition with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
[c] HOV values are the total number of HOVs crossing the screenline, not the amount only in the HOV lanes.
HOV high-occupancy vehicle
N/A not applicable
SOV single-occupant vehicle

The I-90 Two-Way Transit and HOV Operations Project, completed as part of the no-build condition, would provide an additional lane of HOV capacity in each direction across the lake, and therefore, vehicle throughput would increase. By 2030, the highest increase in vehicle throughput would be 12 percent in the westbound direction during the AM peak hour. The other directions (AM and PM) are expected to have a 7 percent or less increase in vehicle throughput compared with existing conditions.

By 2030, the traffic volume in the reversible center roadway would increase by only 5 to 20 percent (only 100 to 400 vehicles), but would continue to operate well under capacity (across the lake) because of its limited access to congested arterial and freeway roadways. These connections would be provided by ramps with the outer mainline roadways and through a traffic signal at the intersection of 5th Avenue South and South Dearborn Street. These poor connections would not provide enough capacity to effectively use the two freeway lanes in the reversible center roadway. By 2030, 2,200 vehicles or fewer are expected to use the reversible center roadway.

In the PM peak period, evidence of congestion affecting entry into the reversible center roadway is clear because the number of SOVs decreases in both no-build conditions compared with the existing conditions (as indicated in Table 1-7). This is caused by the eastbound congestion near the Mount Baker Tunnel creating a bottleneck that reduces drivers' ability to enter the reversible center roadway.

Screenline 3: Interstate 90 (at Mercer Slough)

Even with the assumed capacity provided by the I-90 Two-Way Transit and HOV Operations Project, the vehicle throughput at Screenline 3 would increase by about 10 percent or less over existing conditions for most peak directions; the eastbound PM peak period shows an increase of slightly more than 30 percent with the completion of Stages 1 through 3. Most of the vehicle throughput increase experienced at this location is associated with an increase in HOV throughput. The SOV throughput at this location shows little change compared with existing conditions because of the anticipated continuation of high congestion levels and, in some cases,

less change than under existing conditions as a result of the substantial congestion experienced. Table 1-7 shows these vehicle throughput trends.

Completion of Stages 1 through 3 would result in a higher vehicle throughput compared with Stages 1 and 2 only, particularly in the PM eastbound direction. The highest increase in vehicle throughput is in the traditional peak direction (AM westbound and PM eastbound), because there is growing demand and capacity that can be filled up. By 2030, the HOV throughput at Screenline 3 is expected to double from existing conditions in most directions. Future person and vehicle throughput trends differ between Screenlines 2 and 3 because of three complicating factors: (1) the outer roadway HOV lanes are already provided across Screenline 3, (2) the center roadway lanes merge with the outer roadways west of Screenline 3, and (3) the Mercer Island and Bellevue Way interchanges change the travel patterns of traffic entering and leaving I-90.

1.5.3.2 Freeway LOS and Travel Speeds

In conjunction with the other freeway analytical measures presented in this policy point, freeway operations, in terms of LOS, are also measured. LOS is a function of demand and capacity. Because of the urban, congested character of I-90, the analysis used a simulation model software (VISSIM) rather than deterministic modeling. This provides a better understanding of how each phase of I-90 improvements affects vehicle capacity bottlenecks and the operations upstream and downstream of them. In many situations, capacity improvements (or congestion relief) projects will improve driver conditions (faster travel times, greater throughput) although freeway LOS densities might increase in some segments; this is because bottlenecks that form congestion are removed, which increases traffic flow downstream and allows more vehicles to reach their destination sooner. WSDOT has established a desirable freeway LOS of D in urban areas and a desirable HOV lane-operating speed of 45 miles per hour (mph). LOS is determined in VISSIM based on the Transportation Research Board's (TRB's) *Highway Capacity Manual* (HCM)-equivalent freeway density (passenger cars per mile per lane [pcphpl]) calculation (TRB, 2000). The freeway LOS figures in Appendix 1B illustrate existing and 2030 no-build condition volumes (throughput), density, and LOS from VISSIM along I-90 within the Proposal's IJR study area.

The LOS on I-90 mainline (Tables 1-8 and 1-9) and the congestion diagrams in Figure 1-10 illustrate that 2030 no-build conditions are expected to degrade from existing conditions and generally operate at LOS F. On Figure 1-10, LOS E and F conditions (speeds at or below 55 mph) can be considered where areas of yellow, red, and black occur. LOS D or better conditions can be considered where areas of green (vehicles speeds higher than 55 mph) occur.

Overall, congestion (LOS E and F conditions) in the future is expected to occur for longer durations and throughout most of the study area. The most obvious observation is that the center roadway will rarely fall below LOS B, even with substantial congestion on the outside roadways because the access into the center roadway is limited by connections that are surrounded by congested mainline ramps and arterials. This is highlighted in Figure 1-11, which indicates that the operating conditions in the 2030 PM peak hour for each lane type (GP, HOV, and center roadway). As auto demand becomes equal between the eastbound and westbound directions and is not completely resolved with the I-90 Two-Way Transit and HOV Operations Project, congestion both directions will continue to increase, especially in the traditional reverse peak direction (eastbound in the AM and westbound in the PM).

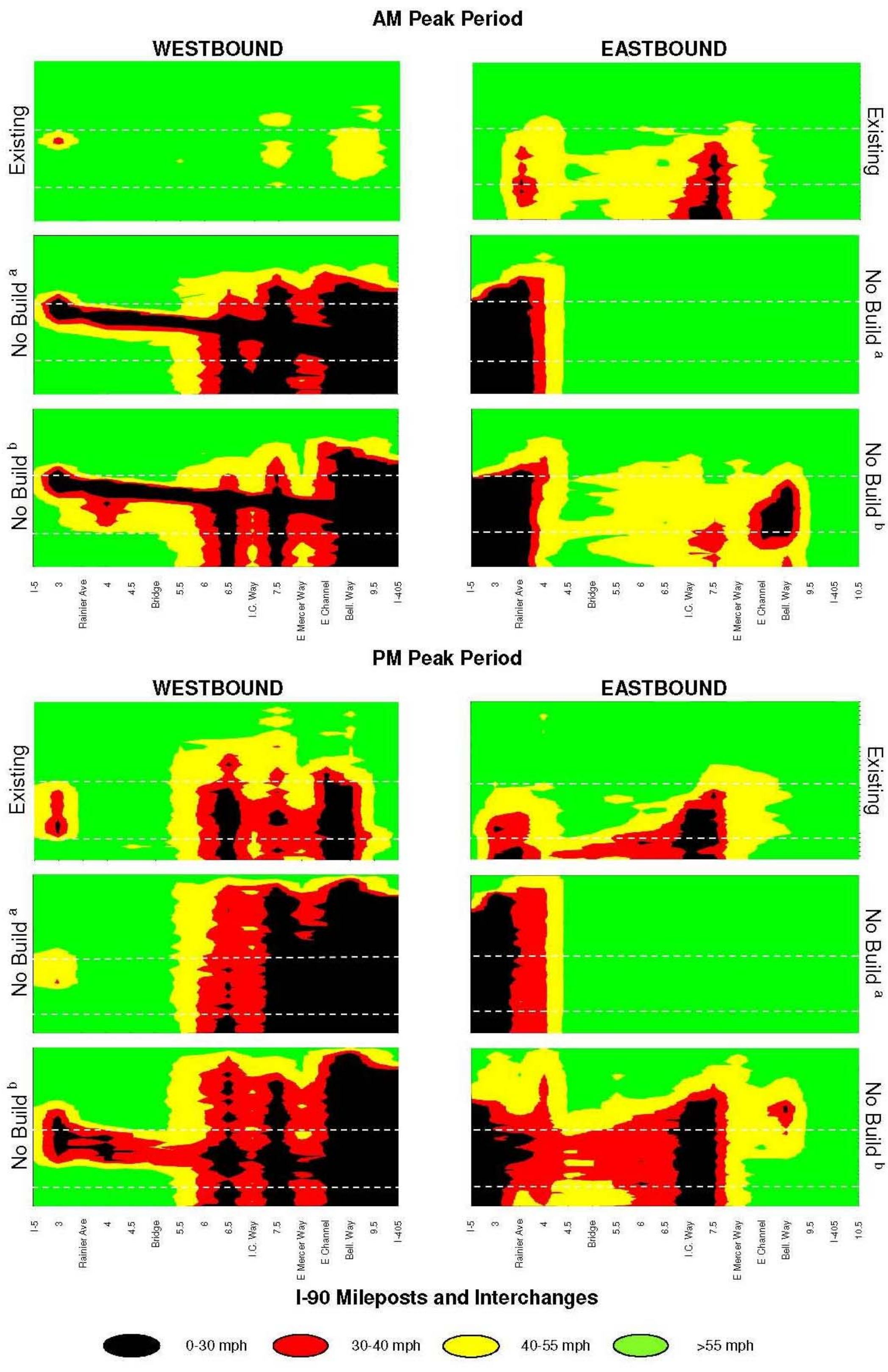


FIGURE 1-10
I-90 Existing and 2030 No-build AM and PM Peak-period Congestion Maps

As indicated in Figure 1-11, the eastbound center roadway and outer roadway HOV lanes will operate mainly in free-flow conditions, while the westbound lanes will operate in slower conditions with substantial congestion, especially in the GP lanes. For the complete set of existing and future 2030 no-build condition congestion maps, refer to Appendix 3H. These maps indicate the GP lanes, outer roadway HOV lanes, and the center roadway performance.

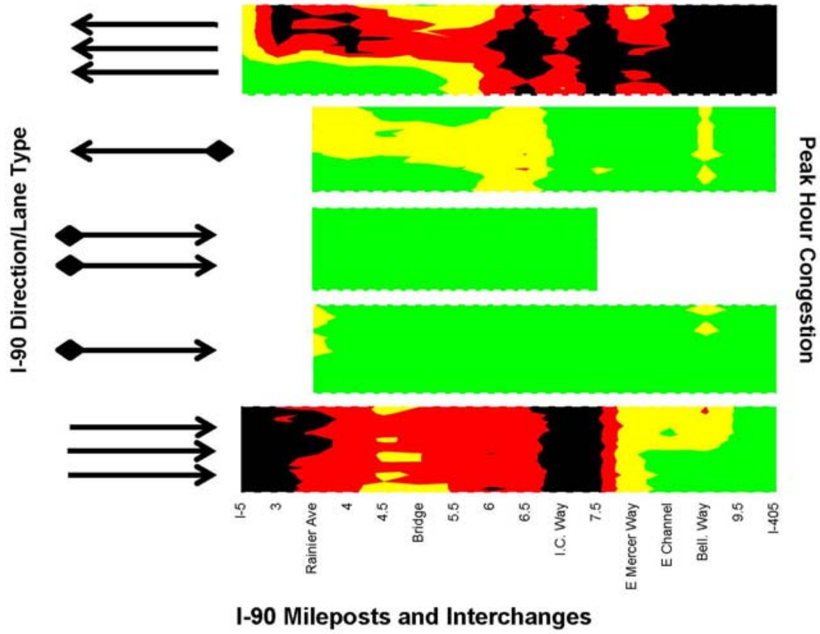


FIGURE 1-11
2030 PM Peak-Hour No-Build Congestion by Lane Type

AM Peak-Hour LOS

GP Lanes LOS

As indicated in Table 1-8, in the existing AM conditions the majority of I-90 (in both westbound and eastbound directions) will operate between LOS D and F between the I-5 and Bellevue Way interchanges. West of I-5, at the I-90 terminus, I-90 will operate fairly well because volumes are low. East of Bellevue Way, a collector-distributor system splits volumes between I-405 and I-90, so that congestion would be reduced. In the AM peak hour, the reversible center roadway operates in the westbound direction. Most sections of the center roadway will operate at LOS B or better, even though the westbound mainline operates at LOS F through most of the study area. The highest vehicle densities in the center roadway occurs at the western terminus near the Rainier Avenue South interchange.

In 2030 for both no-build conditions with and without Stage 3 of the I-90 Two-Way Transit and HOV Operations Project, I-90 will operate at LOS F in both westbound and eastbound directions during the AM peak hour (Table 1-8). The only areas on I-90 that will not operate at LOS F are in the eastbound direction, east of the Mount Baker tunnel for the No-build condition that only assumes Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operation Project are completed. This would be caused by a bottleneck that is formed near Mount Baker tunnel where the demand exceeds the capacity and constrains throughput. Other areas that operate acceptably include I-90 eastbound, west of the I-5 interchange and east of the I-405 interchange in both directions for both of the No-build conditions.

Providing an HOV lane in each direction across the lake (Stage 3) would improve throughput and vehicle travel times, but it would not necessarily improve the freeway segment densities and corresponding LOS in the GP lanes since this project helps to reduce some bottlenecks, thereby increasing vehicle throughput and creating higher vehicle densities elsewhere. These

poor operating conditions are also indicated in Figure 1-10, which demonstrates that vehicles speeds will be less than 40 mph for most of the study area in the peak hour.

HOV Lanes LOS

In addition to the general I-90 operating conditions, the performance of the HOV lanes were evaluated to identify where they would fail to meet WSDOT's HOV policy of a 45-mph speed threshold. During the AM peak period in the 2030 no-build condition, the westbound HOV lane would meet the State's performance threshold except immediately west of Island Crest Way and near the Rainier Avenue South interchange. The eastbound HOV lane for the 2030 no-build condition would meet the State's performance threshold throughout the corridor except near the Rainier Avenue South interchange. The westbound and eastbound HOV lane congestion that would occur near the Rainier Avenue South interchange is where the HOV lanes transition to/from a GP lane and where the center roadway merges/diverges from the outer mainline roadway. In addition, the HOV lanes near Island Crest Way are expected to operate at less than 45 mph slightly under the 90 percent requirement (88 percent.)

In the future, the center roadway (with only Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project completed) will operate similarly to existing conditions, at LOS B or better. When Stage 3 of this project is constructed, a merging condition will be created near the Mount Baker Tunnel with the new HOV lane in the outer westbound roadway, so that the LOS for the reversible center roadway through the Mount Baker Tunnel will degrade to LOS F. This congestion will affect the performance of buses that use the center roadway because about 1 minute of additional delay will be incurred, as discussed in Section 1.5.3.3, Freeway Travel Times. This congestion further highlights the constraints of the I-90 center roadway because the capacity, and performance of this facility will be limited by the congested operations surrounding its accesses.

PM Peak-Hour LOS

GP Lanes LOS

In the existing PM conditions, most segments of I-90 operate poorly at LOS F between I-5 and the Bellevue Way ramps, as indicated in Table 1-9. West of I-5, I-90 operates fairly well because volumes are low. East of Bellevue Way, a collector-distributor system splits volumes between I-405 and I-90, so congestion is reduced in the eastbound direction.

In year 2030, east of the Mount Baker tunnel, with only the I-90 Two-Way Transit and HOV Operations Project Stage 2 completed, eastbound congestion is expected to be less, compared with the condition assuming Stage 3 of the project is constructed, due to the substantial bottleneck that is created at the Mount Baker tunnel. The lack of an HOV lane at this location would create a bottleneck that substantially reduces the amount of vehicular demand that can be served, thus creating more queuing to the west of the tunnel and less congestion to the east of the tunnel. With the HOV lane constructed, vehicle densities would improve near the Mount Baker tunnel, but the area would continue to operate at LOS F. East of the Mount Baker tunnel area, the I-90 GP lanes would operate at LOS F because of the higher vehicle throughput as described earlier in AM Peak-hour LOS discussion.

In the westbound direction, in 2030, most I-90 segments will operate at LOS F east of the I-405 interchange to the I-5 interchange with either no-build condition (with Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project built or with all stages of this project built). With Stage 3, some I-90 segments are expected to have improved operations, highlighted by lower

vehicle densities, but these areas are still expected to operate at LOS F conditions. These degrading I-90 operations are highlighted in Figure 1-10, where stop-and-go conditions (0 to 30 mph, black areas) are substantial east of Mercer Island. This substantial congestion is caused by demand in the reverse peak direction exceeding capacity and is not addressed by the I-90 Two-Way Transit and HOV Operations Project. Similar to the westbound direction, the eastbound direction in both the 2030 no-build conditions will be worse (LOS F) than existing conditions between the I-5 and I-405 interchanges. These conditions are further highlighted in Figure 1-10, where stop-and-go operations (black areas) are experienced near Rainier Avenue South/Mount Baker tunnel area and through Mercer Island.

HOV Lanes LOS

During the PM peak period, the westbound HOV lane in the 2030 no-build condition would have some increased congestion between Island Crest Way and Rainier Avenue South. In the 2030 build condition, the westbound HOV lane would meet WSDOT HOV policy in all areas, except near Rainier Avenue South where a small amount of congestion would be expected to occur as the lane transitions from an HOV lane to a GP lane. In the 2030 no-build condition, the eastbound HOV lane would meet WSDOT HOV policy. In the 2030 build condition, the HOV lane would perform similar to the no-build condition except that it would operate worse at the transition to an HOV lane near Rainier Avenue South for the same reasons described in the AM peak period. The center roadway in both 2030 no-build conditions will operate as it does today (generally LOS B or better) except in the AM peak period at the merge with the westbound outer roadway.

1.5.3.3 Freeway Travel Times

Travel time paths between Seattle and Mercer Island, Bellevue Way, and I-405 were established to understand both regional and shorter distance trips. Specifically, the I-90 travel times were computed to and from three travel areas in the study area: I-90 between Island Crest Way and I-5 in Downtown Seattle, I-90 between Bellevue Way SE and I-5 in Downtown Seattle, and I-90 east of I-405 to and from I-5 in Downtown Seattle. Travel times for transit were calculated assuming they do not use the I-5 interchange but rather use the D2 Roadway, which connects Seattle and I-90 and is currently exclusively used by only transit and HOV vehicles. The D2 Roadway extends between the intersection of Airport Way and South Dearborn Street and the Rainier Avenue South interchange. Depending on the travel direction in the reversible center roadway, vehicles might connect between the D2 Roadway and the reversible center roadway or merge and/or diverge with the westbound and eastbound mainline roadways. Table 3J-1 in Appendix 3J provides the travel times for existing and 2030 no-build conditions for SOV, HOV, freight, and transit modes. By 2030, travel times for SOVs will more than double in some cases and could take almost 30 minutes in the PM peak hour. This is indicated in Figure 1-12, which provides a snapshot of SOV travel along the corridor between I-5 and I-405.

TABLE 1-8
Existing and 2030 No-Build AM Peak-Hour (7:15 to 8:15 AM) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2007 Existing		2030 No-Build[b]		2030 No-Build[c]	
		Density[d]	LOS[e]	Density[b]	LOS[e]	Density[d]	LOS[e]
I-90 Eastbound							
Mainline: west of I-5 southbound off-ramp	Basic	8.3	A	18.3	C	24.1	C
Diverge: I-5 southbound off-ramp	Diverge	8.3	A	18.3	B	24.1	C
Diverge: I-5 northbound off-ramp	Diverge	13.5	B	163.6	F	171.3	F
Mainline: between I-5 northbound off-ramp and I-5 northbound on-ramp	Basic	13.4	B	162.9	F	170.8	F
Mainline: Point where I- northbound and southbound merge to I-90	Basic	18.0	B	127.0	F	115.6	F
Mainline: drop lane from 5 to 4 lanes	Basic	22.5	C	114.7	F	105.4	F
Diverge: off-ramp to Rainier Avenue southbound	Diverge	22.4	C	109.0	F	99.9	F
Mainline: between Rainier Avenue off-ramp and Rainier Avenue on-ramp	Basic	28.9	D	93.2	F	103.6	F
Merge: on-ramp from Rainer Avenue southbound	Merge	100.3	F	127.3	F	131.1	F
Mainline: lane drop at center roadway	Basic	99.6	F	120.3	F	128.3	F
Merge: I-90 eastbound Mount Baker Tunnel and northbound Rainier Avenue on-ramp	Merge	N/A	N/A	N/A	N/A	85.2	F
Mainline: eastbound I-90 Tunnel at First Hill (two-lane section only)	Basic	101.7	F	130.7	F	118.0	F
Mainline: across I-90 bridge deck	Basic	43.4	E	27.9	D	33.3	D
Diverge: off-ramp to West Mercer Way	Diverge	43.4	E	27.9	C	33.3	D
Mainline: basic segment through Mercer Island tunnel	Basic	56.2	F	26.4	D	41.7	E
Diverge: 77th Avenue SE off-ramp	Diverge	56.2	F	26.4	C	41.7	E
Mainline: between 77th Avenue SE and Island Crest Way	Basic	59.8	F	29.0	D	49.6	F
Diverge: Island Crest Way off-ramp	Diverge	67.7	F	37.8	E	58.6	F
Mainline: between Island Crest Way on- and off-ramp	Basic	73.3	F	30.7	D	49.4	F
Merge: on-ramp for Island Crest Way and SE 27th Street	Merge	113.9	F	16.2	B	61.4	F
Mainline: between Island Crest Way and East Mercer Way	Basic	111.4	F	22.0	C	52.4	F
Diverge East Mercer Way off-ramp	Diverge	49.4	F	21.2	C	40.6	E
Merge: East Mercer Way on-ramp	Merge	36.1	E	21.1	C	43.6	E
Mainline: basic between East Mercer Way and Bellevue Way off-ramp	Basic	33.4	D	22.8	C	99.5	F
Diverge: off-ramp to Bellevue Way	Diverge	29.8	D	25.9	C	113.8	F

TABLE 1-8
Existing and 2030 No-Build AM Peak-Hour (7:15 to 8:15 AM) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2007 Existing		2030 No-Build[b]		2030 No-Build[c]	
		Density[d]	LOS[e]	Density[b]	LOS[e]	Density[d]	LOS[e]
Mainline: east of Bellevue Way off-ramp, before I-405 off-ramp	Basic	21.6	C	20.1	C	125.3	F
Major diverge: I-405 off-ramp	Major diverge	22.2	C	15.3	B	102.1	F
Mainline: under I-405 interchange	Basic	13.1	B	8.2	A	9.0	A
Weave: Bellevue Way onto Factoria Boulevard off-ramp	Weave	11.3	A	8.0	A	8.1	A
Mainline: east of Factoria Boulevard on-ramp	Basic	8.7	A	4.7	A	4.4	A
Mainline: I-405 northbound and southbound on-ramp	Major merge	12.0	B	8.3	A	8.0	A
I-90 Westbound							
Mainline: basic east of I-405 northbound and southbound off-ramp	Basic	24.5	C	136.1	F	134.9	F
Major diverge: I-405 off-ramp	Major diverge	24.5	C	136.5	F	135.3	F
Mainline: between I-405 off-ramp and Richards Road on-ramp	Basic	17.2	B	122.9	F	119.1	F
Merge: Richards Road on-ramp	Merge	20.5	C	139.9	F	138.3	F
Diverge: Bellevue Way off-ramp [DROP LANE]	Basic	37.0	E	122.0	F	117.3	F
Mainline: three-lane segment between Bellvue Way off-ramp and I-405 on-ramp	Basic	26.5	D	113.1	F	107.6	F
Merge: I-405 on-ramp [ADD LANE]	Basic	33.9	D	144.3	F	139.1	F
Bellevue Way on-ramp: analyze as basic between Bellevue Way on-ramp and East Mercer Way off-ramp	Basic	25.6	C	114.4	F	109.1	F
Mainline: drop lane at center roadway entrance (Between East Mercer Way on- and off-ramp)	Basic	32.7	D	84.9	F	78.6	F
Merge: East Mercer Way on-ramp	Merge	28.3	D	105.3	F	88.7	F
Mainline: East Mercer Way on-ramp to Island Crest Way off-ramp	Basic	37.5	E	120.2	F	110.0	F
Diverge: Island Crest Way off-ramp	Diverge	44.5	E	114.0	F	105.9	F
Mainline: Island Crest off-ramp to Island Crest on-ramp (left-hand)	Merge	33.0	D	86.1	F	72.8	F
Mainline: Island Crest Way on-ramp to 76th Avenue SE on-ramp	Basic	32.7	D	90.9	F	82.2	F
Merge: 76th Avenue SE on-ramp	Merge	23.9	C	102.1	F	96.8	F
Mainline: 76th Avenue SE on-ramp to West Mercer Way on-ramp	Basic	32.4	D	106.8	F	92.7	F
Merge: West Mercer Way on-ramp	Merge	33.2	D	114.4	F	104.7	F
Mainline: West Mercer Way on-ramp to tunnel	Basic	34.2	D	104.8	F	86.7	F
Mainline: through first hill tunnel	Basic	33.0	D	103.1	F	82.8	F

TABLE 1-8
Existing and 2030 No-Build AM Peak-Hour (7:15 to 8:15 AM) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2007 Existing		2030 No-Build[b]		2030 No-Build[c]	
		Density[d]	LOS[e]	Density[b]	LOS[e]	Density[d]	LOS[e]
Mainline: add lane at tunnel	Basic	24.6	C	68.5	F	65.4	F
Diverge: Rainier Avenue northbound off-ramp	Diverge	24.4	C	71.4	F	70.4	F
Diverge: Rainier Avenue southbound off-ramp	Basic	29.8	D	69.0	F	87.2	F
Mainline: Rainier Avenue soutbound off-ramp to I-5 off-ramp	Basic	51.0	F	130.1	F	129.0	F
Major diverge: I-5 northbound off-ramp	Major diverge	71.3	F	139.9	F	138.8	F
Mainline: I-90 under I-5 interchange	Basic	21.4	C	137.1	F	133.2	F
West of I-5 interchange on SR 519 and I-90	Basic	11.0	B	14.3	B	15.4	B
Westbound on-ramp from I-5 SB	Merge	8.0	A	11.9	B	12.8	B
Westbound on-ramp from I-5 northbound	Merge	8.3	A	17.7	B	23.1	C
Mainline: west of I-5 northbound on-ramp	Basic	12.8	B	7.9	A	8.9	A
I-90 Center Roadway							
HOV, GP, and center merge across East Channel Bridge	Basic	N/A	N/A	N/A	N/A	N/A	N/A
Center roadway: east of Center Roadway and I-90 merge	Basic	1.3	A	N/A	N/A	N/A	N/A
Center merge from I-90	Merge	7.4	A	N/A	N/A	N/A	N/A
Center roadway: I-90 merge to 80th Avenue SE	Basic	8.0	A	N/A	N/A	N/A	N/A
Diverge: 80th Avenue SE off-ramp	Diverge	5.2	A	N/A	N/A	N/A	N/A
Center roadway: between 80th Avenue SE and Island Crest Way	Basic	7.0	A	9.7	A	7.1	A
Merge: Island Crest Way on-ramp	Merge	8.1	A	9.3	A	7.9	A
Merge: 77th Avenue SE on-ramp	Merge	10.6	B	12.1	B	10.2	B
Center roadway: 77th Avenue SE to Mount Baker tunnel	Basic	15.5	B	17.3	B	74.1	F
Through Mount Baker tunnel	Basic	16.3	B	22.3	C	131.8	F

[a] Segment type listed is based on existing conditions.
[b] No-build condition including Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
[c] No-build condition including Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
[d] Density calculated as passenger cars per mile per lane.
[e] Highway Capacity Manual LOS thresholds were applied to VISSIM densities to obtain LOS (HCM 2000 Exhibit 23-2 for basic freeway, Exhibit 24-2 for weaving, Exhibit 25-4 for merge/diverge).
GP general purpose
HOV high-occupancy vehicle
LOS level of service
N/A not applicable

TABLE 1-9
Existing and 2030 No-build PM Peak-hour (4:30-5:30 PM) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2007 Existing		2030 No-Build[b]		2030 No-Build[c]	
		Density[d]	LOS[e]	Density[d]	LOS[e]	Density[d]	LOS[e]
I-90 Eastbound							
Mainline: west of I-5 southbound off-ramp	Basic	8.5	A	12.6	B	18.4	C
Diverge: I-5 southbound off-ramp	Diverge	8.5	A	12.7	B	18.4	B
Diverge: I-5 northbound off-ramp	Diverge	25.4	C	108.5	F	104.4	F
Mainline: between I-5 northbound off-ramp and northbound on-ramp	Basic	25.6	C	108.6	F	104.7	F
Mainline: point where I- northbound and southbound merge to I-90	Basic	105.4	F	100.9	F	65.7	F
Mainline: drop lane from 5 to 4 lanes	Basic	95.8	F	87.1	F	58.6	F
Diverge: off-ramp to Rainier Avenue southbound	Diverge	98.5	F	81.9	F	54.4	F
Mainline: between Rainier Avenue off- and on-ramp	Basic	72.4	F	57.7	F	56.0	F
Merge: on-ramp from Rainer Avenue southbound	Merge	54.3	F	75.3	F	76.5	F
Mainline: lane drop at Center Roadway	Basic	101.5	F	66.1	F	75.4	F
Merge: I-90 eastbound Mount Baker tunnel and northbound Rainier Avenue on-ramp	Merge	N/A	N/A	N/A	N/A	122.8	F
Mainline: eastbound I-90 tunnel at First Hill (two-lane section only)	Basic	95.1	F	99.5	F	86.9	F
Mainline: across I-90 bridge deck	Basic	64.7	F	23.3	C	54.6	F
Diverge: off-ramp to West Mercer Way	Diverge	64.7	F	23.3	C	54.6	F
Mainline: basic segment through Mercer Island Tunnel	Basic	90.5	F	21.5	C	74.4	F
Diverge: 77th Avenue SE off-ramp	Diverge	90.5	F	20.6	C	74.3	F
Mainline: between 77th Avenue SE and Island Crest Way	Basic	98.6	F	20.1	C	80.1	F
Diverge: Island Crest Way off-ramp	Diverge	107.2	F	19.7	B	82.4	F
Mainline: between Island Crest Way on- and off-ramp	Basic	112.9	F	19.6	C	84.5	F
Merge: on-ramp for Island Crest Way and SE 27th Street	Merge	118.9	F	16.4	B	84.5	F
Mainline: between Island Crest Way and East Mercer Way	Basic	112.7	F	20.0	C	55.9	F
Diverge East Mercer Way off-ramp	Diverge	51.7	F	19.8	B	35.1	E
Merge: East Mercer Way on-ramp	Merge	39.5	E	19.2	B	34.4	D
Mainline: basic between East Mercer Way and Bellevue Way off-ramp	Basic	38.5	E	19.7	C	43.1	E
Diverge: off-ramp Bellevue Way	Diverge	46.4	F	19.4	B	62.7	F
Mainline: east of Bellevue Way off-ramp, before I-405 off-ramp	Basic	29.4	D	16.9	B	68.2	F
Major diverge: I-405 off-ramp	Major diverge	29.2	D	13.6	B	68.7	F

TABLE 1-9
Existing and 2030 No-build PM Peak-hour (4:30-5:30 PM) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2007 Existing		2030 No-Build[b]		2030 No-Build[c]	
		Density[d]	LOS[e]	Density[d]	LOS[e]	Density[d]	LOS[e]
Mainline: under I-405 interchange	Basic	19.6	C	13.0	B	17.7	B
Weave: Bellevue Way on to Factoria Boulevard off-ramp	Weave	18.0	B	12.9	B	17.4	B
Mainline: east of Factoria Boulevard on-ramp	Basic	19.6	C	12.5	B	15.8	B
Mainline: I-405 northbound and southbound on-ramp	Major merge	21.0	C	16.7	B	19.0	B
I-90 Westbound							
Mainline: basic east of I-405 northbound and southbound off-ramp	Basic	19.4	C	110.7	F	101.9	F
Major diverge: I-405 off-ramps	Major diverge	19.4	B	110.7	F	101.9	F
Mainline: between I-405 off-ramp and Richards Road on-ramp	Basic	12.2	B	113.3	F	112.0	F
Merge: Richards Road on-ramp	Merge	13.7	B	122.1	F	124.6	F
Diverge: Bellevue Way off-ramp [DROP LANE]	Basic	23.1	C	107.5	F	107.7	F
Mainline: three-lane segment between Belle Way off-ramp / I-405 on-ramp	Basic	39.2	E	93.5	F	92.8	F
Merge: I-405 on-ramp [ADD LANE]	Basic	97.4	F	110.7	F	106.7	F
Bellevue Way on-ramp: analyze as basic between Bellevue Way on-ramp and East Mercer Way off-ramp	Basic	88.2	F	74.2	F	70.1	F
Mainline: drop lane at center roadway entrance (between East Mercer Way on- and off-ramp)	Basic	68.1	F	50.5	F	52.2	F
Merge: East Mercer Way on-ramp	Merge	44.2	E	58.8	F	63.1	F
Mainline: East Mercer Way on-ramp to Island Crest Way off-ramp	Basic	100.9	F	89.6	F	92.6	F
Diverge: Island Crest Way off-ramp	Diverge	99.7	F	92.3	F	96.4	F
Mainline: Island Crest Way off-ramp to Island Crest Way on-ramp (left-hand)	Merge	66.5	F	65.6	F	69.7	F
Mainline: Island Crest Way on-ramp to 76th Avenue SE on-ramp	Basic	68.3	F	88.2	F	91.8	F
Merge: 76th Avenue SE on-ramp	Merge	101.0	F	82.4	F	88.2	F
Mainline: 76th Avenue SE on-ramp to West Mercer Way on-ramp	Basic	70.8	F	60.5	F	68.7	F
Merge: West Mercer Way on-ramp	Merge	121.4	F	71.7	F	73.8	F
Mainline: West Mercer Way on-ramp to tunnel	Basic	38.8	E	32.5	D	55.7	F
Mainline: through First Hill tunnel	Basic	35.4	E	29.5	D	73.3	F
Mainline: add lane at tunnel	Basic	26.2	D	29.6	D	72.0	F
Diverge: Rainier Avenue northbound off-ramp	Diverge	26.0	C	22.6	C	56.4	F
Diverge: Rainier Avenue southbound off-ramp	Basic	26.8	D	16.2	B	74.6	F

TABLE 1-9
Existing and 2030 No-build PM Peak-hour (4:30-5:30 PM) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2007 Existing		2030 No-Build[b]		2030 No-Build[c]	
		Density[d]	LOS[e]	Density[d]	LOS[e]	Density[d]	LOS[e]
Mainline: Rainier Avenue southbound off-ramp to I-5 off-ramp	Basic	109.4	F	45.9	F	106.2	F
Major diverge: I-5 northbound off-ramp	Major diverge	144.9	F	87.5	F	112.8	F
Mainline: I-90 under I-5 interchange	Basic	149.9	F	110.7	F	135.9	F
West of I-5 interchange on SR519 and I-90	Basic	12.9	B	11.7	B	16.6	B
Westbound on-ramp from I-5 southbound	Merge	8.4	A	8.7	A	11.7	B
Westbound on-ramp from I-5 northbound	Merge	8.5	A	12.8	B	18.6	B
Mainline: west of I-5 northbound on-ramp	Basic	13.1	B	6.0	A	8.6	A
I-90 Center Roadway							
Through Mount Baker tunnel	Basic	15.4	B	16.0	B	18.1	C
Center roadway: from Mount Baker tunnel to 77th Avenue SE	Basic	16.0	B	16.8	B	18.6	C
Diverge: 77th Avenue SE off-ramp	Diverge	10.7	B	15.9	B	18.6	B
Diverge: Island Crest Way off-ramp	Diverge	8.3	A	8.5	A	10.0	A
Center roadway: east of Island Crest Way	Basic	9.6	A	9.9	A	10.9	A
Merge: 80th Avenue SE off-ramp	Merge	6.8	A	N/A	N/A	N/A	N/A
Center roadway: east of 80th Avenue SE	Basic	10.1	A	N/A	N/A	N/A	N/A
Diverge: center roadway and I-90	Diverge	10.1	B	N/A	N/A	N/A	N/A
East of center roadway and I-90 merge	Basic	3.9	A	N/A	N/A	N/A	N/A
HOV, GP, and center merge across East Channel bridge	Basic	N/A	N/A	19.0	C	21.9	C

[a] Segment type listed is based on existing conditions.
[b] No-build condition including Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
[c] No-build condition including Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
[d] Density calculated as passenger cars per mile per lane.
[e] Highway Capacity Manual LOS thresholds were applied to VISSIM densities to obtain LOS (HCM 2000 Exhibit 23-2 for basic freeway, Exhibit 24-2 for weaving, Exhibit 25-4 for merge/diverge).

GP general purpose
HOV high-occupancy vehicle
LOS level of service
N/A not applicable

Most notable from the travel time information found in Figures 1-13 and 1-14 is that, with the I-90 Two-Way Transit and HOV Operations Project, HOV travel times would be maintained because HOV lanes would be provided in both directions on the outer mainline roadways. However, travel times for SOVs would continue to worsen, as discussed in the following paragraph. For HOVs in the AM and PM peak periods, it could take 8 to 17 minutes for an HOV to travel between I-5 and I-405.

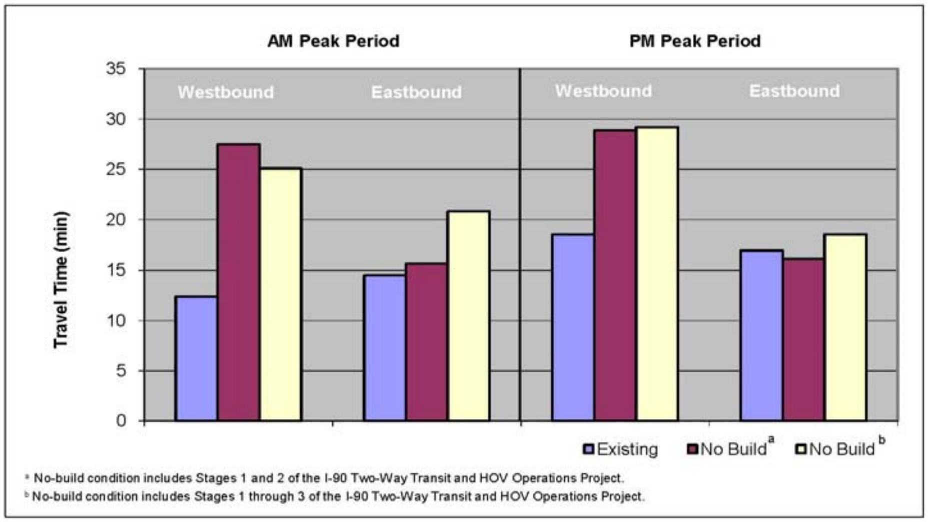


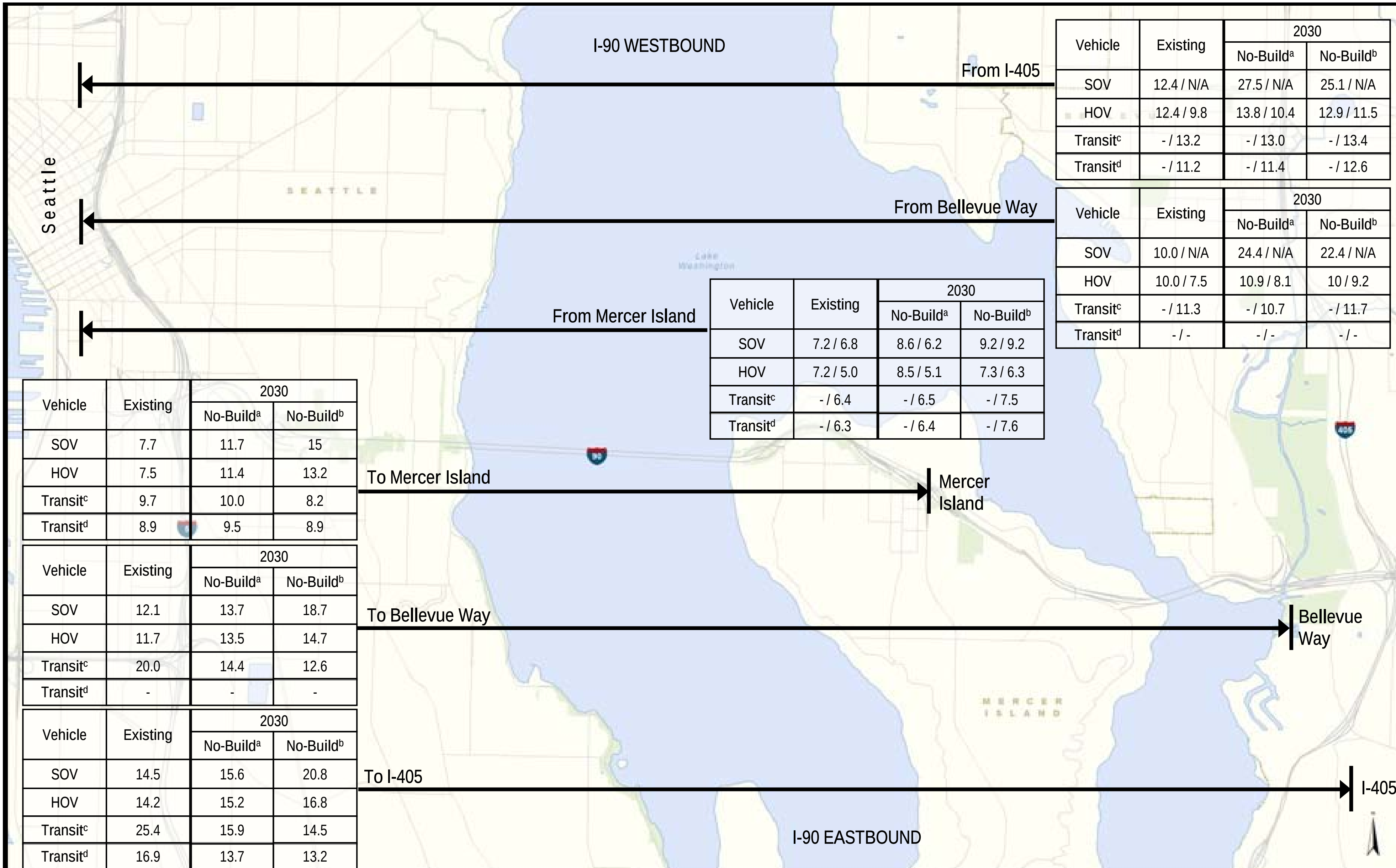
FIGURE 1-12
AM and PM Peak-period Existing and 2030 No-build SOV I-90 Travel Times Between I-405 and I-5

Buses (with or without stops on Mercer Island) are expected to have shorter travel times on I-90 in the opposite direction of the reversible center roadway because the outer HOV lane would provide transit with a faster lane than the GP lanes they are restricted to use in existing conditions. However, bus travel times between I-5 and I-405 (with stops on Mercer Island) are still expected to be between 14 and 18minutes in 2030 because service will still be mixed in with congestion on not only I-90 but also the local streets system to access the Mercer Island Park-and-Ride lot. It is expected that, by 2030, SOV travel from I-405 to Seattle in the AM peak period will almost double in duration from existing conditions and take about 24 minutes.

In the opposite (eastbound) direction, travel times will increase by approximately 40 percent over existing conditions, so that a trip that now takes 15 minutes on average will take close to 21 minutes by 2030. In the PM peak period, similar increases in travel time are expected. In the westbound direction, to go from I-405 to Seattle, the trip will take close to 30 minutes, an increase of more than 50 percent from existing conditions. In the eastbound direction, to go from Seattle to I-405, it will take about 19 minutes. For freight vehicles, a similar increase in travel time would be expected because freight also travels in the GP lanes, although freight generally takes slightly longer to traverse the corridor due to their lane choices and vehicle characteristics.

1.5.3.4 Intersection Operations

In addition to analyzing freeway segment operations and performance, local arterial intersections were evaluated near interchanges and ramp terminals close to I-90 in Seattle, Mercer Island, and Bellevue during the AM and PM hours for existing and future year (2030) conditions because they might influence or affect freeway operations.



From I-405 (westbound)

Vehicle	Existing	2030	
		No-Build[a]	No-Build[b]
SOV	12.4 / N/A	27.5 / N/A	25.1 / N/A
HOV	12.4 / 9.8	13.8 / 10.4	12.9 / 11.5
Transit[c]	- / 13.2	- / 13.0	- / 13.4
Transit[d]	- / 11.2	- / 11.4	- / 12.6

From Bellevue Way (westbound)

Vehicle	Existing	2030	
		No-Build[a]	No-Build[b]
SOV	10.0 / N/A	24.4 / N/A	22.4 / N/A
HOV	10.0 / 7.5	10.9 / 8.1	10 / 9.2
Transit[c]	- / 11.3	- / 10.7	- / 11.7
Transit[d]	- / -	- / -	- / -

From Mercer Island (westbound)

Vehicle	Existing	2030	
		No-Build[a]	No-Build[b]
SOV	7.2 / 6.8	8.6 / 6.2	9.2 / 9.2
HOV	7.2 / 5.0	8.5 / 5.1	7.3 / 6.3
Transit[c]	- / 6.4	- / 6.5	- / 7.5
Transit[d]	- / 6.3	- / 6.4	- / 7.6

To Mercer Island (eastbound)

Vehicle	Existing	2030	
		No-Build[a]	No-Build[b]
SOV	7.7	11.7	15
HOV	7.5	11.4	13.2
Transit[c]	9.7	10.0	8.2
Transit[d]	8.9	9.5	8.9

To Bellevue Way (eastbound)

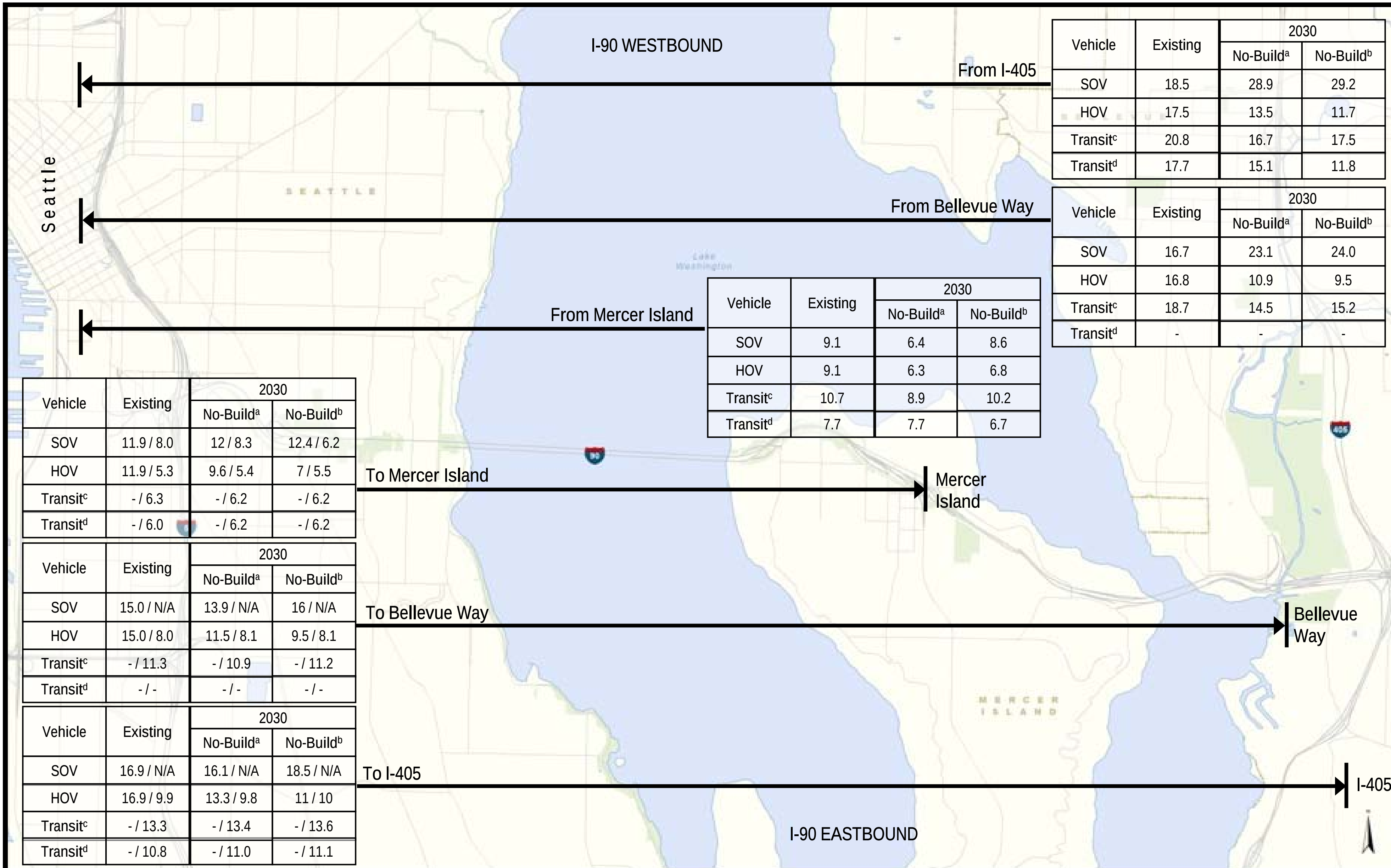
Vehicle	Existing	2030	
		No-Build[a]	No-Build[b]
SOV	12.1	13.7	18.7
HOV	11.7	13.5	14.7
Transit[c]	20.0	14.4	12.6
Transit[d]	-	-	-

To I-405 (eastbound)

Vehicle	Existing	2030	
		No-Build[a]	No-Build[b]
SOV	14.5	15.6	20.8
HOV	14.2	15.2	16.8
Transit[c]	25.4	15.9	14.5
Transit[d]	16.9	13.7	13.2

Travel times represented are outer roadway / center roadway.
Reversible center roadway operates westbound in the AM peak and eastbound in the PM peak.
[a] No-build condition with stages 1 and 2 of the I-90 Two Way Transit and HOV Operations Project.
[b] No-build condition with stages 1 through 3 of the I-90 Two Way Transit and HOV Operations Project.
[c] Transit routes with stops on Mercer Island.
[d] Transit routes with no stops on Mercer Island.
- = Buses that do not travel on this roadway during this period and/or do not travel between these points.
N/A = not applicable because the mode is not eligible to travel this path or the path is restricted

Figure 1-13
AM Peak Period
I-90 Existing and 2030 No-build Travel Times in Minutes by Mode



Vehicle	Existing	2030	
		No-Build[a]	No-Build[b]
SOV	18.5	28.9	29.2
HOV	17.5	13.5	11.7
Transit[c]	20.8	16.7	17.5
Transit[d]	17.7	15.1	11.8

Vehicle	Existing	2030	
		No-Build[a]	No-Build[b]
SOV	16.7	23.1	24.0
HOV	16.8	10.9	9.5
Transit[c]	18.7	14.5	15.2
Transit[d]	-	-	-

Vehicle	Existing	2030	
		No-Build[a]	No-Build[b]
SOV	9.1	6.4	8.6
HOV	9.1	6.3	6.8
Transit[c]	10.7	8.9	10.2
Transit[d]	7.7	7.7	6.7

Vehicle	Existing	2030	
		No-Build[a]	No-Build[b]
SOV	11.9 / 8.0	12 / 8.3	12.4 / 6.2
HOV	11.9 / 5.3	9.6 / 5.4	7 / 5.5
Transit[c]	- / 6.3	- / 6.2	- / 6.2
Transit[d]	- / 6.0	- / 6.2	- / 6.2

Vehicle	Existing	2030	
		No-Build[a]	No-Build[b]
SOV	15.0 / N/A	13.9 / N/A	16 / N/A
HOV	15.0 / 8.0	11.5 / 8.1	9.5 / 8.1
Transit[c]	- / 11.3	- / 10.9	- / 11.2
Transit[d]	- / -	- / -	- / -

Vehicle	Existing	2030	
		No-Build[a]	No-Build[b]
SOV	16.9 / N/A	16.1 / N/A	18.5 / N/A
HOV	16.9 / 9.9	13.3 / 9.8	11 / 10
Transit[c]	- / 13.3	- / 13.4	- / 13.6
Transit[d]	- / 10.8	- / 11.0	- / 11.1

Travel times represented are outer roadway / center roadway.
Reversible center roadway operates westbound in the AM peak and eastbound in the PM peak.
[a] No-build condition with stages 1 and 2 of the I-90 Two Way Transit and HOV Operations Project.
[b] No-build condition with stages 1 through 3 of the I-90 Two Way Transit and HOV Operations Project.
[c] Transit routes with stops on Mercer Island.
[d] Transit routes with no stops on Mercer Island.
- = Buses that do not travel on this roadway during this period and/or do not travel between these points.
N/A = not applicable because the mode is not eligible to travel this path or the path is restricted

Figure 1-14
PM Peak Period
I-90 Existing and 2030 No-build Travel Times in Minutes by Mode

A total of 32 local intersections were evaluated using Synchro software: 11 intersections in Seattle, 19 on Mercer Island, and 2 in Bellevue. LOS is a qualitative measurement of intersection operation and is measured in terms of average delay per vehicle and compared with the following desired minimum LOS for each jurisdiction. The LOS for both unsignalized and signalized intersections are based on average delay. LOS ranges from grades A through F; LOS grades A through C are generally considered acceptable with a minimal amount of delay to drivers, and LOS grades D and E indicate that the intersection is reaching capacity, therefore, drivers experience higher delays. LOS F is generally considered unacceptable by most drivers and the intersection is over-capacity. The relevant agencies within the I-90 IJR study area and their LOS intersection standards are:

- WSDOT: LOS E
- City of Seattle: LOS D
- City of Mercer Island: LOS C
- City of Bellevue: LOS D

Existing and 2030 intersection LOS values for the AM and PM peak hours are shown in Figure 1-15 and included in Appendix 3K. Within the I-90 IJR study area, eight intersections fail to meet agency standards in the existing condition. The following intersections fail to meet agency standards in the existing PM peak hour unless noted in parenthesis:

- Rainier Avenue South and South Dearborn Street
- I-90 and 4th Avenue South
- South Royal Brougham Way and 4th Avenue South
- 77th Avenue SE and SE 27th Street
- 77th Avenue SE and North Mercer Way (AM peak hour only)
- East Mercer Way and I-90 westbound ramps
- Bellevue Way SE and SE 30th Street (AM and PM peak hours)
- Bellevue Way SE and South Bellevue Park-and-Ride Lot

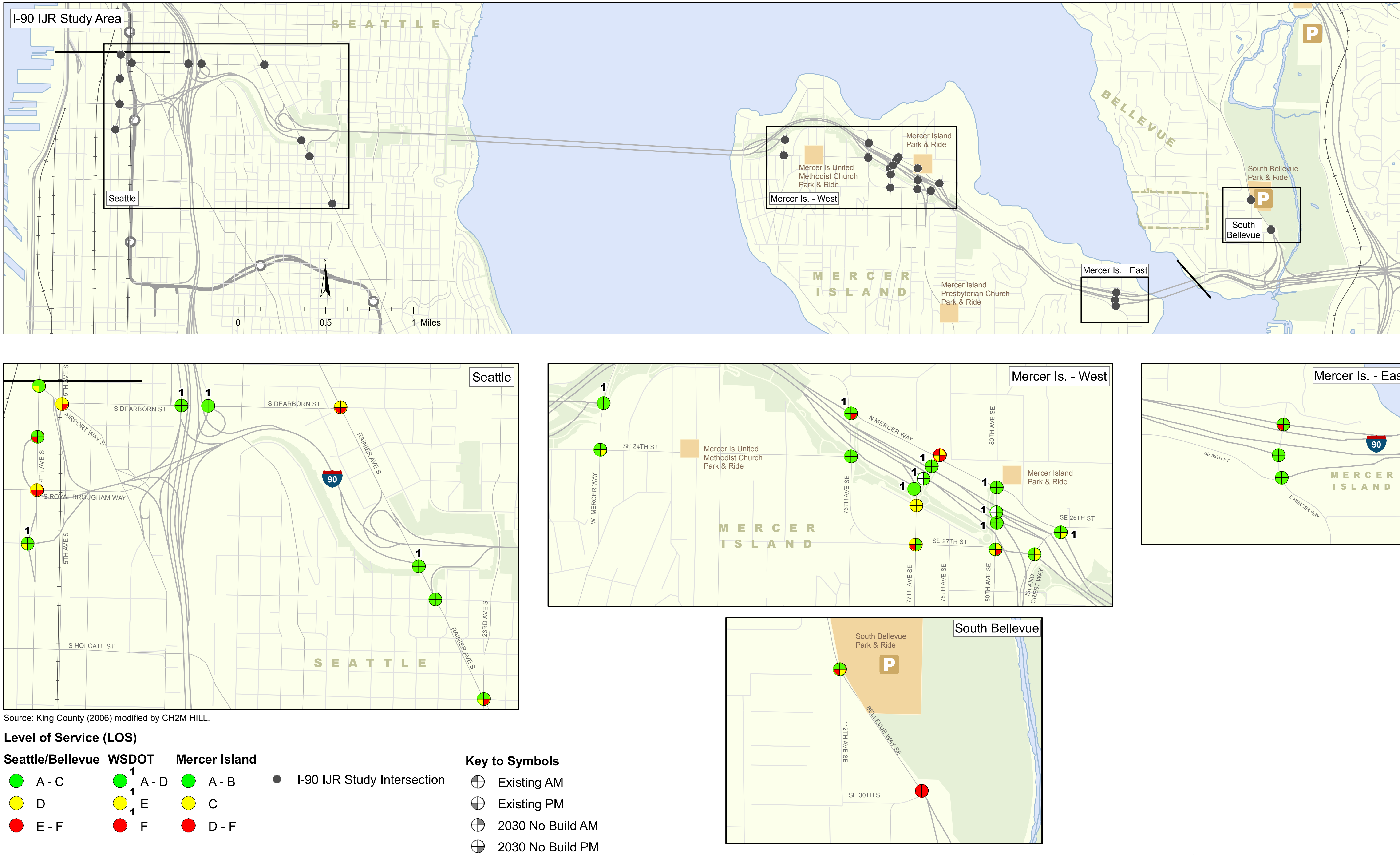
In Seattle, Mercer Island, and Bellevue, intersection operations in the future 2030 no-build condition are expected to get worse as travel demand increases on the arterials serving I-90. A total of seven intersections will fail in the PM peak hour in the no-build condition because of increasing local and regional demand.

In Seattle during the PM peak hour, the following four intersections will fail by 2030:

- Rainier Avenue South and South Dearborn Street
- Rainier Avenue South and 23rd Avenue South
- South Royal Brougham Way and 4th Avenue South
- Airport Way South and South Dearborn Street

By 2030, the following three Mercer Island intersections will fail to meet the appropriate operating standard in the PM peak hour:

- 80th Avenue SE and SE 27th Street
- 77th Avenue SE and North Mercer Way
- 76th Avenue SE and North Mercer Way/I-90 westbound on ramp



Source: King County (2006) modified by CH2M HILL.

NOTES:
a) The level of service in yellow is the jurisdiction's standard for intersections in this segment.
b) The level of service in white indicates that this intersection does not exist for the existing (2007) condition.

1 - Intersection within WSDOT jurisdiction, other intersections are under the local agency's jurisdiction

Figure 1-15 I-90 IJR Segments A and B
EXISTING AND 2030 NO-BUILD CONDITIONS
INTERSECTION AM/PM LOS
Sound Transit East Link Project

In Bellevue, the intersection of Bellevue Way SE at SE 30th Street is not expected to meet agency LOS standards during the PM peak hour in 2030. The intersection of Bellevue Way SE at the South Bellevue Park-and-Ride entrance operates at LOS D, the City's intersection LOS standard. Because this arterial is a key transit connection between I-90 and downtown Bellevue, poor LOS along this street is an indication of poor transit reliability. In the AM peak hour, only the Bellevue Way SE at SE 30th Street intersection does not meet agency LOS standards. This is caused by the high delays on the side streets.

1.5.3.5 Transit Performance

Transit performance within the Proposal study area is discussed, but only briefly, in this IJR, even though the need for the interchange modification is predicated on the regional need for improved transit service in the corridor. However, approval of this IJR does not depend on the evaluation of transit performance, as discussed below. The East Link Final EIS (WSDOT and Sound Transit, 2011) contains a more detailed discussion of transit performance.

Within the IJR study area, transit services—including regional express and local buses—are provided by King County Metro and Sound Transit. The frequency and number of bus routes in service increases during the peak periods (6 to 9 a.m. and 3 to 6 p.m.), most noticeably in the peak direction of travel (into employment areas in the AM, out of employment areas in the PM). Other transit services within the study area include Sound Transit's Sounder Commuter rail (Seattle to Tacoma and Seattle to Everett) and Central Link light rail (opened in year 2009). For the no-build condition, several existing routes are proposed to be eliminated or modified by 2020 and 2030 as part of the future transit integration plan developed by Sound Transit and King County Metro. Even with these changes in future service, the transit service coverage area would stay relatively constant.

The transit LOS performance levels were analyzed using the methodology defined in the *Transit Cooperative Research Program Report 100: Transit Capacity and Quality of Service Manual*, (TRB, 2003). The *East Link Project Transportation Methods and Assumptions Report* (CH2M HILL, 2010b) in Appendix 3A of this report provides a detailed discussion of the transit LOS methodology.

Transit performance was evaluated in four LOS categories in the East Link Project Final EIS (WSDOT and Sound Transit, 2011): service frequency, hours of service, passenger load, and transit reliability. In this IJR, only transit reliability is described because the other three metrics are not relevant to IJR review and approval.

The single transit performance metric that contributes to need and is directly affected by the I-90 operations and congestion is reliability of service/on-time performance LOS: the degree to which a transit vehicle meets or misses its scheduled headway at its arrival station. Buses that arrive close together and miss schedule arrival times create a poor LOS. Transit reliability is a key factor for people who decide to use the transit system. Providing poor transit reliability will not attract potent new riders and discourages overall ridership. As an example, poor transit reliability indicates that buses frequently arrive close together rather than at their desired intervals, and that transit vehicles are unable to meet their scheduled arrival times because of congested local and regional roadways. As congestion on I-90 in the off-peak directions results in a decrease in transit service reliability, transit becomes less desirable.

The transit routes that currently serve the major transit hubs along the I-90 IJR study area (International District/Chinatown Station and Mercer Island Park-and-Ride) operate with a

reliability of LOS E or F and on-time performance at or less than 50 percent. None of the bus routes serving these transit hubs have a reliability LOS better than LOS E in the future 2030 no-build conditions. One of these bus routes is Sound Transit Regional Express Route 550 (ST 550). In the westbound direction, ST 550 starts its route at the Bellevue Transit Center. Following this route into Seattle along I-90, the ST 550 on-time performance at the Mercer Island Park-and-Ride is only at 50 percent, corresponding to LOS F. Once ST 550 reaches the International District/Chinatown Station, its on-time performance further degrades to 30 percent, an LOS F reliability. This route is a good example of how transit is impeded because roadway congestion restricts transit from providing reliable service to the region.

Even though the I-90 Two-Way Transit and HOV Operations Project would improve two-directional transit speeds on I-90, most bus service would still operate with poor transit reliability because they will be in heavy vehicle congestion into and out of the urban centers. Poor reliability between Downtown Seattle and Downtown Bellevue is expected to continue because bus speeds between these two major urban centers are predicted to decrease by up to 30 percent by 2030, even with improvements to I-90. This will occur because there are no improvements planned to roadways connecting I-90 to these urban centers, especially to and from Bellevue.

1.6 Why the Existing System Does Not Meet the Needs

I-90 is one of the most heavily traveled corridors in the Central Puget Sound region and is critical to the economic vitality of the region, as well as the State of Washington. The vehicular capacity of this corridor during peak periods is expected to be reached as early as 2015 (WSDOT, 2006a). Reaching capacity in such a short time frame will limit roadway performance and its ability to accommodate the increase in traffic volumes associated with the expected employment and residential growth in Seattle and Eastside communities. In the region, physical capacity expansions are planned, such as widening SR 520 to add HOV and pedestrian/bike facilities, widening of I-405 and restriping I-90 to include HOV lanes, but large-capacity expansions for SOV travel are no longer desirable or financially feasible.

Promoting travel modes such as light rail that support efficient person throughput is consistent with a regional vision of moving people as opposed to vehicles. To make light rail viable and attractive, travel times for this mode must be as reliable as or more reliable than SOV modes. Although the I-90 center roadway provides competitive travel times in an exclusive right-of-way, it is currently severely underused because of vehicle access constraints. Additionally, it provides benefit to users in only one direction, and even so is limited to only a portion of a person's trip because it does not directly connect to the urban centers of Seattle, Downtown Bellevue and other Eastside communities. Therefore, even with substantial congestion in adjoining lanes, the use of the center roadway is limited.

With only two Lake Washington crossings connecting the urban centers of Seattle and Downtown Bellevue, choices for the growing number of people crossing the lake are limited. Given the anticipated population and employment growth for the areas served by the corridor and the associated increase in traffic volumes, congestion and a substantial decrease in mobility are likely to occur in the future without light rail investment in the I-90 corridor across Lake Washington. Even with planned improvements on the SR 520 and I-90 bridge crossings, travel times on I-90 are expected to increase and, in some cases, double.

Overall, travel into key employment and population areas of the region will continue to be substantially constrained, highlighting the need for light rail because it is more effective in moving people than SOVs. Because bus reliability will continue to fail in the future and vehicle travel times will substantially increase, light rail is required in the I-90 center roadway to provide a reliable high-capacity transportation option. Designation of the center roadway for light rail requires the removal of vehicle access to the center roadway to ensure safe operations. However, vehicle access to the funded outer roadway HOV lanes will be in place prior to East Link construction and provide two-way HOV operations throughout the day.

Policy Point 2: Alternatives

Describe the reasonable alternatives that have been evaluated.

2.1 Summary

This policy point briefly describes the overall East Link Project alternatives and how they were developed for the Final EIS (WSDOT and Sound Transit, 2011), including specifically the alternative along I-90. The alternatives described here meet the project's purpose and need and include the alternatives identified for further study. The evaluation processes comply with guidelines of the National Environmental Policy Act (NEPA); the Washington State Environmental Policy Act (SEPA); and the Safe, Accountable, Flexible, and Efficient Transportation Equity Act—A Legacy for Users (SAFETEA-LU).

The East Link Project involves constructing and operating a 14- to 18-mile light rail system that links Downtown Seattle with the communities east of Lake Washington, including Mercer Island, Bellevue, and Redmond. Figure 2-1 shows the five projects segments (A through E) and alternatives considered for environmental review in the Final EIS (WSDOT and Sound Transit, 2011). The IJR study area is the western portion of the East Link Project, referred to in this IJR as the Proposal. This portion consists of the Segment A I-90 corridor alternatives and the southern portion of Segment B. As shown in Figure 2-1, the Proposal study area includes I-90 from downtown Seattle starting at the D2 Roadway to Bellevue Way and a portion of Bellevue Way to the South Bellevue Park-and-Ride. A no-build condition is also addressed in this IJR to describe how the transportation system would operate if the proposed project were not

FIGURE 2-1
East Link Project Segments and Alternatives

built and to compare with the impacts of the build conditions.

As discussed in this policy point, the proposed removal of access to the I-90 center roadway as part of the East Link Project has been fully evaluated in public and policy areas, including a series of planning, engineering, and policy decisions leading to the current Proposal being selected. Alternatives considered were broad in scope and included evaluating different HCT modes. Development of these alternatives is discussed in the following sections.

2.2 Alternative Development

The East Link Project proposals and alternatives considered in the Final EIS (WSDOT and Sound Transit, 2011) build on the conclusions of previous studies and public involvement processes dating back to the mid 1960s. Consistent with the memorandum *Integration of Planning and NEPA Processes* (Appendix A to Title 49, Section 613, of the *Federal Register,* Statewide Transportation Planning, Metropolitan Transportation Planning, 2-14-07), the decision process is based on comprehensive studies that were completed in cooperation with state and local agencies and with broad public input. Prior to beginning the environmental review, the Sound Transit Board made the following two major decisions after extensive evaluation and review with agencies and the public:

- Regional HCT is to be provided to the Eastside via I-90.
- Light rail is the preferred HCT technology for the I-90/East Corridor HCT connecting Seattle, Mercer Island, Bellevue, Overlake, and Redmond.

Section 2.2.1 (including Figure 2-2) summarizes key milestones that contributed to the process of making these decisions, and Section 2.2.2 describes the process used to identify alternatives for the East Link Project environmental analysis.

2.2.1 History of East Link Corridor

Since the mid-1960s, local and regional agencies have been studying HCT alternatives to connect Seattle with the Eastside of Lake Washington. Sound Transit has assembled the *East Corridor High Capacity Transit Mode Analysis History* (Sound Transit, 2006a), which is provided in Appendix 2A. That report documents the outcome of this local public transportation planning process and forms the basis for the purpose and need statement for the East Link Project Final EIS (WSDOT and Sound Transit, 2011). Light rail transit has been chosen as the HCT mode for the East Corridor across I-90 by the Sound Transit Board based on the extensive history of analyses as well as the recent analysis prepared for the update to the *Regional Transit Long-Range Plan* (Sound Transit, 2005).

2.2.1.1 Evaluation of Regional High-Capacity Transit to the Eastside via I-90

HCT crossing Lake Washington and connecting Seattle with the Eastside communities has been envisioned since the 1960s, and I-90 has been consistently described as the preferred transit-exclusive route ever since the center roadway was designed and constructed. In 1976, after extensive review and discussion, the Washington State Highway Commission signed I-90 MA with the cities of Seattle, Mercer Island, and Bellevue.

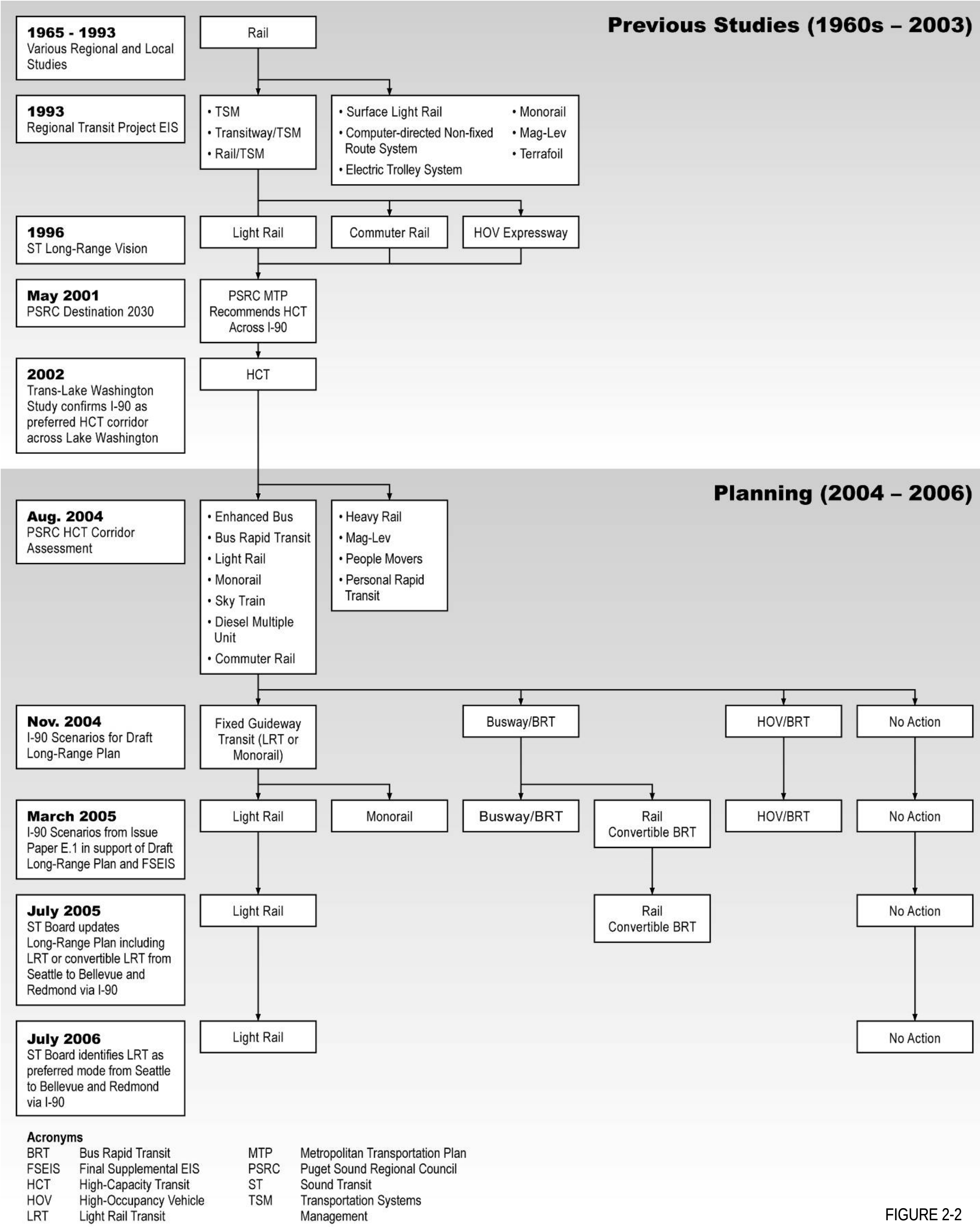


FIGURE 2-2
History of High-capacity Transit in the East Corridor

King County Metro Transit and the State Highway Commission confirmed the configuration of the I-90 roadway and specified that the I-90 center roadway be designed and constructed for exclusive transit and carpool use (WSDOT, 1976). I-90 across Lake Washington was then further evaluated for potential usage by HCT, and different modes of HCT were evaluated. Over the course of the last 40 years, public outreach and environmental process have tested the choice of light rail on I-90. Regional long-range planning documents also recognize light rail on the I-90 center roadway. A detailed summary of the evaluation of HCT on I-90 is included the *East Corridor High Capacity Transit Mode Analysis History* (Sound Transit, 2006a) (Appendix 2A).

Most recently, in 2004, as part of implementing Sound Move (Sound Transit, 1996b), WSDOT, Sound Transit, and FHWA collaborated on the I-90 Two-Way Transit and HOV Operations Project. From 1998 to 2004, extensive public outreach and coordination with local jurisdictions occurred during the conceptual design and environmental phase of the project. An EIS for the I-90 Two-Way Transit and HOV Operations Project was issued in May 2004 (WSDOT and Sound Transit, 2004). Although HCT was not directly considered as an element of the EIS, the alternatives were analyzed to assess whether the I-90 Two-Way Transit and HOV Operations Project could accommodate future plans to convert the center roadway to HCT, in accordance with the I-90 MA.

The preferred alternative of the I-90 Two-Way Transit and HOV Operations Project (illustrated in Figure 2-3), known as "the R-8A Alternative," proposes to narrow the outer roadway lanes and shoulders to add an HOV lane in each direction while maintaining the current reversible operation in the center roadway. The project also includes new and reconfigured direct-access HOV on- and off-ramps on Mercer Island and South Bellevue Way. Policy Point 1 provides further information about specific improvements in the I-90 Two-Way Transit and HOV Operations Project.

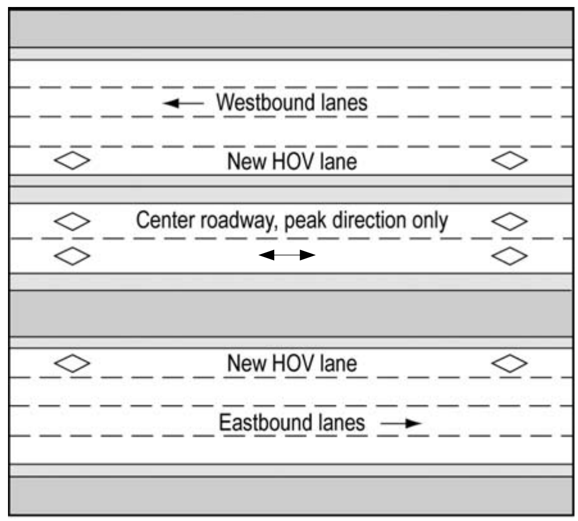


FIGURE 2-3
I-90 Two Way Transit and HOV Operations Project

As part of the identification of the preferred alternative for the I-90 Two-Way Transit and HOV Operations Project, the signatories to the 1976 Memorandum Agreement (MA) for I-90 developed an amendment in 2004 stating "the ultimate configuration for I-90 between Bellevue, Mercer Island, and Seattle should be defined as High Capacity Transit in the center roadway and HOV lanes in the outer roadways; and further agree that High Capacity Transit for this purpose is defined as a transit system operating in dedicated right-of-way such as light rail, monorail, or a substantially equivalent system" (WSDOT, 2004).

2.2.1.2 Identification of Light Rail as the Preferred Mode

Although alternative HCT transportation modes were evaluated in previous studies, Sound Transit conducted a series of additional studies of high-capacity modes for the region, and on I-90 in particular, as part of the update to the *Regional Long-Range Plan* (Sound Transit, 2005b).

An assessment of HCT corridors and technologies was conducted by PSRC at the request of Sound Transit (PSRC, 2004). The PSRC established a base of fully updated population, employment, and travel demand forecasts to be used in this assessment and in the process to update the *Regional Long-Range Plan* (Sound Transit, 2005b).Using updated land use and transportation plans as adopted in the regional *Vision 2020 Growth Strategy and Transportation Plan* (PSRC, 1995), PSRC found that, after the North Corridor between Downtown Seattle and Northgate, the East Corridor is the next highest-priority HCT corridor for development. The study reviewed a range of HCT technologies using updated land use and population projections for the planned HCT corridors. Bus rapid transit, light rail transit, and monorail were identified as appropriate transit options for the East Corridor.

The Sound Transit Board adopted the updated *Regional Long-Range Plan* (Sound Transit, 2005b), which recommended two alternative HCT modes (light rail transit and rail-convertible BRT) on exclusive right-of-way for further consideration in the I-90/East Corridor between Downtown Seattle, Mercer Island, Downtown Bellevue, Overlake, and Redmond. The Sound Transit Board also directed staff to complete additional transportation analysis of the I-90 corridor and to present the results of that analysis to the Board for consideration in the development of the next phase of HCT system investments, ST2. The following further analyses were completed:

- A full-scale "load test" that simulated light rail operations on the I-90 Floating Bridge (known as the Homer Hadley Bridge), an elevated superstructure, and confirmed its capacity to support light rail infrastructure and operations
- A planning-level analysis of the feasibility of the rail expansion joint necessary for construction and operation of light rail on the I-90 Floating Bridge
- A WSDOT report (WSDOT, 2006a) that detailed future congestion on I-90 and projected traffic effects on I-90 that would result from growth in traffic volumes
- A historical review of the more than 40 years of transportation planning studies and agreements relevant to the I-90 corridor between the Eastside and Seattle

Based on the results of the analyses described above and the technical reports and issue papers on alternative HCT modes, the Sound Transit Board on July 13, 2006, identified light rail as the preferred HCT transportation mode for the East Corridor (Seattle to Bellevue to Redmond via I-90). Light rail provides service reliability, speed, and the ability to meet future ridership capacity for the East Corridor needs. In addition, the identification of light rail from Seattle to Redmond via I-90 provides the advantage of linking seamlessly onto the Central Link rail line and thus continuing northbound to Northgate, minimizing transfers and increasing service operations on the Central Link line.

In July 2008, the Sound Transit Board adopted the ST2 package of transit investments in the region, which includes light rail as the mode choice for the East Corridor on I-90. ST2, also known as the Regional Transit System Plan (2007b), was approved by voters in November 2008.

Summaries of I-90 HCT studies from the 1960s to the present are documented in *East Corridor High Capacity Transit Mode Analysis History* (Sound Transit, 2006a). Each of these studies and agreements involved stakeholder and public review prior to conclusion and adoption.

2.2.2 Development of Alternatives

Sound Transit's light rail alternatives development process for the East Link Project included the following steps:

- Identifying feasible alternatives
- Obtaining scoping comments on alternatives
- Conducting a detailed evaluation of refined alternatives

The alternative evaluation process was also informed by an interagency team that included WSDOT; the U.S. Army Corps of Engineers (USACE); the Federal Transit Administration (FTA); FHWA; the cities of Seattle, Mercer Island, Bellevue, and Redmond; and King County. In addition, Sound Transit attended and presented information about East Link at neighborhood organizations, stakeholder gatherings, and, upon request, city council, and other board meetings.

For evaluation purposes, the East Link study area was divided into five segments along distinct geographic boundaries (see Figure 2-1). For the IJR, the Proposal consists of Segment A (I-90, downtown Seattle to Bellevue) and the southern portion of Segment B (I-90 to the South Bellevue Park-and-Ride Lot). The five segments are described as follows:

- **Segment A: Interstate 90**. Begins in the Downtown Seattle Transit Tunnel (where the East Link Project would connect to the Central Link light rail system currently under construction) through Mercer Island to South Bellevue, where I-90 touches land in Bellevue.
- **Segment B: South Bellevue.** Begins at the I-90 and Bellevue Way interchange to SE 6th Street, including the south boundary of Surrey Downs Park.
- **Segment C: Downtown Bellevue**. Travels from SE 6th Street north to NE 12th Street, encompassing Downtown Bellevue and the area east of I-405 to the Burlington Northern Santa Fe (BNSF) Railway corridor.
- **Segment D: Bel-Red/Overlake.** Travels from Downtown Bellevue (from the BNSF Railway corridor or NE 12th Street) to the Overlake Transit Center at the intersection of NE 40th Street and State Route 520 (SR 520).
- **Segment E: Downtown Redmond.** Travels from the Overlake Transit Center to Downtown Redmond, with two potential project terminus locations.

To identify the most promising alternatives to propose during the public scoping process, Sound Transit developed 35 preliminary alternatives (only one alternative was studied in Segment A and I-90) for the East Corridor between Seattle and the Eastside growth centers of Bellevue, Overlake, and Downtown Redmond. In developing the preliminary alternatives, Sound Transit reviewed past planning studies in the corridor and consulted with state, federal, and local agencies in the corridor.

The processes in evaluating these alternatives is recorded in the *East Link Alternatives Evaluation Report, Seattle to Bellevue and Redmond* (Sound Transit, 2006b). The 27 alternatives that were advanced for further evaluation and comparison based on ridership, environmental impacts, markets served, construction risk, and cost are summarized in the *Sound Transit Board Briefing Book, Light Rail Alternatives* (Sound Transit, 2006c).

The public scoping period for the NEPA and SEPA EIS processes took place from September 1 to October 2, 2006. City and county agencies; affected tribes; regional, state, and federal agencies; interest groups; businesses; affected communities; individuals; and the public participated in this scoping process. Public and agency comments together with alternative evaluation results led to the Sound Transit Board's December 2006 identification of the 19 alternatives to be analyzed in the Draft EIS (WSDOT and Sound Transit, 2008). In December 2008, Sound Transit, the WSDOT, and the FTA published a Draft Environmental Impact Statement (Draft EIS) on the East Link Project. The 2008 Draft EIS evaluated a no-build alternative and 19 build alternatives within five segments (A to E) for an approximately 18-mile extension of the Link light rail system from Downtown Seattle to Redmond across the I-90 bridge.

After the 2008 Draft EIS was published, the Sound Transit Board of Directors reviewed public and agency comments, developed and evaluated new alternatives and design modifications, identified the preferred alternatives for each segment, and then revised the preferred alternatives while directing staff to include more alternatives for study. New alternatives were added to Segments B and C, and design modifications to alternatives previously studied in the Draft EIS were added in Segments B, C, D, and E. A Supplemental Draft Environmental Impact Statement (SDEIS) was published in November 2010 (Sound Transit, 2010a) to review the new alternatives and design modifications to existing alternatives that could result in substantial impacts not previously disclosed or made available for public comment in the 2008 Draft EIS (Sound Transit, 2008). Also, new information regarding the historic nature of I-90 in Segment A was included and evaluated in the SDEIS (Sound Transit, 2010a).

A preferred alternative must be identified in the Final EIS for projects, like this one, undergoing NEPA review. A preferred alternative is a statement of the Sound Transit Board's current intent, but it is not a final decision. The Sound Transit Board will not make a final decision on the route and station locations to be built until after the publication of the Final EIS (Sound Transit, 2011). The board's final decision may confirm or amend the preferred alternative identified in the Final EIS.

The preferred alternative identified is called a "locally preferred alternative" by FTA to make clear that the federal government has not made a decision on the project until it issues a Record of Decision (ROD) after the Final EIS is completed. Both FTA and FHWA will issue RODs stating their final decisions on the project, identifying the alternatives considered by both agencies in reaching their decisions, and itemizing Sound Transit's commitments to mitigate project impacts. These final decisions by the Sound Transit Board, FTA, FHWA, and the issuance of the ROD, are expected by summer 2011. After the ROD has been issued and if a build alternative is selected, then final design would begin and construction could start as early as 2013.

2.3 Project Alternatives

Within the I-90 corridor, two no-build conditions and one build condition with design options were carried forward for analysis in the Final EIS (WSDOT and Sound Transit, 2011). This section describes the I-90 corridor alternatives.

2.3.1 No-Build Condition (I-90 with the I-90 Two-Way Transit and HOV Operations Project)

The no-build condition represents the transportation system and environment as they would exist without the proposed project. This condition provides a baseline condition for comparing impacts of the build conditions and includes two future transportation forecast years, 2020 and 2030. There are also two variations in the no-build condition related to implementation of the I-90 Two-Way Transit and HOV Operations Project. These variations occur in Segment A and influence only the transportation impact analysis (see Policy Point 1).

The no-build conditions include a variety of projects, funding packages, and proposals in the Central Puget Sound region. The projects primarily consist of funded or committed roadway and transit actions by the state, regional, and local agencies combined with other projects that are considered likely to be implemented, based on approval and committed funding. The no-build conditions include completion of the express bus, HOV, and Transportation System Management projects described in Sound Move (Sound Transit, 1996b) and also include the RapidRide and other transit enhancements in the *Transit Now Program* (King County Metro, 2006). Table 1-2 in Policy Point 1 summarizes the roadway and transit projects that have been incorporated into the no-build condition. The Transportation Methods and Assumptions Report (CH2M HILL, 2010c) provided in Appendix 3A provides a detailed list of assumed major projects as part of this condition.

The two variations in the no-build condition occur depending on the implementation schedule of the I-90 Two-Way Transit and HOV Operations Project (Section 2.2.1.1).. Figure 2-4 illustrates how the I-90 Two-Way Transit and HOV Operations Project has been separated into three stages for schedule purposes and describes what is included in each phase. With the passage of ST2, which included funding to complete Stage 3, Sound Transit is working with WSDOT to design and construct Stage 3 and then close the center roadway for light rail conversion. In other words, the center roadway may close for construction of the light rail project immediately after the HOV lanes on the outer roadway are completed. Therefore, the new HOV lanes in the outer roadway would more than likely not operate in conjunction with the center roadway before construction of East Link. Because coordination is ongoing and the I-90 Two-Way Transit and HOV Operations Project and East Link Project schedules are not finalized, the no-build condition was analyzed with and without Stage 3 completion to account for all the possible scenarios between these two projects. Without Stage 3, the only HOV lanes between Mercer Island and Seattle are the center reversible lanes, which are available in the peak direction only (westbound in the morning and eastbound in the evening).

2.3.2 Build Conditions in I-90 Corridor

For this IJR, only the East Link preferred alternative in Segment A and in the southern portion of Segment B is described in detail. Descriptions of the overall East Link Project can be found in the East Link Final EIS (WSDOT and Sound Transit, 2011). Although a variety of alternatives and interim termini are being considered in the other East Link Project segments (C through E), these various options of routes and stations are anticipated to cause only slight variations in vehicle demand along I-90. Therefore, only one travel demand forecast was developed for the East Link Project along I-90, with channelization modifications reflecting different alternatives and their configurations near the Bellevue Way interchange.

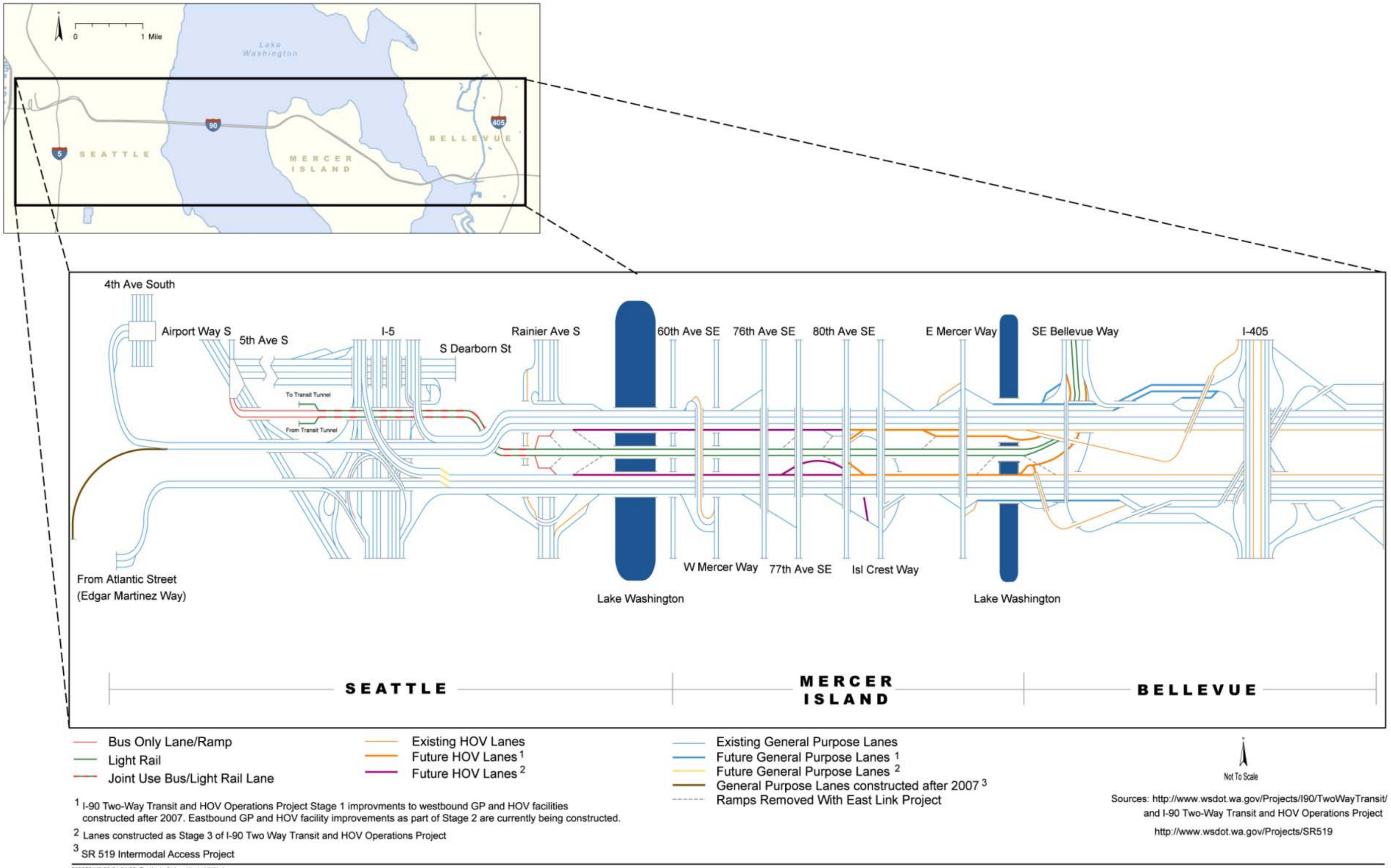


FIGURE 2-4
I-90 Future Channelization and Ramps

Not included in the Proposal is a change to the outer roadway HOV lane eligibility. Outer roadway HOV traffic will remain consistent with the I-90 Two-Way Transit and HOV Operations Project ROD (FHWA, 2004). HOV and transit will be authorized to use only the eastbound, left-side off-ramp at Island Crest Way, and Mercer Island traffic from the left-side westbound on-ramp at Island Crest Way will be allowed only in the HOV lane for merge and acceleration purposes. With the access modifications from the I-90 Two-Way Transit and HOV Operations Project and the East Link Project, the traffic analysis assumed Mercer Island SOVs would be able to use the HOV lanes in both directions of I-90 between Seattle and Island Crest Way. This was assumed to demonstrate that it does not affect the results of the analysis and represents a worst case condition. This assumption does not represent approval of SOVs using the outer roadway HOV lanes or the eastbound left-side off-ramp to Island Crest Way. Any changes to the HOV lane eligibility such as tolling, managed lanes or Mercer Island SOV use would need to be addressed in a future analysis, approval and agreement.

2.3.2.1 Segment A: Interstate 90

Segment A has one alternative, the *Preferred Interstate 90 Alternative (A1)*, which crosses Lake Washington and connects Seattle and Mercer Island with Segment B in South Bellevue (Figure 2-5). This alternative has two stations, one in Seattle and one on Mercer Island**.**

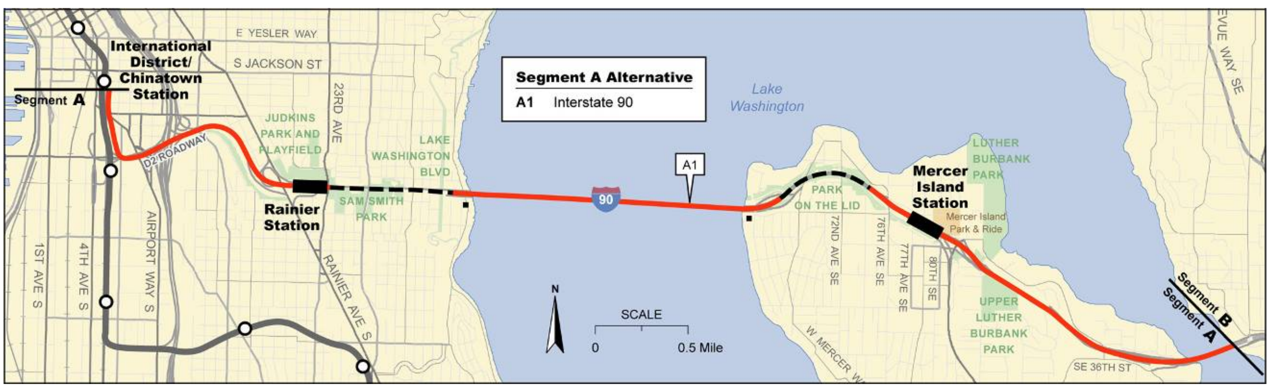


FIGURE 2-5
East Link Project - Segment A

Preferred Alternative A1 begins in the Downtown Seattle Transit Tunnel at the International District/Chinatown Station, where it connects to the Central Link light rail system. From there, the alternative enters the D2 Roadway. The D2 Roadway is a ramp between Downtown Seattle and Rainier Avenue South that currently provides HOV and transit access to and from I-90. With the East Link Project, the D2 Roadway will operate as a joint light rail/bus facility with embedded track. Non-transit (such as carpools) vehicles will be prohibited from using the D2 Roadway.

The alternative continues in the I-90 center roadway to the Rainier Station, passes through the Mount Baker Tunnel, travels in an exclusive right-of-way in the center roadway on the Homer Hadley floating bridge, and continues to the Mercer Island Station located between 77th Avenue SE and 80th Avenue SE by the existing Mercer Island Park-and-Ride lot. As part of Alternative A1, an HOV direct access ramp will be constructed at Island Crest Way in the eastbound direction. Even though the current proposal as part of Stage 3 of the I-90 Two-Way Transit and HOV Operations Project is to construct the eastbound HOV off-ramp proposed at

77th Avenue SE, it is not the preferred option in conjunction with the East Link Project, because bus use of 77th Avenue SE ramp would be partially or wholly replaced by light rail service. Sound Transit and WSDOT prefer to connect this access with the Island Crest Way eastbound off-ramp from the center roadway.

From the Mercer Island Station to Segment B, *Preferred Alternative A1* continues along the I-90 center roadway in exclusive right-of-way. The conversion of the center roadway to light rail would require closure of the center roadway ramp with 77th Avenue SE and the center roadway eastbound direct HOV off-ramp to Island Crest Way. To mitigate queuing effects onto the I-90 mainline, traffic signals at the 77th Avenue off-ramp are included within the technical analysis.

2.3.2.2 Segment B: South Bellevue

The preferred alternative in Segment B is *112th SE Modified Alternative (B2M)*. This alternative becomes elevated as it crosses I-90 westbound mainline to the Eastside of Bellevue Way. The preferred alternative preserves both HOV direct-access ramps in the westbound and eastbound directions at the Bellevue Way and I-90 interchange. This alternative would include an East Link station at the South Bellevue Park-and-Ride lot.

Policy Point 4 provides a detailed description of Proposal's I-90 channelization and access, including modifications.

Policy Point 3: Operational and Accident Analysis

How will the proposal affect safety and traffic operations at year of opening and design year?

3.1 Summary

This policy point summarizes the future no-build and build (the Proposal) conditions in the Proposal study area by means of regional, corridor, and operational analyses in 2020 (the year of opening) and 2030 (the design year). An in-depth safety analysis is also provided. Traffic forecasts (from Policy Point 1) indicate that most the highways in the study area will be congested and, by 2030, will fail to efficiently move people into and out of the urban centers; especially the cities of Seattle and Bellevue. This will occur even with implementation of planned transportation improvements on the regional highways. With the Proposal, light rail would connect the region's dense commercial and residential urban centers of Downtown Seattle and the Eastside (Bellevue and Redmond) across Lake Washington and accommodate the movement of people even with failing roadway conditions.

Along I-90, the Proposal would approximately double the person-carrying capacity across Lake Washington without requiring additional roadway widening or capacity improvements. This increase is expected because the maximum capacity of the East Link light rail system would be 18,000 to 24,000 people per hour or the equivalent of about seven to ten freeway lanes of traffic. The I-90 facility would have the capacity equivalent of less than ten freeway lanes in either of the two the no-build conditions. This is caused by a combination of the surrounding congestion on I-90 mainline and arterial streets that limit the number of vehicles able to use the center roadway and the limited number of connections into and out of the center roadway. Additionally, since the East Link light rail system is not assumed to be operating at maximum capacity by year 2030, converting the center roadway to a fixed light rail guideway would provide person-moving capacity beyond year 2030. Overall, being able to move more people with light rail in both directions, especially in the reverse peak direction (eastbound in the morning and westbound in afternoon), where travel times are expected to substantially increase in the future, would improve the mobility into and out of the urban centers of Seattle and Bellevue.

As described in Policy Point 1, I-90 is expected to reach capacity during the peak periods in the near future, with no further plans to expand I-90 beyond the improvements assumed for the no-build condition. This will further constrain travel for all modes, including freight, HOVs, and buses that share lanes with GP traffic.

Constrained vehicle travel into and out of the major urban centers highlights the need for increased utilization of transit because it is more efficient and reliable in moving people than other modes. As indicated in Figure 3-1, during the most congested periods of the day (AM and PM peak hour), the Proposal across the I-90 floating bridge is forecast to deliver close to 45,000 people in the AM and PM peak hours by 2030.

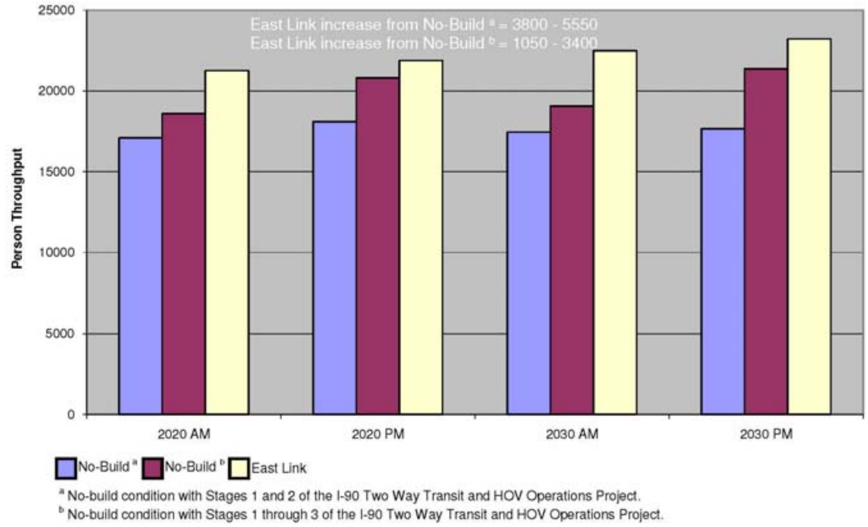


FIGURE 3-1
I-90 2020 and 2030 AM and PM Peak-Hour Person Throughput across Lake Washington

In comparison with the no-build condition when the I-90 Two-Way Transit and HOV Operations Project is completed, I-90 in the build condition would accommodate up to 3,400 more people in the peak periods across Lake Washington by 2030, with virtually the same infrastructure but with a different mode (light rail). Compared with the no-build condition that only completes Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project, up to 5,500 more people in the peak periods would cross I-90 with the ultimate configuration of I-90 complete (light rail in the center roadway and HOV lanes in both directions of the outer roadways). As indicated in Policy Points 1 and 2, funding to complete Stage 3 is included in ST2. Because ST2 was approved by voters in 2008, Sound Transit is working with WSDOT to complete Stage 3 and then immediately close the center roadway for light rail conversion. In other words, the center roadway might close to construct light rail project immediately after the HOV lanes on the outer roadway are completed. Therefore, the new HOV lanes (Stage 3) in the outer roadway would not likely operate in conjunction with the center roadway before East Link construction.

Transit travel time between the key urban centers of Seattle and Downtown Bellevue would improve with light rail service because light rail provides faster travel time with better reliability than bus or auto. With light rail along I-90, travel times for SOVs would remain the same or improve compared with the no-build conditions as people shift to use light rail, which would provide some relief to congestion on I-90.

Without the Proposal, existing and future transit service will continue to operate at failing conditions and fail to meet the transportation reliability and capacity needs for the Eastside corridor. In contrast, with light rail, the frequency of transit throughout the day would improve because light rail would arrive every 7 (during peak periods) to 15 (during off-peak hours) minutes or less, compared with the buses arriving on average every 30 minutes or more during off-peak hours.

By 2030, the East Link Project could attract more than 10,000 new riders over 2030 no-build conditions. This would mean that the transit mode share percentage across Lake Washington would increase up to 33 percent during the PM peak period. This shift to transit indicates the growing demand for transit that is consistent with urban environments and is crucial to providing person mobility rather than vehicle capacity.

The Proposal is not expected to have negative impacts on the overall safety conditions on I-90 because the accident predictions with or without the project are similar. More importantly, the number of accidents per person traveling on I-90 could be reduced because the East Link Project would increase the person throughput on the facility but maintain similar accident expectancy. With the exception of the segment between 5th Avenue South and Rainier Avenue South interchange—known as the D2 Roadway—vehicle access to the directional center roadway would be removed when light rail is operating in the center roadway on a fixed guideway to avoid train-vehicle conflicts and provide safe train operations. Buses and light rail would jointly use the D2 Roadway to provide similar bus connectivity between I-90 and Downtown Seattle as today.

3.2 Analysis Parameters and Assumptions

As discussed in Policy Point 1, the transportation evaluation and MOE analysis for the IJR were performed at three assessment levels: regional, corridor, and operational. This policy point analyzes the future transportation operations with and without the Proposal during the AM and PM peak periods for two future analysis years: 2020 (representing the opening year) and 2030 (representing a design horizon year). The analysis assumed two conditions: no action is taken (no-build), and the Proposal is built (build). There are two variations of the no-build condition that were considered; these variations, as discussed in Policy Point 1 and later in this policy point in Section, 3.2.4, I-90 Future Channelization and Ramps, include the expected completion of the different stages of the I-90 Two-Way Transit and HOV Operations Project.

The same MOEs that were assessed in Policy Point 1 were also used to assess and compare future build to no-build conditions. These include the following:

- Regional MOEs
  - VMT and VHT
  - Transit ridership
- Corridor MOEs
  - Screenline analysis (volume-to-capacity, mode share, person and vehicle throughput, and demand served)
- Operational MOEs
  - Freeway analysis (LOS/density, travel times)
  - Intersection analysis (LOS/delay, vehicle queue length)
  - Freeway and intersection safety
  - Transit performance

In several sections of this policy point (Sections 3.2.3, 3.3.1, and 3.3.3.4), the no-build results documented only assume the full completion of the I-90 Two-Way Transit and HOV Operations Project. Data for only this condition are presented for the no-build conditions because differences in the results between the no-build conditions with or without Stage 3 of the I-90 Two-Way Transit and HOV Operations Project are insignificant.

Table 1-1 in Policy Point 1 provides information on the different types of analyses used to evaluate the performance of the existing and future transportation system. A detailed

methodology and assumptions for the traffic analysis are provided in a memorandum and a report (CH2M HILL, 2010a), attached in Appendixes 3A and 3B, respectively.

3.2.1 VISSIM Model Calibration

The VISSIM calibration and model validation process follows FHWA guidelines for determining the acceptability of model results. Existing freeway volume, average standstill distance, and saturation flow were adjusted as necessary to match data collected from the WSDOT automated traffic recorders; archived travel times; and observed travel times, queues, and delays. Appendix 3C further discusses calibration and validation procedures.

3.2.2 Analysis Years and Time Periods

In this policy point, future years 2020 and 2030 are analyzed to evaluate the operational and safety effects of the Proposal on the transportation system compared with the no-build conditions. Year 2020 was selected as a conservative estimate of the East Link Project opening year. (Selecting this opening year is discussed further in Policy Point 8.) The selected 2030 design year, while not a 20-year horizon beyond the project implementation, provides a consistent analysis with the regional and local planning efforts by PSRC, WSDOT, and other agencies. Year 2040 land use and travel demand forecasts were not available, nor endorsed, at the time of analysis. In the future year analyses, both AM and PM peak periods were evaluated. The peak freeway conditions were determined to be from 6:00 to 9:00 a.m. in the morning and from 3:00 to 6:00 p.m. in the afternoon. Within these periods, traffic volumes were highest from 7:15 to 8:15 a.m. and from 4:30 to 5:30 p.m. For the VISSIM analysis, the first 30 minutes of the peak periods were considered the seeding period to reflect traffic operating conditions.

3.2.3 Future Travel Demand

Future-year analysis for this policy point was conducted for the opening year (2020) and the design year (2030), based on PSRC's current population and land use forecasts and regional model (spring 2007). Policy Point 1 and Appendix 3A provide details of the travel demand forecast methodology used to analyzed future conditions. A number of highway and arterial improvements are considered reasonable and foreseeable; therefore, they were assumed to be constructed by 2020 and 2030. For example, it was assumed that the SR 520 Evergreen Point Bridge would be rebuilt by 2020 and would include HOV lanes and tolling (consistent with the *SR 520 Bridge Replacement and HOV Project Supplemental Draft EIS* [WSDOT, 2011]). Table 1-2 in Policy Point 1 lists the transportation programs and/or projects assumed for the 2030 no-build conditions. The project list in Appendix 3A is the complete list of future transportation infrastructure projects assumed by the year of opening (2020) and the design horizon year (2030). From the PSRC travel demand forecasts, annual vehicle growth rates were calculated for the I-90 corridor. Table 3-1 presents the AM and PM peak-period (3-hour) I-90 vehicle forecasts by 2020 and 2030. Although the I-90 capacity will be reached before 2030 (as indicated in Policy Point 1), the demand for using I-90 will continue to grow as land uses continue to increase on both sides of Lake Washington.

TABLE 3-1
AM and PM Peak-Period I-90 Vehicle Demand Forecasts

Direction	Vehicles								
		2020				2030			
	Existing (2007)	No-build	Annual Growth Rate (2007 to 2020)	Build	Annual Growth Rate (2007 to 2020)	No-build	Annual Growth Rate (2007 to 2030)	Build	Annual Growth Rate (2007 to 2030)
AM Peak Period									
Westbound	35,100	43,900	1.7	42,500	1.5	46,600	1.2	45,800	1.2
Eastbound	28,600	38,800	2.4	35,400	1.7	41,100	1.6	38,300	1.3
PM Peak Period									
Westbound	33,900	50,200	3.1	49,100	2.9	55,600	2.2	53,900	2.0
Eastbound	40,900	54,300	2.2	53,000	2.0	58,400	1.6	55,400	1.3

Source: PSRC (2010b).

In both 2020 and 2030 build conditions, slightly less vehicle growth was predicted compared with the no-build condition as the model predicts people would shift from driving to riding light rail. This is because light rail provides a substantial travel-time savings compared with a vehicle travelling in a congested regional roadway network especially between the urban centers of the City of Seattle and the City of Bellevue. Even so, AM and PM peak period growth rates along I-90 with the project are expected to be up to 2 percent per year.

3.2.4 Future I-90 Channelization and Ramps

As discussed in Policy Point 1, the no-build condition includes two assumptions for staging the I-90 Two-Way Transit and HOV Operations Project (its preferred alternative is called "Alternative R-8A") because the construction schedule between the East Link Project and when Stage 3 (constructing HOV lanes in both directions from Mercer Island to the Rainier Avenue South interchange) is completed is not finalized. In one no-build condition, the HOV lanes on I-90 are assumed to be completed (to Rainier Avenue South) and all associated access modifications built (Stages 1 through 3). The other no-build condition assumes that the HOV lanes (Stages 1 and 2 only) would only be partially completed; this would include HOV lanes west from the Bellevue Way interchange to Mercer Island. The floating bridge section of I-90 would remain unchanged.

ST2 includes funding to fulfill Stage 3, and Sound Transit intends to work with WSDOT to complete Stage 3 and then close the center roadway for light rail conversion. In other words, the center roadway would close for light rail construction immediately after the HOV lanes on the outer roadway are completed. Therefore, the new HOV lanes in the outer roadway would not likely operate in conjunction with the center roadway before construction of East Link. Policy Point 7 provides more information about the I-90 Two-Way Transit and HOV Operations Project.

Figure 3-2 is a schematic of the future I-90 channelization and ramps with the Proposal, and Table 3-2 lists the access modifications from the following assumed projects in the no-build condition and the Proposal:

- I-90 Two-Way Transit and HOV Operations Project
- SR 519 South Seattle Intermodal Access Project and
- I-90 access modifications as part of the East Link Project (the Proposal)

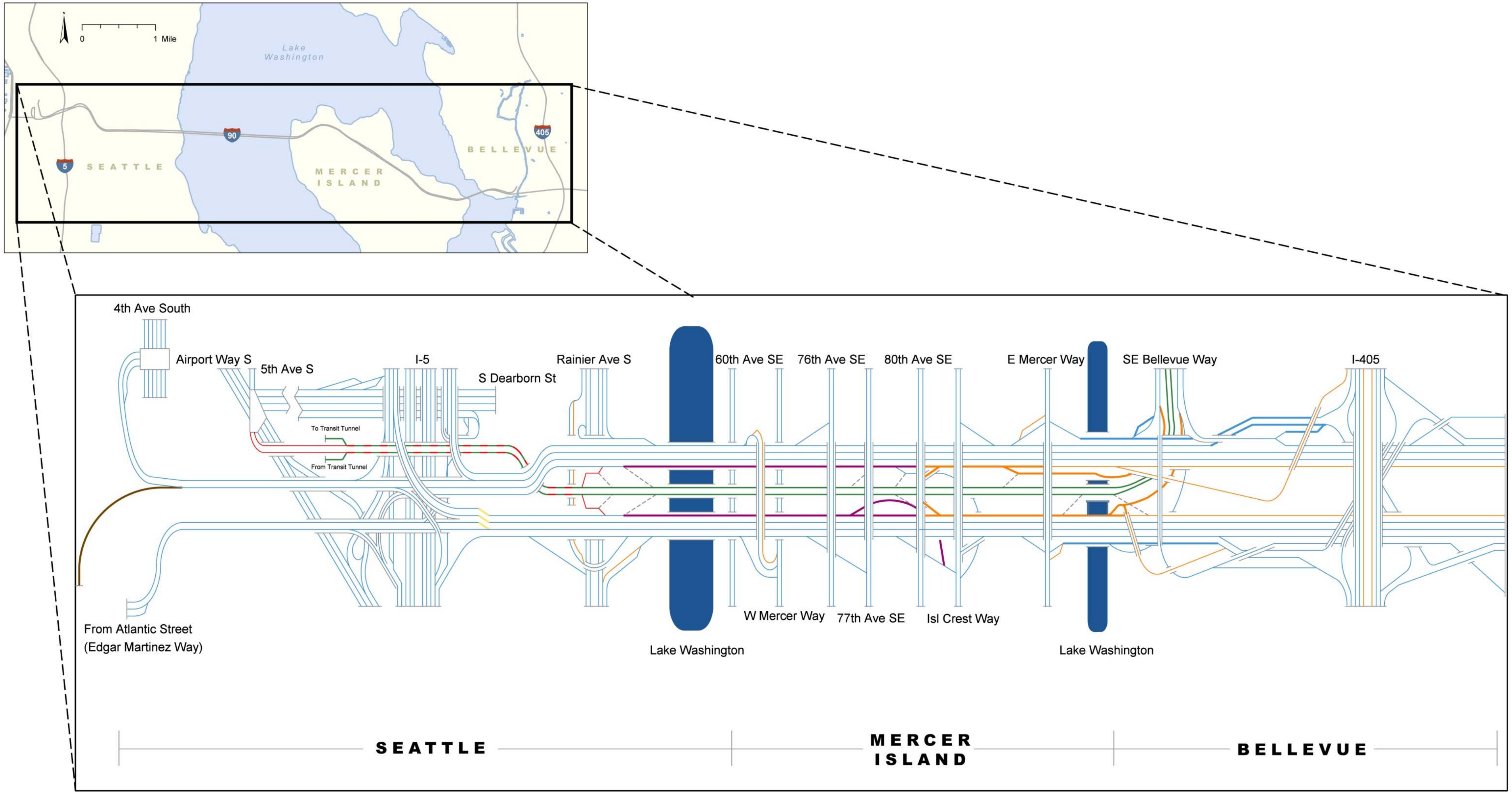
The Proposal would remove access to and from the reversible center roadway with the I-90 westbound and eastbound mainline roadways, and the center roadway access connections at 77th Avenue SE and Island Crest Way would also be removed. In conjunction with the East Link Project, the eastbound HOV direct-access ramp originally proposed at 77th Avenue SE as part of the I-90 Two-Way Transit and HOV Operations Project would be constructed at Island Crest Way. Overall, with the access modifications as part of the Proposal and the I-90 Two-Way Transit and HOV Operations Project, Downtown Mercer Island (between 76th Avenue SE and Island Crest Way/SE 26th Street) would continue to have full access in all directions to I-90.

Not included in the Proposal is a change to the outer roadway HOV lane eligibility. Outer roadway HOV traffic will remain consistent with the I-90 Two-Way Transit and HOV Operations Project ROD (FHWA, 2004). HOV and transit will be authorized to use only the eastbound left-side off-ramp at Island Crest Way, and Mercer Island traffic from the left-side westbound on-ramp at Island Crest Way will be allowed only in the HOV lane for merge and acceleration purposes. With the East Link Project, access to and from reversible center roadway would be removed as well as its ramps connecting to Mercer Island (77th Avenue SE and Island Crest Way). With the access modifications from the I-90 Two-Way Transit and HOV Operations Project and the East Link Project, the traffic analysis assumed Mercer Island SOVs would be able to use the HOV lanes in both directions of I-90 between Seattle and Island Crest Way. This was assumed to demonstrate that it does not affect the analysis results and represents a worst-case condition. This assumption does not represent approval of SOVs using the outer roadway HOV lanes or the eastbound left-side off-ramp to Island Crest Way. Any changes to the HOV lane eligibility, such as tolling, managed lanes, or Mercer Island SOV use, would need to be addressed in a future analysis, approval, and agreement.

The Proposal would maintain both the westbound and eastbound Bellevue Way SE HOV direct-access ramps to the westbound and from the eastbound I-90 HOV lanes and would maintain bus service between Seattle and I-90 on the D2 Roadway. Appendix 4A provides preliminary engineering drawings for the preferred alternative (*Preferred Alternatives A1* and *B2M*) of the East Link Project within the Proposal study area. All modifications were evaluated for 2020 and 2030. In all conditions (build and no-build), the I-90 HOV designation is 2 or more-person vehicles.

3.3 Future No-Build and Build Conditions

Future no-build and build conditions (2020 and 2030) were assessed for freeway, intersection, and transit operations. VISSIM microsimulation software was used to assess freeway operations (travel times; person and vehicle throughput; and segment LOS for mainline, merge, diverge, and weaving areas). Intersection analysis at ramp terminals and adjacent surface street intersections was conducted using Synchro software.



Bus Only Lane/Ramp
Light Rail
Joint Use Bus/Light Rail Lane
Existing HOV Lanes
Future HOV Lanes [1]
Future HOV Lanes [2]
Existing General Purpose Lanes
Future General Purpose Lanes [1]
Future General Purpose Lanes [2]
General Purpose Lanes constructed after 2007 [3]
Ramps Removed With East Link Project

Not To Scale

[1] I-90 Two-Way Transit and HOV Operations Project Stage 1 improvments to westbound GP and HOV facilities constructed after 2007. Eastbound GP and HOV facility improvements as part of Stage 2 are currently being constructed.

[2] Lanes constructed as Stage 3 of I-90 Two Way Transit and HOV Operations Project

[3] SR 519 Intermodal Access Project

Sources: http://www.wsdot.wa.gov/Projects/I90/TwoWayTransit/ and I-90 Two-Way Transit and HOV Operations Project
http://www.wsdot.wa.gov/Projects/SR519

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FIGURE 3-2
I-90 Future Channelization and Ramps

TABLE 3-2
I-90 Future Channelization and Access Modifications

Modification/Ramp	No-Build		
	No-Build[a]	No-Build[b]	Build
SR 519 Intermodal Access Project			
Revise westbound access to Seattle via new ramp connection with Edgar Martinez Drive South, and maintain existing ramp to 4th Avenue South.	X	X	X
I-90 Two-Way Transit and HOV Operations Project			
Construct I-90 westbound and eastbound HOV lane to outer roadway from Bellevue Way to 80th Avenue SE.	X	X	X
Construct an 80th Avenue SE westbound HOV direct-access off-ramp.	X	X	X
Restripe the I-405 westbound on-ramp to provide an additional I-90 lane to the Bellevue Way westbound on-ramp, thereby extending the auxiliary lane across the East Channel bridge to the I-405 westbound on-ramp.	X	X	X
Convert the HOV bypass lane on the Bellevue Way westbound on-ramp to a GP lane.	X	X	X
Modify Bellevue Way interchange for two-way continuous HOV operations to and from the west (and preserve right-of-way space for light rail).	X	X	X
Modify the eastbound on-ramp at 80th Avenue SE to connect from the reversible center roadway to the new eastbound HOV lane in the outer roadway.	X	X	X
Add an eastbound I-90 GP lane between East Mercer Way and I-405 interchanges.	X	X	X
Add a westbound and eastbound HOV lane to the outer roadways between 80th Avenue SE to Rainier Avenue South.		X	X
Construct an eastbound HOV direct-access off-ramp at Island Crest Way.[c]		X	X
East Link Project (the Proposal)			
Modify the D2 Roadway to allow joint use between buses and light rail. Nontransit vehicles would be restricted from using the I-90 D2 Roadway between Seattle and Rainier interchange.			X
Close vehicle access to (eastbound direction) and from (westbound direction) the reversible center roadway at Rainier Avenue South.			X
Close vehicle access to (westbound direction) and from (eastbound direction) the reversible center roadway at East Mercer Way.			X
Close the Island Crest Way accesses with the reversible center roadway.			X
Close the 77th Avenue SE access with the reversible center roadway.			X

[a] With SR 519 Project and Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
[b] With SR 519 Project and Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
[c] This eastbound HOV direct-access off-ramp at Island Crest Way was approved to be constructed at 77th Avenue SE as part of Stage 3 of the I-90 Two-Way Transit and HOV Project; in conjunction with East Link, both WSDOT and Sound Transit prefer to relocate this access to Island Crest Way.
GP general purpose
HOV high-occupancy vehicle
SR state route
WSDOT Washington State Department of Transportation
Source: WSDOT (2011a, b).

Existing freeway and intersection safety was assessed by comparing accident rates and reviewing accident statistic (CAC and CAL) data developed by the state. Along I-90, a predictive assessment of how accidents (and weaving volumes) might change along the mainline roadways in the future based on congestion levels was developed to assess I-90 with and without the Proposal.

3.3.1 Regional Analysis Measures of Effectiveness

To assess regional travel trends, three regional measures (VHT, VMT, and transit ridership) were identified to address how effectively people and goods are moving across the region in the future no-build and build conditions.

3.3.1.1 Vehicle Miles Traveled and Vehicle Hours Traveled

Daily VHT and VMT data for the no-build and build conditions are provided in Table 3-3. In both 2020 and 2030, the regional conditions would improve with the Proposal compared with the no-build condition because the Proposal would provide a mode of travel that shifts people from vehicles to transit. In the build condition in 2030, regionwide VHT and VMT would decrease by approximately 0.2 percent, a reduction of about 230,000 VMT and about 9,000 hours of travel in 2030. As a result, the region would benefit from people using light rail in lieu of their vehicles.

TABLE 3-3
2020 and 2030 Regional Travel Impact Comparison Summary

Year	Daily Vehicle Miles Traveled		Daily Vehicle Hours Traveled	
	No-Build	Build	No-Build	Build
2020	97,417,900	97,240,700	3,085,600	3,080,500
2030	116,690,200	116,461,200	4,463,000	4,453,900

Source: PSRC (2010b); Sound Transit (2010b).

3.3.1.2 Transit Ridership

To forecast transit ridership, Sound Transit uses an incremental demand model. This model is structured so that transit ridership results are based on observed origins and designations of transit users and observed transit line volumes that realistically depict observed transit service characteristics. External changes in demographics, highway travel time, and costs are distinctly incorporated into the process in phases before the impacts of incremental changes in transit service are estimated. The Sound Transit model relies on the PSRC model for data on external changes. Attachment 3 of Appendix 3A describes in detail the Sound Transit ridership model.

Because the route, profile, and station locations are different for each East Link Project alternative being evaluated outside the Proposal study area, variations are expected in projectwide ridership but not for the three stations within I-90 study area. Based on ridership forecasts, the East Link Project would attract between 39,500 and 42,500 daily riders in 2020 and between 48,000 to 52,500 daily riders by 2030 (as provided in Table 3-4).

TABLE 3-4
Year 2020 and 2030 East Link Ridership Forecasts Along I-90

Stations in I-90 Vicinity	Daily Station Ridership (persons)	
	2020	2030
Rainier	3,000	3,000
Mercer Island	1,500	1,500
South Bellevue	4,000	4,500
Projectwide Ridership	39,500 to 42,500	48,000 to 52,500

Source: Sound Transit (2010b).

Along the I-90 corridor, there are three proposed stations: Rainier Avenue South (where the current bus flyer stop is located), Mercer Island, and the South Bellevue Park-and-Ride. The station ridership shown in Table 3-4 is the total number of people boarding that station daily. Compared with the no-build conditions, there would be about 8,500 new daily riders (new riders are people who would not use transit in the no-build condition), in 2020 and 10,500 by 2030 with the East Link Project. The East Link Final EIS (Sound Transit, 2011) contains more information about the transit forecasts.

3.3.2 Corridor Analysis Measures of Effectiveness

Locations of Screenlines 2 (Lake Washington) and 3 (I-90 at Mercer Slough) used in the corridor assessment can be viewed in Figure 1-3 in Policy Point 1. The intent of Screenline 2 is to identify changes in travel patterns across Lake Washington (SR 520 and I-90) with the Proposal; Screenline 3 is intended to assess the impacts of the Proposal east of the project area. V/C ratio and mode share data, provided from the PSRC regional model and Sound Transit ridership model, offer a snapshot of the future I-90 conditions. Information in this section was acquired from a more macrolevel regional travel demand model; Section 3.3.3, Operational Analysis Measures of Effectiveness, provides a more in-depth understanding of the expected future I-90 operations.

Generally, the V/C ratio results for the future suggest that I-90 will be at capacity. Considering the density of the urban environment in the East Link Project area, V/C ratios near 1.0 or at capacity are not abnormal or unexpected for the peak hour. By 2030, the Proposal would improve the V/C ratios in the reverse-peak direction (eastbound in the AM and westbound in the PM) and slightly degrade the V/C ratios in the peak direction (westbound in the AM and eastbound in the PM) because vehicle access to the center roadway would be removed.

One indicator of how efficiently people are moving can be derived by comparing mode share information between the no-build and build conditions. Compared with the no-build condition, a substantial growth in transit across the lake in conjunction with a decrease in the SOV and HOV mode share is expected with the East Link Project.

3.3.2.1 Volume-to-Capacity

Screenline 2: Lake Washington (Includes I-90 and SR 520)

In the future no-build and build conditions, the westbound and eastbound PM peak-hour vehicle V/C ratios crossing Screenline 2 would be near 1.0 or above. This indicates highly

congested conditions, as shown in Table 3-5. Slightly less congestion is predicted for the future AM peak hour.

With the build condition, the V/C ratio is expected to increase slightly from no-build conditions in the "peak" direction (westbound in the AM and eastbound in the PM) because vehicle access to the reversible roadway would be prohibited. In the "reverse peak" direction (eastbound in the AM and westbound in the PM), the V/C ratio is expected to improve with the build condition the reliability of light rail attracting commuters crossing the lake, thereby reducing congestion. By 2030, the V/C ratio is forecasted to be reduced by up to 13 percent in these directions under the build condition.

Screenline 3: Interstate 90 (at Mercer Slough)

With the Proposal, V/C ratios would be similar or decrease slightly from no-build conditions because of a slight shift in travel patterns associated with the Proposal. Although the V/C ratio between the no-build and build conditions would improve, the level of congestion at this location is relatively low (as shown in Table 3-5).

TABLE 3-5
2020 and 2030 No-Build and Build Screenline PM Peak-Hour Vehicle Volume-to-Capacity Ratios

		2020						2030					
		No-Build[a]		No-Build[b]		Build		No-Build[a]		No-Build[b]		Build	
Screenline	**Direction**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Screenline 2 (Lake Washington; I-90 and SR 520)	Westbound	0.95	1.14	0.91	1.06	1.01	1.04	0.97	1.22	0.93	1.13	1.04	1.12
	Eastbound	0.95	1.06	0.90	1.01	0.85	1.14	1.01	1.09	0.96	1.02	0.92	1.17
Screenline 3 (I-90 at Mercer Slough)	Westbound	0.63	0.56	0.63	0.60	0.62	0.60	0.67	0.66	0.67	0.70	0.67	0.68
	Eastbound	0.45	0.69	0.46	0.69	0.47	0.63	0.49	0.83	0.51	0.82	0.53	0.72

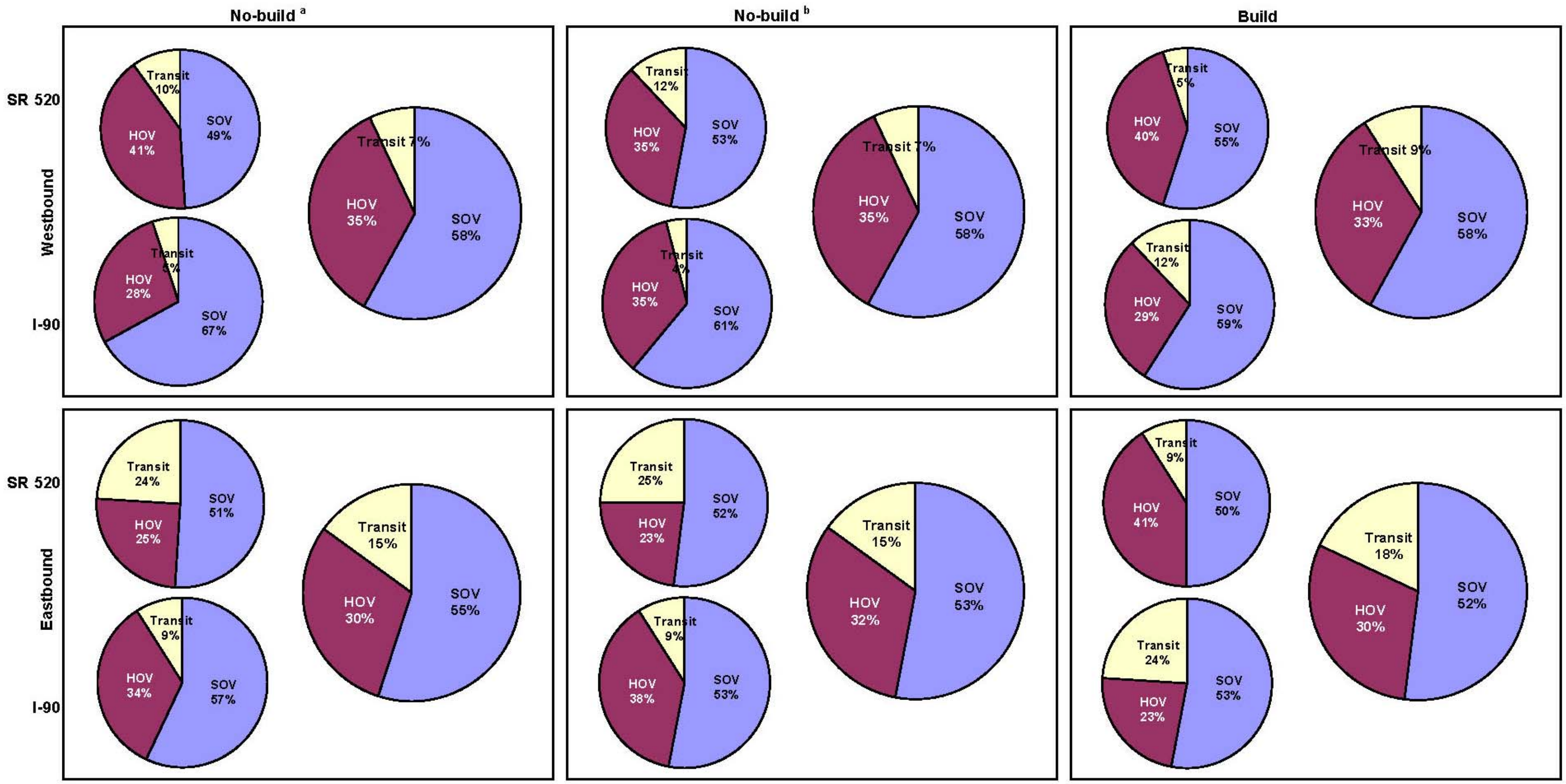
[a] No-build condition with Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
[b] No-build condition with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
Source: PSRC (2010b); Sound Transit (2010b).

3.3.2.2 Mode Share

Screenline 2: Lake Washington (Includes I-90 and SR 520)

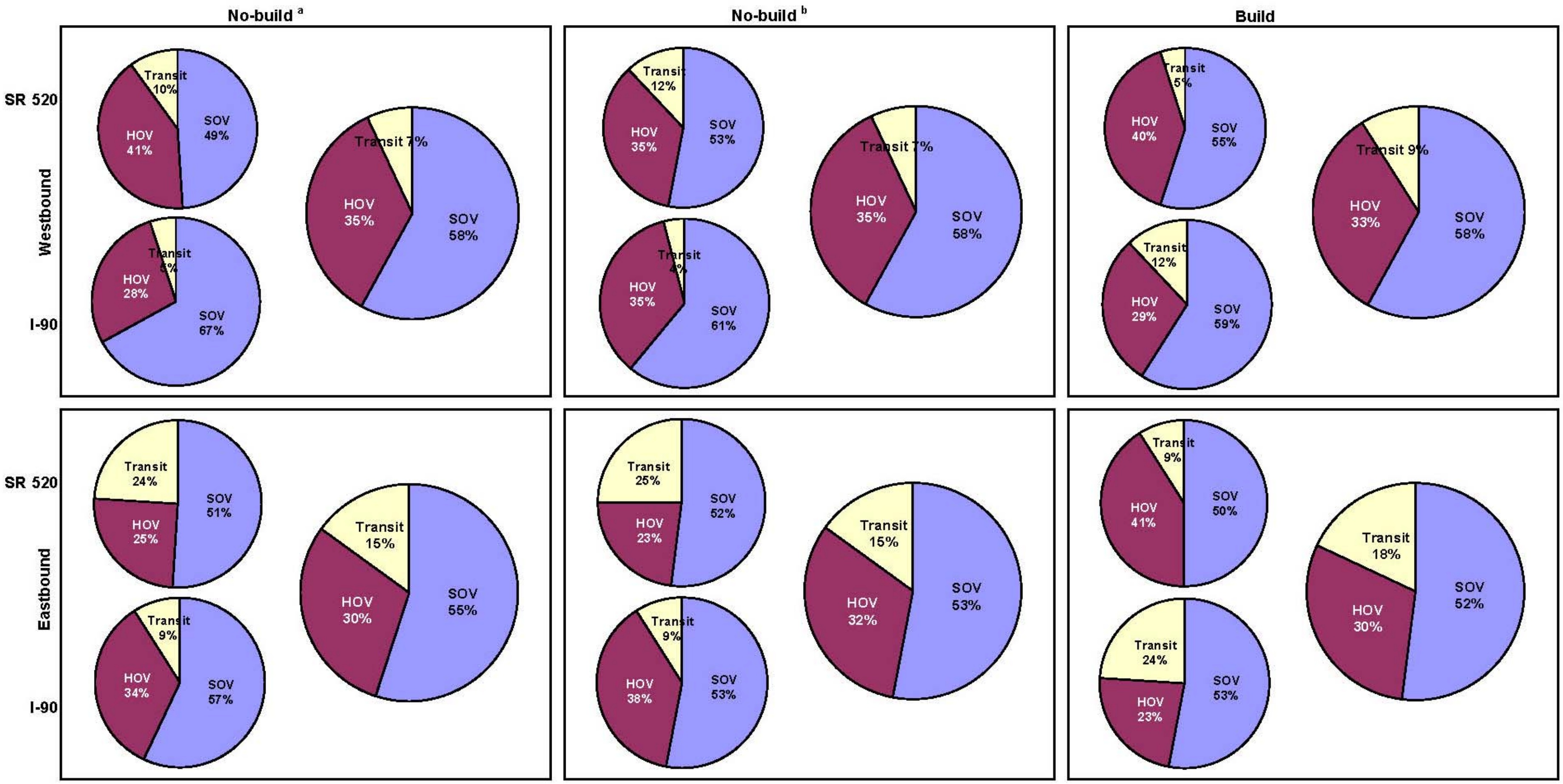
With the Proposal, both SOV and HOV usage would decrease as people choose to ride transit, as shown in Figures 3-3 (2020) and 3-4 (2030). In 2030, with a faster and more reliable mode choice—light rail—being provided, the transit mode share percentage across Lake Washington in the PM peak hour would grow by 25 to 33 percent, indicating a substantial shift to transit. Appendix 3D contains the complete set of mode share information, including AM peak hour.

With the Proposal, the transit service along SR 520 and I-90 across Lake Washington is expected to reduce because most bus service that duplicates or parallels light rail would be either modified or deleted. This, in combination with light rail on I-90, indicates I-90 across Lake Washington would carry a much higher number of transit riders than SR 520 and become the crossing with a higher transit mode share.



Notes:
[a] No-build condition with Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
[b] No-build condition with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
Larger pie chart provides mode share data for both I-90 and SR-520.
HOV high-occupancy vehicle
SOV single-occupant vehicle

FIGURE 3-3
Screenline 2 (Lake Washington) with I-90 and SR 520 Separated 2020 No-Build and Build PM Peak-Hour Mode Share (people)



Notes:

[a] No-build condition with Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.

[b] No-build condition with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.

Larger pie chart provides mode share data for both I-90 and SR-520.

HOV high-occupancy vehicle

SOV single-occupant vehicle

FIGURE 3-4

Screenline 2 (Lake Washington) with I-90 and SR 520 Separated 2030 No-Build and Build PM Peak-Hour Mode Share (people)

Comparing 2020 and 2030, the HOV mode share between I-90 and SR 520 is expected remain similar between the two bridges. With the Proposal, the HOV mode share on I-90 would decrease slightly and increase on SR 520. This is because some people in HOVs would shift to ride light rail, access to the center roadway would be removed, and Mercer Island traffic would be eligible to use the HOV lanes between Seattle and Mercer Island, as described in Section 3.2.4. SOV percentages would be expected to slightly decrease with the Proposal.

Screenline 3: Interstate 90 (at Mercer Slough)

Figure 3-5 indicates that, with the Proposal, the HOV share would decrease slightly for the reasons discussed for Screenline 2. Minimal change to the transit mode share is expected because the Proposal does not cross this screenline. Lastly, SOV use across this screenline would increase with the Proposal because some transit users would drive to the South Bellevue Park-and-Ride to access light rail.

3.3.3 Operational Analysis Measures of Effectiveness

3.3.3.1 Person and Vehicle Throughput

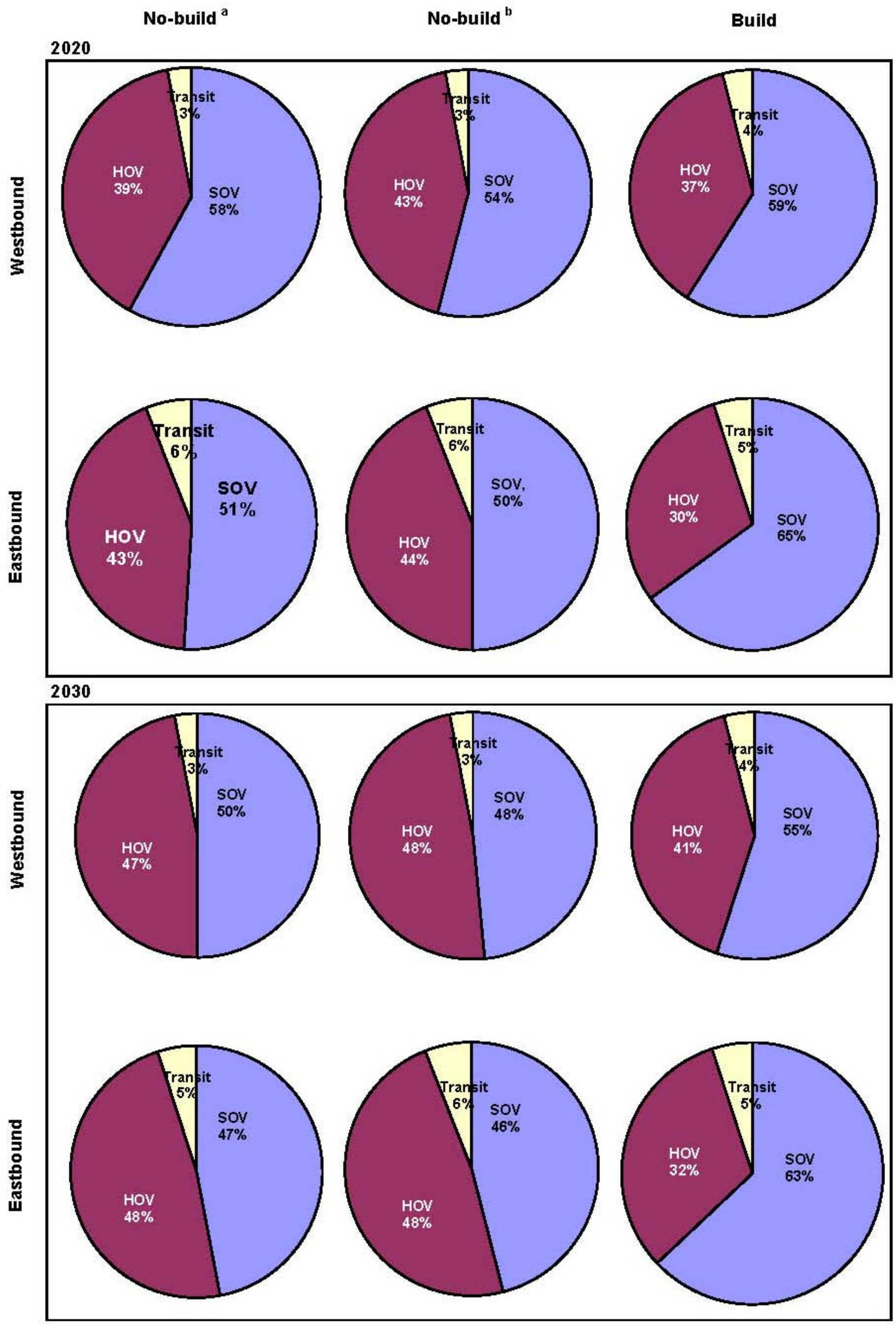
Similar to the corridor analysis MOEs, vehicle and person throughput were tabulated at Screenline 2 (Lake Washington) and Screenline 3 (I-90 at Mercer Slough). Compared with vehicle throughput, person throughput is a more appropriate assessment measure for analysis of a transit project because it illustrates the overall system efficiency through the number of people moved instead of vehicles.

Although Screenline 2 included I-90 and SR 520 for the previously described corridor analysis of MOEs, Screenline 2 data in this section include I-90 only. Throughput is summarized in the build and no-build conditions for the SOV, HOV, and transit modes. For the build condition, transit includes both bus and light rail. Existing and future 2020 and 2030 no-build and build condition vehicle and person throughput data are shown in Tables 3-6 and 3-7 and in Figures 3-6 and 3-7. More detailed throughput data are in Appendix 3F.

Person Throughput

Screenline 2: Lake Washington (Includes I-90 only)

The person throughput in the build condition would be higher in every direction in both 2020 and 2030 when compared with the no-build condition, with only Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project. Compared with this no-build condition between a 17 to 24 percent increase in person throughput in either the AM or PM peak hour would be expected with the Proposal. If Stage 3 is assumed to be complete in the no-build condition, the build condition person throughput would still be higher in all directions in 2020 and 2030, except for the eastbound direction in the PM peak hour. Overall, compared with this no-build condition, person throughput with the Proposal would be expected to increase between a 5 to 15 percent in either the AM or PM peak hour. Table 3-6 and Figure 3-6 indicate these person throughput trends, which would occur because light rail (both directions) in the center roadway would more effectively move people than lower-occupancy HOVs or buses in one direction. Having more people travel on light rail in the center roadway would create more opportunities for people to travel on the outer roadways. This has an overall benefit to I-90 because it would improve mobility for each roadway; however, some users would be adversely affected at isolated locations, as described in the following paragraphs.



Notes:
[a] No-build condition with Stages 1 and 2 of the I-90 Two Way Transit and HOV Operations Project.
[b] No-build condition with Stages 1 through 3 of the I-90 Two Way Transit and HOV Operations Project.
HOV = high-occupancy vehicle
SOV = single-occupancy vehicle

FIGURE 3-5
Screenline 3 (I-90 at Mercer Slough) 2020 and 2030 No-Build and Build AM and PM Peak-Hour Mode Share (people)

TABLE 3-6
2020 and 2030 Vehicle and Person Peak-Hour I-90 Throughput at Lake Washington (Screenline 2)

	2020							2030						
	Vehicles					Persons		Vehicles					Persons	
Direction	**SOV**	**HOV[a]**	**Transit**	**LRT**	**Total**	**Total**	**% Increase over No-Build[b]**	**SOV**	**HOV[a]**	**Transit**	**LRT**	**Total**	**Total**	**% Increase over No-Build[b]**
AM Westbound														
No-build[c]	5,550	2,000	32	N/A	7,600	11,050	N/A	5,500	2,150	34	N/A	7,700	11,450	N/A
No-build[d]	6,000	2,050	33	N/A	8,100	11,600	N/A	5,900	2,200	35	N/A	8,100	11,900	N/A
Build	5,600	1,850	17	7	7,450	12,850	14/10	5,550	1,950	17	8	7,550	13,600	16/13
AM Eastbound														
No-build[c]	4,450	600	12	N/A	5,050	6,050	N/A	4,400	550	12	N/A	4,950	6,000	N/A
No-build[d]	4,950	750	13	N/A	5,750	6,950	N/A	5,000	800	13	N/A	5,800	7,150	N/A
Build	5,400	750	4	7	6,150	8,400	28/17	5,250	750	4	8	6,050	8,900	33/20
AM Total														
No-build[c]	10,000	2,600	44	N/A	12,650	17,100	N/A	9,900	2,700	46	N/A	12,650	17,450	N/A
No-build[d]	10,950	2,800	46	N/A	13,800	18,600	N/A	10,900	2,950	48	N/A	13,900	19,050	N/A
Build	11,000	2,600	21	14	13,600	21,250	20/13	10,800	2,750	21	16	13,550	22,500	22/15
PM Westbound														
No-build[c]	5,200	950	11	N/A	6,150	7,600	N/A	5,050	1,150	13	N/A	6,200	8,050	N/A
No-build[d]	5,300	1,000	13	N/A	6,300	7,850	N/A	5,200	1,200	14	N/A	6,400	8,400	N/A
Build	5,100	1,550	4	7	6,650	9,950	24/21	5,000	1,650	4	8	6,650	10,700	25/22
PM Eastbound														
No-build[c]	4,400	2,200	34	N/A	6,650	10,500	N/A	3,850	1,950	37	N/A	5,850	9,600	N/A
No-build[d]	5,500	2,850	34	N/A	8,350	12,950	N/A	5,250	2,750	37	N/A	8,050	13,000	N/A

TABLE 3-6
2020 and 2030 Vehicle and Person Peak-Hour I-90 Throughput at Lake Washington (Screenline 2)

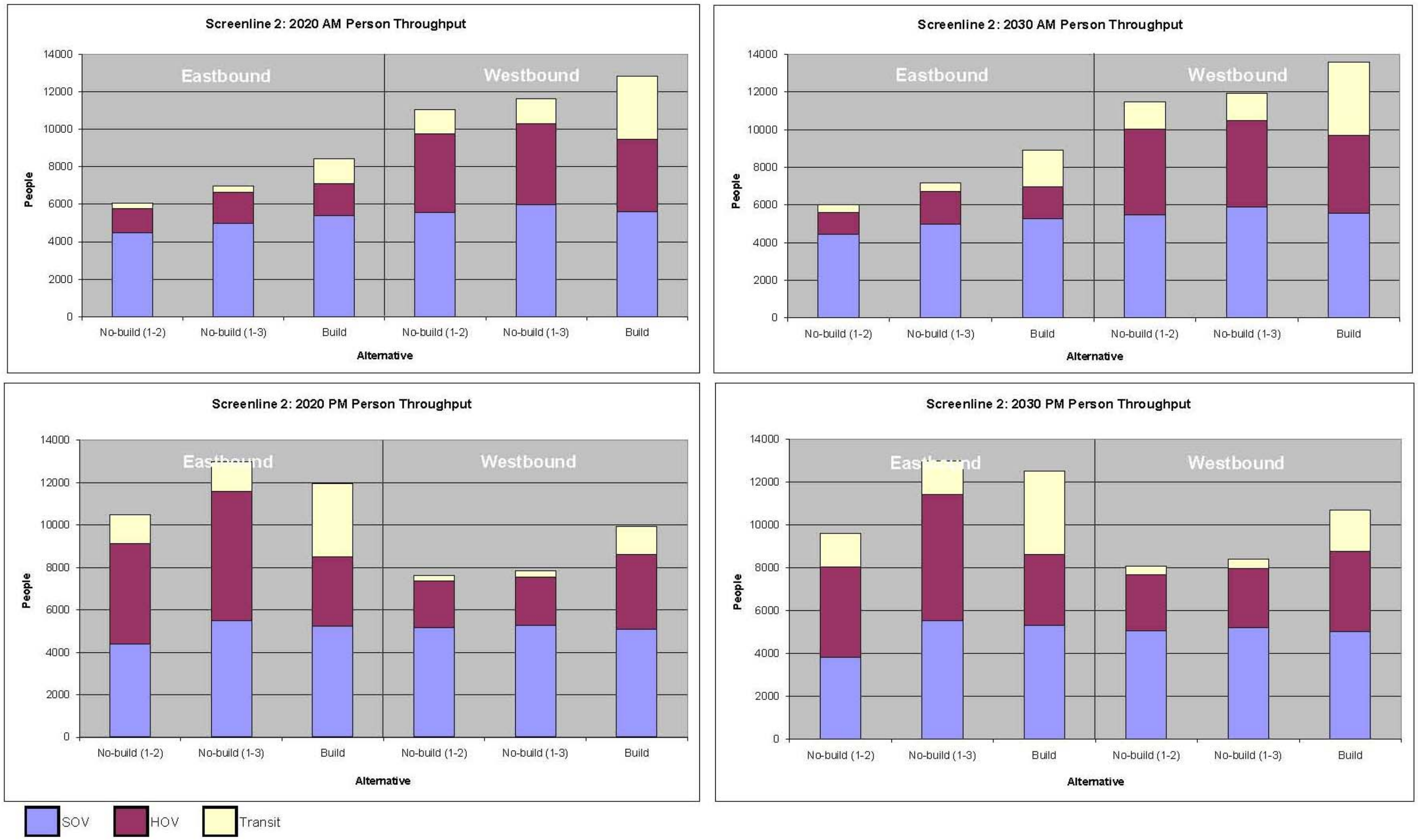
Direction	2020							2030						
	Vehicles					Persons		Vehicles					Persons	
	SOV	HOV[a]	Transit	LRT	Total	Total	% Increase over No-Build[b]	SOV	HOV[a]	Transit	LRT	Total	Total	% Increase over No-Build[b]
Build	5,200	1,550	20	7	6,750	11,950	12/-8	5,300	1,550	18	8	6,850	12,500	23/-4
PM Total														
No-build[c]	**9,550**	**3,150**	**45**	**N/A**	**12,750**	**18,100**	N/A	**8,900**	**3,100**	**50**	**N/A**	**12,050**	**17,650**	N/A
No-build[d]	**10,750**	**3,850**	**47**	**N/A**	**14,650**	**20,800**	N/A	**10,450**	**3,950**	**51**	**N/A**	**14,450**	**21,350**	N/A
Build	**10,350**	**3,050**	**24**	**14**	**13,400**	**21,900**	**17/5**	**10,350**	**3,150**	**22**	**16**	13,550	23,200	24/8

Note: Because of rounding, values might not sum correctly.
[a] HOV values are the total number of HOVs crossing the screenline not the amount only in the HOV lanes.
[b] Percent increase compares build condition with no-build condition assuming Stages 1 and 2 only and no-build condition assuming Stages 1 through 3.
\c No-build condition with Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
[d] No-build condition with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
HOV high-occupancy vehicle
LRT light rail transit
N/A not applicable
SOV single-occupant vehicle

TABLE 3-7
2020 and 2030 Vehicle and Person Peak-Hour Throughput for I-90 at Mercer Slough (Screenline 3)

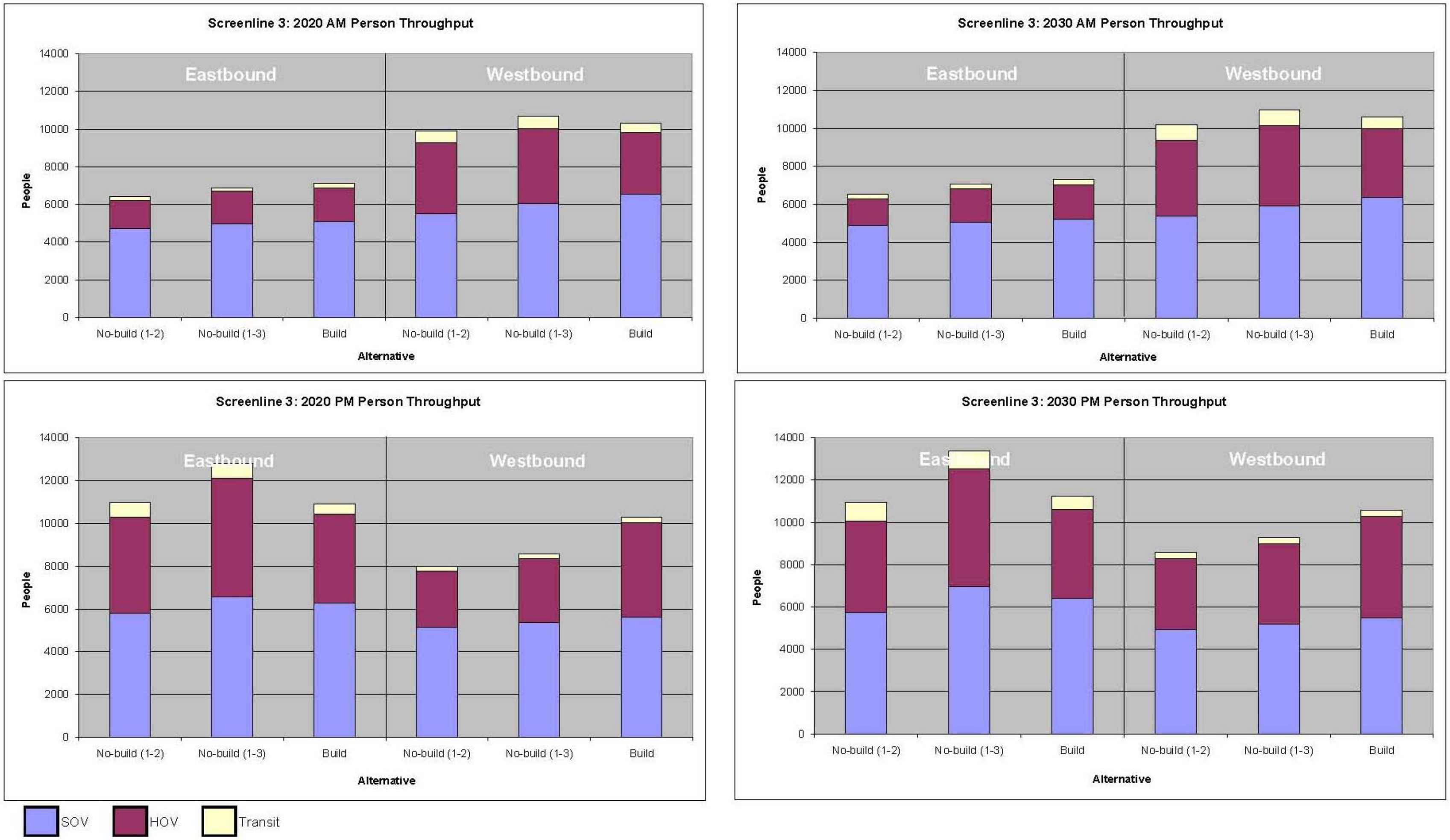
	2020					2030				
	Vehicles				Persons	Vehicles				Persons
Direction	SOV	HOV[d]	Transit	Total	Total	SOV	HOV[d]	Transit	Total	Total
AM Westbound										
No-build[a]	5,500	1,800	30	7,300	9,900	5,400	1,900	33	7,300	10,200
No-build[b]	6,050	1,900	30	7,950	10,700	5,900	2,000	33	7,950	10,950
Build[c]	6,550	1,550	31	8,150	10,300	6,350	1,700	32	8,100	10,600
AM Eastbound										
No-build[a]	4,700	650	12	5,400	6,400	4,850	650	12	5,500	6,550
No-build[b]	4,950	750	12	5,750	6,900	5,050	800	10	5,850	7,050
Build[c]	5,100	800	13	5,900	7,150	5,200	800	12	6,000	7,300
AM Total										
No-build[a]	10,200	2,450	42	12,700	16,350	10,250	2,500	45	12,850	16,700
No-build[b]	11,000	2,650	42	13,700	17,550	10,950	2,800	43	13,800	18,000
Build[c]	11,650	2,350	44	14,050	17,450	11,550	2,550	44	14,150	17,900
PM Westbound										
No-build[a]	5,150	1,150	13	6,300	8,000	4,950	1,450	13	6,400	8,550
No-build[b]	5,350	1,300	13	6,650	8,550	5,200	1,650	13	6,850	9,250
Build[c]	5,600	1,950	12	7,550	10,250	5,500	2,100	11	7,600	10,550
PM Eastbound										
No-build[a]	5,800	2,050	32	7,900	10,950	5,750	2,000	35	7,800	10,950
No-build[b]	6,600	2,600	32	9,200	12,800	6,950	2,600	35	9,600	13,400
Build[c]	6,300	1,950	30	8,250	10,900	6,400	1,950	33	8,400	11,250
PM Total										
No-build[a]	10,950	3,200	45	14,200	18,950	10,700	3,450	48	14,200	19,500
No-build[b]	11,950	3,900	45	15,850	21,400	12,150	4,250	48	16,450	22,650
Build[c]	11,900	3,850	42	15,800	21,200	11,900	4,050	44	16,000	21,800

Note: Because of rounding, values may not sum correctly
[a] No-build condition with Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
[b] No-build condition with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
[c] Light rail is not included in the build condition data because light rail does not cross Screenline 3.
[d] HOV values are the total number of HOVs crossing the screenline not the amount only in the HOV lanes.
HOV high-occupancy vehicle
SOV single-occupant vehicle



Note:
No-build (1-2) includes Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
No-build (1-3) includes Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
Values represent the total number of vehicles for that mode crossing the screenline not the amount in each lane.

FIGURE 3-6
2020 and 2030 I-90 Peak-Hour Person Throughput at Screenline 2 (Lake Washington)



Note:
"No-build (1-2)" includes Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
"No-build (1-3)" includes Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
Values represent the total number of vehicles for that mode crossing the screenline not the amount in each lane.

FIGURE 3-7
2020 and 2030 I-90 Peak-Hour Person Throughput at Screenline 3 (I-90 at Mercer Slough)

By direction, person throughput in the 2020 and 2030 build condition would be substantially higher in the reverse-peak direction (eastbound in AM peak hour, westbound in PM peak hour) compared with either of the no-build conditions. In either future analysis year, approximately a 25 to 33 percent increase in the reverse-peak direction person throughput would occur with the Proposal compared with the no-build condition, where only Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project would be constructed, and between a 17 to 22 percent increase in the reverse-peak direction person throughput would occur with the project compared with the no-build condition, assuming that all three stages are constructed. The reason for the substantial increase in person throughput in the reverse-peak direction is that light rail would provide a bidirectional transportation option in the center roadway that otherwise would not be available for people traveling in this direction.

In the peak direction (westbound in the AM peak hour and eastbound in the PM peak hour), the reversible center roadway would be closed to vehicle access because bidirectional light rail would be provided with the Proposal. In either 2020 or 2030, an increase between 12 to 23 percent in the peak direction person throughput would occur with the Proposal compared with no-build condition, when only Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project are constructed.

In 2030, person throughput in the westbound direction with the Proposal would increase by up to 13 percent in the AM peak period and decrease by approximately 4 percent in the PM eastbound direction compared with the no-build condition, assuming that all three stages of the I-90 Two-Way Transit and HOV Operations Project are constructed. This decrease in eastbound throughput is attributable to a relatively low throughput in the eastbound HOV lane that crosses this screenline. Lane changing associated with transitioning the inner GP lane to an HOV lane near the Rainier Avenue South interchange and the additional vehicles involved in the lane changing caused by the center roadway closure would reduce throughput in the HOV lane. If the lane were managed in a way that accommodates more people, then the eastbound throughput should be comparable between the no-build and build conditions. However, compared with the no-build condition with only Stages 1 and 2 of the I-90 Two-Way Transit and HOV Project, the person throughput would increase by about 23 percent in the 2030 PM peak eastbound direction with the Proposal. This is likely the more appropriate comparison because the I-90 HOV lanes would likely be completed immediately before the center roadway is closed for light rail construction; therefore, I-90 drivers would likely be able to use the center roadway and outer roadway HOV lanes for any considerable length of time.

Screenline 3: Interstate 90 (at Mercer Slough)

Comparing the 2020 and 2030 total person throughput at Screenline 3, the Proposal would increase person throughput when compared with the no-build condition with only Stages 1 and 2 of the I-90 Two-Way Transit and HOV Project constructed and would be similar to slightly less if Stage 3 is completed for both the AM and PM peak hours, as indicated in Table 3-7 and Figure 3-7. Compared with Screenline 2, the Proposal would not substantially change travel conditions at this screenline since light rail would not cross this screenline and HOV lanes currently exist across this screenline.

In the reverse-peak directions (eastbound in the AM peak hour and westbound in the PM peak hour), the person throughput with East Link compared with the two no-build conditions would be up to 24 percent higher in either of the 2030 AM and PM peak hours. In the westbound (peak) direction in the 2030 AM peak hour, person throughput with the East Link Project

compared with than the two no-build conditions would range from 3 percent lower to 4 percent higher. In the eastbound (peak) direction in the 2030 PM peak hour, person throughput would be up to 16 percent less than in the no-build condition, assuming that Stage 3 of the I-90 Two-Way Transit and HOV Project is completed. As previously stated in the Screenline 2 (Lake Washington) discussion, the low eastbound HOV throughput causes a low HOV throughput downstream at this screenline. Again, if the HOV lanes were managed more efficiently, the throughput could be similar between the no-build and build conditions. The Proposal also would change the travel patterns of transit riders across Screenline 3. Instead of accessing transit at the Eastgate Park-and-Ride, some transit patrons would travel to the South Bellevue Station to access light rail, reducing the number of transit riders at Screenline 3 with the Proposal.

Vehicle Throughput

Screenline 2: Lake Washington (Includes I-90 only)

Overall, total vehicle throughput for 2030 with the Proposal compared with no-build condition (with Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project) would increase by 7 (AM peak hour) to 12 percent (PM peak hour). Compared with the no-build condition (with Stages 1 through 3), the proposal would have a similar (AM peak hour) to slightly decreased (PM peak hour) total vehicle throughput in 2030.

By direction, the Proposal would have a higher vehicle throughput compared with either of the two no-build conditions in the reverse peak direction (eastbound in the AM and westbound in the PM) because the roadway capacity would be unaffected in combination with people shifting to ride light rail. People shifting to use light rail would slightly reduce vehicle congestion and, therefore, increase vehicle throughput.

In the peak directions (westbound in the AM and eastbound in the PM), the Proposal would have a similar vehicle throughput compared with the no-build condition (with Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project). Compared with the no-build condition (with Stages 1 through 3) a 7 to 15 decrease in vehicle throughput would be expected with the Proposal because the center roadway would be closed for vehicle access. In the PM eastbound direction, part of the reason is a relatively low throughput in the eastbound HOV lane that crosses this screenline, as described earlier in Section 3.3.3.1. These comparisons are shown in Table 3-6.

Although the Proposal would close the reversible center roadway to vehicle access, the vehicle throughput in the peak direction would not be substantially lower in the build condition because the reversible center roadway would not accommodate a full two lanes of traffic in the no-build conditions. The two-lane capacity is underutilized because of upstream constraints that are described in detail in Policy Point 1.

Screenline 3: Interstate 90 (at Mercer Slough)

As shown in Table 3-7 with the Proposal and as compared with the no-build condition, the number of vehicles that travel across I-90 in the reverse peak direction would be, at worse, similar but up to a 20-percent increase over no-build conditions, except in the 2030 PM eastbound direction. The cause of these trends is similar to the causes discussed above for Screenline 2.

3.3.3.2 Vehicle and Person Demand Served

In conjunction with throughput, the percentage of the forecast demand able to be accommodated was evaluated. This measure compares the person and vehicle throughput to the expected demand across each screenline and highlights a roadway's efficiency in moving move people. A percentage less than 100 means congestion exists that limits the number of vehicles (or people) able to cross the screenline. Table 3-8 provides the vehicle and person demand served across Screenlines 2 and 3 for 2030 conditions. Overall, a greater percentage of total vehicles and people would be served with the project compared with either no-build condition.

TABLE 3-8
2030 Vehicle and Person Peak-Hour Demand Served for I-90 at Lake Washington (Screenlines 2 and 3)

Condition/ Screenline	Vehicles			Persons		
	Demand	Throughput	Percent Served	Demand	Throughput	Percent Served
Screenline 2 (I-90 only)						
AM Total						
No-build[a]	21,000	12,600	60.2	27,100	17,500	64.5
No-build[b]	20,900	13,900	66.4	27,000	19,100	70.7
Build	19,700	13,600	68.8	29,200	22,500	76.9
PM Total						
No-build[a]	22,200	12,000	54.3	30,000	17,700	58.9
No-build[b]	22,300	14,500	64.7	30,500	21,100	69.2
Build	20,500	13,500	66.1	31,800	23,200	73.1
Screenline 3						
AM Total						
No-build[a]	20,300	12,800	63.3	25,000	16,700	66.8
No-build[b]	20,300	13,800	67.9	25,300	18,000	71.0
Build	20,000	14,100	70.5	24,500	17,900	73.0
PM Total						
No-build[a]	22,300	14,200	63.8	29,200	19,500	66.7
No-build[b]	22,700	16,400	72.5	30,100	22,700	75.4
Build	21,500	16,000	74.4	28,800	21,800	75.8

[a] With Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
[b] With Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.

At Screenline 2, the AM and PM peak-hour total (combined eastbound and westbound directions) vehicle- and person-demand served percentage increased in the build condition compared with either of the two no-build conditions. Total vehicle percent demand served would increase between 14 to 22 percent in the build condition compared with the no-build condition with only Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project and between 2 to 4 percent if Stage 3 were completed in the no-build condition. Total person percent demand served would increase between 19 to 24 percent in the build condition compared with the no-build conditions with only Stages 1 and 2 and between 6 to 9 percent if Stage 3 is completed in the no-build condition. At Screenline 3, total (eastbound and westbound directions) vehicle and person demand served would increase between 9 to 16 percent compared with the no-build condition only Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project and when compared with the no-build condition if Stage 3 is completed would have a similar to 4-percent increase with the project.

3.3.3.3 Freeway LOS and Travel Speeds

Freeway densities and LOS are provided as a measure to understand freeway operations and should be reviewed in conjunction with the other freeway analytical measures (throughput and travel time) presented in this policy point to better understand how each phase of I-90 improvements affects vehicle capacity bottlenecks and the operations upstream and downstream of them. In many situations, the Proposal would improve driver conditions (faster travel times and greater throughput), although freeway LOS densities might increase in some segments; this is because bottlenecks, which form congestion, would be removed with the Proposal. This, in turn, would increase the flow of traffic downstream and allow more vehicles to reach their destination sooner.

As discussed in Policy Point 1, overall congestion on I-90 is expected to occur for longer distances and longer periods of each day in the future no-build condition. The 2020 and 2030 freeway LOS (Tables 3-9 through 3-12) and the 2030 congestion maps in Figure 3-8 illustrate that, in the build condition (light rail provided in the reversible center roadway and vehicle access closed) congestion would relocate, but congestion patterns and vehicle operations would remain fairly similar to the no-build condition. Overall, in both no-build and build conditions, LOS E and F conditions are expected in the future throughout most of the study area, although the Proposal would improve the travel speeds and reduce the vehicle densities for many freeway segments. Policy Point 1 further discusses the two no-build conditions and how they compare with existing conditions.

The congestion maps in Figure 3-8 are translated to the LOS results provided in Tables 3-9 through 3-12; therefore, the information provided between the figure and tables are the same. To calculate a traditional HCM-based LOS using VISSIM requires applying equivalent freeway density calculations (passenger car per hour per lane). Appendix 3G provides the freeway LOS figures that illustrate volumes (throughput), density, and LOS from VISSIM along I-90 within the Proposal study area. The congestion maps in Figure 3-8 indicate vehicle speeds over time (vertical axis) and distance (horizontal axis) for 2030 in the no-build and build conditions. The time indicated on these maps is for 2.5-hour duration in both the AM (6:30 to 9:00 a.m.) and PM (3:30 to 6:00 p.m.) peak periods. The study limits extend from I-90 at the western terminus at SR 519 to east of the I-405 system interchange. On the maps, LOS E and F conditions (speeds at or below 55 mph) are those areas on the graphics shown in yellow, red, and black. LOS D or better are indicated by green areas (vehicles speeds greater than 55 mph).

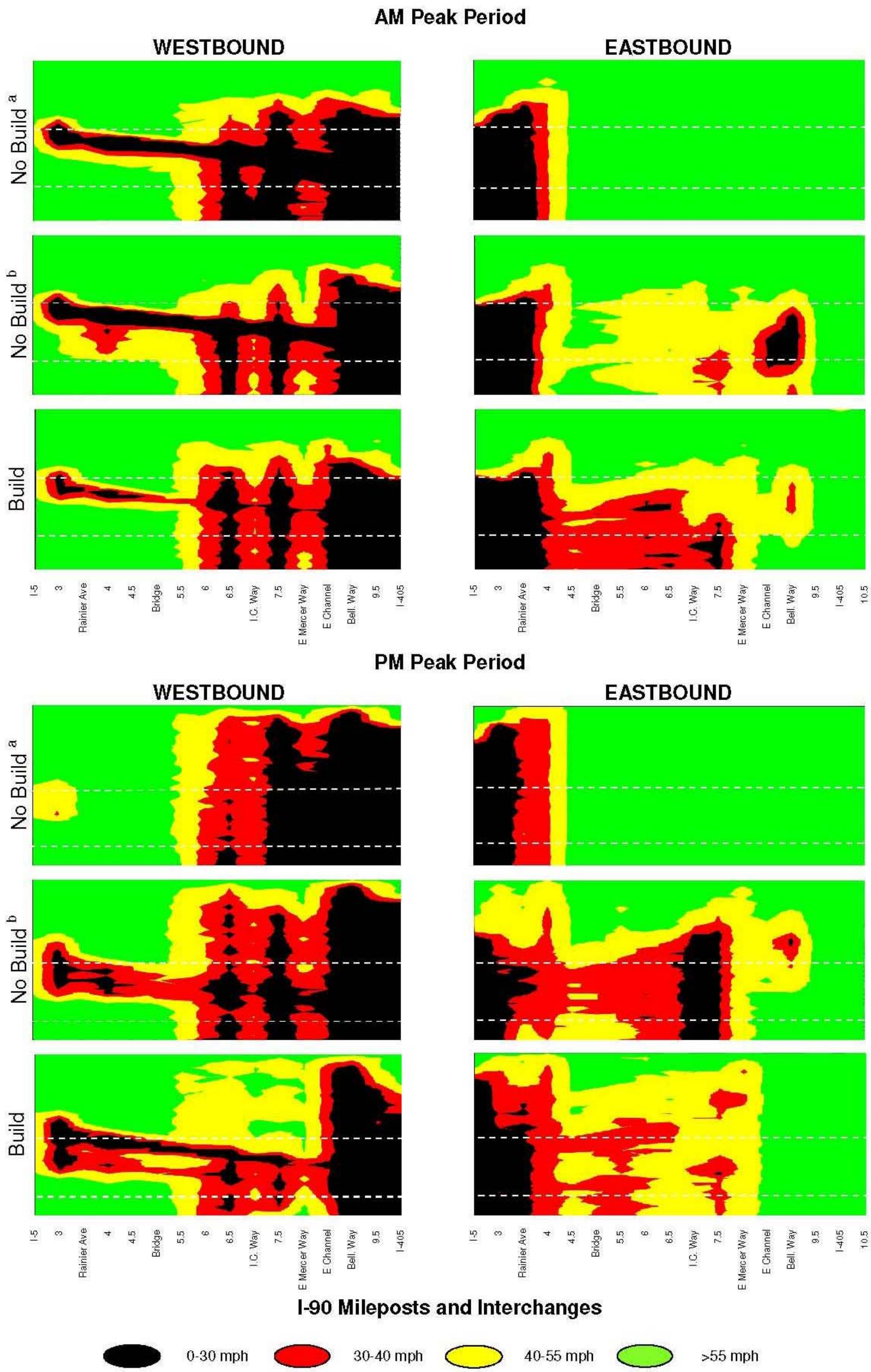


FIGURE 3-8
I-90 2030 No-build and Build Congestion Maps

WSDOT has established a desirable freeway LOS of D in urban areas. Appendix 3H contains the complete set of congestion maps for both future years and conditions, including HOV lanes. In addition to the general I-90 operating conditions, HOV lane performance was evaluated and discussed in this section. Specific areas are identified that fail to meet the WSDOT HOV policy of a 45-mph speed threshold for 90 percent of the time in the peak period. Appendix 3I presents the HOV lane performance tables.

AM Peak-Hour LOS

GP Lanes LOS

In 2020, the I-90 westbound direction consistently shows less congestion with the Proposal than with the no-build condition (as indicated by Table 3-9). Comparing the build condition (the Proposal) with the no-build condition with all three stages of the I-90 Two-Way Transit and HOV Operations Project completed, the freeway segment densities from the eastern edge of the study area (I-405 interchange) to the I-5 interchange would noticeably improve. Although the densities in each segment would likely noticeably improve, the segments would continue to operate at LOS F with the Proposal. In the no-build condition, congested conditions (LOS F operations) would occur in the reversible center roadway as vehicles merge with the westbound outer roadway and create vehicle queuing through the Mount Baker tunnel in the reversible center roadway. In the build condition, congestion in the mainline roadway would be substantially less as this merge is eliminated.

In the eastbound direction, the build condition would operate better through the key bottleneck area (Rainier Avenue South interchange and Mount Baker tunnel area) identified in Policy Point 1 to occur with the no-build conditions. As people shift to use light rail, less vehicle congestion would occur in this area (i.e., improved freeway segment densities), thereby allowing more vehicles to travel through this point of congestion. As a result, more vehicles are able to travel downstream and higher throughput would occur across Lake Washington. This would increase the vehicle densities in the freeway segments near Mercer Island as indicated in Table 3-9. Less vehicle congestion would also occur between the East Channel bridge and I-405.

In 2030, eastbound and westbound congestion patterns would resemble 2020 conditions. The eastbound direction with the Proposal would improve slightly (from LOS F to LOS E or better) over both no-build conditions for a few freeway segments near East Channel bridge and would degrade (from LOS E or better to LOS F) for a few segments near Mercer Island, as indicated in Table 3-11. In the westbound direction, the Proposal and no-build conditions would have LOS F conditions throughout most of the study area between I-5 and I-405, but the segment densities generally improve for most segments with the Proposal compared with the no-build conditions as people shift to use light rail.

HOV Lane LOS

In 2020 and 2030, the HOV lane in the no-build condition with only Stages 1 and 2 completed of the I-90 Two-Way Transit and HOV Operations Project would meet the State's performance threshold in both westbound and eastbound directions. In the 2020 and 2030 no-build conditions (when Stages 1 through 3 are completed of the I-90 Two-Way Transit and HOV Operations Project), the westbound HOV lane would meet the State's performance threshold at all locations except near the Rainier Avenue South interchange when the HOV lane transitions into a GP lane and the center roadway merges with the westbound outer roadway. With the Proposal, the westbound HOV lane would continue to meet the State's performance threshold at all locations except near the Rainier Avenue South interchange. At this location, the lane

transitions into a GP lane and congestion from the adjacent GP lanes would influence HOV lane operations.

In 2020 and 2030, the eastbound HOV lane in both the no-build (when Stages 1 through 3 are completed) and build condition would not meet the State's performance threshold near the Rainier Avenue South interchange. This would be caused by the congestion in the surrounding congested GP lanes influencing the HOV lane operations and drivers changing lanes as the lane transitions from a GP to an HOV lane.

PM Peak-Hour LOS

GP Lanes LOS

In both years 2020 and 2030, while the LOS in the westbound direction would only slightly improve with the Proposal compared with the no-build condition with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project completed the freeway densities consistently improve for most of the freeway segments as indicated in Tables 3-10 and 3-12. Most of the improved freeway densities and LOS occur between the I-405 and East Mercer Way interchanges and between the Rainier Avenue South and I-5 interchanges. The congestion diagrams in Figure 3-8 further indicate that, outside the peak hour, the build condition would have less congestion surrounding the major bottleneck between Bellevue Way and Mercer Island as people shift to use light rail with the Proposal compared with the no-build condition. Compared with the no-build condition when only Stages 1 and 2 are completed, the Proposal would substantially improve the freeway densities and congestion diagrams because the Proposal would reduce the congestion that forms as a result of the westbound bottleneck near the East Channel bridge. These comparisons are indicated in Tables 3-10 and 3-12 and in Appendix 3H with the congestion maps.

In both years 2020 and 2030, the eastbound direction on I-90 would operate at LOS F near the Rainier Avenue South interchange and Mount Baker tunnel area in both the build and no-build conditions (with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project completed). The freeway segment densities of these freeway segments would increase in the build condition because of the lane changing associated with the transition of the inner GP lane to an HOV lane near the Rainier Avenue South interchange in addition to the additional vehicles involved in the lane changing with the center roadway closure. Because of this additional congestion, slightly less downstream congestion would occur, and hence, better freeway LOS would be expected with the Proposal. This would be noticeable for some freeway segments between Mercer Island and I-405.

While slightly more congestion is expected with the Proposal near the Mount Baker tunnel, a similar amount of throughput is expected across Lake Washington (Screenline 2), and the SOV and HOV travel times in this direction would also be similar to either of the two no-build conditions. If the HOV lane were managed differently than assumed, then vehicle throughput could further improve, and the freeway densities might improve and become comparable with the no-build condition.

HOV Lane LOS

In years 2020 and 2030, the HOV lane in the no-build condition with only Stages 1 and 2 completed would meet the State's performance threshold in the eastbound direction. In the westbound direction, the HOV lane would meet the State's performance threshold for all

locations except at the lane's termination near Island Crest Way, which requires vehicles to merge into the adjacent GP lane.

In 2020 and 2030, the westbound HOV lanes would meet the State's performance threshold in all locations for the no-build condition (with Stages 1 through 3) and the build condition, except near Island Crest Way for the no-build condition, and near Rainier Avenue South for both the no-build and build condition. The westbound HOV lane congestion that occurs in the no-build condition near Island Crest way is caused by the demand using the reverse-peak HOV lane with no alternative options.

In the eastbound direction, the HOV lane would meet the State's performance threshold in the no-build condition (with Stages 1 through 3) for both years 2020 and 2030. In the build condition, the HOV lane would meet the State's performance threshold in all locations except near Rainier Avenue South and near Island Crest Way. The congestion near the Rainier Avenue South interchange is again caused by drivers changing lanes as the lane transitions from a GP to an HOV lane. The Island Crest Way congestion is a result of lane changing that occurs from SOVs transition to the right-hand off-ramps.

In either of the two no-build conditions, the eastbound center roadway would meet the State's freeway LOS thresholds for all segments during the PM peak hour highlighting the under-utilization of this roadway.

3.3.3.4 Freeway Travel Times

Travel time is provided to assess the future operating conditions because this a key measure to understand both regional and shorter distance trips. Figures 3-9 through 3-13 and Appendix 3J provide I-90 travel times for 2020 and 2030 no-build and build conditions.

As discussed in Policy Point 1, travel time paths within the Proposal study area were assessed between Seattle and Mercer Island, Bellevue Way, and I-405. Between the 2020 and 2030 no-build and build conditions, travel times generally would stay the same or improve in the build condition. This is indicated in Figure 3-9, which provides a snapshot of SOV travel times along the corridor between I-5 and I-405. In all cases, the Proposal would either improve or maintain the travel times expected in the no-build condition with Stage 3 of the Two-Way HOV and Transit Operations Project.

SOVs

With the Proposal in 2020 and 2030, westbound SOV travel times (between I-5 and I-405) would be expected to improve by approximately 5 minutes compared with the no-build condition (with only Stages 1 and 2 completed of the I-90 Two-Way Transit and HOV Operations Project) in the AM peak period. In the eastbound direction, vehicle travel times would be expected to decrease by approximately 3 minutes, which would be a similar decrease from the no-build condition with Stages 1 and 2 only completed to the no-build condition when all three stages of the I-90 Two-Way Transit and HOV Operations Project are completed. During the 2020 and 2030 PM peak period, westbound SOV travel times with the Proposal would improve by up to 8 minutes compared with the no-build condition (with only Stages 1 and 2 completed). The substantial decrease in the westbound travel time is attributed to a shift from people driving their autos to riding light rail and the additional capacity provided with the outer roadway HOV lanes. In the eastbound direction, SOV travel time would likely remain similar to the no-build condition (with only Stages 1 and 2 completed).

TABLE 3-9
2020 No-Build and Build AM Peak-Hour (7:15 to 8:15 a.m.) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2020 No-Build[b]		2020 No-Build[c]		2020 Build	
		Density[d]	LOS	Density[d]	LOS	Density[d]	LOS
I-90 Eastbound							
Mainline: west of I-5 southbound off-ramp	Basic	21.0	C	24.5	C	23.4	C
Diverge: I-5 southbound off-ramp	Diverge	21.0	C	24.4	C	23.4	C
Diverge: I-5 northbound off-ramp	Diverge	164.4	F	170.6	F	169.3	F
Mainline: between I-5 northbound off- and on-ramp	Basic	163.7	F	170.0	F	168.5	F
Mainline: point where I-5 northbound and southbound merge to I-90	Basic	128.0	F	167.4	F	102.9	F
Mainline: drop lane from five to four lanes	Basic	114.6	F	104.2	F	95.2	F
Diverge: off-ramp to Rainier Avenue southbound	Diverge	109.9	F	99.8	F	87.2	F
Mainline: between Rainier Avenue off- and on-ramp	Basic	92.2	F	103.0	F	72.9	F
Merge: on-ramp from Rainer Avenue southbound	Merge	124.5	F	132.6	F	110.6	F
Mainline: lane drop at Center Roadway	Basic	114.0	F	126.9	F	100.5	F
Merge: I-90 eastbound Mount Baker tunnel and northbound Rainier Avenue on-ramp	Merge	N/A	N/A	81.8	F	120.4	F
Mainline: eastbound I-90 tunnel at First Hill (two-lane section only)	Basic	123.9	F	120.2	F	109.9	F
Mainline: across I-90 bridge deck	Basic	28.3	D	24.2	C	62.4	F
Diverge: off-ramp to West Mercer way	Diverge	27.7	C	24.0	C	62.4	F
Mainline: basic segment through Mercer Island tunnel	Basic	26.5	D	29.7	D	77.0	F
Diverge: 77th Avenue SE off-ramp	Diverge	26.4	C	29.7	D	76.9	F
Mainline: between 77th Avenue SE and Island Crest Way	Basic	26.4	D	32.5	D	75.5	F
Diverge: Island Crest Way off-ramp	Diverge	26.4	C	39.3	E	83.6	F
Mainline: between Island Crest Way on- and off-ramp	Basic	27.0	D	33.1	D	85.6	F
Merge: on-ramp for Island Crest Way and SE 27th Street	Merge	15.9	B	41.3	E	82.4	F
Mainline: between Island Crest Way and East Mercer Way	Basic	21.9	C	41.1	E	55.7	F
Diverge East Mercer Way off-ramp	Diverge	22.4	C	36.3	E	34.0	D
Merge: East Mercer Way on-ramp	Merge	21.1	C	38.9	E	25.3	C
Mainline: basic between East Mercer Way and Bellevue Way off-ramp	Basic	21.9	C	78.0	F	20.0	C
Diverge: off-ramp to Bellevue Way	Diverge	23.9	C	110.1	F	21.8	C
Mainline: East of Bellevue Way off-ramp, before I-405 off-ramp	Basic	18.6	C	131.4	F	30.9	D
Major diverge: I-405 off-ramp	Major diverge	14.6	B	105.5	F	63.3	F
Mainline: under I-405 Interchange	Basic	8.0	A	10.1	A	9.5	A
Weave: Bellevue Way to Factoria Boulevard off-ramp	Weave	7.9	A	9.5	A	8.6	A
Mainline: east of Factoria Boulevard on-ramp	Basic	4.6	A	5.0	A	4.8	A
Mainline: I-405 northbound and southbound on-ramp	Major merge	7.2	A	7.5	A	7.3	A

TABLE 3-9
2020 No-Build and Build AM Peak-Hour (7:15 to 8:15 a.m.) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2020 No-Build[b]		2020 No-Build[c]		2020 Build	
		Density[d]	LOS	Density[d]	LOS	Density[d]	LOS
I-90 Westbound							
Mainline: basic east of I-405 northbound and southbound off-ramp	Basic	135.4	F	131.2	F	107.6	F
Major diverge: I-405 off-ramps	Major diverge	135.8	F	131.5	F	107.9	F
Mainline: between I-405 off-ramp and Richards Road on-ramp	Basic	125.3	F	114.3	F	107.9	F
Merge: Richards Road on-ramp	Merge	139.7	F	139.1	F	124.0	F
Diverge: Bellevue Way off-ramp [DROP LANE]	Basic	122.9	F	118.7	F	104.3	F
Mainline: three-lane segment between Bellevue Way off-ramp and I-405 on-ramp	Basic	111.4	F	108.4	F	87.9	F
Merge: I-405 on-ramp [ADD LANE]	Basic	144.0	F	140.7	F	112.2	F
Bellevue Way on-ramp: analyze as basic between Bellevue Way on-ramp and East Mercer Way off-ramp	Basic	113.1	F	108.6	F	74.0	F
Mainline: drop lane at Center Roadway entrance (between East Mercer Way on- and off-ramp)	Basic	83.6	F	78.8	F	48.7	F
Merge: East Mercer Way on-ramp	Merge	102.9	F	88.8	F	62.9	F
Mainline: East Mercer Way on-ramp to Island Crest Way off-ramp	Basic	121.2	F	111.7	F	84.1	F
Diverge: Island Crest Way off-ramp	Diverge	113.9	F	104.9	F	88.1	F
Mainline: Island Crest Way off- to on-ramp (left hand)	Merge	86.5	F	70.5	F	58.2	F
Mainline: Island Crest Way on-ramp to 76th Avenue SE on-ramp	Basic	88.9	F	77.3	F	82.8	F
Merge: 76th Avenue SE on-ramp	Merge	100.6	F	92.4	F	68.9	F
Mainline: 76th Avenue SE on-ramp to West Mercer Way on-ramp	Basic	102.4	F	91.7	F	58.5	F
Merge: West Mercer Way on-ramp	Merge	108.8	F	100.4	F	69.9	F
Mainline: West Mercer Way on-ramp to tunnel	Basic	103.1	F	85.1	F	44.8	E
Mainline: through First Hill tunnel	Basic	107.7	F	81.9	F	64.2	F
Mainline: add lane at tunnel	Basic	70.1	F	62.8	F	61.8	F
Diverge: Rainier Avenue northbound off-ramp	Diverge	70.9	F	71.5	F	49.2	F
Diverge: Rainier Avenue southbound off-ramp	Basic	66.5	F	87.7	F	52.5	F
Mainline: Rainier Avenue southbound off-ramp to I-5 off-ramp	Basic	131.9	F	132.0	F	105.6	F
Major Diverge: I-5 northbound off-ramp	Major diverge	143.3	F	141.7	F	112.6	F
Mainline: I-90 under I-5 interchange	Basic	131.6	F	131.6	F	130.5	F
West of I-5 interchange on SR 519 and I-90	Basic	14.8	B	15.7	B	16.5	B
Westbound on-ramp from I-5 southbound	Merge	12.2	B	13.1	B	13.9	B
Westbound on-ramp from I-5 northbound	Merge	20.2	C	23.5	C	22.6	C
Mainline: west of I-5 northbound on-ramp	Basic	8.0	A	9.0	A	10.1	A

TABLE 3-9
2020 No-Build and Build AM Peak-Hour (7:15 to 8:15 a.m.) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2020 No-Build[b]		2020 No-Build[c]		2020 Build	
		Density[d]	LOS	Density[d]	LOS	Density[d]	LOS
I-90 Center Roadway							
HOV, GP, and center merge across East Channel bridge	Basic	N/A	N/A	N/A	N/A	N/A	N/A
Center Roadway: East of Center Roadway and I-90 merge	Basic	N/A	N/A	N/A	N/A	N/A	N/A
Center merge from I-90	Merge	N/A	N/A	N/A	N/A	N/A	N/A
Center Roadway: I-90 Merge to 80th Avenue SE	Basic	N/A	N/A	N/A	N/A	N/A	N/A
Diverge: 80th Avenue SE off-ramp	Diverge	N/A	N/A	N/A	N/A	N/A	N/A
Center Roadway: between 80th Avenue SE and Island Crest Way	Basic	9.7	A	7.1	A	N/A	N/A
Merge: Island Crest Way on-ramp	Merge	9.3	A	7.9	A	N/A	N/A
Merge: 77th Avenue SE on-ramp	Merge	12.1	A	10.2	B	N/A	N/A
Center Roadway: 77th Avenue SE to Mount Baker Tunnel	Basic	17.3	B	74.1	F	N/A	N/A
Through Mount Baker Tunnel	Basic	22.3	C	131.8	F	N/A	N/A

Note: Highway Capacity Manual LOS thresholds were applied to VISSIM densities to obtain LOS (HCM 2000 Exhibit 23-2 for basic freeway, Exhibit 24-2 for weaving, Exhibit 25-4 for merge/diverge).
[a] Segment type listed is based on existing conditions.
[b] No-build condition including Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.
[c] No-build condition including Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
[d] Density calculated as passenger cars per mile per lane (pc/mi/ln)
GP general purpose
HOV high-occupancy vehicle
LOS level of service
N/A not applicable

TABLE 3-10
2020 No-Build and Build PM Peak-Hour (4:30 to 5:30 p.m.) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2020 No-Build[b]		2020 No-Build[c]		2020 Build	
		Density[d]	LOS	Density[d]	LOS	Density[d]	LOS
I-90 Eastbound							
Mainline: west of I-5 southbound off-ramp	Basic	14.5	B	21.9	C	16.7	B
Diverge: I-5 southbound off-ramp	Diverge	14.5	B	22.0	C	16.8	B
Diverge: I-5 northbound off-ramp	Diverge	87.5	F	102.5	F	138.3	F
Mainline: between I-5 northbound off- and on-ramp	Basic	87.5	F	102.8	F	138.2	F
Mainline: point where I-5 northbound and southbound merge to I-90	Basic	94.6	F	60.6	F	78.4	F
Mainline: drop lane from five to four lanes	Basic	76.0	F	54.7	F	74.7	F
Diverge: off-ramp to Rainier Avenue southbound	Diverge	79.1	F	51.1	F	64.5	F
Mainline: between Rainier Avenue off- and on-ramp	Basic	84.9	F	45.5	F	60.8	F
Merge: on-ramp from Rainer Avenue southbound	Merge	101.3	F	71.0	F	89.6	F
Mainline: lane drop at Center Roadway	Basic	92.3	F	69.2	F	85.1	F
Merge: I-90 eastbound Mount Baker tunnel and northbound Rainier Avenue on-ramp	Merge	N/A	N/A	116.3	F	116.4	F
Mainline: eastbound I-90 tunnel at First Hill (two-lane section only)	Basic	106.1	F	79.2	F	93.3	F
Mainline: across I-90 bridge deck	Basic	24.6	C	50.3	F	58.6	F
Diverge: off-ramp to West Mercer way	Diverge	24.6	C	50.2	F	58.5	F
Mainline: basic segment through Mercer Island tunnel	Basic	24.0	C	69.4	F	73.1	F
Diverge: 77th Avenue SE off-ramp	Diverge	24.0	C	69.4	F	73.1	F
Mainline: between 77th Avenue SE and Island Crest Way	Basic	24.1	C	77.0	F	78.6	F
Diverge: Island Crest Way off-ramp	Diverge	23.0	C	80.5	F	89.5	F
Mainline: between Island Crest Way on- and off-ramp	Basic	22.9	C	80.9	F	85.9	F
Merge: on-ramp for Island Crest Way and SE 27th Street	Merge	16.0	B	83.4	F	93.3	F
Mainline: between Island Crest Way and East Mercer Way	Basic	22.2	C	54.1	F	63.4	F
Diverge East Mercer Way off-ramp	Diverge	21.1	C	33.3	D	48.9	F
Merge: East Mercer Way on-ramp	Merge	22.2	C	28.1	D	25.9	C
Mainline: basic between East Mercer Way and Bellevue Way off-ramp	Basic	21.9	C	25.1	C	18.9	C
Diverge: off-ramp to Bellevue Way	Diverge	22.2	C	25.4	C	18.9	B
Mainline: East of Bellevue Way off-ramp, before I-405 off-ramp	Basic	19.0	C	23.8	C	17.3	B
Major diverge: I-405 off-ramp	Major diverge	14.8	B	30.7	D	18.2	B
Mainline: under I-405 Interchange	Basic	13.1	B	14.9	B	12.6	B
Weave: Bellevue Way to Factoria Boulevard off-ramp	Weave	13.0	B	14.7	B	12.5	B
Mainline: east of Factoria Boulevard on-ramp	Basic	12.6	B	14.3	B	12.4	B
Mainline: I-405 northbound and southbound on-ramp	Major merge	15.3	B	16.5	B	16.2	B

TABLE 3-10

2020 No-Build and Build PM Peak-Hour (4:30 to 5:30 p.m.) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2020 No-Build[b]		2020 No-Build[c]		2020 Build	
		Density[d]	LOS	Density[d]	LOS	Density[d]	LOS
I-90 Westbound							
Mainline: basic east of I-405 northbound and southbound off-ramp	Basic	109.0	F	103.7	F	22.1	C
Major diverge: I-405 off-ramps	Major diverge	109.0	F	103.8	F	22.0	C
Mainline: between I-405 off-ramp and Richards Road on-ramp	Basic	114.4	F	111.7	F	72.9	F
Merge: Richards Road on-ramp	Merge	126.2	F	120.5	F	115.7	F
Diverge: Bellevue Way off-ramp [DROP LANE]	Basic	107.4	F	106.4	F	97.8	F
Mainline: three-lane segment between Bellevue Way off-ramp and I-405 on-ramp	Basic	93.2	F	96.0	F	85.2	F
Merge: I-405 on-ramp [ADD LANE]	Basic	112.6	F	114.1	F	99.1	F
Bellevue Way on-ramp: analyze as basic between Bellevue Way on-ramp and East Mercer Way off-ramp	Basic	72.4	F	76.5	F	63.2	F
Mainline: drop lane at Center Roadway entrance (between East Mercer Way on- and off-ramp)	Basic	49.3	F	54.8	F	41.6	E
Merge: East Mercer Way on-ramp	Merge	58.4	F	62.2	F	43.4	E
Mainline: East Mercer Way on-ramp to Island Crest Way off-ramp	Basic	86.6	F	94.1	F	70.0	F
Diverge: Island Crest Way off-ramp	Diverge	88.9	F	97.5	F	74.3	F
Mainline: Island Crest Way off- to on-ramp (left hand)	Merge	63.2	F	69.3	F	52.6	F
Mainline: Island Crest Way on-ramp to 76th Avenue SE on-ramp	Basic	94.6	F	89.5	F	76.6	F
Merge: 76th Avenue SE on-ramp	Merge	79.3	F	83.9	F	71.8	F
Mainline: 76th Avenue SE on-ramp to West Mercer Way on-ramp	Basic	63.9	F	65.5	F	63.7	F
Merge: West Mercer Way on-ramp	Merge	65.8	F	72.9	F	65.6	F
Mainline: West Mercer Way on-ramp to tunnel	Basic	42.7	E	59.0	F	53.8	F
Mainline: through First Hill tunnel	Basic	49.9	F	75.6	F	79.4	F
Mainline: add lane at tunnel	Basic	59.1	F	72.0	F	75.3	F
Diverge: Rainier Avenue northbound off-ramp	Diverge	50.8	F	58.0	F	61.1	F
Diverge: Rainier Avenue southbound off-ramp	Basic	83.9	F	79.8	F	74.5	F
Mainline: Rainier Avenue southbound off-ramp to I-5 off-ramp	Basic	122.8	F	113.8	F	105.2	F
Major Diverge: I-5 northbound off-ramp	Major diverge	122.1	F	118.9	F	112.4	F
Mainline: I-90 under I-5 interchange	Basic	140.1	F	139.3	F	116.0	F
West of I-5 interchange on SR 519 and I-90	Basic	14.5	B	17.1	B	15.9	B
Westbound on-ramp from I-5 southbound	Merge	9.8	A	11.7	B	10.1	B
Westbound on-ramp from I-5 northbound	Merge	14.7	B	22.1	C	17.1	B
Mainline: west of I-5 northbound on-ramp	Basic	6.9	A	9.0	A	8.4	A

TABLE 3-10

2020 No-Build and Build PM Peak-Hour (4:30 to 5:30 p.m.) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2020 No-Build[b]		2020 No-Build[c]		2020 Build	
		Density[d]	LOS	Density[d]	LOS	Density[d]	LOS
I-90 Center Roadway							
HOV, GP, and center merge across East Channel bridge	Basic	16.0	B	18.1	C	N/A	N/A
Center Roadway: East of Center Roadway and I-90 merge	Basic	16.8	B	18.6	C	N/A	N/A
Center merge from I-90	Diverge	15.9	B	18.6	B	N/A	N/A
Center Roadway: I-90 Merge to 80th Avenue SE	Diverge	8.5	A	10.0	A	N/A	N/A
Diverge: 80th Avenue SE off-ramp	Basic	9.9	A	10.9	A	N/A	N/A
Center Roadway: between 80th Avenue SE and Island Crest Way	Merge	N/A	N/A	N/A	N/A	N/A	N/A
Merge: Island Crest Way on-ramp	Basic	N/A	N/A	N/A	N/A	N/A	N/A
Merge: 77th Avenue SE on-ramp	Diverge	N/A	N/A	N/A	N/A	N/A	N/A
Center Roadway: 77th Avenue SE to Mount Baker Tunnel	Basic	N/A	N/A	N/A	N/A	N/A	N/A
Through Mount Baker tunnel	Basic	19.0	C	21.9	C	N/A	N/A

Note: HCM LOS thresholds were applied to VISSIM densities to obtain LOS (HCM 2000 Exhibit 23-2 for basic freeway, Exhibit 24-2 for weaving, Exhibit 25-4 for merge/diverge.

[a] Segment type listed is based on existing conditions.

[b] No-build condition including Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.

[c] No-build condition including Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.

[d] Density calculated as passenger cars per mile per lane (pc/mi/ln)

GP general purpose
HOV high-occupancy vehicle
LOS level of service
N/A not applicable

TABLE 3-11

2030 No-Build and Build AM Peak-Hour (7:15 to 8:15 a.m.) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2030 No-Build[b]		2030 No-Build[c]		2030 Build	
		Density[d]	LOS	Density[d]	LOS	Density[d]	LOS
I-90 Eastbound							
Mainline: west of I-5 southbound off-ramp	Basic	18.3	C	24.1	C	23.9	C
Diverge: I-5 southbound off-ramp	Diverge	18.3	B	24.1	C	23.9	C
Diverge: I-5 northbound off-ramp	Diverge	163.6	F	171.3	F	170.1	F
Mainline: between I-5 northbound off- and on-ramp	Basic	162.9	F	170.8	F	169.3	F
Mainline: point where I-5 northbound and southbound merge to I-90	Basic	127.0	F	115.6	F	108.5	F
Mainline: drop lane from five to four lanes	Basic	114.7	F	105.4	F	102.3	F
Diverge: off-ramp to Rainier Avenue southbound	Diverge	109.0	F	99.9	F	93.2	F
Mainline: between Rainier Avenue off- and on-ramp	Basic	93.2	F	103.6	F	84.8	F
Merge: on-ramp from Rainer Avenue southbound	Merge	127.3	F	131.1	F	119.8	F
Mainline: lane drop at Center Roadway	Basic	120.3	F	128.3	F	111.5	F
Merge: I-90 eastbound Mount Baker tunnel and northbound Rainier Avenue on-ramp	Merge	N/A	N/A	85.2	F	125.0	F
Mainline: eastbound I-90 tunnel at First Hill (two-lane section only)	Basic	130.7	F	118.0	F	118.7	F
Mainline: across I-90 bridge deck	Basic	27.9	D	33.3	D	62.6	F
Diverge: off-ramp to West Mercer way	Diverge	27.9	C	33.3	D	62.6	F
Mainline: basic segment through Mercer Island tunnel	Basic	26.4	D	41.7	E	78.8	F
Diverge: 77th Avenue SE off-ramp	Diverge	26.4	C	41.7	E	78.7	F
Mainline: between 77th Avenue SE and Island Crest Way	Basic	29.0	D	49.6	F	83.8	F
Diverge: Island Crest Way off-ramp	Diverge	37.8	E	58.6	F	90.0	F
Mainline: between Island Crest Way on- and off-ramp	Basic	30.7	D	49.4	F	51.1	F
Merge: on-ramp for Island Crest Way and SE 27th Street	Merge	16.2	B	61.4	F	75.5	F
Mainline: between Island Crest Way and East Mercer Way	Basic	22.0	C	52.4	F	53.4	F
Diverge East Mercer Way off-ramp	Diverge	21.2	C	40.6	E	32.3	D
Merge: East Mercer Way on-ramp	Merge	21.1	C	43.6	E	26.7	C
Mainline: basic between East Mercer Way and Bellevue Way off-ramp	Basic	22.8	C	99.5	F	43.7	E
Diverge: off-ramp to Bellevue Way	Diverge	25.9	C	113.8	F	57.6	F
Mainline: East of Bellevue Way off-ramp, before I-405 off-ramp	Basic	20.1	C	125.3	F	65.3	F
Major diverge: I-405 off-ramp	Major diverge	15.3	B	102.1	F	67.3	F
Mainline: under I-405 Interchange	Basic	8.2	A	9.0	A	10.9	A
Weave: Bellevue Way to Factoria Boulevard off-ramp	Weave	8.0	A	8.1	A	9.5	A
Mainline: east of Factoria Boulevard on-ramp	Basic	4.7	A	4.4	A	5.5	A
Mainline: I-405 northbound and southbound on-ramp	Major merge	8.3	A	8.0	A	8.5	A

TABLE 3-11

2030 No-Build and Build AM Peak-Hour (7:15 to 8:15 a.m.) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2030 No-Build[b]		2030 No-Build[c]		2030 Build	
		Density[d]	LOS	Density[d]	LOS	Density[d]	LOS
I-90 Westbound							
Mainline: basic east of I-405 northbound and southbound off-ramp	Basic	136.1	F	134.9	F	105.1	F
Major diverge: I-405 off-ramps	Major diverge	136.5	F	135.3	F	105.4	F
Mainline: between I-405 off-ramp and Richards Road on-ramp	Basic	122.9	F	119.1	F	111.4	F
Merge: Richards Road on-ramp	Merge	139.9	F	138.3	F	126.4	F
Diverge: Bellevue Way off-ramp [DROP LANE]	Basic	122.0	F	117.3	F	103.5	F
Mainline: three-lane segment between Bellevue Way off-ramp and I-405 on-ramp	Basic	113.1	F	107.6	F	91.0	F
Merge: I-405 on-ramp [ADD LANE]	Basic	144.3	F	139.1	F	114.0	F
Bellevue Way on-ramp: analyze as basic between Bellevue Way on-ramp and East Mercer Way off-ramp	Basic	114.4	F	109.1	F	76.4	F
Mainline: drop lane at Center Roadway entrance (between East Mercer Way on- and off-ramp)	Basic	84.9	F	78.6	F	50.4	F
Merge: East Mercer Way on-ramp	Merge	105.3	F	88.7	F	56.4	F
Mainline: East Mercer Way on-ramp to Island Crest Way off-ramp	Basic	120.2	F	110.0	F	86.1	F
Diverge: Island Crest Way off-ramp	Diverge	114.0	F	105.9	F	90.5	F
Mainline: Island Crest Way off- to on-ramp (left hand)	Merge	86.1	F	72.8	F	63.0	F
Mainline: Island Crest Way on-ramp to 76th Avenue SE on-ramp	Basic	90.9	F	82.2	F	86.9	F
Merge: 76th Avenue SE on-ramp	Merge	102.1	F	96.8	F	72.6	F
Mainline: 76th Avenue SE on-ramp to West Mercer Way on-ramp	Basic	106.8	F	92.7	F	60.0	F
Merge: West Mercer Way on-ramp	Merge	114.4	F	104.7	F	72.6	F
Mainline: West Mercer Way on-ramp to tunnel	Basic	104.8	F	86.7	F	50.1	F
Mainline: through First Hill tunnel	Basic	103.1	F	82.8	F	66.9	F
Mainline: add lane at tunnel	Basic	68.5	F	65.4	F	61.1	F
Diverge: Rainier Avenue northbound off-ramp	Diverge	71.4	F	70.4	F	47.6	F
Diverge: Rainier Avenue southbound off-ramp	Basic	69.0	F	87.2	F	52.6	F
Mainline: Rainier Avenue southbound off-ramp to I-5 off-ramp	Basic	130.1	F	129.0	F	103.2	F
Major Diverge: I-5 northbound off-ramp	Major diverge	139.9	F	138.8	F	109.7	F
Mainline: I-90 under I-5 interchange	Basic	137.1	F	133.2	F	127.6	F
West of I-5 interchange on SR 519 and I-90	Basic	14.3	B	15.4	B	15.3	B
Westbound on-ramp from I-5 southbound	Merge	11.9	B	12.8	B	14.0	B
Westbound on-ramp from I-5 northbound	Merge	17.7	B	23.1	C	23.1	C
Mainline: west of I-5 northbound on-ramp	Basic	7.9	A	8.9	A	10.1	A

TABLE 3-11

2030 No-Build and Build AM Peak-Hour (7:15 to 8:15 a.m.) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2030 No-Build[b]		2030 No-Build[c]		2030 Build	
		Density[d]	LOS	Density[d]	LOS	Density[d]	LOS
I-90 Center Roadway							
HOV, GP, and center merge across East Channel bridge	Basic	N/A	N/A	N/A	N/A	N/A	N/A
Center Roadway: East of Center Roadway and I-90 merge	Basic	N/A	N/A	N/A	N/A	N/A	N/A
Center merge from I-90	Merge	N/A	N/A	N/A	N/A	N/A	N/A
Center Roadway: I-90 Merge to 80th Avenue SE	Basic	N/A	N/A	N/A	N/A	N/A	N/A
Diverge: 80th Avenue SE off-ramp	Diverge	N/A	N/A	N/A	N/A	N/A	N/A
Center Roadway: between 80th Avenue SE and Island Crest Way	Basic	9.7	A	7.1	A	N/A	N/A
Merge: Island Crest Way on-ramp	Merge	9.3	A	7.9	A	N/A	N/A
Merge: 77th Avenue SE on-ramp	Merge	12.1	B	10.2	B	N/A	N/A
Center Roadway: 77th Avenue SE to Mount Baker Tunnel	Basic	17.3	B	74.1	F	N/A	N/A
Through Mount Baker tunnel	Basic	22.3	C	131.8	F	N/A	N/A

Note: HCM LOS thresholds were applied to VISSIM densities to obtain LOS (HCM 2000 Exhibit 23-2 for basic freeway, Exhibit 24-2 for weaving, Exhibit 25-4 for merge/diverge.

[a] Segment type listed is based on existing conditions.

[b] No-build condition including Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.

[c] No-build condition including Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.

[d] Density calculated as passenger cars per mile per lane (pc/mi/ln)

GP general purpose
HOV high-occupancy
LOS level of service
N/A not applicable

TABLE 3-12

2030 No-Build and Build PM Peak-Hour (4:30 to 5:30 p.m.) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2030 No-Build[b]		2030 No-Build[c]		2030 Build	
		Density[d]	LOS	Density[d]	LOS	Density[d]	LOS
I-90 Eastbound							
Mainline: west of I-5 southbound off-ramp	Basic	12.6	B	18.4	C	16.8	B
Diverge: I-5 southbound off-ramp	Diverge	12.7	B	18.4	B	16.9	B
Diverge: I-5 northbound off-ramp	Diverge	108.5	F	104.4	F	143.5	F
Mainline: between I-5 northbound off- and on-ramp	Basic	108.6	F	104.7	F	143.3	F
Mainline: point where I-5 northbound and southbound merge to I-90	Basic	100.9	F	65.7	F	82.7	F
Mainline: drop lane from five to four lanes	Basic	87.1	F	58.6	F	75.3	F
Diverge: off-ramp to Rainier Avenue southbound	Diverge	81.9	F	54.4	F	65.7	F
Mainline: between Rainier Avenue off- and on-ramp	Basic	57.7	F	56.0	F	61.2	F
Merge: on-ramp from Rainer Avenue southbound	Merge	75.3	F	76.5	F	90.0	F
Mainline: lane drop at Center Roadway	Basic	66.1	F	75.4	F	84.4	F
Merge: I-90 eastbound Mount Baker tunnel and northbound Rainier Avenue on-ramp	Merge	N/A	N/A	122.8	F	130.8	F
Mainline: eastbound I-90 tunnel at First Hill (two-lane section only)	Basic	99.5	F	86.9	F	94.5	F
Mainline: across I-90 bridge deck	Basic	23.3	C	54.6	F	64.5	F
Diverge: off-ramp to West Mercer way	Diverge	23.3	C	54.6	F	63.4	F
Mainline: basic segment through Mercer Island tunnel	Basic	21.5	C	74.4	F	71.3	F
Diverge: 77th Avenue SE off-ramp	Diverge	20.6	C	74.3	F	71.2	F
Mainline: between 77th Avenue SE and Island Crest Way	Basic	20.1	C	80.1	F	67.0	F
Diverge: Island Crest Way off-ramp	Diverge	19.7	B	82.4	F	80.1	F
Mainline: between Island Crest Way on- and off-ramp	Basic	19.6	C	84.5	F	60.7	F
Merge: on-ramp for Island Crest Way and SE 27th Street	Merge	16.4	B	84.5	F	78.0	F
Mainline: between Island Crest Way and East Mercer Way	Basic	20.0	C	55.9	F	58.2	F
Diverge East Mercer Way off-ramp	Diverge	19.8	B	35.1	E	42.4	E
Merge: East Mercer Way on-ramp	Merge	19.2	B	34.4	D	25.6	C
Mainline: basic between East Mercer Way and Bellevue Way off-ramp	Basic	19.7	C	43.1	E	18.7	C
Diverge: off-ramp to Bellevue Way	Diverge	19.4	B	62.7	F	18.8	B
Mainline: East of Bellevue Way off-ramp, before I-405 off-ramp	Basic	16.9	B	68.2	F	17.1	B
Major diverge: I-405 off-ramp	Major diverge	13.6	B	68.7	F	17.7	B
Mainline: under I-405 Interchange	Basic	13.0	B	17.7	B	12.8	B
Weave: Bellevue Way to Factoria Boulevard off-ramp	Weave	12.9	B	17.4	B	12.7	B
Mainline: east of Factoria Boulevard on-ramp	Basic	12.5	B	15.8	B	12.6	B
Mainline: I-405 northbound and southbound on-ramp	Major merge	16.7	B	19.0	B	17.0	B

TABLE 3-12

2030 No-Build and Build PM Peak-Hour (4:30 to 5:30 p.m.) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2030 No-Build[b]		2030 No-Build[c]		2030 Build	
		Density[d]	LOS	Density[d]	LOS	Density[d]	LOS
I-90 Westbound							
Mainline: basic east of I-405 northbound and southbound off-ramp	Basic	110.7	F	101.9	F	75.1	F
Major diverge: I-405 off-ramps	Major diverge	110.7	F	101.9	F	74.7	F
Mainline: between I-405 off-ramp and Richards Road on-ramp	Basic	113.3	F	112.0	F	107.6	F
Merge: Richards Road on-ramp	Merge	122.1	F	124.6	F	122.8	F
Diverge: Bellevue Way off-ramp [DROP LANE]	Basic	107.5	F	107.7	F	104.0	F
Mainline: three-lane segment between Bellevue Way off-ramp and I-405 on-ramp	Basic	93.5	F	92.8	F	90.6	F
Merge: I-405 on-ramp [ADD LANE]	Basic	110.7	F	106.7	F	104.4	F
Bellevue Way on-ramp: analyze as basic between Bellevue Way on-ramp and East Mercer Way off-ramp	Basic	74.2	F	70.1	F	69.8	F
Mainline: drop lane at Center Roadway entrance (between East Mercer Way on- and off-ramp)	Basic	50.5	F	52.2	F	45.3	F
Merge: East Mercer Way on-ramp	Merge	58.8	F	63.1	F	48.4	F
Mainline: East Mercer Way on-ramp to Island Crest Way off-ramp	Basic	89.6	F	92.6	F	71.6	F
Diverge: Island Crest Way off-ramp	Diverge	92.3	F	96.4	F	73.7	F
Mainline: Island Crest Way off- to on-ramp (left hand)	Merge	65.6	F	69.7	F	60.6	F
Mainline: Island Crest Way on-ramp to 76th Avenue SE on-ramp	Basic	88.2	F	91.8	F	81.9	F
Merge: 76th Avenue SE on-ramp	Merge	82.4	F	88.2	F	77.5	F
Mainline: 76th Avenue SE on-ramp to West Mercer Way on-ramp	Basic	60.5	F	68.7	F	67.0	F
Merge: West Mercer Way on-ramp	Merge	71.7	F	73.8	F	68.1	F
Mainline: West Mercer Way on-ramp to tunnel	Basic	32.5	D	55.7	F	57.7	F
Mainline: through First Hill tunnel	Basic	29.5	D	73.3	F	84.1	F
Mainline: add lane at tunnel	Basic	29.6	D	72.0	F	78.5	F
Diverge: Rainier Avenue northbound off-ramp	Diverge	22.6	C	56.4	F	63.3	F
Diverge: Rainier Avenue southbound off-ramp	Basic	16.2	B	74.6	F	73.9	F
Mainline: Rainier Avenue southbound off-ramp to I-5 off-ramp	Basic	45.9	F	106.2	F	106.7	F
Major Diverge: I-5 northbound off-ramp	Major diverge	87.5	F	112.8	F	112.3	F
Mainline: I-90 under I-5 interchange	Basic	110.7	F	135.9	F	113.1	F
West of I-5 interchange on SR 519 and I-90	Basic	11.7	B	16.6	B	16.0	B
Westbound on-ramp from I-5 southbound	Merge	8.7	A	11.7	B	10.4	B
Westbound on-ramp from I-5 northbound	Merge	12.8	B	18.6	B	17.3	B
Mainline: west of I-5 northbound on-ramp	Basic	6.0	A	8.6	A	8.8	A

TABLE 3-12

2030 No-Build and Build PM Peak-Hour (4:30 to 5:30 p.m.) I-90 Freeway Segment LOS and Density

Segment Name	Segment Type[a]	2030 No-Build[b]		2030 No-Build[c]		2030 Build	
		Density[d]	LOS	Density[d]	LOS	Density[d]	LOS
I-90 Center Roadway							
HOV, GP, and center merge across East Channel bridge	Basic	16.0	B	18.1	C	N/A	N/A
Center Roadway: East of Center Roadway and I-90 merge	Basic	16.8	B	18.6	C	N/A	N/A
Center merge from I-90	Diverge	15.9	B	18.6	B	N/A	N/A
Center Roadway: I-90 Merge to 80th Avenue SE	Diverge	8.5	A	10.0	A	N/A	N/A
Diverge: 80th Avenue SE off-ramp	Basic	9.9	A	10.9	A	N/A	N/A
Center Roadway: between 80th Avenue SE and Island Crest Way	Merge	N/A	N/A	N/A	N/A	N/A	N/A
Merge: Island Crest Way on-ramp	Basic	N/A	N/A	N/A	N/A	N/A	N/A
Merge: 77th Avenue SE on-ramp	Diverge	N/A	N/A	N/A	N/A	N/A	N/A
Center Roadway: 77th Avenue SE to Mount Baker Tunnel	Basic	N/A	N/A	N/A	N/A	N/A	N/A
Through Mount Baker tunnel	Basic	19.0	C	21.9	C	N/A	N/A

Note: HCM LOS thresholds were applied to VISSIM densities to obtain LOS (HCM 2000 Exhibit 23-2 for basic freeway, Exhibit 24-2 for weaving, Exhibit 25-4 for merge/diverge.

[a] Segment type listed is based on existing conditions.

[b] No-build condition including Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project.

[c] No-build condition including Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.

[d] Density calculated as passenger cars per mile per lane (pc/mi/ln)

GP general purpose
HOV high-occupancy vehicle
LOS level of service
N/A not applicable

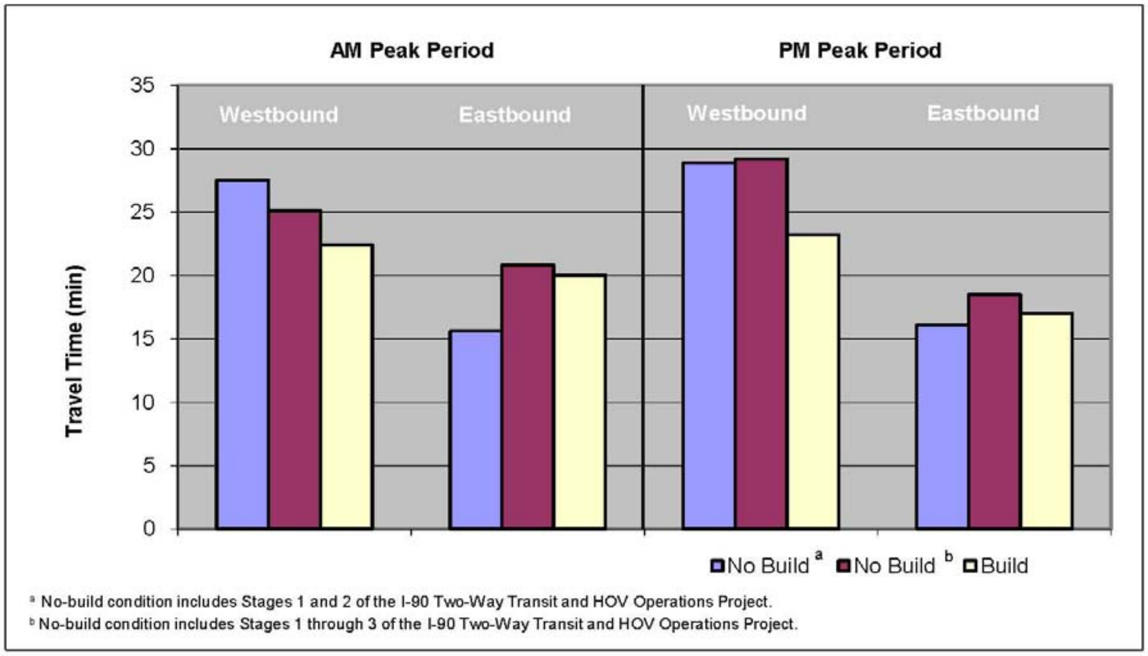


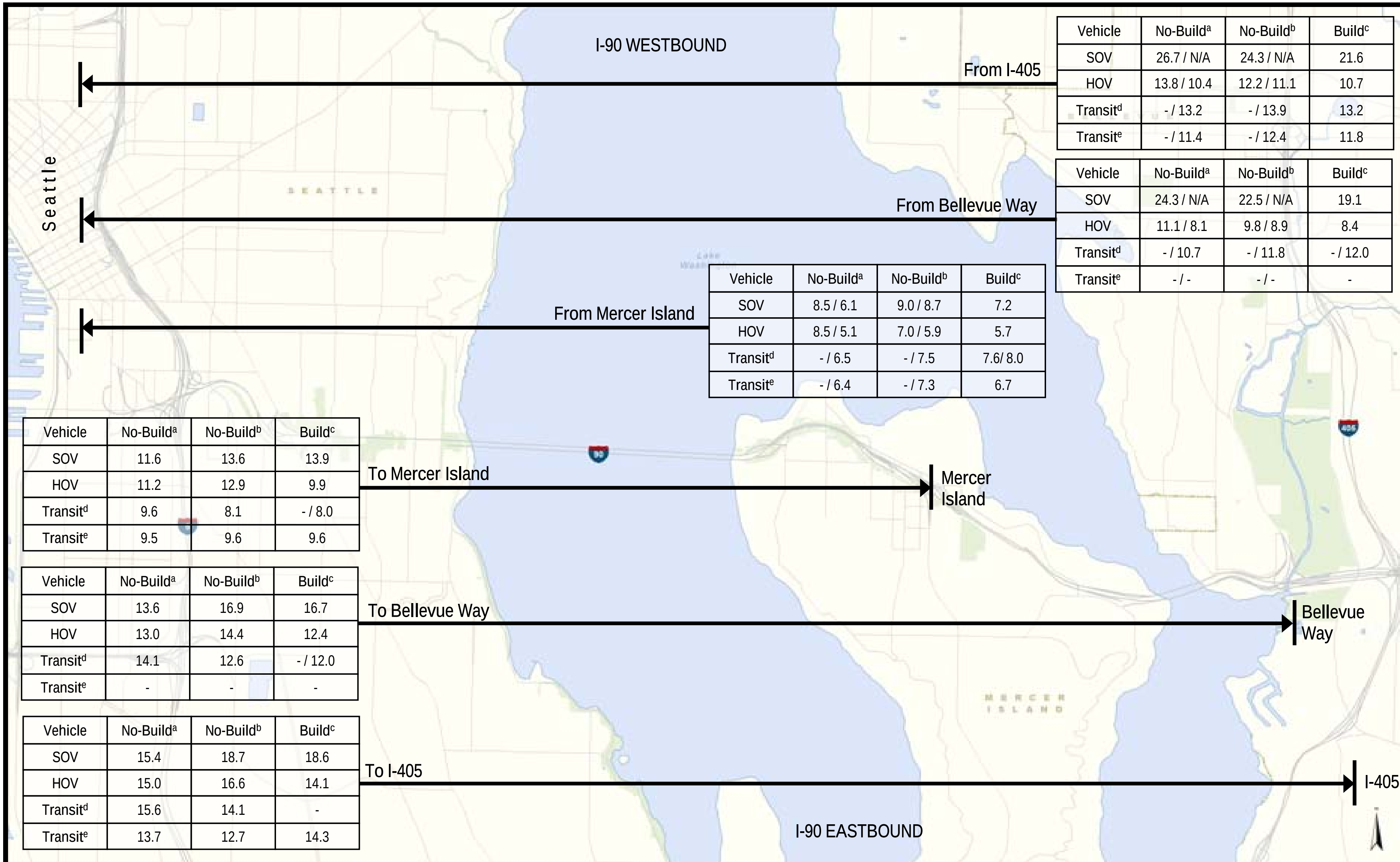
FIGURE 3-9
2030 AM and PM Peak-period No-build and Build SOV I-90 Travel Times Between I-405 and I-5

In 2020 and 2030, the SOV travel times in the Proposal compared with the no-build condition, assuming that Stages 1 through 3 are completed, would have some traits similar to those in the previous paragraph's comparison. In 2020 and 2030, SOV travel times in the AM peak period with the Proposal would get slightly better in the westbound direction (by approximately 3 minutes) and similar in the eastbound direction. In the PM peak period, westbound travel times with light rail are expected to improve by as much as 7 minutes, which is a time savings of approximately 20 percent travel. The time travel savings would be expected in the westbound direction because, with the no-build condition, only eastbound travel in the reversible roadway would be allowed in the PM peak period and a shift from people driving to riding light rail would slightly improve congestion on I-90. In the eastbound direction, PM peak-period travel times would be expected to be similar to or slightly better than those of the no-build condition, although less vehicle throughput is expected, as discussed in Section 3.3.3.1.

Comparing not only the full-length corridor (between I-5 and I-405) trips but also the intermediate trips showed that travel times between Seattle and Mercer Island would remain similar in the both years 2020 and 2030 during the AM and PM peak periods.

With the Proposal, travel between Seattle and Mercer Island would take no more than 14 minutes in 2020. By 2030, similar trends would be exhibited between the no-build and build conditions, and travel between Seattle and Mercer Island would take no more than 15 minutes in the build condition.

Only in the 2030 PM eastbound direction would SOV travel from Seattle to Mercer Island get worse with the Proposal. In this direction, travel from Seattle to Mercer Island would take 6 minutes if the vehicle were eligible to use the center roadway and 12 minutes if the driver used the eastbound outer roadway in the no-build condition. This same trip would take approximately 11 minutes with the East Link Project.



I-90 Westbound – From I-405

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	26.7 / N/A	24.3 / N/A	21.6
HOV	13.8 / 10.4	12.2 / 11.1	10.7
Transit[d]	- / 13.2	- / 13.9	13.2
Transit[e]	- / 11.4	- / 12.4	11.8

I-90 Westbound – From Bellevue Way

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	24.3 / N/A	22.5 / N/A	19.1
HOV	11.1 / 8.1	9.8 / 8.9	8.4
Transit[d]	- / 10.7	- / 11.8	- / 12.0
Transit[e]	- / -	- / -	-

I-90 Westbound – From Mercer Island

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	8.5 / 6.1	9.0 / 8.7	7.2
HOV	8.5 / 5.1	7.0 / 5.9	5.7
Transit[d]	- / 6.5	- / 7.5	7.6/ 8.0
Transit[e]	- / 6.4	- / 7.3	6.7

I-90 Eastbound – To Mercer Island

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	11.6	13.6	13.9
HOV	11.2	12.9	9.9
Transit[d]	9.6	8.1	- / 8.0
Transit[e]	9.5	9.6	9.6

I-90 Eastbound – To Bellevue Way

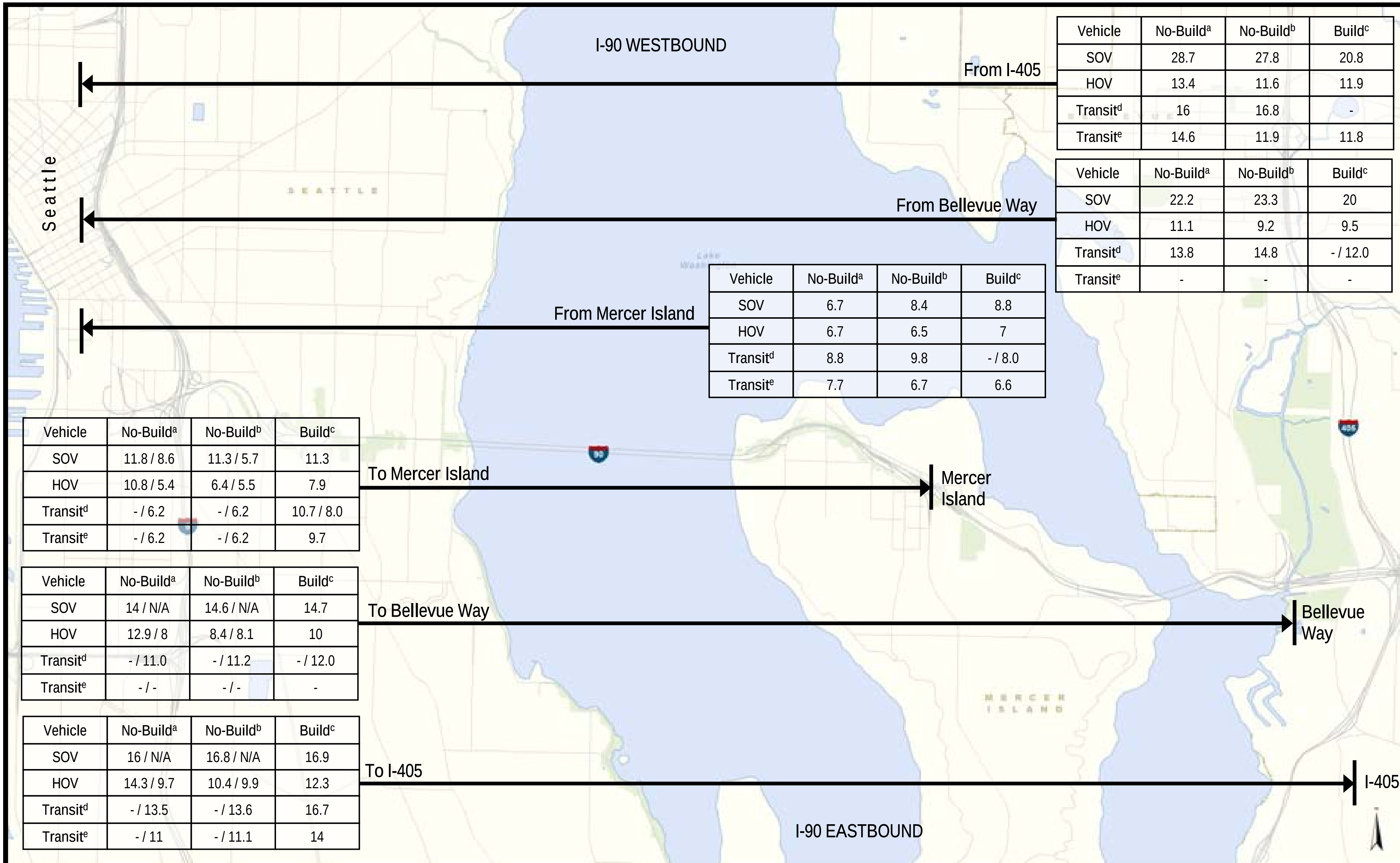
Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	13.6	16.9	16.7
HOV	13.0	14.4	12.4
Transit[d]	14.1	12.6	- / 12.0
Transit[e]	-	-	-

I-90 Eastbound – To I-405

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	15.4	18.7	18.6
HOV	15.0	16.6	14.1
Transit[d]	15.6	14.1	-
Transit[e]	13.7	12.7	14.3

Travel times represented are outer roadway / center roadway.
Reversible center roadway operates westbound in the AM peak and eastbound in the PM peak.
[a] No-build condition with stages 1 and 2 of the I-90 Two Way Transit and HOV Operations Project.
[b] No-build condition with stages 1 through 3 of the I-90 Two Way Transit and HOV Operations Project.
[c] Build condition with WB Bellevue Way HOV on-ramp and joint-use (bus and light rail) in the D2 Roadway. Transit travel times reported in the center roadway in the build contition are light rail travel times.
[d] Transit routes with stops on Mercer Island.
[e] Transit routes with no stops on Mercer Island.
- = Buses that do not travel on this roadway during this period and/or do not travel between these points.
N/A = not applicable because the mode is not eligible to travel this path or the path is restricted

Figure 3-10
2020 AM Peak Period
I-90 No-Build and Build Travel Times in Minutes by Mode



From I-405 (westbound)

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	28.7	27.8	20.8
HOV	13.4	11.6	11.9
Transit[d]	16	16.8	-
Transit[e]	14.6	11.9	11.8

From Bellevue Way (westbound)

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	22.2	23.3	20
HOV	11.1	9.2	9.5
Transit[d]	13.8	14.8	- / 12.0
Transit[e]	-	-	-

From Mercer Island (westbound)

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	6.7	8.4	8.8
HOV	6.7	6.5	7
Transit[d]	8.8	9.8	- / 8.0
Transit[e]	7.7	6.7	6.6

To Mercer Island (eastbound)

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	11.8 / 8.6	11.3 / 5.7	11.3
HOV	10.8 / 5.4	6.4 / 5.5	7.9
Transit[d]	- / 6.2	- / 6.2	10.7 / 8.0
Transit[e]	- / 6.2	- / 6.2	9.7

To Bellevue Way (eastbound)

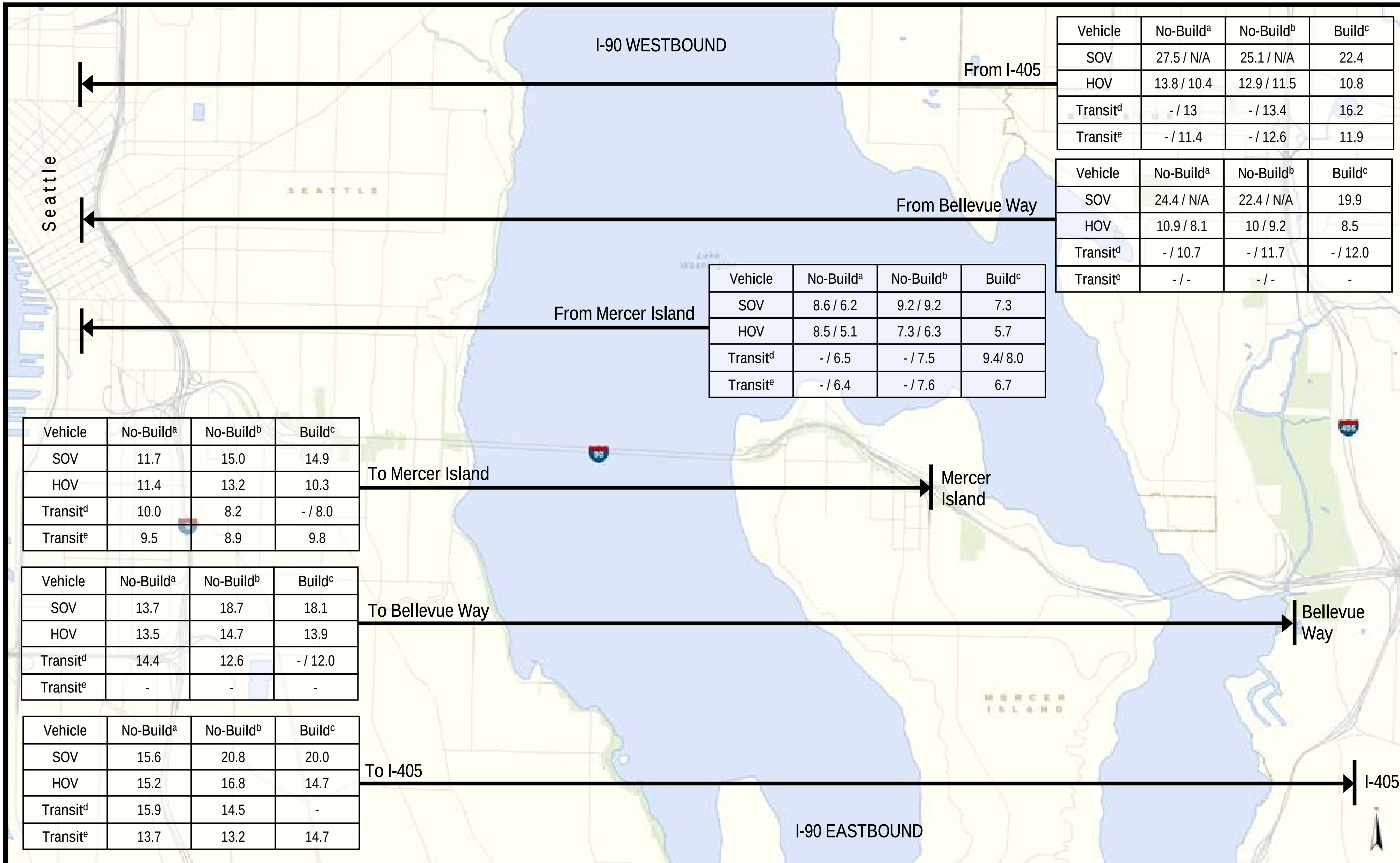
Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	14 / N/A	14.6 / N/A	14.7
HOV	12.9 / 8	8.4 / 8.1	10
Transit[d]	- / 11.0	- / 11.2	- / 12.0
Transit[e]	- / -	- / -	-

To I-405 (eastbound)

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	16 / N/A	16.8 / N/A	16.9
HOV	14.3 / 9.7	10.4 / 9.9	12.3
Transit[d]	- / 13.5	- / 13.6	16.7
Transit[e]	- / 11	- / 11.1	14

Travel times represented are outer roadway / center roadway.
Reversible center roadway operates westbound in the AM peak and eastbound in the PM peak.
[a] No-build condition with stages 1 and 2 of the I-90 Two Way Transit and HOV Operations Project.
[b] No-build condition with stages 1 through 3 of the I-90 Two Way Transit and HOV Operations Project.
Transit travel times reported in the center roadway in the build contition are light rail travel times.
[c] Build condition with WB Bellevue Way HOV on-ramp and joint-use (bus and light rail) in the D2 Roadway.
[d] Transit routes with stops on Mercer Island.
[e] Transit routes with no stops on Mercer Island.
\- = Buses that do not travel on this roadway during this period and/or do not travel between these points.
N/A = not applicable because the mode is not eligible to travel this path or the path is restricted

Figure 3-11
2020 PM Peak Period
I-90 No-Build and Build Travel Times in Minutes by Mode



From I-405

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	27.5 / N/A	25.1 / N/A	22.4
HOV	13.8 / 10.4	12.9 / 11.5	10.8
Transit[d]	- / 13	- / 13.4	16.2
Transit[e]	- / 11.4	- / 12.6	11.9

From Bellevue Way

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	24.4 / N/A	22.4 / N/A	19.9
HOV	10.9 / 8.1	10 / 9.2	8.5
Transit[d]	- / 10.7	- / 11.7	- / 12.0
Transit[e]	- / -	- / -	-

From Mercer Island

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	8.6 / 6.2	9.2 / 9.2	7.3
HOV	8.5 / 5.1	7.3 / 6.3	5.7
Transit[d]	- / 6.5	- / 7.5	9.4/ 8.0
Transit[e]	- / 6.4	- / 7.6	6.7

To Mercer Island

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	11.7	15.0	14.9
HOV	11.4	13.2	10.3
Transit[d]	10.0	8.2	- / 8.0
Transit[e]	9.5	8.9	9.8

To Bellevue Way

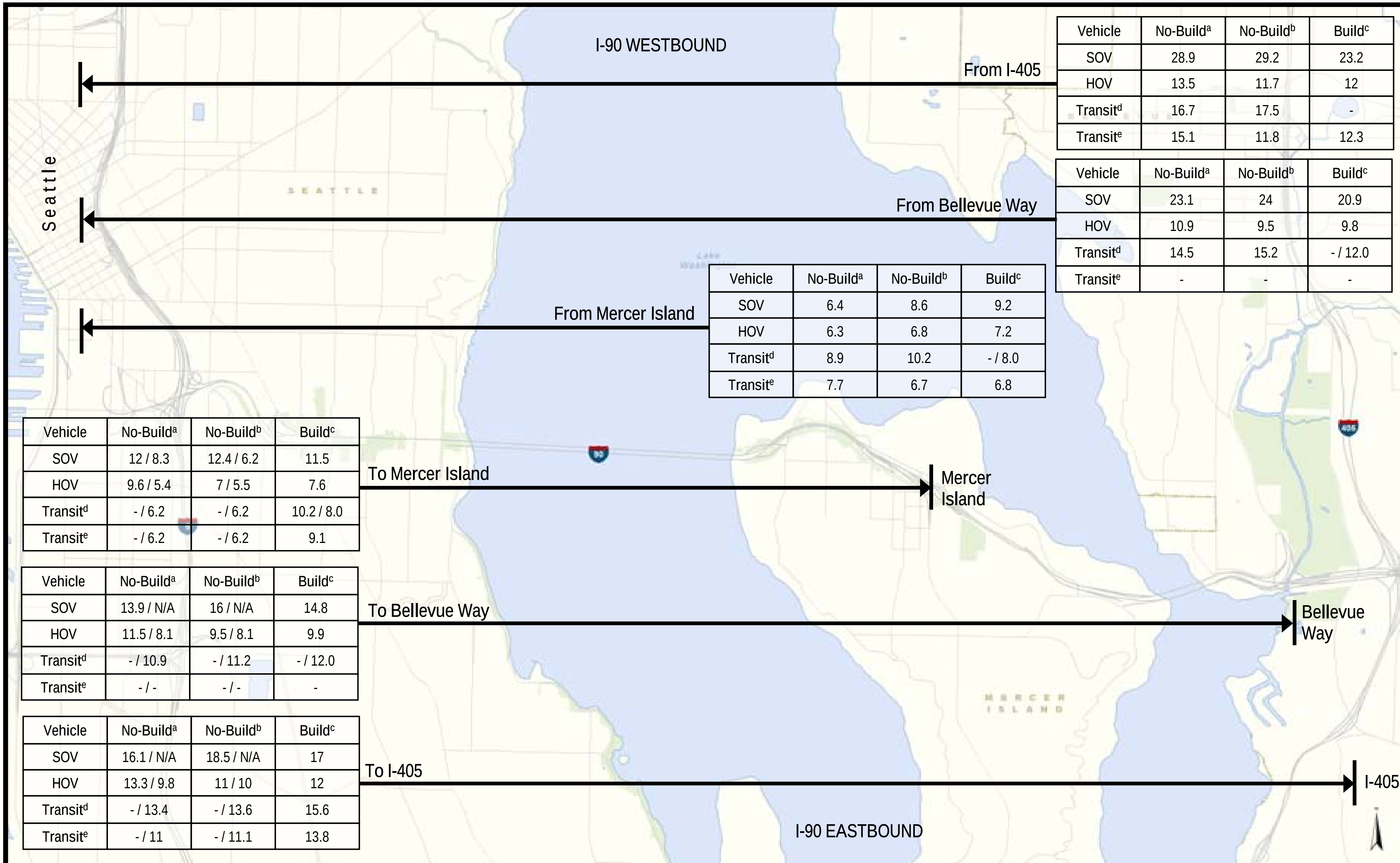
Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	13.7	18.7	18.1
HOV	13.5	14.7	13.9
Transit[d]	14.4	12.6	- / 12.0
Transit[e]	-	-	-

To I-405

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	15.6	20.8	20.0
HOV	15.2	16.8	14.7
Transit[d]	15.9	14.5	-
Transit[e]	13.7	13.2	14.7

Travel times represented are outer roadway / center roadway.
Reversible center roadway operates westbound in the AM peak and eastbound in the PM peak.
[a] No-build condition with stages 1 and 2 of the I-90 Two Way Transit and HOV Operations Project.
[b] No-build condition with stages 1 through 3 of the I-90 Two Way Transit and HOV Operations Project.
[c] Build condition with WB Bellevue Way HOV on-ramp and joint-use (bus and light rail) in the D2 Roadway. Transit travel times reported in the center roadway in the build contition are light rail travel times.
[d] Transit routes with stops on Mercer Island.
[e] Transit routes with no stops on Mercer Island.
- = Buses that do not travel on this roadway during this period and/or do not travel between these points.
N/A = not applicable because the mode is not eligible to travel this path or the path is restricted

Figure 3-12
2030 AM Peak Period
I-90 No-Build and Build Travel Times in Minutes by Mode



I-90 Westbound — From I-405

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	28.9	29.2	23.2
HOV	13.5	11.7	12
Transit[d]	16.7	17.5	-
Transit[e]	15.1	11.8	12.3

I-90 Westbound — From Bellevue Way

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	23.1	24	20.9
HOV	10.9	9.5	9.8
Transit[d]	14.5	15.2	- / 12.0
Transit[e]	-	-	-

I-90 Westbound — From Mercer Island

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	6.4	8.6	9.2
HOV	6.3	6.8	7.2
Transit[d]	8.9	10.2	- / 8.0
Transit[e]	7.7	6.7	6.8

I-90 Eastbound — To Mercer Island

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	12 / 8.3	12.4 / 6.2	11.5
HOV	9.6 / 5.4	7 / 5.5	7.6
Transit[d]	- / 6.2	- / 6.2	10.2 / 8.0
Transit[e]	- / 6.2	- / 6.2	9.1

I-90 Eastbound — To Bellevue Way

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	13.9 / N/A	16 / N/A	14.8
HOV	11.5 / 8.1	9.5 / 8.1	9.9
Transit[d]	- / 10.9	- / 11.2	- / 12.0
Transit[e]	- / -	- / -	-

I-90 Eastbound — To I-405

Vehicle	No-Build[a]	No-Build[b]	Build[c]
SOV	16.1 / N/A	18.5 / N/A	17
HOV	13.3 / 9.8	11 / 10	12
Transit[d]	- / 13.4	- / 13.6	15.6
Transit[e]	- / 11	- / 11.1	13.8

Travel times represented are outer roadway / center roadway.
Reversible center roadway operates westbound in the AM peak and eastbound in the PM peak.
[a] No-build condition with stages 1 and 2 of the I-90 Two Way Transit and HOV Operations Project.
[b] No-build condition with stages 1 through 3 of the I-90 Two Way Transit and HOV Operations Project.
[c] Build condition with WB Bellevue Way HOV on-ramp and joint-use (bus and light rail) in the D2 Roadway.
Transit travel times reported in the center roadway in the build contition are light rail travel times.
[d] Transit routes with stops on Mercer Island.
[e] Transit routes with no stops on Mercer Island.
- = Buses that do not travel on this roadway during this period and/or do not travel between these points.
N/A = not applicable because the mode is not eligible to travel this path or the path is restricted

Figure 3-13
2030 PM Peak Period
I-90 No-Build and Build Travel Times in Minutes by Mode

HOV and Transit

With the Proposal, future HOV and bus travel times on I-90 would be similar or improve compared with the no-build conditions with the I-90 Two-Way Transit and HOV Operations Project fully constructed (Stages 1 through 3), with the exception of the 2020 and 2030 eastbound PM peak, during which HOV travel times are expected to be up to 2 minutes higher than under the no-build condition. Similar HOV performance between the Proposal and the no-build condition is expected since the HOV lanes are provided in both directions on I-90 across the lake with the Proposal.

Although HOV and bus travel times would be similar on I-90 without the East Link Project, bus route travel times and reliability are expected to continue to be poor because buses operate on congested arterial streets to access Bellevue Transit Center and other transit facilities. It is expected that, by year 2030, bus speeds between Seattle and Downtown Bellevue will degrade by up to 30 percent from existing conditions, even with the I-90 Two-Way Transit and HOV Operations Project fully constructed (Sound Transit Ridership Model, 2007).

With the Proposal, light rail travel between Seattle and Mercer Island and between Seattle and Bellevue Way would take 8 and 12 minutes, respectively. These times would be improvements compared with SOV trips that could take up to 16 minutes between Seattle and Mercer Island and up to 25 minutes between Seattle and Bellevue Way in 2030 without the project. The travel times for the other modes (such as trucks) would not be expected to change from the travel times already discussed.

3.3.3.5 Intersection Operations

Local arterial intersections near I-90 interchanges and at I-90 ramp terminals in Seattle, Mercer Island, and Bellevue were evaluated during the AM and PM peak hours for the future 2020 and 2030 no-build and build conditions LOS and vehicle queues because they may be influenced or affected by the Proposal's change in freeway access and operations. Figures 3-14 and 3-15 and Appendix 3K show 2020 and 2030 no-build and build condition intersection LOS.

As noted in Policy Point 1 the relevant agencies within the I-90 Proposal study area and their LOS intersection standards for the existing and future conditions are:

- WSDOT: LOS E
- City of Seattle: LOS D
- City of Mercer Island: LOS C
- City of Bellevue: LOS D

In Seattle, during the AM and PM peak hours, intersections would vary slightly when comparing the no-build to the build conditions. Intersection operations would improve near the I-90 D2 Roadway terminus at 5th Avenue South and Airport Way/Dearborn Street because non-transit vehicles would not be permitted to use the D2 Roadway with light rail operations. Intersection operations on 4th Avenue would degrade slightly with the additional HOV traffic using this corridor to access I-90 in the build condition. On Mercer Island, some intersections that provide access to or are adjacent to I-90 may experience some degradation in operations with East Link compared with the no-build alternative because of the changes in I-90 access. Even so, with these access changes proposed under the Proposal, all intersections would meet agency standards in the 2020 and 2030 AM peak hour.

Similar to the AM peak hour, intersections on Mercer Island that provide access to or are adjacent to I-90 might experience some degradation in operations during the PM peak hour, caused by changes in access with East Link. With the Proposal, three intersections in the 2020 PM peak hour would operate worse than under the no-build conditions and not meet agency standards. These intersections are North Mercer Way and 77th Avenue SE, SE 24th Street and West Mercer Way, and SE 27th Street and 80th Avenue SE. These intersections are expected to operate at LOS D or E conditions. In addition, the I-90 eastbound off-ramp and 77th Avenue SE would exhibit vehicle queue lengths that extend onto I-90 mainline. Therefore, installing a traffic signal is proposed as mitigation at the ramp terminal. By 2030, the 76th Avenue SE/North Mercer Way and I-90 westbound on-ramp intersection would fail to meet agency standards with the Proposal and operate worse than in the no-build condition. With the proposed roadway lane striping and traffic signals along Bellevue Way, included as part of Proposal, the two intersections along Bellevue Way would operate with a similar or improved intersection LOS and delay in both 2020 and 2030 build conditions in the AM and PM peak hours compared with the no-build condition.

Proposed Intersection Mitigation

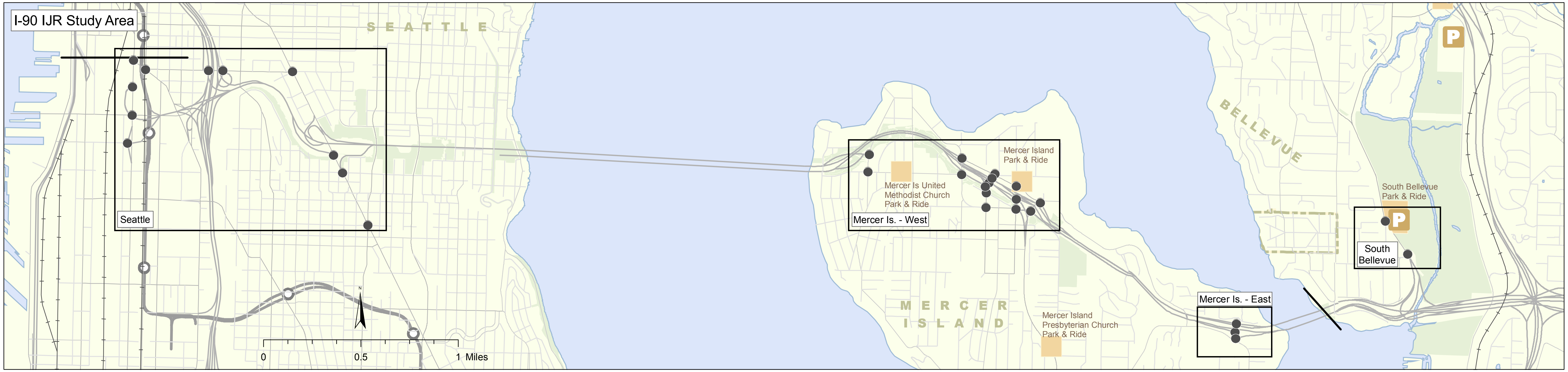
Mitigation is proposed on Mercer Island to improve intersection operations affected by the Proposal, including providing turn pockets and installation of traffic signals. The following list provides potential improvements on Mercer Island to adjust for the change in travel patterns to and from the island with the project (owning agency is identified within the parenthesis):

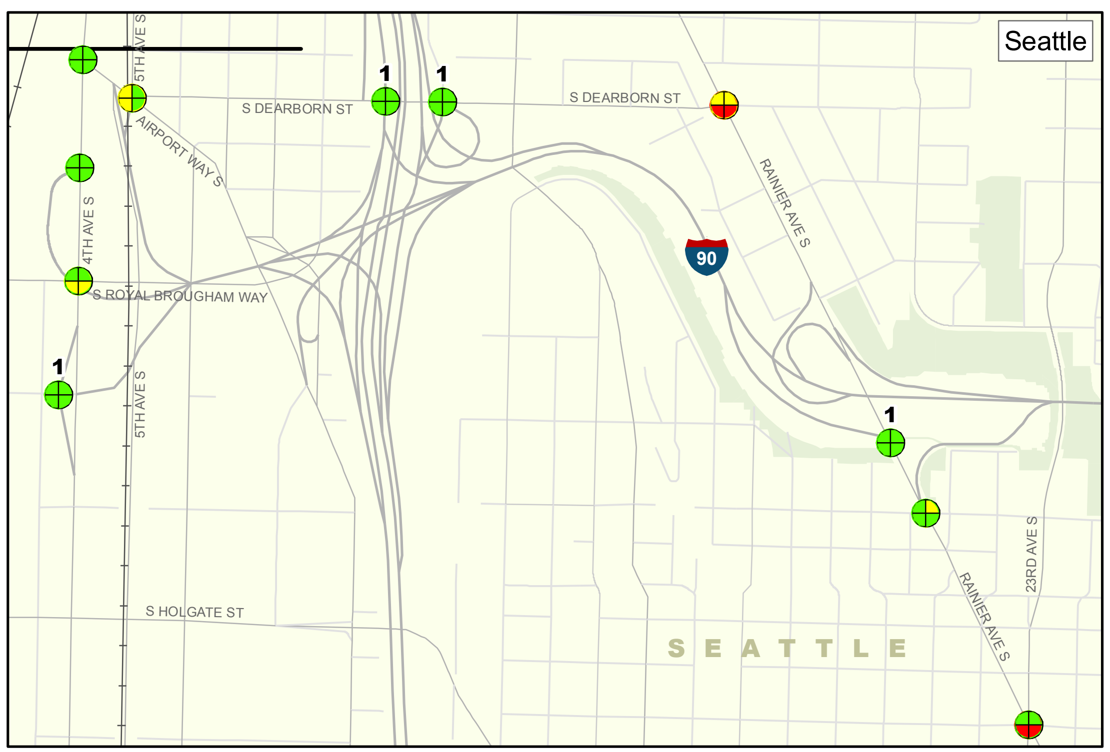
- West Mercer Way and 24th Avenue SE (Mercer Island): Provide southbound left-turn pocket
- 80th Avenue SE and SE 27th Street (Mercer Island): Install a traffic signal
- 77th Avenue SE and North Mercer Way (Mercer Island): Install a traffic signal
- 77th Avenue SE and I-90 eastbound off-ramp (WSDOT): Install a traffic signal (or other traffic control measures such as a roundabout)
- 76th Avenue SE/North Mercer Way and I-90 Westbound on-ramp (WSDOT): Modify the westbound channelization to provide left-turn pocket and through/right shared lane

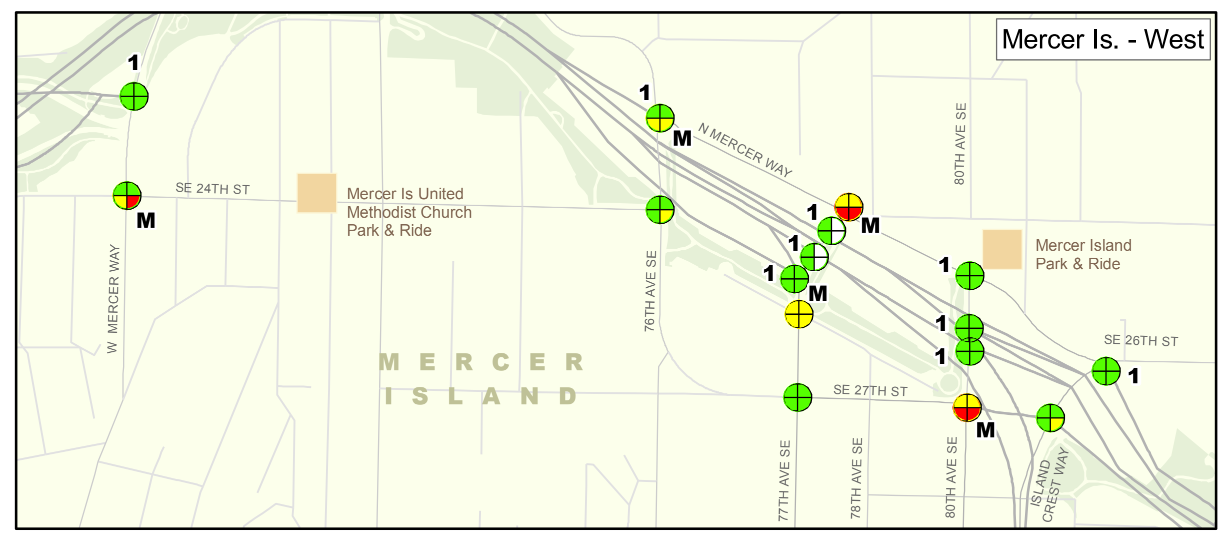
All of these improvements would improve the AM and PM peak hour intersection delay to the same or better than in the no-build conditions. Through continued coordination between Sound Transit, WSDOT, and the local jurisdictions final intersection mitigation will be determined in subsequent project phases and incorporated into the Project's ROD. Additionally, the City of Mercer Island might determine that other improvements to the intersection modifications listed are more compatible with downtown Mercer Island. For intersections within the City of Mercer Island jurisdiction, Sound Transit would contribute their proportionate share of costs to improve project-affected intersections. Sound Transit's contribution would be determined by the project's ratio of trips at the intersection or another equitable method. For the intersections within WSDOT jurisdiction that require mitigation, Sound Transit is committed to constructing the proposed improvements.

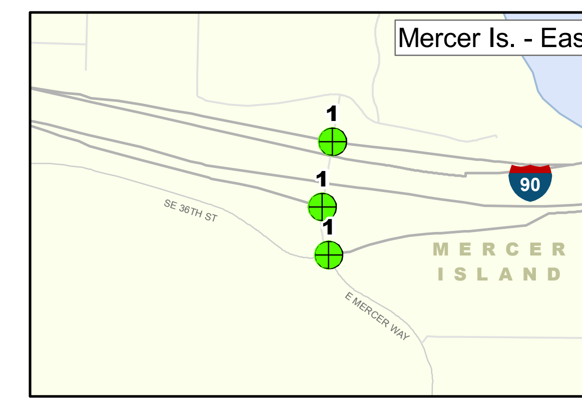
Intersection Ramp Terminal Vehicle Queues

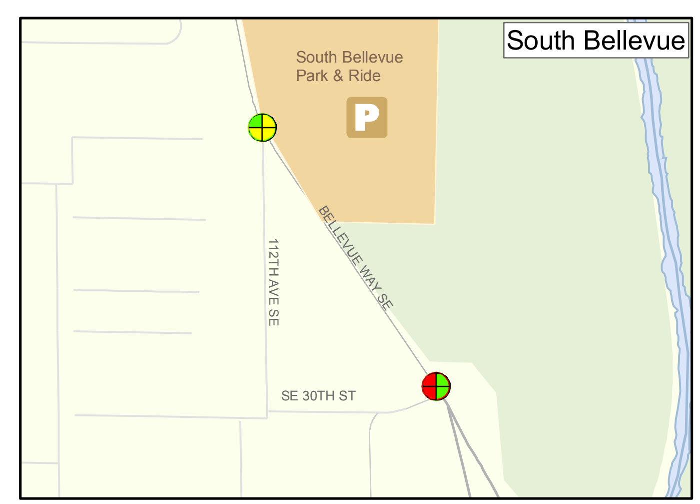
In addition to the LOS assessment of intersection operations, vehicle queues backing up from intersections were analyzed based on VISSIM output. Vehicle queues at I-90 ramp terminals under 2020 and 2030 AM and PM peak period no-build and build conditions are presented in Tables 3-13 and 3-14, respectively. Vehicle queues between the no-build condition and Proposal are similar or do not warrant mitigation; therefore, no improvements to ramp terminal operations beyond the improvements listed earlier in this section under Proposed Intersection Mitigation are proposed.











Source: King County (2006) modified by CH2M HILL.

Level of Service (LOS)

Seattle/Bellevue	WSDOT	Mercer Island
A - C	A - D	A - B
D	E	C
E - F	F	D - F

● I-90 IJR Study Intersection

Key to Symbols

- 2020 No Build AM
- 2020 No Build PM
- 2020 Build AM
- 2020 Build PM

NOTES:
a) The level of service in yellow is the jurisdiction's standard for intersections in this segment.
b) The level of service in white indicates that this intersection does not exist for the build condition.
c) South Bellevue build conditions are reported for the Preferred Alternative B2M.

1 - Intersection within WSDOT jurisdiction, other intersections are under the local agency's jurisdiction

M - Mitigation has been proposed for this intersection in the build condition

Figure 3-14 I-90 IJR Segments A and B
2020 BUILD AND NO BUILD CONDITIONS
INTERSECTION AM/PM LOS
Sound Transit East Link Project

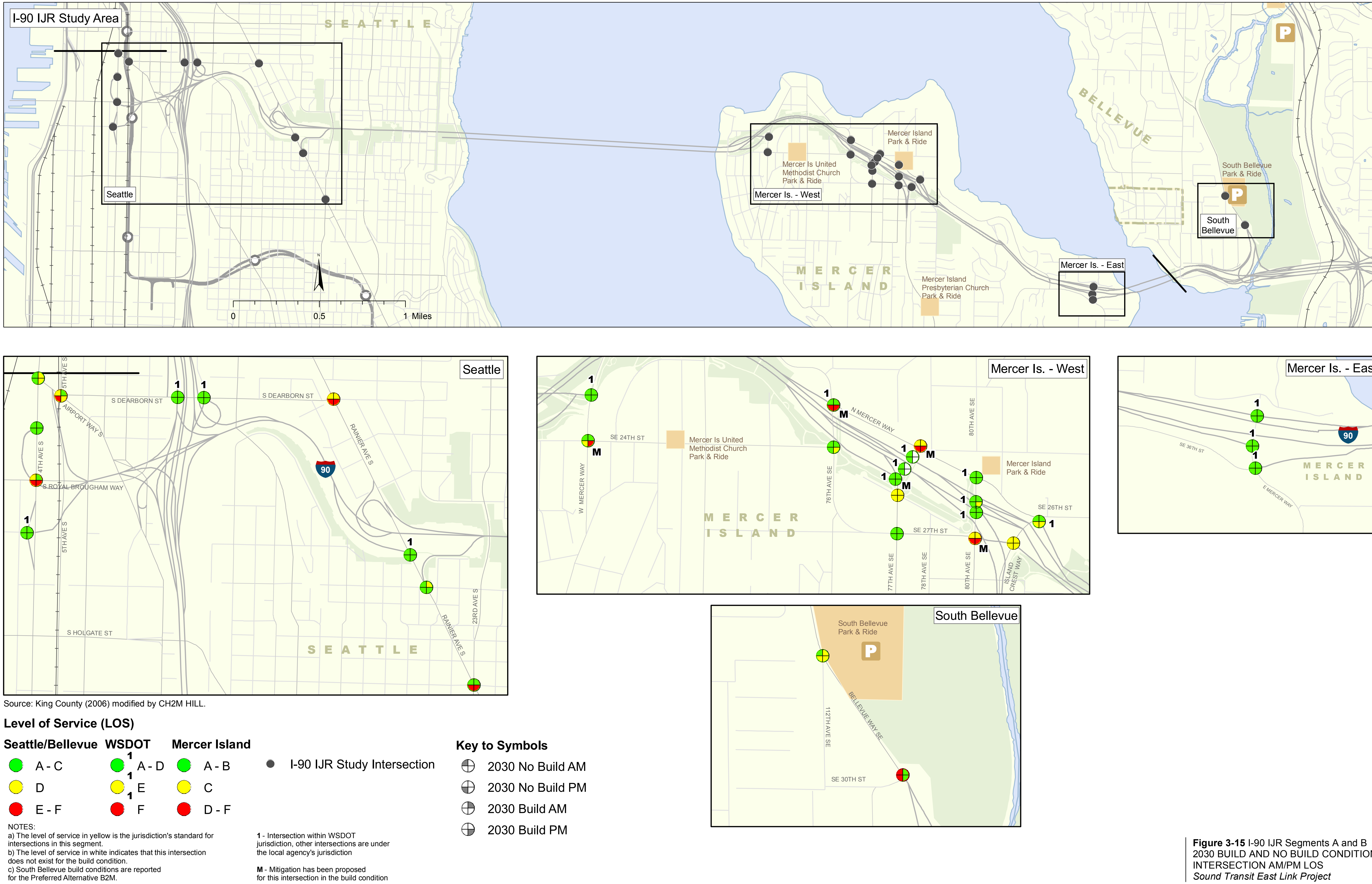


Figure 3-15 I-90 IJR Segments A and B
2030 BUILD AND NO BUILD CONDITIONS
INTERSECTION AM/PM LOS
Sound Transit East Link Project

TABLE 3-13
2020 and 2030 AM Peak Period I-90 Ramp 95th Percentile Vehicle Queues

Interchange/Ramp	Ramp Length (feet)	Vehicle Queue Length (feet)					
		2020 (Opening Year)			2030 (Design Year)		
		No-Build[a]	No-Build[b]	Build	No-Build[a]	No-Build[b]	Build
Eastbound I-90							
Rainier Avenue off-ramp	1,400	200	170	180	190	190	190
Rainier Avenue southbound on-ramp	1,120	**1,120**	**1,120**	**1,120**	**1,120**	**1,120**	**1,120**
Rainier Avenue northbound on-ramp	1,150	**1,150**	**1,150**	**1,150**	**1,150**	**1,150**	**1,150**
West Mercer Way off-ramp	1,000	80	80	70	80	90	80
77th Avenue SE off-ramp	900	80	80	170	80	90	140
Island Crest Way on-ramp	800	0	**790**	140	0	**800**	**800**
80th Avenue SE HOV on-ramp	2,200	0	0	0	0	0	0
East Mercer Way off-ramp	600	40	40	40	40	40	40
East Mercer Way on-ramp	450	0	0	0	0	0	0
Bellevue Way on-ramp	1,230	0	0	0	0	0	0
Westbound I-90							
Richards Road on-ramp	1,480	**1,480**	**1,480**	**1,470**	**1,480**	**1,480**	**1,470**
Bellevue Way on-ramp	1,680	**1,670**	**1,670**	**1,670**	**1,670**	**1,670**	**1,670**
East Mercer Way off-ramp	800	430	**800**	520	560	**800**	650
East Mercer Way on-ramp	280	0	0	0	0	0	150
Island Crest Way off-ramp	800	240	260	0	240	240	0
Island Crest Way on-ramp	More than 2,500	0	0	0	0	0	0
80th Avenue SE HOV off-ramp	More than 2500	0	0	0	0	0	0
76th Avenue SE on-ramp	600	40	40	0	40	50	0
West Mercer Way on-ramp	1050	0	0	**1,040**	0	0	**1,040**
Rainier Avenue northbound off-ramp	More than 2,500	1,660	450	0	1660	1660	0
Rainier Avenue southbound off-ramp	More than 2,500	0	0	0	0	0	0

Notes:
Bold text indicates queues that are expected to extend beyond the length of the ramp.
Ramps without control are not represented because no queue forms (unless congestion causes queue); on-ramps are controlled by ramp meters, and off-ramps are controlled by stop signs or signals.
[a] Stages 1 and 2 only of the I-90 Two-Way Transit and HOV Operations Project.
[b] Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
HOV high-occupancy vehicle

TABLE 3-14
2020 and 2030 PM Peak Period I-90 Ramp 95th Percentile Vehicle Queues

Interchange/Ramp	Ramp Length (feet)	Vehicle Queue Length (feet)					
		2020 (Year of Opening)			2030 (Design Year)		
		No-Build[a]	No-Build[b]	Build	No-Build[a]	No-Build[b]	Build
Eastbound I-90							
Rainier Avenue off-ramp	1,400	430	470	420	370	450	460
Rainier Avenue southbound on-ramp	1,120	**1,120**	**1,110**	**1,120**	**1,120**	**1,120**	**1,120**
Rainier Avenue northbound on-ramp	1,150	**1,150**	**1,150**	**1,150**	**1,150**	**1,150**	**1,150**
West Mercer Way off-ramp	1,000	80	130	160	60	130	160
76th Avenue SE off-ramp	900	60	70	270	60	80	280
Island Crest Way on-ramp	800	0	180	140	0	560	250
80th Avenue SE HOV on-ramp	2,200	0	0	0	0	0	0
East Mercer Way off-ramp	600	30	40	40	40	40	30
East Mercer Way on-ramp	450	0	0	0	0	0	0
Bellevue Way on-ramp	1,230	0	0	0	0	0	0
Westbound I-90							
Richards Road on-ramp	1,480	**1,480**	**1,470**	**1,470**	**1,480**	**1,470**	**1,470**
Bellevue Way on-ramp	1,680	**1,670**	**1,670**	**1,670**	**1,670**	**1,670**	**1,670**
East Mercer Way off-ramp	800	500	650	**800**	390	590	**800**
East Mercer Way on-ramp	280	0	0	0	0	0	0
Island Crest Way off-ramp	800	0	0	0	0	0	0
Island Crest Way on-ramp	More than 2,500	0	0	0	0	0	0
80th Avenue SE HOV off-ramp	More than 2,500	0	0	0	0	0	0
76th Avenue SE on-ramp	600	60	50	0	370	0	0
West Mercer Way on-ramp	1,050	0	0	0	30	0	0
Rainier Avenue northbound off-ramp	More than 2,500	0	0	0	0	0	0
Rainier Avenue southbound off-ramp	More than 2,500	0	0	0	0	0	0

Notes:
Bold text indicates queues that are expected to extend beyond the length of the ramp.
Ramps without control are not represented because no queue forms (unless congestion causes queue); on-ramps are controlled by ramp meters, and off-ramps are controlled by stop signs or signals.
[a] Stages 1 and 2 only of the I-90 Two-Way Transit and HOV Operations Project.
[b] Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.
HOV high-occupancy vehicle

The 95th percentile queue length was collected from the VISSIM model for each on-ramp and off-ramp along the I-90 corridor. For off-ramps, queue lengths were collected from the stop bar for both stop-controlled and signalized ramp terminals. In the case in which an off-ramp was operating under a free-flow condition or uncontrolled, the VISSIM model showed that no queue was present and therefore was excluded from Tables 3-13 and 3-14. For on-ramps, queue lengths were collected from the ramp-meter stop bar or, in cases in which ramp meters were not present, from the gore point of the on-ramp merge.

During the 2020 and 2030 AM peak period in both of the no-build conditions and the build condition, the eastbound I-90 Rainier southbound on-ramp and northbound on-ramp, westbound Richards Road on-ramp, westbound Bellevue Way on-ramp, and westbound Bellevue Way on-ramp are expected to have queues that exceed the queue storage length. In only the no-build condition with Stages 1 through 3 of the I-90 Two-Way HOV and Transit Project completed, queues will exceed storage length at the westbound East Mercer off-ramp and eastbound Island Crest Way ramp on-ramp. At all of these locations, the vehicle queues are expected to be similar or less under the build condition. Only at the westbound West Mercer Way on-ramp would the Proposal create a longer queue than under the no-build condition. At this location, the queue would extend close to the provided ramp length but does not extend beyond the ramp and impact the local street, therefore no mitigation is proposed.

During the 2020 and 2030 PM peak period in both the no-build conditions and build condition, the eastbound Rainier southbound on-ramp and northbound on-ramp, westbound Bellevue Way on-ramp, and the westbound Richards Road on-ramp are expected to have queues that exceed the queue storage length. The impact of the queue length though with the Proposal would be less than in the no-build condition as less demand is forecasted at these ramps with the Proposal. At the westbound East Mercer Way off-ramp, vehicle queues are expected to get close to the available storage length with the Proposal but would not impact mainline operations, therefore mitigation is not necessary. At the remaining ramps, minor variations occur between the no-build and build conditions for all other ramps in the PM peak hour.

3.3.3.6 Transit Performance

As discussed in Policy Point 1, transit performance within the study area was evaluated for reliability LOS. The reliability (on-time performance) of transit can influence whether or not transit is an attractive mode for potential users; poor reliability is a major deterrent to transit use. Overall, the Proposal would improve transit service across Lake Washington by extending transit access and mobility in the growing east Lake Washington communities and providing faster travel times and more reliable transit service, further improving the transit LOS for riders.

It is expected that, under the no-build condition, bus reliability for routes within the Proposal study area will continue to operate at failing levels in both 2020 and 2030. Most transit routes will operate at a reliability of LOS E and F. As discussed in Policy Point 1, in future no-build conditions, poor reliability of routes such as ST 550 (which travels along I-90 between Bellevue, Mercer Island, and Seattle) indicates that buses frequently arrive close together instead of at their desired intervals and that buses are unable to meet their scheduled arrival times. This route is a good example of how roadway congestion impedes transit, how the highly congested transportation network does not serve transit well, and how congestion restricts it from providing reliable service to the region.

With the D2 Roadway operating as joint-use (bus and light rail), buses should have minimal changes to their schedules between Seattle and I-90 with the Proposal. If the state is not able to maintain the 45-mph threshold for the HOV lanes, buses would not likely be able to maintain an acceptable reliability along I-90.

In contrast to bus service, light rail would not experience the same disruptions in transit reliability because it would operate in a dedicated right-of-way, generally separate from vehicle congestion, and therefore would be better able to handle higher ridership more effectively. Data from a light rail line (St. Louis light rail) similar to the East Link Project suggest that the reliability of light rail would be LOS A, arriving 93 percent on time. A detailed discussion of transit performance analysis is provided in the East Link Final EIS (WSDOT and Sound Transit, 2011). This analysis was performed according to the procedures and methods described in *Transit Cooperative Research Program Report 100: Transit Capacity and Quality of Service Manual* (TRB, 2003).

3.3.4 Safety

A safety analysis for existing conditions was performed to assess the type, cause, and frequency of accidents currently occurring within the project limits. For the future year analysis, a predictive assessment of how accidents may change in the future related to congestion level was developed to assess I-90 with and without the Proposal. Overall, the Proposal would have no negative impact on the overall safety conditions on I-90 because the expected accident predictions in the future with or without the project are similar. More importantly, the number of accidents per persons traveling on I-90 could be reduced because the East Link Project would increase the person throughput on the facility but maintain similar crash expectancy. In addition, light rail operates on a fixed guideway, which would be in an exclusive right-of-way along I-90 with no potential conflict points with vehicles, pedestrians or bicyclists except within the D2 Roadway where the right-of-way would be shared with buses.

3.3.4.1 Existing I-90 Safety Conditions

Existing accident data along the study corridor were collected from WSDOT for the 5-year period from 2004 to 2008 (WSDOT, 2010). The accident study corridors included the westbound, eastbound, and reversible roadways. The extent of the analysis was from the SR 519 western terminus of I-90 to just east of I-405, slightly greater than an 8-mile section.

Overall, in the westbound direction, the overall I-90 corridor accident rate for I-90 is 1.04 accident/million vehicle miles (acc./MVM). In the eastbound direction, the rate is 0.80 acc./MVM. The reversible center roadway accident rate is 0.61 acc./MVM. These accident rates are well below the average accident rate for urban interstate facilities (1.44 acc./MVM) in the Northwest Region of WSDOT.

The I-90 roadway sections listed below have accident rates higher than the average accident rate for urban interstate facilities in the Northwest Region of WSDOT. Appendix 3L provides a listing of all sections' accident rates as well as more information on the type of accidents and conditions.

- **I-90 westbound mainline:**
  - Between SR 519 and the SR 5 northbound off-ramp (total crash rate of 1.70 acc./MVM)
  - Between I-405 on-ramp and I-405 off-ramp (total crash rate of 2.56 acc./MVM)

- **I-90 eastbound mainline:**
  - Between Atlantic St and I-5 northbound and southbound on-ramps (total crash rate of 1.62 acc./MVM)
- **I-90 center roadway:**
  - Between the beginning/end of the reversible roadway in Seattle and the westbound transit on-ramp at Rainier Avenue South (total crash rate of 3.11 acc./MVM)
  - Between the westbound transit on-ramp at Rainier Avenue South and the on-ramp from eastbound I-90 at Rainier Avenue South (total crash rate of 2.59 acc./MVM)
  - Between the off-ramp to eastbound I-90 at East Mercer Way and the beginning/end of the reversible roadway at Bellevue Way (total crash rate of 1.93 acc./MVM)

Comparing injury accident rates showed that the westbound direction injury accident rate is 0.33 injury acc./MVM, the injury accident rate in the eastbound direction is 0.26 injury acc./MVM, and the reversible roadway injury accident rate is 0.28 injury acc./MVM. All roadways are below the urban interstate average for injury accident rate in the WSDOT Northwest Region of 0.46 injury acc./MVM.

The I-90 roadway sections listed below exceed the statewide urban interstate average for injury accident rates. All segments, except for one of the westbound segments, were also segments where the total accident rate exceeded the WSDOT Northwest Region average for urban interstates. Appendix 3L provides a listing of all sections' injury accident rates as well as more information on the type of accidents and conditions.

- **I-90 westbound mainline:**
  - Between SR 519 and the SR 5 northbound off-ramp (injury crash rate of 0.60 injury acc./MVM)
  - Between I-5 northbound off-ramp and the Rainier Ave northbound off-ramp (injury crash rate of 0.63 injury acc./MVM)
  - Between I-405 on-ramp and I-405 off-ramp (injury crash rate of 0.70 injury acc./MVM)
- **I-90 eastbound mainline:**
  - Between Atlantic St and I-5 northbound and southbound on-ramps (injury crash rate of 0.81 injury acc./MVM)
- **I-90 center roadway:**
  - Between the beginning/end of the reversible roadway in Seattle and the westbound transit on-ramp at Rainier Avenue South (injury crash rate of 0.83 injury acc./MVM)
  - Between the westbound transit on-ramp at Rainier Avenue South and the on-ramp from eastbound I-90 at Rainier Avenue South (injury crash rate of 2.04 injury acc./MVM)
  - Between the off-ramp to eastbound I-90 at East Mercer Way and the beginning/end of the reversible roadway at Bellevue Way (injury crash rate of 0.64 injury acc./MVM)

The accident analysis also identified CALs and CACs, as defined by WSDOT. A CAL is defined as a spot location determined to have had a clustering of severe accidents during the previous 5 years. A CAC is defined as a 5-mile corridor with a 5-year history of at least 11 fatal or serious collisions. No CACs were identified in the study area, and the only CAL was from Milepost (MP) 8.90 to MP 9.26, which is essentially I-90 between the Bellevue Way and I-405 ramps near the eastern edge of the project's study area. While the study area includes a CAL and a several

segments where the accident rates or injury accident rates are above the statewide average for similar facilities, the Proposal is expected to have no or minimal impact to the roadway geometry in these locations, and the locations identified on the center roadway would be eliminated with the Proposal. Therefore, no mitigation for existing I-90 safety deficiencies is proposed as part of the East Link Project.

3.3.4.2 Future Safety Conditions

The impact analysis evaluated the expected safety conditions on I-90 in the westbound and eastbound mainline roadways. An analysis was done to predict the percent change in the number of accidents on I-90 for the future no-build and build conditions. Overall, the accident prediction for I-90 indicates that the East Link Project would not increase the number of accidents in the corridor. In fact, with more people moving across Lake Washington with East Link and a similar number of accidents predicted between the no-build and East Link conditions, overall safety on I-90 would improve. The following subsections provide more information on the analysis methodology and results.

Methodology

The methodology used to predict future accident frequency for I-90 recognizes that accident rates for this high-volume freeway facility are not uniform throughout the day. It is known that, as volumes increase and congestion worsens, the accident frequency increases at a pace faster than that of VMT (Appendix 3L), resulting in higher peak-period accident rates. Where the percentage of the daily accidents exceeds the percentage of daily volumes in the peak periods, the accident rates are higher. Based on the I-90 patterns observed, existing accident rates (using 2004-2008 accident data) were calculated for the following four time periods:

- AM peak period (7:00 a.m. to 9:59 a.m.)
- PM peak period (4:00 p.m. to 6:59 p.m.)
- Midday (10:00 a.m. to 3:59 p.m.
- Evening and early morning (7:00 p.m. to 6:59 a.m.)

The existing accident data are the accident rates (accidents per million VMT) for the identified time periods, which are summarized in Table 3-15.

TABLE 3-15
Existing Accident Rate Distribution on I-90

Time Period	Accident Rate (accidents per million VMT)	
	Eastbound[a]	Westbound[a]
AM peak period	1.01 (0.31)	1.03 (0.34)
PM peak period	1.13 (0.39)	1.74 (0.51)
Midday	0.53 (0.13)	0.81 (0.26)
Evening and early morning	0.71 (0.27)	0.73 (0.27)

[a] Values in parentheses indicate the injury accident rate.
Accident rates determined using 2004-2008 WSDOT data.
VMT vehicle miles travelled

Additionally, an assessment was completed to provide a qualitative safety review regarding the proposed changes to the center roadway, specifically, changes that may influence lane changes from a GP on-ramp to the center roadway or outer roadway HOV lane and from the center

roadway or outer roadway HOV lane to a GP off-ramp. This assessment compared only the no-build condition with the I-90 Two-Way Transit and HOV Operations Project Stages 1 through 3 completed to the build condition because these two conditions include the completed outer roadway HOV lane.

The existing accident rates calculated for the four time periods were applied to the estimated VMT under the future conditions, where it is accepted that volumes will increase, lengthening the periods of congested travel. In order to estimate the amount of travel occurring in the extended peak periods, the VISSIM model was used to estimate the number of vehicles able to cross Lake Washington on I-90 during the peak periods. The number of vehicles unable to cross Lake Washington because of congestion provides guidance on how many hours congestion would extend beyond the peak periods. The higher peak-period accident rates were applied to the travel that would occur during the peak period and during the times of extended congestion.

Analysis conducted for the I-90 Two-Way Transit and HOV Operations Project (Alternative R-8A, *I-90 Two-Way Transit and HOV Operations Project Transportation Discipline Report* [HNTB Corporation (HNTB) and Mirai Associates, 2002])) formed the basis for predicting accident frequency on the I-90 outer roadways for the no-build condition. The study limits of the future accident prediction for this project and those used in the I-90 Two-Way Transit and HOV Operations Project do not match exactly, but are similar. Therefore, the applied methodology estimates the percent change in accidents expected in the westbound and eastbound mainline roadways that would occur based on the vehicle demand in each facility—westbound outer roadway, eastbound outer roadway, and reversible center roadway.

This analysis for Alternative R-8A estimated that, by 2025, the I-90 outer mainline roadways would have 360 to 390 accidents per year with implementation of measures to mitigate accidents (shown in Table 6-129 of *I-90 Two-Way Transit and HOV Operations Project Transportation Discipline Report* [HNTB Corporation (HNTB) and Mirai Associates, 2002]). These mitigation measures include the following:

- Speed management, such as posted or variable speed changes, west of Island Crest Way
- Shoulder rumble strips
- Enhanced delineation
- Static and variable signing
- Roadway and tunnel illumination
- Incident management

Because congestion under the 2025 condition is expected to resemble 2030 operations, the percentage changes computed for the 2030 conditions were used to estimate the expected change in accident frequency. Furthermore, the scenario analyzed in the I-90 Two-Way Transit and HOV Operations Project matches the no-build condition with Stages 1 through 3, which was therefore used as the baseline in comparing changes in accident frequency. The I-90 Two-Way Transit and HOV Operations Project Report predicted that the reversible facility would have six to seven accidents in 2025.

Total Number of Accidents Analysis

Considering the results of this analysis with the assumed mitigation countermeasures (see Table 3-16), the accident frequency of the I-90 westbound and eastbound mainline roadways in the

build condition could have up to 5 more accidents per year (390 accidents per year x 1.4 percent) than the no-build condition with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project. The no-build condition with only Stages 1 and 2 could have up to 25 fewer accidents per year (390 accidents per year x 6.3 percent) than the no-build condition with Stages 1 through 3 constructed. This would be primarily associated with lower VMT (vehicle throughput) in the no-build condition with only Stages 1 and 2 constructed.

TABLE 3-16
2030 Accident Frequency Predictions for I-90

	Eastbound and Westbound Outer Roadways		Total (includes reversible center roadway)	
	Percent Change	2030 Accident Frequency	Percent Change	2030 Accident Frequency
2030 No-build with Stages 1 through 3 [a]	N/A	360 to 390 [a]	N/A	366 to 397 [b]
2030 No-build with Stages 1 and 2 only	- 6.3%	337 to 365	- 6.3%	343 to 372
2030 Build	+ 1.4%	365 to 395	-0.3%	365 to 395

[a] Same as the preferred alternative in Two-Way Transit and HOV Operations Project with countermeasures.
[b] These values are from the 2025 analysis conducted as part of the I-90 Two-Way Transit and HOV Operations Project (WSDOT, 2002b).
N/A not applicable

While in the existing study period (2004-2008), the reversible center roadway averaged 11 accidents per year, the Two-Way Transit and HOV Operations Project Report predicted that the reversible facility would have 6 to 7 accidents in 2025. These accidents would no longer occur in the reversible center roadway once light rail replaces the vehicle usage. Hence, the East Link Project would result in a vehicle demand shifting to the outer roadways. The analysis considered this by adjusting the VMT in the outer roadways to estimate a slight increase in accident frequency in these facilities; approximately 5 accidents per year in 2030 as indicated in Table 3-16. Accidents occurring on the ramps (including ramp terminal intersections) that connect the reversible lanes to local streets were assumed to redistribute to the ramps that connect to the outer mainline roadways resulting in no change to the accidents at these ramp terminal intersections. This means that, overall, the East Link Project, when combining all three roadway facilities (eastbound, westbound and reversible center), is expected to have no effect on I-90 safety conditions, and a similar accident frequency between the no-build and build conditions is expected (Table 3-16).

Expressing the accident prediction in person miles traveled (PMT) instead of VMT shows a safety benefit from development of the light rail system**.** The accident rates based on daily VMT are similar for all three conditions considered (Table 3-17). However, there would be a noticeable increase in PMT with the build condition, and, therefore, a safety benefit is expected because people using light rail would be in a mode of travel substantially safer than an automobile. Because more people would be traveling through the corridor in the build condition and the expected accident frequency is expected to be similar between the no-build and build conditions, the accident frequency in terms of moving people would be lower.

TABLE 3-17
Accident Rates as a Function of Vehicle and Person Miles Traveled (All Roadways)

	Accident Frequency Prediction	Daily VMT (Estimated)	Accidents per VMT	Daily PMT (Estimated)	Accidents per PMT
2030 No-build with Stages 1 through 3[a]	366 to 397	1,313,970	0.76 to 0.83	1,875,470	0.53 to 0.58
2030 No-build with Stages 1 and 2 only	343 to 372	1,216,250	0.77 to 0.84	1,570,320	0.60 to 0.65
2030 Build	365 to 395	1,302,970	0.77 to 0.83	1,948,760	0.51 to 0.56

Note: Results include predictions for eastbound and westbound travel as well as outer roadways and reversible center roadways combined.
[a] Same as the preferred alternative in Two-Way Transit and HOV Operations Project with countermeasures.
PMT person miles traveled
VMT vehicle miles traveled

With joint bus-rail operations in the D2 Roadway about 30 vehicles (buses and light rail) per hour during the peak periods, or a vehicle every 1.5 to 2 minutes would use this roadway. This number of light rail and bus vehicles would be substantially less than the number of vehicles for safe operations that was determined for Central Link and the bus/light rail joint operations in the Downtown Seattle Transit Tunnel. The findings from the Central Link Initial Segment Environmental Assessment (Sound Transit, 2002) established that 60 buses and up to 10 trains could operate jointly.

To further provide safe vehicle separation and management of bus and light rail vehicle movements on the D2 Roadway, a vehicle identification and signal system would be installed. In addition, bus on-ramps to the D2 Roadway would be equipped with gates to prevent auto/truck traffic from entering this roadway. These gates would be raised when buses entering the D2 Roadway are detected.

Injury Crash Accident Analysis

The analytical process that was performed to predict the total number of accidents was repeated to assess the project’s potential impact on injury-only accidents. In summary, by applying the existing injury accident rates to future conditions, it was estimated that, by 2030, the build condition is expected to have a 1.9 percent increase in the accident frequency in the I-90 outer mainline roadways when compared with the no-build condition with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project. Comparing the two no-build conditions, the no-build condition with only Stages 1 and 2 is predicted to have 6 percent fewer accidents than the no-build condition with all three stages constructed.

This previous analysis estimated that, by 2025, the I-90 outer mainline roadways would have 130 to 180 injury accidents per year if accident reduction countermeasures were implemented, and 205 to 275 with no countermeasures. Considering the results of this analysis with the assumed countermeasures (see Table 3-18), the injury accident frequency of the I-90 westbound and eastbound mainline roadways under the build condition could have up to three injury accidents per year (180 injury accidents per year x 1.9 percent) more than that of the no-build condition with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project.

TABLE 3-18
2030 Injury Accident Frequency Predictions for I-90 Outer Mainline Roadways

	Eastbound and Westbound Outer Roadways		Total (includes reversible center roadway)	
	Percent Change	2030 Injury Accident Frequency	Percent Change	2030 Injury Accident Frequency
2030 No-build with Stages 1 through 3[a]	N/A	130 to 180[a]	N/A	132 to 184 [b]
2030 No-build with Stages 1 and 2 only	- 6.0%	122 to 169	- 6.0%	124 to 173
2030 Build	+ 1.9%	132 to 183	+ 0%	132 to 183

[a] Same as the preferred alternative in Two-Way Transit and HOV Operations Project with countermeasures.
[b] These values are from the 2025 analysis conducted as part of the Two-Way Transit and HOV Operations Project. (source: HNTB Corporation and Mirai Associates, 2002).
HOV high-occupancy vehicle
N/A not applicable

Furthermore, the no-build condition with only Stages 1 and 2 of the I-90 Two-Way Transit and HOV Operations Project could have 11 fewer injury accidents per year (180 injury accidents per year x 6.0 percent) than the no-build condition with all three stages constructed. Similar to the analysis for total accidents, this decrease is primarily associated with lower VMT (vehicle throughput) in the no-build condition with only Stages 1 and 2 completed.

As was done in the analysis that took into consideration the total number of accidents, a review was completed to determine the impact of the reversible facility and the impact of increased PMT associated with light rail on injury-only accidents. In the existing study period (2004-2008), the reversible center roadway averaged nearly five injury accidents per year, which are expected to be prevented when light rail replaces the vehicle usage in the reversible center roadway. Furthermore, the I-90 Two-Way Transit and HOV Operations Project analysis predicted that the reversible facility will have two to four injury accidents in 2025. This means that, overall, the East Link Project, when combining all three roadway facilities (eastbound, westbound and reversible center), is still expected to have no effect on the I-90 injury accidents, and a similar injury accident frequency between the no-build and build conditions is expected (see Table 3-18). A review of the injury accident rates based on PMT for the three conditions considered shows that the build condition would have similar or slightly lower injury accident rates as a function of PMT when compared with the two no-build conditions (Table 3-19). The similar expected frequency of injury accidents combined with the additional PMT that accompanies light rail results in similar or slightly lower injury rates based on person travel.

3.3.4.3 Qualitative Safety Review of Interchange Specific Weaving

In addition to the corridor safety assessment discussed in the previous section, a qualitative assessment was completed of lane changes from a GP on-ramp to the center roadway or outer roadway HOV lane and from the center roadway or outer roadway HOV lane to a GP off-ramp. The full technical memorandum is located in Appendix 3M (CH2M HILL, 2010a). This assessment only compared the no-build condition with Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project completed to the build condition because these two conditions include the completed outer roadway HOV lane. Data used in this assessment was based on 2030 peak-hour throughput presented earlier in this section (3.3.3.1).

TABLE 3-19
Injury Accident Rates as a Function of Vehicle and Person Miles Traveled (All Roadways)

	Injury Accident Frequency Prediction	Daily VMT (Estimated)	Injury Accident per VMT	Daily PMT (Estimated)	Injury Accident per PMT
2030 No-build with Stages 1 through 3[a]	132 to 184 [a]	1,313,970	0.28 to 0.38	1,875,470	0.19 to 0.27
2030 No-build with Stages 1 and 2 only	124 to 173	1,216,250	0.28 to 0.39	1,570,320	0.22 to 0.30
2030 Build	132 to 183	1,302,970	0.28 to 0.38	1,948,760	0.19 to 0.26

Note: Results include predictions for eastbound and westbound travel as well as outer roadways and reversible center roadways combined.
[a] Same as the preferred alternative in Two-Way Transit and HOV Operations Project with countermeasures.
PMT person miles traveled
VMT vehicle miles traveled

The reversible center roadway is open to westbound HOV and Mercer Island traffic in the AM peak hour and eastbound HOV and Mercer Island traffic in the PM peak hour; therefore, the East Link Project would result in no physical differences in weaving between the HOV lanes and the outside GP lanes in the off-peak travel direction, except for eastbound I-90 at Island Crest Way during both periods. Therefore, the review of weaving volumes focuses on the following movements:

- Westbound I-90 weaving from the center roadway exit or the HOV lane to the ramp to I-5 northbound (AM peak hour)
- Northbound I-5 to eastbound I-90 ramp weaving from the ramp to the entrance to the center roadway or the HOV lane (PM peak hour)
- 76th Avenue SE westbound on-ramp weaving to the HOV lane (AM peak hour)
- Eastbound I-90 weaving from the HOV lane to the 77th Avenue SE and Island Crest Way off-ramp (AM and PM peak hours)
- Rainer Avenue ramps between the Transit Flyer Stop and the westbound and eastbound mainline roadways

The weaving volumes considered in this review are based on the 2030 peak hour throughput shown in Table 3-20. Specific to the Mercer Island weaves, the volumes represent the number of vehicles that complete/begin the weave within 2,500 feet of the on-/off-ramp. This distance is based on the weaving definition in the *Highway Capacity Manual* (TRB, 2000), and represents the number of weaves that may occur in a relatively short distance. The weavers identified within this distance are assumed to have the highest potential to contribute to an accident because they may select smaller gaps to lane change, slow down or come to a stop while waiting for a gap, or result in increased levels of driver frustration and aggressive behavior. The weaving volume does not represent the total number of vehicles that will complete the maneuver.

I-90 Westbound Center Roadway and HOV Lane to I-5 Northbound (AM peak period only)

Weave volumes under the no-build condition are from the inside HOV lane and the center reversible roadway to I-5 northbound (approximately 3,800 feet), while the weave volumes

under the build condition are from the HOV lane only. Under the 2030 no-build condition, approximately 680 vehicles are expected to complete the weave from the HOV lane or center roadway. In comparison, 520 vehicles are expected to complete a similar weave from the inside HOV lane under the 2030 build condition. Even though the 2030 build condition has slightly lower weaving volumes, the weaves will cross against higher volumes in the GP lanes: 6,240 vehicles in comparison with 5,480 vehicles under the no-build condition. Overall, the total potential conflicts for the 2030 build condition should be similar to those of no-build condition.

TABLE 3-20
2030 Expected Weave and Mainline Volumes at Select Locations

Weave Location	Time Period	No-Build		Build	
		Weave Volume	GP Mainline	Weave Volume	GP Mainline
I-90 westbound center roadway and HOV lane to I-5 northbound	AM peak hour	680	5,480	520	6,240
I-5 northbound to I-90 eastbound center roadway and HOV lane	PM peak hour	710	4,560	330	4,760
76th Avenue SE on-ramp to I-90 westbound HOV lane	AM peak hour	0	5,020	20	5,430
I-90 eastbound to Downtown Mercer Island off-ramps	AM peak hour	30	5,080	150	4,930
I-90 eastbound to Downtown Mercer Island off-ramps	PM peak hour	Less than 10	5,000	90	5,400

GP general purpose
HOV high-occupancy vehicle

I-5 Northbound to I-90 Eastbound Center Roadway and HOV Lane (PM peak period only)

Weave volumes under the no-build condition are from I-5 northbound to the inside HOV lane or to the center reversible roadway (approximately 4,700 feet), while the weave volumes under the build condition are to the HOV lane only. Under the 2030 no-build condition, approximately 710 vehicles are expected to complete the weave to the HOV lane or center roadway. This is more than double what is expected under the 2030 build condition, in which approximately 330 vehicles would perform this weave. Within this weaving section, the 2030 build condition is expected to have about 200 additional vehicles in the GP lanes. This increase in volume would not offset the substantial decrease in the weaving volume; therefore, the potential number of conflicts for the build condition is less than under the no-build condition.

76th Street On-ramp to I-90 WB HOV Lane (AM peak period only)

Replacing the center roadway with East Link light rail will eliminate the westbound direct access from 77th Avenue SE to the center roadway in the morning, resulting in the potential for an increase in weaving maneuvers from the 76th Street westbound on-ramp to the westbound HOV lane. With the Proposal, it is expected that only 20 vehicles are expected to complete the weave to the inside HOV lane at a distance of 2,500 feet or less. The low frequency of expected weave vehicles under the build condition is expected to have minimal impact on the safety performance of westbound I-90 in the area of the 76th Street on-ramp.

I-90 Eastbound to Downtown Mercer Island Off-ramps

An HOV direct-access off-ramp to southbound Island Crest Way, which is the location preferred by WSDOT and Sound Transit, is assumed for this comparison. In Table 3-19, the ramp and weaving volumes to both GP ramps at 77th Street and Island Crest Way were combined because of their proximity to reflect the total weaving volume in the area.

The eastbound direction in the AM peak hour is the off-peak travel direction, with the mainline typically not operating at congested conditions in this area. Approximately 150 vehicles in the AM peak hour are expected to weave from the inside HOV lane to the GP off-ramps with the Proposal, while about 30 vehicles are predicted to perform this similar weave under the no-build condition. Higher weaving volumes crossing a similar number of volumes under the build condition would result in the potential for a greater number of weaving conflicts in the area. In the PM peak hour, the no-build condition is expected to have few weaves to the off-ramps because vehicles can use the center roadway. Approximately 90 vehicles are expected to weave from the inside HOV lane to the GP off-ramps with the Proposal. In comparison with the no-build condition, the Proposal has the potential to result in a greater number of weaving conflicts.

Rainier Avenue Transit Flyer Stop Ramps

In addition to the weaving analysis, a review of the bus volumes that would merge and diverge with at the Rainier Avenue ramps between the westbound and eastbound mainline roadways and the transit flyer stop are provided.

In the build condition, there would be a decrease in the daily number of buses that would use the eastbound ramp from the flyer stop to eastbound mainline. This decrease would be from 85 buses in the no-build condition to 73 buses in the build condition. By peak period, a substantial decrease in the number of buses that would do this merge in the morning and mid-day would occur with the project (85 buses in the no-build condition to 6 buses in the build condition). In the afternoon peak period, the number of buses that would do this merge increases with the project (from none in the no-build condition to 67 buses in the build condition) as the center roadway is closed with the project.

In the westbound direction, there would be a decrease in the daily number of buses that would use the westbound mainline ramp to the flyer stop with the project. This decrease would be from 93 buses in the no-build to 61 with the project. By peak period, a substantial decrease in the number of buses would do this diverge in the mid-day, pm peak and evening periods with the project (93 buses in the no-build condition to 9 buses in the build condition). In the morning peak period, the number of buses doing this diverge increases with the project (from none in the no-build condition to 52 buses in the build condition) as the center roadway is closed with the project.

In summary, the weaves to/from I-90 and the northbound I-5 ramps in the peak travel direction for the AM and PM peak hour is expected to reduce with the East Link Project. This should reduce the potential for related incidents under the build condition compared with the 2030 no-build condition. The 76th Street on-ramp to westbound I-90 will have an increase in the expected number of weaving vehicles; however, due to the magnitude of the volume increase (20 vehicles), the frequency should be negligible in terms of the overall impact to the corridor. Eastbound I-90 weaving volumes to 77th Street off-ramp and Island Crest Way off-ramp are expected to increase in comparison with the no-build condition, which has the potential for a

greater number of weaving conflicts. Lastly, the number of buses that would use the ramps connecting the Rainier Avenue transit flyer stop with the eastbound and westbound mainline roadways decreases as many bus routes along I-90 are eliminated or truncated with the project. As a system, the Proposal will result in a lower number of weaving vehicles, but a similar number of weaving conflicts as the mainline GP volumes are higher in the build condition than under the no-build condition.

3.3.4.4 Intersection Safety Conditions

Accident data for arterial intersections were collected from each jurisdiction and reviewed for the Proposal study area. Accident rates were calculated as the number of accidents per million entering vehicles (MEV). The City of Seattle uses a system similar to the WSDOT accident system, in which high accident locations (HALs) are identified for future safety improvements. A signalized intersection is considered to be an HAL if it experiences an average of more than 10 collisions per year. An unsignalized intersection is considered to be an HAL if it experiences an average of more than five collisions per year. Intersections with the City of Mercer Island and the City of Bellevue with an accident rate near or above 1.0 acc./MEV are considered intersections with high accident rates.

Within the Proposal study area, there are no intersections that have more than 10 collisions per year or intersections with accident rates over 1.0 acc./MEV. With the project, intersection accident rates are not expected to change from no-build conditions. Yearly accident rates were calculated for the study intersection, as shown in Appendix 3L.

Policy Point 4: Design

Will the proposal provide full directional interchanges connected to public streets or roads, spaced appropriately, and designed to full design level geometric control criteria?

4.1 Summary

The Proposal (build condition) removes vehicle access to and from the I-90 reversible center roadway with the conversion of the reversible center roadway to fixed light rail guideway. This Proposal also includes modifying the use of the D2 Roadway for only buses and light rail, restricting carpools from using this roadway and relocating the eastbound direct-access HOV off-ramp to Island Crest Way (previously proposed at 77th Avenue SE with the I-90 Two-Way Transit and HOV Project).

While the East Link Project evaluates 27 alternatives throughout the project's study area, this IJR describes Sound Transit Board's *Preferred Alternative A1* and *Preferred Alternative B2M. Preferred Alternatives A1* and *B2M* are the preferred alternatives in Segment A and B, respectively. For the purposes of the IJR, these two alternatives create the Proposal (or build condition). *Preferred Alternative B2M* extends beyond the IJR study area therefore only the portion that affects I-90 near the Bellevue Way interchange is included in this report.

4.2 Interchange Modifications

With this project, no new interchange access is proposed, only the removal of access to and from the reversible center roadway. Tables 4-1 and 4-2 list the future westbound and eastbound access (and modifications) on I-90 with the Proposal. Overall, seven access locations are proposed to be closed with the project. These are:

- The center roadway entry and exit ramps with the westbound and eastbound outer roadways at the East Channel Bridge
- The center roadway entry and exit ramps with the westbound and eastbound outer roadways at the Rainier Avenue South interchange
- The 77th Avenue SE reversible center roadway ramp
- The Island Crest Way reversible center roadway westbound and eastbound ramps, although the westbound left-side HOV ramp to the outer roadway HOV lane would remain.

The Proposal also would modify the D2 Roadway vehicle eligibility to permit only buses and light rail use (HOVs would be restricted from accessing this facility. Bus access into the D2 Roadway would be controlled by a two-gate system at its entry locations. A more in-depth discussion of this can be found in Section 4.2.1.) and would modify two elements of Stage 3 of the I-90 Two-Way Transit and HOV project. These modifications are:

- The Bellevue Way interchange eastbound HOV direct-access ramp is modified to accommodate both light rail and westbound and eastbound HOV direct-access ramps.

TABLE 4-1
Future Westbound I-90 Interchange Access

Interchange	No-Build[a]	No-Build[b]	Proposal	Notes
I-405 Interchange				
Off-ramp and on-ramp	X	X	X	No change
HOV on-ramp	X	X	X	No change
Bellevue Way Interchange				
Off-ramp and on-ramp	X	X	X	No change
HOV on-ramp	X	X	X	No change
Reversible Center Roadway at East Channel Bridge				
Entry into reversible center roadway from outer roadway	X	X	Closed	No-build: available only during morning hours
East Mercer Way Interchange				
Off-ramp and on-ramp	X	X	X	No change
Island Crest Way Interchange				
Off-ramp and on-ramp	X	X	X	No change
On-ramp to reversible center roadway	X	X	Closed	No-build: available only during morning hours
HOV on-ramp	X	X	X	No change
80th Avenue SE Interchange				
HOV off-ramp	X	X	X	No change
77th Avenue SE Interchange				
On-ramp to reversible center roadway	X	X	Closed	No-build: available only during morning hours
76th Avenue SE Interchange				
On-ramp	X	X	X	No change
West Mercer Way Interchange				
On-ramp	X	X	X	No change
Reversible Center Roadway at Rainier Avenue South				
Exit from reversible center roadway to outer roadway	X	X	Closed	No-build: available only during morning hours
Rainier Avenue South Interchange				
Off-ramp and on-ramp	X	X	X	No change
Ramp from mainline to transit flyer stop	X	X	X	Bus only
Interstate 5 Interchange				
Off-ramp and on-ramp	X	X	X	No change

TABLE 4-1
Future Westbound I-90 Interchange Access

Interchange	No-Build[a]	No-Build[b]	Proposal	Notes
5th Avenue South Interchange				
HOV off-ramp (with D2 Roadway)	X	X	Modified	Proposal: buses continued use; HOV restricted
Edgar Martinez Drive South/4th Avenue South/SR519 Interchange				
Off-ramp	X	X	X	No change

[a] Includes Stages 1 and 2 of the Two-Way Transit and HOV Operations Project.
[b] Includes Stages 1 through 3 of the Two-Way Transit and HOV Operations Project.
HOV high-occupancy vehicle

TABLE 4-2
Future Eastbound I-90 Interchange Access

Direction/Interchange	No-Build[a]	No-Build[b]	Proposal	Notes
Edgar Martinez Drive South/4th Avenue South/SR519 Interchange				
On-ramp	X	X	X	No change
5th Avenue South Interchange				
HOV on-ramp (with D2 Roadway)	X	X	Modified	Proposal: buses continued use; HOV restricted
Interstate 5 Interchange				
Off-ramp and on-ramp	X	X	X	No change
Rainier Avenue South Interchange				
Off-ramp and on-ramp	X	X	X	No change
Ramp from transit flyer stop to mainline	X	X	X	Bus only
Reversible Center Roadway at Rainier Avenue				
Entry into reversible center roadway from outer roadway	X	X	Closed	No-build: available only during afternoon hours
West Mercer Way Interchange				
Off-ramp	X	X	X	No change
77th Avenue SE Interchange				
Off-ramp	X	X	X	No change
Off-ramp from reversible center roadway	X	X	Closed	No-build: available only during afternoon hours
HOV off-ramp	N/A	X	Modify to Island Crest	Ramp relocated to Island Crest Way

TABLE 4-2
Future Eastbound I-90 Interchange Access

Direction/Interchange	No-Build[a]	No-Build[b]	Proposal	Notes
			Way	
80th Avenue SE Interchange				
HOV on-ramp	X	X	X	No change
Island Crest Way Interchange				
Off-ramp and on-ramp	X	X	X	No change
Off-ramp from reversible center roadway	X	X	Closed	No-build: available only during afternoon hours
HOV off-ramp	N/A	N/A	Modify from 77th Avenue SE	Ramp relocated from 77th Avenue SE
East Mercer Way Interchange				
Off-ramp and On-ramp	X	X	X	No change
Reversible Center Roadway at East Channel Bridge				
Exit from reversible center roadway to outer roadway	X	X	Closed	No-build: only available during afternoon hours
Bellevue Way Interchange				
Off-ramp and on-ramp	X	X	X	No change
HOV off-ramp	X	X	X	Reconstructed to accommodate East Link
I-405 Interchange				
Off-ramp and on-ramp	X	X	X	No change
HOV off-ramp	X	X	X	No change

[a] Includes Stages 1 and 2 of the Two-Way Transit and HOV Operations Project.
[b] Includes Stages 1 through 3 of the Two-Way Transit and HOV Operations Project.
HOV high-occupancy vehicle
N/A not applicable

- An eastbound HOV direct-access off-ramp would be located at Island Crest Way rather than at 77th Avenue SE. The 77th Avenue SE location was previously approved by FHWA as part of the I-90 Two-Way Transit and HOV Project.

Relocating the eastbound HOV off-ramp to Island Crest Way would provide HOV and rubber tire transit access all day and in both directions on Mercer Island because the left-side westbound access to the outer roadway HOV lanes will be maintained at Island Crest Way.

Not included in the Proposal is a change to the outer roadway HOV lane eligibility. Outer roadway HOV traffic will remain consistent with the I-90 Two-Way Transit and HOV Operations Project ROD (FHWA, 2004). HOV and transit will be authorized to use only the eastbound, left-side off-ramp at Island Crest Way, and Mercer Island traffic from the left-side westbound on-ramp at Island Crest Way will be allowed only in the HOV lane for merge and

acceleration purposes. With the East Link Project, access to and from reversible center roadway would be removed as well as its ramps connecting to Mercer Island (77th Avenue SE and Island Crest Way). With the access modifications from the I-90 Two-Way Transit and HOV Operations Project and the East Link Project, the traffic analysis assumed Mercer Island SOVs would be able to use the HOV lanes in both directions of I-90 between Seattle and Island Crest Way. This was assumed to demonstrate that it does not affect the results of the analysis and represents a worst case condition. This assumption does not represent approval of SOVs using the outer roadway HOV lanes or the eastbound left-side off-ramp to Island Crest Way. Any changes to the HOV lane eligibility such as tolling, managed lanes or Mercer Island SOV use would need to be addressed in a future analysis, approval and agreement.

Removal of the reversible center roadway access would not affect the design function of I-90, but rather improve I-90 functional design by removing conflict points. Within the reversible center roadway, the East Link light rail with a fixed guideway includes stations designed to FTA and Sound Transit standards and guidelines. The future channelization and ramps on I-90 associated with the East Link Project are depicted in Figure 4-1. Appendix 4A contains East Link Project preliminary engineering drawings that pertain to the Proposal.

As indicated in Tables 4-1 and 4-2, there are a number of interchanges that would have no access modifications. These are Edgar Martinez Drive South/4th Avenue South (as recently completed in the SR 519 project), I-5, West Mercer Way, 76th Avenue SE, East Mercer Way, and I-405. Lastly, where access exists in the corridor and remains with the Proposal, the access connects only to public roadways. The following sections break down the access changes and modifications by local jurisdiction.

4.2.1 Seattle

As part of the Proposal, carpool usage on the D2 Roadway would be prohibited to ensure safe light rail operations, but bus access would be maintained on the D2 Roadway as joint-use operations with light rail. Current access to and from Airport Way would be permanently closed and blocked for all vehicles other than buses. Access into the D2 Roadway would be controlled by a two-gate system at its entry locations. These gates would be controlled by the transit operations center that currently monitors the gates and signals in the Downtown Seattle Transit Tunnel. This two-gate system would limit the ability for general vehicles to enter the D2 Roadway or transit tunnel. Appendix 4B contains a memorandum documenting the gates and signal operations of the D2 Roadway when jointly used by light rail and buses (LTK Engineering Services, 2010). Carpools that use the D2 under existing conditions would likely rerouted to the 4th Avenue South/Edgar Martinez Drive South/SR 519 intersection.

Near the I-90 and Rainier Avenue South interchange, the reversible center roadway westbound exit and eastbound entry ramps with the outer mainline roadways would be closed with the Proposal. This would not affect access to the local street system.

4.2.2 Mercer Island

As listed in Tables 4-1 and 4-2, access to and from the center roadway on Mercer Island would be removed. Westbound and eastbound outer roadway access to and from the Central Business District on Mercer Island operates as a split diamond interchange with access provided at 76th Avenue SE, 77th Avenue SE, and Island Crest Way. These access points would remain unchanged with the Proposal; therefore, full access to/from Mercer Island and I-90 would

continue to be provided. The Proposal also maintains a “split diamond” left-side HOV access to and from with westbound and eastbound outer roadway HOV lanes at Island Crest Way (to and from Seattle) and at 80th Avenue SE (to and from Bellevue and points east). Changes to access at West Mercer Way and East Mercer Way are not proposed.

4.2.3 Bellevue

The Proposal maintains full access for the outer roadway at the Bellevue Way SE interchange. Direct access from the center roadway I-90 eastbound HOV lane to Bellevue Way SE would be closed. Sound Transit Board’s *Preferred Alternative B2M* maintains direct access between Bellevue Way SE and the outer HOV lanes in both directions.

4.3 Conceptual Signing Plan

The majority of I-90 sign modifications with the Proposal would be to remove signs as the project will eliminate access to and from the center roadway. These sign removals would occur on the I-90 mainline roadways and local streets near access locations with the center roadway. Additionally, any sign bridges on the center roadway would be removed for the light rail equipment.

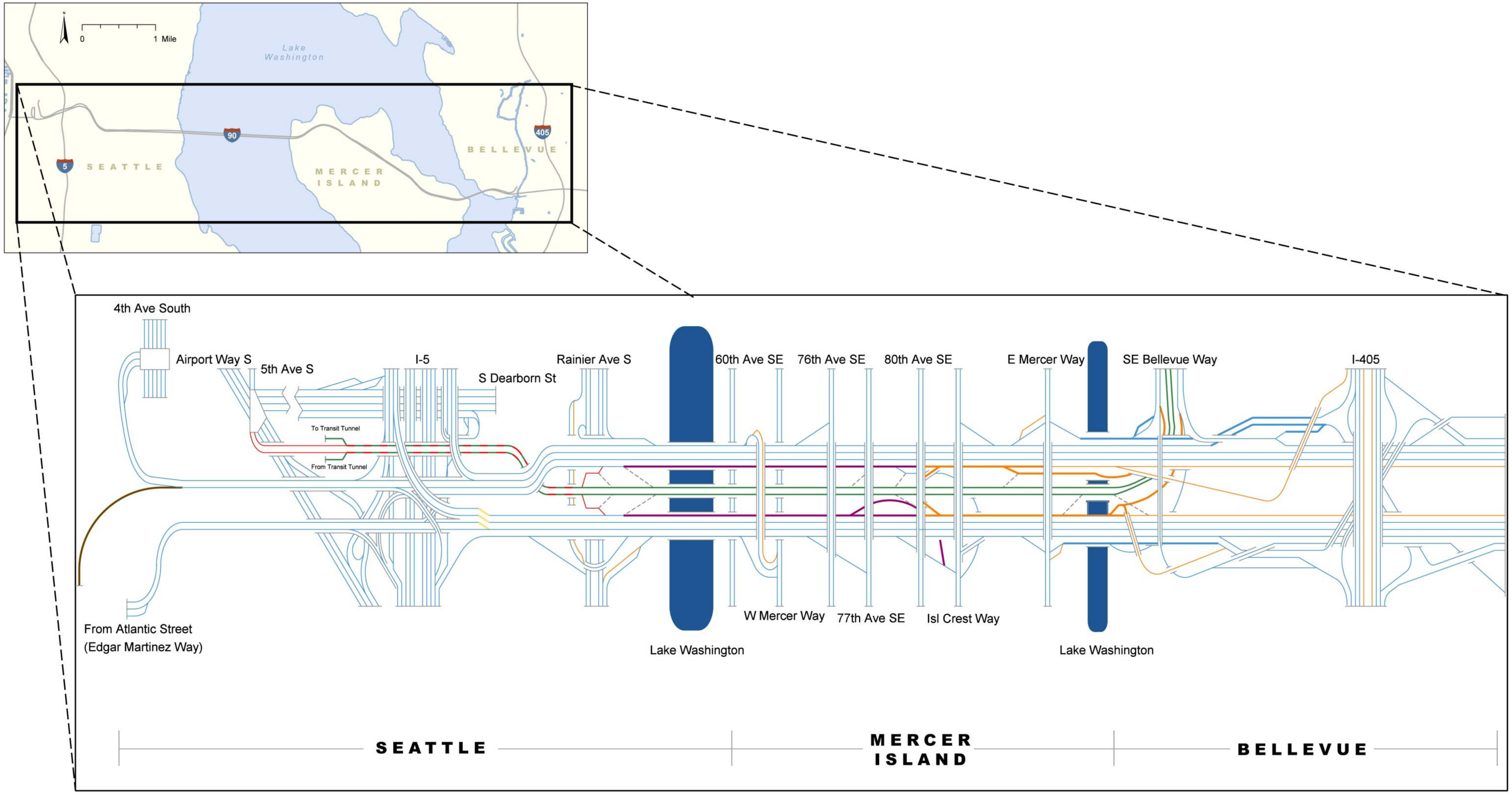
Near the 5th Avenue/Airport Way/D2 Roadway ramp, the existing signs and variable message signs (VMS) will remain to indicate ”bus access only”. Signs along I-90 westbound mainline near the Rainier Avenue South related to the D2 Roadway entrance ramp and the transit flyer stop will remain to continue indicating “Bus Only”. If an unauthorized vehicle uses either of the D2 ramps at 5th Avenue/Airport Way or Rainier Avenue South, signs would be provided to direct the vehicle to return to 5th Avenue/Airport Way or the I-90 mainline, respectively.

With the proposed Island Crest Way eastbound HOV direct-access off-ramp, signs would be provide similar the previously designed eastbound direct-access HOV off-ramp at 77th Avenue SE. All new signs would meet WSDOT standards.

4.4 I-90 Design Deviations

Sixteen design deviations were identified and approved for the no-build condition (Stages 1 through 3 of the I-90 Two-Way Transit and HOV Operations Project) (HNTB, 2005). Of the 16 design deviations, up to three deviations could be removed when implementing the Proposal. These are deviations 9, 10, and 16 of the I-90 Two-Way Transit and HOV Operations Project) (HNTB, 2005).

Design deviations 9 and 10 describe the nonstandard ramp width of the eastbound and westbound HOV direct access ramps to and from the Bellevue Way SE interchange. Design deviation 16 is a supplement to design deviations 1 and 3 regarding lane widths and shoulder widths, respectively. Design deviation 16 includes four additional deviation locations. Three deviations of lane and shoulder width within the center roadway from Milepost 7.21 to 7.69 would be eliminated with the Proposal. One deviation of lane width on the eastbound roadway from Milepost 7.78 to 7.97 would remain.



Bus Only Lane/Ramp
Light Rail
Joint Use Bus/Light Rail Lane
Existing HOV Lanes
Future HOV Lanes [1]
Future HOV Lanes [2]
Existing General Purpose Lanes
Future General Purpose Lanes [1]
Future General Purpose Lanes [2]
General Purpose Lanes constructed after 2007 [3]
Ramps Removed With East Link Project

Not To Scale

[1] I-90 Two-Way Transit and HOV Operations Project Stage 1 improvments to westbound GP and HOV facilities constructed after 2007. Eastbound GP and HOV facility improvements as part of Stage 2 are currently being constructed.

[2] Lanes constructed as Stage 3 of I-90 Two Way Transit and HOV Operations Project

[3] SR 519 Intermodal Access Project

Sources: http://www.wsdot.wa.gov/Projects/I90/TwoWayTransit/ and I-90 Two-Way Transit and HOV Operations Project

http://www.wsdot.wa.gov/Projects/SR519

393372.H3.02.04.01.06_EastLink_2_1apr11.ai_4/1/11_lw

FIGURE 4-1
Future I-90 Channelization and Ramps

Table 4-3 lists the anticipated design deviations related to the Proposal, none of which would be created by the Proposal because they are existing deviations that the project would not eliminate. A few additional anticipated design deviations (listed in Table 4-4) are anticipated as part of the I-90 Two-Way Transit and HOV project when modifying the Bellevue Way interchange and relocating the eastbound HOV direct-access ramp to Island Crest Way (described earlier in Section 4.2). The anticipated deviations listed in Tables 4-3 and 4-4 are not approved. Appendix 4A includes East Link Project design drawings and updated drawings for Island Crest Way and Bellevue Way as part of the I-90 Two-Way Transit and HOV project.

TABLE 4-3
I-90 Design Deviations with East Link Project

Location	Deviation	Justification	WSDOT Design Manual
D2 viaduct	Shoulder striping to be substandard: 4-foot outside and 2-foot inside (typical).	Striping would be identical to current conditions. Inside shoulder width would be 1 foot smaller on each side to accommodate ductbank within 4-foot-wide center barrier. Alternatives would require drilling into deck to place ductbank or hanging ductbank in cable tray on side of structure.	Chapter 1140
D2 superelevation	D2 Roadway to be superelevated to noninteger values to match LRT superelevation (unsure if this is technically a deviation).	Because only trained vehicle operators would be using the roadway, this should not be an issue. LRT superelevation vs. WSDOT superelevation: 1 inch = 1.77 percent, 2 inches = 3.53 percent, 3 inches = 5.31 percent, 4 inches = 7.07 percent. Advisory speed signage and adjustments to curve design speeds might be required.	Chapter 1250
Rainier Avenue South Interchange bus ramps	All ramps will maintain existing route continuity and geometry excluding any connection to center roadway east of Rainer Avenue. Substandard geometry includes acceleration and deceleration lengths, shoulder widths, lane widths, and taper rates.	Several structural limitations in the area prevent a straightforward solution to adjusting the existing geometry to meet the standards in the WSDOT Design Manual. To meet the standard, the deceleration ramps would need to be over 1,000 feet at a minimum 15 to 1 taper and the acceleration ramp would need to be over 2,100 feet at a 50 to 1 taper. These distances would require significantly modifying the I-90 Mount Baker tunnel portal. Alternatively, the bus platforms could be relocated within the Corwin curves to provide adequate width to accommodate a transit stop and light rail track. Since the ramps at the Rainier Avenue South flyer stop are separated from the mainline, parallel ramps might be possible but would likely feature restrictive reversing curves required to match the existing structures over Rainier Avenue South. The length needed for the eastbound on-ramp from the flyer stop to match into eastbound mainline at the prescribed taper could require modifying the existing structural members that support the Mount Baker lid and separate the center roadway. Currently, the bus volumes using these two ramps are relatively low, and with the project the estimated number of buses using the two ramps would be less as the East Link's bus integration plan forecasts the elimination of some bus routes along I-90. Final design has not been approved at the time of this IJR submittal.	Chapter 1360

Note: None of these deviations are approved as of April 2011.
IJR Interchange Justification Report
LRT light rail transit
WSDOT Washington State Department of Transportation

TABLE 4-4
I-90 Design Deviations at Island Crest Way and Bellevue Way Interchanges with the I-90 Two-Way Transit and HOV Project

Location	Deviation	Justification	WSDOT Design Manual
Island Crest Way Eastbound HOV Direct-Access Off-Ramp			
Island Crest Way eastbound HOV off-ramp[a]	Ramp lane width	A reduction in ramp lane width would be required because of limited space and so that the ramp would not conflict with the light rail station.	1360.06
Island Crest Way eastbound HOV off-ramp[a]	Ramp shoulder width	A reduction in ramp shoulder width would be required because of limited space and so that the ramp would not conflict with the light rail station.	1360.06
Bellevue Way East-north HOV Direct-Access Ramp			
I-90 gore to east-north GP ramp	Gore geometrics	Geometric and structural constraints would prevent a WSDOT Design Manual standard gore area. Taper rates and width will be affected.	1360.06
I-90 gore to 405 HOV flyover ramp	Gore geometrics	Geometric constraints would produce a reduced length and width gore area with nonstandard taper rates. However, this HOV ramp is expected to maintain a lower level of traffic volume.	1360.06
I-90 gore to east-north HOV ramp	Gore geometrics	Geometric constraints would produce a reduced length and width gore area with nonstandard taper rates. However, this HOV ramp is expected to maintain a lower level of traffic volume.	1360.06
I-90 mainline	Mainline shoulder width	Any substandard shoulders would supplement the existing deviation.	1360.05
East-north HOV off-ramp	Ramp shoulder width	Existing structures in the area would restrict the ramp shoulders. Moving these existing structures would be outside the project scope.	1420.05
East-north HOV off-ramp	Horizontal stopping sight distance	Existing structures in the area would restrict the sight distance. Moving these existing structures would be outside the project scope.	1260.04
East-north HOV off-ramp	Vertical stopping sight distance	The proposed design could have a deviation for vertical sight distance, pending final decision on ramp design speed.	1260.04
East-north HOV off-ramp	Maximum grade	The proposed max grade could be a deviation, pending final decision on ramp design speed.	1360.05
East-north GP off-ramp	Ramp shoulder width	The existing westbound I-90 pier is located so that it overhangs the ramp. This overhang is less than the minimum vertical clearance required; therefore, the shoulder is less than WSDOT Design Manual standard. Reconstructing the pier would be outside the project scope.	1360.05
East-north GP off-ramp	Horizontal stopping sight distance	An existing vegetated slope would restrict sight distance; however, this could be alleviated in final design.	1260.04

TABLE 4-4
I-90 Design Deviations at Island Crest Way and Bellevue Way Interchanges with the I-90 Two-Way Transit and HOV Project

Location	Deviation	Justification	WSDOT Design Manual

Note: None of these deviations are approved as of April 2011.
The deviations listed are in addition to those previously approved through the I-90 Two-Way Transit and HOV Project.
[a] These deviations are based on the station location in the February 5, 2010 Interim Submittal of the Segment A Light Rail Plan Set.
GP general purpose
HOV high-occupancy vehicle
WSDOT Washington State Department of Transportation

Policy Point 5: Consistency with Land Use and Transportation Plans

Is the proposed access point revision compatible with all land use and transportation plans for the area?

5.1 Summary

Sound Transit reviewed regional, state, local, and major institution master land use and transportation plans to identify goals and/or policies applicable to the East Link Project. This policy point summarizes the applicable plans and discusses the Proposal's consistency with long-term regional planning objectives. Table 5A-1 in Appendix 5A provides information on specific goals and policies in the relevant plans, and the consistency of the Proposal (build condition) with each of them. The table lists each plan, including a description of the applicable plan element(s) and any subsections, identifies whether the Proposal, as part of the East Link Project, is consistent with the goal or policy, and identifies any conflicts. As noted in Table 5A-1 and in summary, the route and station alternatives are consistent with plans and polices in the study area.

Agencies having jurisdiction over land use within the East Link Project area include King County and the cities of Seattle, Mercer Island, Bellevue, and Redmond. In addition to WSDOT and Sound Transit, King County and these cities also have jurisdiction over transportation planning and infrastructure investments. PSRC is the MPO for the Central Puget Sound region. Its responsibility includes establishing the regional Metropolitan Transportation Plan as well as reviewing plans from local agencies for state growth management compliance. The Proposal is consistent with plans and policies of the agencies having jurisdiction over land use and transportation planning.

5.2 Regional and State Plans

There are six regional and state planning documents that establish the framework for local land use and transportation. The following subsections discuss these regional and state planning documents: the GMA, PSRC's VISION 2040 (PSRC, 2009a) and Transportation 2040 (PSRC, 2010a), Sound Transit's Regional Transit Long-Range Plan (Sound Transit, 2005a), King County Comprehensive Plan (King County, 2010, and the Washington State Transportation Plan (WSDOT, 2005). This section also discusses the coordination with King County Metro's Transit Now program. In addition, this section discusses the 1976 I-90 MA and its 2004 amendment, which specifically relates to the Proposal and the East Link Project.

Table 5A-1 discusses the goals and policies of each of the following regional and state plans and how the Proposal, as part of the East Link Project, is consistent with these plans.

5.2.1 Growth Management Act

5.2.1.1 Plan Summary

The GMA (*Revised Code of Washington* [RCW] 36.70A), adopted in 1990, provides a comprehensive framework for managing growth and coordinating land use development with the construction of infrastructure investments including transportation. Local, county, and regional plans in Washington are required to be consistent with the policies of the GMA. The overall goals of the GMA encourage denser development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner, and encourage efficient multimodal transportation systems that are based on regional priorities in coordination with county and city comprehensive plans.

Jurisdictions within the East Link Project area—including Seattle, Mercer Island, Bellevue, and Redmond—keep pace with land development by providing public road and transit improvements to help meet the expected transportation demand. Coordination of land use and transportation through a mechanism called "concurrency" is a key component of the GMA.

5.2.1.2 Project Consistency

The East Link Project would connect Mercer Island, Seattle, Bellevue, and Redmond and their dense residential and employment centers, furthering the goals of the GMA by specifically preserving rural areas throughout the state. The East Link Project is consistent with concurrency requirements because it does not require or propose the development of new roadways to support light rail.

5.2.2 Puget Sound Regional Council: VISION 2040

5.2.2.1 Plan Summary

VISION 2040, adopted in April 2008, serves as the region's integrated long-range growth management strategy. It promotes the development of a coordinated transportation system that is integrated with and supported by the growth management strategy and builds upon and supports local, countywide, regional, and state planning efforts. Countywide planning policies in each of the counties supply the local framework and provide additional detail for county and city comprehensive plans.

VISION 2040's focus is to manage growth, concentrate dense residential and employment into urban centers, and link the centers with a high-quality multimodal transportation system. This strategy is designed to foster a greater mix of land uses and a more complete and efficient network of streets and other public rights-of way, and to support an urban environment that is more amenable to walking, biking, and using transit.

5.2.2.2 Project Consistency

VISION 2040 contains many goals and policies that support implementation of the Proposal and the East Link Project and their associated access modifications. This coordination between VISION 2040 and the East Link Project facilitates the provision of an efficient transportation mode choice between dense urban environments. Providing person movement capacity within existing transportation rights-of-way would allow for development and density to occur. Increasing person movement capacity through light rail would also potentially curb growth in VMT and VHT, which is a key objective in the draft plans for the next planning horizon (2020).

Table 5A-1 in Appendix 5A provides information on the goals and policies of VISION 2040 and how the East Link Project is consistent with these.

5.2.3 Puget Sound Regional Council: Transportation 2040

5.2.3.1 Plan Summary

Transportation 2040 (PSRC, 2010a) is the long-range Metropolitan Transportation Plan in the central Puget Sound region through the year 2040 and is the transportation element of VISION 2040. The transportation-related plans of cities, counties, transit agencies, and the region form the basis for the Transportation 2040 plan. The plan holistically and systematically looks at the needs of the Central Puget Sound Region and identifies what transportation improvements are needed in order to provide a safe, cleaner, integrated, sustainable, and highly efficient multimodal transportation system that supports the regional growth strategy and promotes economic and environmental vitality, and better public health. Transportation 2040 supports a balanced multimodal transportation system that provides options to users. The plan identifies more than 1,000 specific projects that have been designed to result in improved mobility and safety among all modes (PSRC, 2010a).

Since initiation of the East Link Project, PSRC has adopted VISION 2040 and Transportation 2040, which promotes higher-density population and employment growth in designated regional growth centers. Under VISION 2040, the future transportation system will support the regional strategy by focusing on connecting centers with a highly efficient multimodal transportation network, which is achieved through the preservation of existing rights-of-way for future high-capacity transit.

5.2.3.2 Project Consistency

The East Link Project, of which the Proposal is a part, is identified in Transportation 2040 and VISION 2040 and is a key component in the development of a regional high-capacity system linking urban centers. In addition, East Link would allow for jurisdictions to better implement transit and pedestrian-oriented land use patterns where current zoning allows for such development to occur.

5.2.4 Sound Transit Regional Transit Long-Range Plan

5.2.4.1 Plan Summary

Updated in 2005, Sound Transit's *Regional Transit Long-Range Plan* represents the goals, polices, and strategies for the long-term development of an HCT system within the Central Puget Sound Region (Sound Transit, 2005b). As the Regional Transit Authority (under Chapters 81.104 and 81.112 RCW), Sound Transit is responsible for regional HCT system planning in the context of Destination 2030 and Transportation 2040. The Long-Range Plan serves as the basis for the next phase of HCT investments, known as "ST2." ST2 builds upon Sound Move, the initial implementation phase of the Long-Range Plan, and extends the regional transit network, especially in areas that are now encouraging increases in land use density in their comprehensive plans and development regulations. ST2 includes the expansion of the light rail system from Seattle to the Eastside via Lake Washington, connecting the cities of Seattle, Mercer Island, Bellevue, and potentially Redmond. ST2 (Sound Transit, 2007b), also known as "the Regional Transit System Plan," was approved in November 2008. ST2 is consistent with established long-range regional transportation and land use plans.

5.2.4.2 Project Consistency

East Link, of which the Proposal is a part, is a proposed regional HCT system project that is a key component of the Long-Range Plan.

5.2.5 King County Comprehensive Plan

5.2.5.1 Plan Summary

The King County Countywide Planning Policies (CWPPs) set the framework for county and city comprehensive plans. The CWPPs address issues that transcend city boundaries, such as setting urban growth areas, accommodating housing and job demand, and addressing capital facilities that are regional in nature, as well as providing a framework to promote consistency among a multitude of city plans.

Goals of the policies include reducing urban sprawl, protecting rural areas, providing affordable housing throughout the county and coordinating protection of environmentally sensitive areas. The CWPPs call for urban centers to provide areas of concentrated employment and housing with direct service by HCT and with a wide range of land uses. In this context, the East Link Project is an important element of the region's growth strategy (King County, 2010).

5.2.5.2 Project Consistency

The proposed access modification accommodates HCT and allows for the provision of a transportation system that meets and facilitates the goals identified in King County CWPPs. Table 5A-1 discusses the goals and policies of the King County CWPPs and how the East Link Project is consistent with these.

5.2.6 Coordination with King County Metro's Transit Service Plans (Transit Now)

5.2.6.1 Plan Summary

In 2006, voters approved the Transit Now initiative to expand regional transit service by 15 to 20 percent over the next 10 years. Recent improvements include an increase of 37,000 annual service hours within the first year of Transit Now. Longer-range improvements include the creation of new bus rapid transit service corridors (RapidRide), more bus service on high-ridership routes and in growing residential areas, and improvements to some of Metro's other transportation services (Metro, 2008).

5.2.6.2 Project Consistency

Sound Transit and King County Metro service planners developed bus service plans for the 2020 and 2030 years for the no-build condition and the East Link Project alternatives. Although the service plans have not been finalized, the draft plans provide a snapshot of how bus service would look with and without the East Link Project. Some of these plans are now being implemented through Transit Now.

With the Proposal, as part of the East Link Project, light rail would directly connect Downtown Seattle, Mercer Island, Bellevue, and Redmond. Future bus service within the study area would change with the East Link Project, because most bus routes that provide parallel service to the light rail service would be eliminated or modified to terminate at light rail stations. As part of Transit Now, there is a planned Bellevue to Redmond BRT Rapid Ride line proposed on NE 8th Street and 156th Avenue NE via Crossroads and Overlake. It is scheduled to launch in fall 2011. This BRT line would support East Link by creating a bus connection between proposed stations

and eastern Bellevue. Sound Transit and King County Metro would continually coordinate bus service planning through programs such as Transit Now to confirm that the regional transit network, including light rail, would coordinate and continue to serve the area's growing residential and employment centers.

5.2.7 State of Washington Transportation Plan (2007-2026)

5.2.7.1 Plan Summary

The Washington Transportation Plan (WTP) (Washington State Transportation Commission and WSDOT, 2007) is the state's blueprint for implementation programs and budget development to be pursued in future years. The 2007-2026 update of the 2003-2022 WTP (Washington State Transportation Commission and WSDOT, 2002) contains an overview of the current conditions facing the statewide transportation system, an assessment of the state's transportation investment needs for the next 20 years, and a statewide policy for transportation. The State Transportation Commission developed an update of the plan dated July 2010 (Washington State Transportation Commission, 2010). This plan further supports urban density served by transit but is not yet adopted. The Washington State Highway System Plan (HSP) is the element of the WTP that addresses the state's highway system. The HSP includes a comprehensive assessment of existing and projected 20-year deficiencies on the state's highway system. It also lists potential solutions that address these deficiencies. The WTP also fulfills the requirements of state and federal law.

The WTP is the result of a Washington State Transportation Commission and WSDOT collaborative effort of more than 2 years. The result of this collaboration is a statewide policy and an inventory of potential investments to sustain a desirable transportation future in our state. The plan is designed to identify the top transportation investment priorities for the entire state in the areas of (1) preservation, (2) safety, (3) economic vitality, (4) mobility, and (5) environmental quality and health (Washington State Transportation Commission and WSDOT, 2006).

5.2.7.2 Project Consistency

HCT is identified in the WTP as a key component in the development of a regional high-capacity system to address congestion issues "by reducing delay in large urban areas" (Washington State Transportation Commission and WSDOT, 2006). The East Link Project is identified as a Tier III solution in the Highway System Plan "to address existing and future congestion deficiencies on I-90 floating bridge" (Washington State Transportation Commission and WSDOT, 2006).The updated plan specifically addresses light rail and mentions policies to address funding of transit (Washington State Transportation Commission, 2010).

5.2.8 1976 I-90 Memorandum Agreement and 2004 Amendment

5.2.8.1 Plan Summary

In 1976, the I-90 MA (WSDOT, 2004) was issued, with plans to construct an improved I-90 facility between I-405 and I-5, including exclusive transit/carpool lanes (center roadway). This highway facility was identified as a critical regional need to effectively connect the communities of Seattle, Mercer Island, and Bellevue by providing improved HOV reliability, transit service, truck access, and capacity.

In 2004, an Amendment to the I-90 MA was issued, stating that "the ultimate configuration for I-90 between Bellevue, Mercer Island, and Seattle should be defined as High Capacity Transit in the center roadway and HOV lanes in the outer roadways; and further agree that High Capacity Transit for this purpose is defined as a transit system operating in dedicated right-of-way such as light rail, monorail, or a substantially equivalent system" (WSDOT, 2004). From this agreement, I-90 HCT studies began, resulting in the selection of light rail as the HCT mode across I-90 in the center roadway.

5.2.8.2 Project Consistency

East Link is a proposed regional HCT system project that is consistent with the 2004 Amendment to the I-90 MA.

5.3 Local Plans

The following subsections discuss the land use and transportation plans for the local jurisdictions within the Proposal's study area: the cities of Seattle, Mercer Island, and Bellevue. The East Link Project is proposed to extend to Redmond, which is outside the Proposal's study area; discussion of the land use and transportation plan coordination with Redmond is described in Table 5A-1. This table also discusses, in more detail, the plans of the cities of Seattle, Mercer Island, and Bellevue, and the East Link Project's consistency with each.

Table 5A-1 discusses the goals and policies of each of the following local plans and how the Proposal, as part of the East Link Project, is consistent with these plans.

5.3.1 City of Seattle Comprehensive Plan

5.3.1.1 Plan Summary

Seattle's *Comprehensive Plan: Toward a Sustainable Seattle*, first adopted in 1994 and last amended in 2008, was developed to communicate how Seattle will accommodate residential and employment growth over the next 20 years. The plan consists of 11 elements, each containing goals and policies for guiding growth in Seattle: Urban Village, Land Use, Transportation, Housing, Capital Facilities, Utilities, Economic Development, Neighborhood Planning, Human Development, Cultural Resource, and Environment. Sound Transit reviewed the elements to identify the applicable goals and policies (City of Seattle, 2008).

5.3.1.2 Project Consistency

Table 5A-1 discusses the goals and policies of Seattle's Comprehensive Plan, including the Neighborhood Comprehensive Element, and how the East Link Project, of which the Proposal is a part, is consistent with them.

5.3.2 City of Mercer Island Comprehensive Plan

5.3.3.1 Plan Summary

The *Comprehensive Plan of the City of Mercer Island* was adopted in 1994 and last updated in 2005. The comprehensive plan is used to reinforce the long-term goal of maintaining a single-family community within a unique physical setting and focusing growth and revitalizing the Town Center. The comprehensive plan is divided into five elements: land use, housing, transportation, utilities, and capital facilities (City Mercer Island, 2005).

5.3.3.2 Project Consistency

Table 5A-1 discusses the goals and policies of the City of Mercer Island's Comprehensive Plan and how the East Link Project, of which the Proposal is a part, is consistent with them.

5.3.3 City of Bellevue Comprehensive Plan

5.3.3.1 Plan Summary

Originally adopted in 1993, the *City of Bellevue Comprehensive Plan* was updated in 2009. The Plan is a broad statement of community goals and policies divided into 12 elements that direct the orderly and coordinated physical development of the city into the future. Elements with goals and policies related to the East Link Project include land use, transportation, capital facilities, urban design, and environmental (City of Bellevue, 2009).

5.3.3.2 Project Consistency

Table 5A-1 discusses the goals and policies of the City of Bellevue's Comprehensive Plan and how the East Link Project, of which the Proposal is a part, is consistent with them.

5.3.4 City of Bellevue Subarea Plans

5.3.4.1 Plan Summary

Bellevue is divided into 14 subareas, each with its own subarea-specific plans and with goals and policies developed with citizen participation to help maintain the unique characteristics and quality of life for the subarea residents. Subareas with boundaries that the East Link Project alternatives would travel through include Southwest Bellevue, Richards Valley, Downtown, Wilburton/NE 8th, and Bel-Red/Northup. Both the Downtown and Bel-Red Subarea Plans have policies relevant to the East Link Project (City of Bellevue, 2009).

5.3.4.2 Project Consistency

Table 5A-1 discusses the goals and policies of Bellevue's subarea plans and how the Proposal, as part of the East Link Project, is consistent with them.

5.3.5 Eastside Transportation Program

5.3.5.1 Plan Summary

In addition to the subarea plans, Bellevue adopted the Eastside Transportation Program in order to address transportation problems on the Eastside of Lake Washington. In addition to Bellevue, other participants include the cities of Bothell, Issaquah, Kirkland, and Redmond; King County, WSDOT; PSRC; King County Metro; and members of the private sector (City of Bellevue, 2009).

5.3.5.2 Project Consistency

Table 5A-1 discusses the goals and policies of the Eastside Transportation Program and how the Proposal, as part of the East Link Project, is consistent with them.

Policy Point 6: Future Interchanges

Is the proposed access point revision compatible with a comprehensive network plan? Is the proposal compatible with other known new access points and known revisions to existing points?

6.1 Summary

The Proposal (build condition) presented in this IJR proposes the removal of vehicle access to and from the reversible I-90 center roadway (including removing HOV access from the D2 Roadway) to allow exclusive use for HCT that will improve the person throughput along I-90, connect the Eastside Lake Washington communities to Seattle, and provide a reliable transit option.

The following three projects are planned and programmed in the regional Metropolitan Transportation Plan, *VISION 2040* (PSRC, 2009), that might influence the Proposal because they include access modifications to I-90:

- SR 519 Intermodal Access Project (http://www.wsdot.wa.gov/Projects/SR519)
- I-90 Two-Way Transit and HOV Operations Project (http://www.wsdot.wa.gov/Projects/I90/TwoWayTransit)
- I-405 Corridor Program (http://www.wsdot.wa.gov/projects/i405)

As noted in the Methods and Assumptions Memorandum (Appendix 3A), these three projects include access modifications, and have been included as part of the project baseline (no-build) conditions. Funded modifications to I-405, as well as improvements to the I-90 Two-Way Transit and HOV Operations Project and SR 519 Intermodal Access Project, were assumed in the year of opening for the East Link Project. Each of these projects has been evaluated through the IJR process and been approved (finding of engineering and operational acceptability) for what is currently funded. As part of the I-405 program, any future modifications of access near or related to I-90 will also be reviewed through supplemental IJR documents.

The Proposal has been developed with these projects in the no-build condition and, as such, the operations and safety effects are comprehensive. In addition, the Proposal is not in conflict with these projects and works in concert with them to improve the interstate transportation system to efficiently move people and goods. Specifically, the Proposal provides a natural progression from the I-90 Two-Way Transit and HOV Operations Project's outside HOV lanes, helping enable the conversion of the center roadway to light rail.

In addition to the compatibility with network modification plans, the project must be consistent with land use and transportation plans for each jurisdiction within the Proposal study area. The compatibility with these plans is discussed under Policy Point 5 and presented in further detail in Appendix 5A.

6.2 SR 519 Intermodal Access Project

The SR 519 project is located on the western edge of the Proposal's study area, linking I-90 and the Port of Seattle waterfront communities. This project modified the access of the westbound I-

90 off-ramp configuration to improve the distribution of traffic and circulation of freight and pedestrians within the SODO Neighborhood.

Consideration of HCT on the I-90 center roadway was included within the design framework for the SR 519 Intermodal Access Project. Specifically, the SR 519 project assumed that the East Link Project reassigned HOVs currently using the D2 Roadway to the ramps within the SR 519 Project (Edgar Martinez Drive South at I-90). The addition of light rail to the center roadway is not likely to affect the design year operations of the SR 519 project because the Proposal's transit service is expected to reduce traffic volumes by shifting modal usage off the center roadway facility. The SR 519 IJR and environmental documentation have been approved, and project construction was completed in June 2010.

6.3 I-90 Two-Way Transit and HOV Operations Project

The preferred alternative of the I-90 Two-Way Transit and HOV Operations Project, Alternative R-8A, provides HOV lanes on the outer roadway of I-90 between I-5 and I-405. Stages 1 and 2 have been legislatively approved and fully funded. Funding for this project was fulfilled with the passage of ST 2 in 2008. Sound Transit intends to work with WSDOT to complete Stage 3 and then close the center roadway for light rail conversion. In other words, the center roadway would likely close for light rail construction immediately after the HOV lanes on the outer roadway are completed. Therefore, the new HOV lanes in the outer roadway would more than likely not operate in conjunction with the center roadway before construction of East Link. The completion of the I-90 Two-Way Transit and HOV Operations Project would likely reduce the dependence on the reversible center roadway because HOVs can choose to use either the center roadway or the eastbound and westbound HOV lanes in the outer roadways.

This project and the East Link Project have been determined to be compatible through the Amendment to the 1976 I-90 MA (WSDOT, 2004), which states that "Alternative R-8A with High Capacity Transit (for example, light rail) deployed in the center lanes is the ultimate configuration for I-90…." Construction of Alternative R-8A (the I-90 Two-Way Transit and HOV Operations Project) is the first step to the ultimate configuration.

Design and planning of the Proposal is being developed in concert with the I-90 Two-Way Transit and HOV Operations Project. Sound Transit and WSDOT are working cooperatively in the design and implementation of HCT on the center roadway. The I-90 Two-Way Transit and HOV Operations Project IJR and environmental documents are approved. Stage 1 of the project has been completed and Stage 2 is currently under construction. As part of Stage 3, the I-90 Two-Way Transit and HOV Operations Project proposed to construct an eastbound HOV direct-access off-ramp at 77th Avenue SE, but with the East Link Project considered in conjunction with this project, both WSDOT and Sound Transit prefer to relocate this access to Island Crest Way. Additionally, at the I-90 and Bellevue Way interchange this project is modifying the design of the HOV direct-access ramps to accommodate both light rail and the HOV direct-access ramps. Further information is provided in Policy Point 4.

6.4 I-405 Corridor Program

The I-405 Corridor Program (I-405 Congestion Relief and Bus Rapid Transit Projects) is a program of more than 150 individual, coordinated projects designed to relieve congestion and improve mobility for motorists, transit, and freight users along the freeway's 30-mile length.

The project includes the addition of up to two new lanes in each direction, a corridor-wide bus rapid transit line, and increased transit service.

Although the I-405 improvements are located outside the Proposal study area, Sound Transit is working with WSDOT to maintain operations of I-405 facilities that connect with I-90 and potentially could be affected by the East Link Project. The portion of the I-405 Corridor Program that is currently funded has been included in the no-build conditions. The East Link Project is not expected to affect or preclude the long-term anticipated improvements in the I-405 program. The I-405 program has programmatic-level approvals of both the master plan IJR and program environmental documentation. Portions of the program are funded and currently under construction.

6.5 Other Projects

Improvements to I-5 as part of the I-5 reconstruction projects are currently under study and not defined. As a result, they have not been included in the Proposal's analysis. It is expected that any improvements from the Proposal would not substantially affect any I-5 corridor improvements.

Policy Point 7: Coordination

Are all coordinating projects and actions programmed and funded?

Given the design horizon (2030) and the many anticipated, extensive corridor-length infrastructure investments planned in the Puget Sound region, there are a number of proposed highway improvements on I-90 within the Proposal study area that were incorporated in the analysis. Regional highway and local projects that were within the Proposal's analysis area were given consideration and coordination because they could influence the project performance within the study area and are discussed below. Ongoing and close coordination between WSDOT, a SEPA co-lead and NEPA cooperating agency, and Sound Transit on the East Link Project have helped to integrate the design, planning, and policies of the East Link Project with other infrastructure. Ongoing coordination is also occurring among the FTA; FHWA; and the regional and local agencies King County, PSRC, and the cities of Seattle, Mercer Island, Bellevue, and Redmond.

This policy point discusses projects within the Proposal study area that have been considered, coordinated, and included in the East Link Project's environmental analysis and design. These projects are described in the following subsections.

7.1 SR 519 Intermodal Access Project

The SR 519 project influences the western edge of the Proposal's study area, linking I-90 and the Port of Seattle waterfront community. The SR 519 project consisted of two freeway construction phases to provide direct access from I-90 to the waterfront through grade-separated access that eliminates circuitous routing. It also reduces surface-level conflicts at South Royal Brougham Way and Fourth Avenue South, through grade-separated crossing over the BNSF rail tracks. In fall 2003, WSDOT opened the new SR 519 Edgar Martinez Drive South on-ramp to I-5 and I-90. In June 2010, WSDOT completed coordinating Phase 2 design with Sound Transit. This phase completed the Edgar Martinez Drive South westbound off-ramp from I-90.

This project was primarily funded through several sources including state pre-existing funding accounts, the Washington State Nickel Fund Program, the Washington State Freight Mobility Strategic Investment Board, and FHWA. An IJR (WSDOT, 2008) for this project was submitted to FHWA in December 2007, and a finding of engineering and operational acceptability was granted in August 2008. Further information about the amount of allocated funding for this project is available on the project website (see below).

The SR 519 Project assumed East Link in its baseline, specifically the effect of the increase of HOV vehicles using SR 519 as a result of the potential closure of the D2 Roadway to HOV traffic with East Link.

Project website: *http://www.wsdot.wa.gov/Projects/SR519*

7.2 I-90 Two-Way Transit and HOV Operations Project

Sound Transit and WSDOT have (and will continue to) coordinate efforts to improve mobility and modify freeway access on I-90. In the early 2000s, an EIS was prepared that selected an alternative to complete the HOV lanes on the I-90 outer roadways between Seattle and Bellevue. Several alternatives were evaluated, and the selected alternative for the I-90 Two-Way Transit and HOV Operations Project (Alternative R-8A) will add HOV lanes to the I-90 outer roadways while maintaining center reversible roadway operations. An ROD was issued by FHWA in 2004.

This project is divided into three construction stages, as previously discussed in Policy Point 1 (Figure 1-6). Stage 1 construction began in 2007 and was completed in 2008. The design phase for Stage 2 is completed and construction began in 2010 with an estimated completion date of 2012. Funding for Stage 3 (constructing HOV lanes in both directions from Mercer Island to the Rainier Avenue South interchange) has been fulfilled by ST2, which was approved by voters in November 2008. Stage 3 is currently under design and construction will be completed by 2014 in advance of conversion of the center roadway for light rail.

As discussed in Policy Points 1 and 3, the no-build condition includes the I-90 Two-Way Transit and HOV Operations Project.

Project website: *http://www.wsdot.wa.gov/Projects/I90/TwoWayTransit*

7.3 I-405 Corridor Program

The I-405 Corridor Program (I-405 Congestion Relief and Bus Rapid Transit Projects) is a program of more than 150 individual, coordinated projects intended to relieve congestion and improve mobility for motorists, transit, and freight users along the freeway's 30-mile length. The I-405 Corridor Program was approved in 2002 by the cities and counties along the corridor, FHWA, FTA, Sound Transit, King County Metro, and WSDOT.

The master plan of the I-405 Corridor Program includes adding up to two new lanes in each direction on I-405, a corridor-wide BRT line, and increased local transit service. The Program is intended to fix bottlenecks at interchanges in addition to improving key arterials and transit center facilities.

Although the I-405 improvements are located outside of the Proposal's I-90 study area, Sound Transit is working with WSDOT to maintain operations at these facilities that could potentially be affected indirectly by the East Link Project.

Project website: *http://www.wsdot.wa.gov/Projects/i405*

7.4 Local Projects

Local projects in the City of Seattle, Mercer Island, Bellevue, and Redmond are included in the East Link Project environmental analysis if they were identified as reasonably foreseeable projects (in either planning or capacity improvement documents or have gone through an environmental review). Overall, the Proposal is not foreseen to affect local roadway projects within the IJR study area. The Reasonable Foreseeable Future Actions list provided in Appendix H1 of the East Link Final EIS (WSDOT and Sound Transit, 2011) identifies these projects. Within

the Proposal study area, a few minor intersection improvements (signalization, turn pockets) unrelated to East Link are planned on Mercer Island.

7.5 Other Potential Projects

Improvements to I-5 as part of the I-5 reconstruction project have not been included in the East Link Project because these improvements are currently under study and have not been established as alternatives through an environmental process. It is expected that any improvements from the I-5 project would not substantially affect the Proposal study area.

Project website: *http://www.wsdot.wa.gov/Projects/I5/Rehab/*

Policy Point 8: Environmental Process (NEPA)

What is the status of the proposal's environmental processes? This section should be something more than just a status report of the environmental process; it should be a brief summary of the environmental process.

8.1 Summary

The East Link Project is a component of ST2, which implements the next phase of regional high-capacity public transit, following the completion of Sound Transit's Sound Move Program. This program was included in the November 2008 ST2 ballot measure approved by the voters and, therefore, is fully funded from Seattle to the Overlake Transit Center in Redmond. ST2 has been incorporated into the regionwide transportation plan, *Destination 2030: Metropolitan Transportation Plan for the Central Puget Sound Region* (PSRC, 2007a); it is also included in the most recent plan, *Transportation 2040*, adopted in March 2010 (PSRC, 2010a). Sound Transit's long-range plan, the basis for developing the next phase of ST2 investments, has undergone environmental review as a programmatic EIS under the Washington SEPA. In 2005, Sound Transit prepared a Supplemental EIS (SEIS) (Sound Transit, 2005a) under SEPA to address the potential environmental effects of an updated long-range plan to the *1993 Regional Transit System Plan Final Environmental Impact Statement* (Sound Transit, 1993). The updated plan is consistent with PSRC's *Transportation 2040*, which calls for expanding the regional transit system to help meet increased transportation demand resulting from population and employment growth in the region.

8.2 Environmental Process

FTA and Sound Transit held a public scoping and comment period to officially initiate the NEPA and SEPA EIS process. The scoping period took place September 1 through October 2, 2006. Sound Transit invited city and county agencies; affected tribes; regional, state, and federal agencies; interest groups; businesses; affected communities; individuals; and the public to comment during the scoping process. As part of the scoping process, more than 154,000 postcards were sent to residents and businesses along the corridor, four public scoping meetings, and one agency scoping meeting were held, and approximately 300 written and oral comments were received.

Since the scoping process, project environmental impacts have been evaluated in a combined NEPA/SEPA Draft EIS, which was published by Sound Transit in December 2008. Sound Transit's Board then identified in June 2010 a preferred alternative for each East Link segment. After the Draft EIS was published, a Supplemental Draft EIS was published in November 2010 to evaluate additional and modified alternatives resulting from comments and coordination with local jurisdictions. Last, a Final EIS was published in 2011, and it evaluated the preferred alternatives. The content of many of the policy points (such as Policy Points 1, 2, and 3) was coordinated with the project's environmental analysis for transportation and traffic (Sound Transit, 2011).

Only the I-90 corridor of the East Link Project is addressed in this IJR, and, within this corridor, there is only one alternative along the majority of the corridor: Sound Transit Board's *Preferred*

Alternative A1. Near the Bellevue Way interchange, six alternatives are being evaluated (*Preferred Alternative B2M* and Alternatives B1, B2A, B2E, B3, and B7), but five of the alternatives have similar traffic operations analysis and design considerations (*Preferred Alternative B2M* and Alternative B1, B2A, B2E, and B7). Even so only one option is being evaluated in this IJR; Sound Transit's Board *Preferred Alternative B2M*.
Policy Points 3 and 4 provide further information about these alternatives.

Following publication of the Final EIS, the Sound Transit Board of Directors will make a final decision on the route, station, and maintenance facility locations to be built for the project. In addition, after publication of the Final EIS, FTA and FHWA are expected to issue their own ROD's on the project, which are anticipated in 2011. FHWA is also expected to make a determination on Findings of Engineering and Operational Acceptability. Figure 8-1 lists the estimated milestone schedule associated with the NEPA process for this project. Preliminary construction for the East Link Project is scheduled to begin in 2013 or 2014. The project would likely be constructed in stages, with the first segment opening near 2020.

FIGURE 8-1
East Link Targeted Project Milestones

Preliminary Design and Environmental Review	
Draft EIS published	December 2008
Draft EIS comment period	75 days
Sound Transit Board identifies preferred alternative	Spring 2009/ Spring 2010
SDEIS published	Fall 2010
SDEIS comment period	60 days
Final EIS published	Spring 2011
Sound Transit Board selects project to be built	Summer 2011
Federal Record of Decision	Summer 2011
Final Design, Construction, and Operation — ST2 Targets	
Final Design	2011 - 2014
Construction	
• Seattle to Bellevue • Bellevue to Overlake	2013 - 2019 2014 - 2020
Start of Service	
• Seattle to Bellevue • Bellevue to Overlake	2020 2021

Table 8-1 is a list of anticipated permits and approvals applicable to the East Link Project. With the exception of the approvals made by FTA in the ROD (Section 106, Section 4(f), and Endangered Species Act), other permits and approvals would occur after completion of the environmental process and the ROD is issued. It is anticipated that the FEIS would be used by FHWA to prepare its own ROD for NEPA compliance and support the FHWA Finding of Engineering and Operational Acceptability for this IJR process.

TABLE 8-1
Anticipated Permits and Approvals for East Link Project

Permit or Approval	Issuing Agency
Federal	
Section 106 Review	Federal Transit Administration, Advisory Council for Historic Preservation
Section 4(f) Review	Federal Transit Administration, U.S. Department of Transportation, U.S. Department of the Interior
Clean Water Act, Section 404 and Section 10	U.S. Army Corps of Engineers
Federal Endangered Species Act Review	U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration Fisheries Service

TABLE 8-1
Anticipated Permits and Approvals for East Link Project

Permit or Approval	Issuing Agency
Interchange Justification Report	Federal Highway Administration
Franchise for Use of Interstate Right-of-way	Washington State Department of Transportation
State and County	
Hydraulic Project Approval	Washington Department of Fish and Wildlife
Aquatic Use Authorization: Aquatic Lease	Washington Department of Natural Resources
Public Utility Commission Permits	Washington Public Utility Commission
Section 106 Review	Washington State Department of Archaeology and Historic Preservation
National Pollution Discharge Elimination System Stormwater Discharge Permit	Washington State Department of Ecology
Coastal Zone Management Consistency Certification	Washington State Department of Ecology
Temporary Modification of Water Quality Criteria	Washington State Department of Ecology
Underground Storage Tank Notification Requirement	Washington State Department of Ecology
Water Quality Certification: Section 401	Washington State Department of Ecology
Interchange Justification Report	Federal Highway Administration
Air Space Lease for Use of Interstate Right-of-way	Federal Highway Administration
Breaks-in-limited Access	Federal Highway Administration
Conversion of highway travel lanes to transit only	Federal Highway Administration
Cities	
Shoreline permits	Cities of Seattle, Mercer Island, Bellevue, Redmond
Street use permits	Cities of Bellevue and Redmond
Construction permits	Cities of Bellevue, Redmond, Seattle and Mercer Island
Right-of-way permits or franchise for use of city right-of-way	Cities of Bellevue and Redmond
Environmental critical areas/sensitive areas review	Cities of Bellevue and Redmond
Development permits	Cities of Bellevue and Redmond
Noise variance	Cities of Bellevue and Redmond
Street vacations	Cities of Bellevue and Redmond
Certificates of approval	Cities of Seattle and Redmond Landmark Preservation Boards
Other	
Various approvals: planning, design, and arts commissions	Cities of Seattle, Mercer Island, Bellevue, and Redmond
Notification of Intent to Perform Demolition or Asbestos	Puget Sound Clean Air Agency

TABLE 8-1
Anticipated Permits and Approvals for East Link Project

Permit or Approval	Issuing Agency
Removal	
Pipeline and utility crossing: permits	Utility providers
Utility approvals: easements and use agreements	Utility providers
Property permits and licenses	Burlington Northern Santa Fe Railway

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Acronyms and Abbreviations

acc./MVM	accident/million vehicle miles
Bel-Red	Bellevue-Redmond
BNSF	Burlington Northern Santa Fe
BRT	bus rapid transit
CAC	collision analysis corridor
CAL	collision analysis location
CFR	*Code of Federal Regulations*
CIP	Capital Improvement Program
CWPP	Countywide Planning Policy
Eastside	east side of Lake Washington
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GMA	Washington State Growth Management Act of 1990
GP	general purpose
HAC	high-accident corridor
HAL	high-accident location
HCM	Highway Capacity Manual
HCT	high-capacity transit
HOV	high-occupancy vehicle
HSP	Washington State Highway System Plan
I-405	Interstate 405
I-90	Interstate 90
IJR	Interchange Justification Report
LOS	level of service
MA	Memorandum Agreement
MA I-90	Memorandum Agreement on the Design and Construction of the I-90 Bridge
Metro	King County Metro
MEV	million entering vehicles
MOE	measure of effectiveness
MP	Milepost
mph	miles per hour

MPO	Metropolitan Planning Organization
MVM	million vehicle miles
N/A	not applicable
NEPA	National Environmental Policy Act of 1969
PMT	person miles traveled
PRSC	Puget Sound Regional Council
RCW	Revised Code of Washington
ROD	Record of Decision
SAFETEA-LU	Safe, Accountable, Flexible, and Efficient Transportation Equity Act—A Legacy for Users
SDEIS	Supplemental Draft Environmental Impact Statement
Sea-Tac Airport	Seattle-Tacoma International Airport
SEIS	Supplemental Environmental Impact Statement
SEPA	Washington State Environmental Policy Act
Sound Transit	Central Puget Sound Regional Transit Authority
SOV	single-occupant vehicle
SR	State Route
ST	Sound Transit
ST2	Sound Transit 2
TCQSM	Transit Capacity and Quality of Service Manual
TCRP	Transit Cooperative Research Program
TRB	Transportation Research Board
USACE	U.S. Army Corps of Engineers
v/c ratio	volume-to-capacity ratio
VHT	vehicle hours traveled
VMT	vehicle miles traveled
WSDOT	Washington State Department of Transportation
WTP	Washington Transportation Plan