FINAL ENVIRONMENTAL IMPACT STATEMENT
AND FINAL SECTION 4(F) AND 6(f) EVALUATIONS
SR 520 BRIDGE REPLACEMENT AND HOV PROGRAM

MAY 2011

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

Final Transportation Discipline Report

Washington State
Department of Transportation

U.S. Department of Transportation
Federal Highway
Administration

SR 520, I-5 to Medina: Bridge Replacement and HOV Project Final EIS and Final Section 4(f) and 6(f) Evaluations

Final Transportation Discipline Report

Prepared for

Washington State Department of Transportation
Federal Highway Administration

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Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
Arboretum	Washington Park Arboretum
AVO	average vehicle occupancy
CBD	central business district
CTR	Commute Trip Reduction
EB	eastbound
EIS	environmental impact statement
ESSB	Engrossed Substitute Senate Bill
ETL	express toll lane
FHWA	Federal Highway Administration
HCT	high-capacity transit
HCS	Highway Capacity Software
HOT	high-occupancy toll
HOV	high-occupancy vehicle
HSS	Highway of Statewide Significance
I-5	Interstate 5
ITS	Intelligent Transportation Systems
LOS	level of service
Metro	King County Metro
MOE	measure of effectiveness
MOHAI	Museum of History and Industry
mph	miles per hour
MPO	Metropolitan Planning Organization
mvmt	million vehicle miles traveled

NB	northbound
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
Non-HSS	Non-Highway of Statewide Significance
PSRC	Puget Sound Regional Council
RSSH	Regionally Significant State Highway
SB	southbound
SDEIS	Supplemental Draft Environmental Impact Statement
SDOT	Seattle Department of Transportation
SEPA	State Environmental Policy Act
Ship Canal Bridge	Lake Washington Ship Canal Bridge
SR	State Route
TDM	transportation demand management
TIC	Tolling Implementation Committee
TMP	Traffic Management Plan
TSMC	Traffic System Management Center
UW	University of Washington
V/C	volume-to-capacity (ratio)
vph	vehicles per hour
WB	westbound
WSDOT	Washington State Department of Transportation

Chapter 1—Background

Why is transportation considered in an environmental impact statement?

Transportation affects everyone. Whether we are working, delivering products, driving children to school, or taking a vacation, all of us depend on a safe, efficient, reliable transportation system. Many people depend on multiple modes of travel, such as driving alone; carpooling; taking a bus, train, or plane; walking; or biking. Good connections between these various travel modes are critical to the efficient movement of people, goods, and services throughout an area.

Understanding the effects of a proposed public project and its alternatives is an important part of any environmental impact statement (EIS) and is required by law. The National and State Environmental Policy Acts (NEPA and SEPA) require federal agencies to integrate environmental values into their decision-making processes.

Federal, state, and local agencies must consider the environmental effects of their proposed actions and reasonable alternatives to those actions. For example, how would each alternative affect traffic operations on the freeways and local streets? Would congestion improve or get worse? How would each alternative affect traffic volumes? How would moving high-occupancy vehicle (HOV) lanes from the outside lane to the inside lane affect traffic operations? Would the project change traffic patterns, causing people to take a different route to work and increasing traffic at one intersection while decreasing traffic at another? Does having a toll on the Evergreen Point Bridge shift traffic patterns? If so, how? Transportation is included in our EIS because of these questions.

What is this report about?

This Final Transportation Discipline Report—Appendix R to the State Route (SR) 520, Interstate 5 (I-5) to Medina: Bridge Replacement and HOV Project Final EIS—describes transportation conditions on the SR 520 corridor between I-5 to the west and 84th Avenue NE to the east. The report presents transportation information for SR 520 as it exists today and estimates transportation performance and operations for the

No Build Alternative and Preferred Alternative under evaluation for this project.

The Preferred Alternative is described below in this chapter. Chapter 1 is followed by:

- *Chapter 2—Key Findings*. Summarizes the most important information and findings of the transportation analysis.
- *Chapter 3—Travel Demand Modeling*. Describes how the project travel demand model was developed, updated during the project, and used to estimate future growth and changes in travel patterns for the No Build and Preferred Alternatives.
- *Chapter 4—Transportation Forecasts and Operations Analysis Methodology*. Provides the methodology of the detailed project-level forecasts developed and the methodology for conducting the detailed traffic operational analysis.
- *Chapter 5—Freeway Volumes and Operations*. Describes the existing freeway forecasts results and operating conditions for the project corridor. Compares the future No Build Alternative with the Preferred Alternative.
- *Chapter 6—Local Volumes and Operations*. Describes the existing forecast results and operating conditions at local intersections. Compares the future No Build Alternative with the Preferred Alternative.
- *Chapter 7—Nonmotorized Facilities*. Describes existing bicycle, pedestrian, and other nonmotorized transportation facilities as well as improvements proposed as part of the SR 520 Bridge Replacement and HOV Project.
- *Chapter 8—Transit Operations*. Describes and quantifies how the project alternatives affect SR 520 corridor bus service and person-moving capacity.
- *Chapter 9—Parking Supply*. Evaluates the existing parking supply, estimated demand, and estimated use and determines the effects of the Preferred Alternative design on parking supply.

Did you know?

The **SR 520 Bridge Replacement and HOV Program** will enhance safety by replacing the aging floating bridge and keep the region moving with vital transit and roadway improvements throughout the corridor. The 12.8-mile program area begins at I-5 in Seattle and extends to SR 202 in Redmond.

In 2006, WSDOT prepared a Draft EIS—published formally as **the SR 520 Bridge Replacement and HOV Project**—that addressed corridor construction from the I-5 interchange in Seattle to just west of I-405 in Bellevue. Growing transit demand on the Eastside and structure vulnerability in Seattle and Lake Washington, however, led WSDOT to identify new projects, each with a separate purpose and need that would provide benefit even if the others were not built. These four independent projects were identified after the Draft EIS was published in 2006, and these now fall under the umbrella of the entire **SR 520 Bridge Replacement and HOV Program**:

- **SR 520, I-5 to Medina: Bridge Replacement and HOV Project** replaces the SR 520 roadway, floating bridge approaches, and floating bridge between I-5 and the eastern shore of Lake Washington. This project spans 5.2 miles of the SR 520 corridor.
- **Medina to SR 202: Eastside Transit and HOV Project** completes and improves the transit and HOV system from Evergreen Point Road to the SR 202 interchange in Redmond. This project spans 8.6 miles of the SR 520 corridor.
- **SR 520 Pontoon Construction Project** involves constructing the pontoons needed to restore the Evergreen Point Bridge in the event of a catastrophic failure and storing those pontoons until needed.

- ***Chapter 10—Construction Effects****.* Describes the effects of construction on traffic and parking for the Preferred Alternative and identifies temporary measures to mitigate the effect of construction on traffic.
- ***Chapter 11—Cumulative Transportation Effects****.* Identifies the cumulative effects of the Preferred Alternative in combination with a regional package of additional transportation facility improvements and tolling/pricing strategies.
- ***Chapter 12—Traffic and Parking Improvement Guidelines****.* Presents the approach and guidelines for determining the extent and timing of mitigation for freeway and local street operations and parking supply.
- ***Chapter 13—References****.* Lists all of the documentation cited in this report.

What is the SR 520, I-5 to Medina: Bridge Replacement and HOV Project?

The SR 520, I-5 to Medina: Bridge Replacement and HOV Project would widen the SR 520 corridor to six lanes from I-5 in Seattle to Evergreen Point Road in Medina and would restripe and reconfigure the lanes in the corridor from Evergreen Point Road to 92nd Avenue Northeast in Yarrow Point. It would replace the vulnerable Evergreen Point Bridge (including the west and east approach structures) and Portage Bay Bridge as well as the existing local street bridges across SR 520. The project would complete the regional HOV lane system across SR 520, as called for in regional and local transportation plans. New stormwater facilities would be constructed for the project to provide stormwater treatment.

What is the Preferred Alternative?

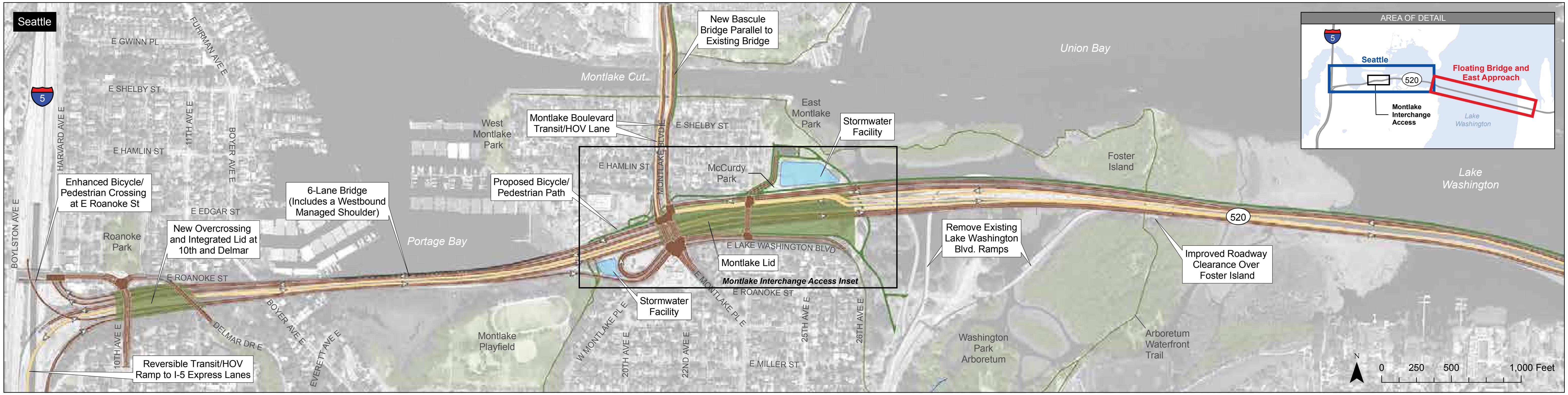
The SR 520, I-5 to Medina: Bridge Replacement and HOV Project Supplemental Draft Environmental Impact Statement (SDEIS), published in January 2010, evaluated a 6-Lane Alternative with three design options (Options A, K, and L) for the Seattle portion of the SR 520 corridor, and a No Build Alternative (WSDOT 2010a). Since the SDEIS was published, Washington State Department of Transportation (WSDOT) and the Federal Highway Administration (FHWA) announced a Preferred Alternative for the SR 520, I-5 to Medina project. All components of the Preferred Alternative were evaluated in the

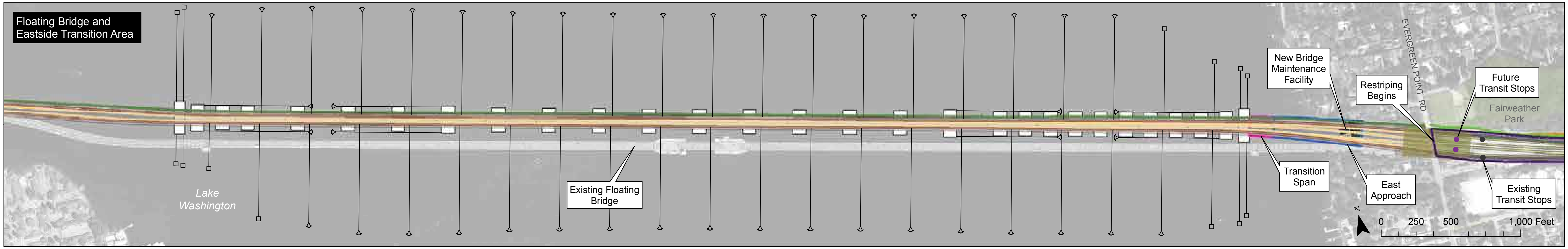
SDEIS, and the design of the SR 520 corridor has been further refined in response to comments received during public review of the SDEIS. The Preferred Alternative is summarized below. More information about the Preferred Alternative is provided in the Description of Alternatives Discipline Report Addendum (WSDOT 2011a).

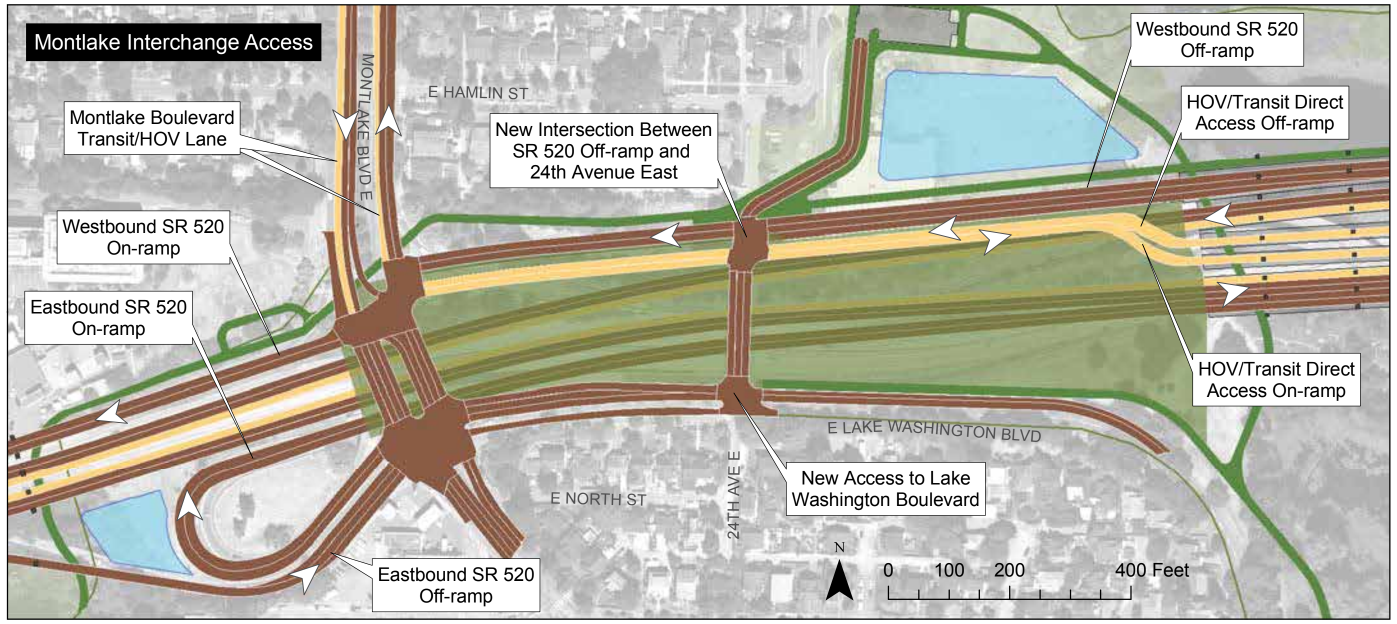
The new SR 520 corridor would be six lanes wide (two 11-foot-wide outer general-purpose lanes and one 12-foot-wide inside HOV lane in each direction), with 4-foot-wide inside shoulders and 10-foot-wide outside shoulders across the floating bridge. In response to community interests expressed during public review of the SDEIS, the SR 520 corridor between I-5 and the Montlake area would operate as a boulevard or parkway with a posted speed limit of 45 miles per hour (mph), and median planting across the Portage Bay Bridge. To support the boulevard concept, the width of the inside shoulders in this section of SR 520 would be narrowed from 4 feet to 2 feet, and the width of the outside shoulders would be reduced from 10 feet to 8 feet. Exhibit 1-1 highlights the major components of the SR 520, I-5 to Medina project Preferred Alternative.

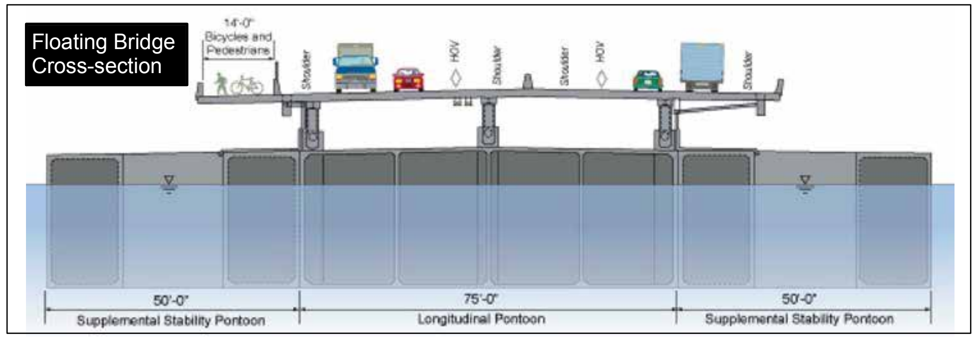
The Preferred Alternative would include design elements that would also provide noise reduction such as a reduced speed limit between I-5 and the Montlake area, 4-foot concrete traffic barriers, noise absorptive material on the inside of the traffic barriers and around the lid portals, and encapsulated bridge joints. The Preferred Alternative, like the SDEIS options, would also include quieter concrete pavement along the main line between I-5 and the floating bridge. Traffic noise modeling completed for the Final EIS resulted in fewer recommended noise walls for the Preferred Alternative than for the SDEIS options. Noise walls would meet all FHWA and WSDOT requirements for avoidance and minimization of negative noise effects. In areas where noise walls are warranted, they would only be constructed if approved by the affected communities.

The description and evaluation of the Preferred Alternative and the comparison of the Preferred Alternative to the design options presented in the SDEIS are organized by three areas along the project corridor: Seattle, Lake Washington, and the Eastside. Within these larger areas, project elements are described by geographic area, as identified in Exhibit 1-2. The project features for the Preferred Alternative are described under the geographic area headings so that the differences between the Preferred Alternative and the SDEIS options can be easily identified and compared.









I-5 to Medina Project Elements

- • Column
- — Anchor and Cable
- — Existing Regional Bicycle/Pedestrian Path
- ▬ General-Purpose Lane
- ▬ HOV, Direct Access, and/or Transit-Only Lane
- ▬ Westbound Managed Shoulder
- ▬ Proposed Bicycle/Pedestrian Path
- ☐ East Approach
- ☐ Transition Span
- ☐ Restriping Area
- ▬ Stormwater Treatment Facility
- ▬ Lid
- ☐ Pontoon

Medina to SR 202 Project Elements

- ▬ General-Purpose Lane
- ▬ HOV Lane
- ▬ Bike Path
- ▬ Points Loop Trail
- ▬ Medina to SR 202 Project Lid

Source: King County (2006) Aerial Photo, King County (2008) GIS Data (Stream), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 1-1. **Preferred Alternative Project Elements**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

Exhibit 1-2. **Preferred Alternative and Comparison to SDEIS Options**

Geographic Area	Preferred Alternative	Comparison to SDEIS Options A, K, and L
I-5/Roanoke Area	The SR 520 and I-5 interchange ramps would be reconstructed with generally the same ramp configuration as the ramps for the existing interchange. A new reversible transit/HOV ramp would connect with the I-5 express lanes.	Similar to all options presented in the SDEIS. Instead of a lid over I-5 at Roanoke Street, the Preferred Alternative would include an enhanced bicycle/pedestrian path adjacent to the existing Roanoke Street Bridge.
Portage Bay Area	The Portage Bay Bridge would be replaced with a wider and, in some locations, higher structure with six travel lanes and a westbound-managed shoulder.	Similar in width to Options K and L; similar in operation to Option A. Shoulders are narrower than described in the SDEIS, posted speed would be reduced to 45 mph, and median plantings would be provided to create a boulevard-like design.
Montlake Area	The Montlake interchange would remain in a similar location as today. A new bascule bridge would be constructed over the Montlake Cut. A 1,400-foot-long lid would be constructed between Montlake Boulevard and the Lake Washington shoreline, and would include direct access ramps. Access would be provided to Lake Washington Boulevard via a new intersection at 24th Avenue East.	Interchange location similar to Option A. Lid would be approximately 75 feet longer than previously described for Option A, and would be a complete lid over the top of the SR 520 main line, which would require ventilation. Transit connections would be provided on the lid to facilitate access between neighborhoods and the Eastside. Montlake Boulevard would be restriped for two general-purpose lanes and one HOV lane in each direction between SR 520 and the Montlake Cut.
West Approach Area	The west approach bridge would be replaced with wider and higher structures, maintaining a constant profile rising from the shoreline at Montlake out to the west transition span. Bridge structures would be compatible with potential future light rail through the corridor.	Bridge profile is most similar to Option L and slightly steeper; structure types similar to Options A and L. The gap between the eastbound and westbound structures would be wider than previously described to accommodate light rail in the future.
Floating Bridge Area	A new floating span would be located approximately 190 feet north of the existing bridge at the west end and 160 feet north of the existing bridge at the east end. The floating bridge would be 20 feet above the water surface at the midspan (about 10 feet higher than the existing bridge deck).	Similar to design described in the SDEIS. The roadway profile of the bridge would be approximately 10 feet lower than described in the SDEIS, and most of the roadway deck support would be constructed of steel trusses instead of concrete columns.
Eastside Transition Area	A new east approach to the floating bridge, and a new SR 520 roadway would be constructed between the floating bridge and Evergreen Point Road.	Same as described in the SDEIS.

The differences between the Preferred Alternative and the options presented in the SDEIS include:

- Reduced the lid over I-5 to a smaller bicycle/pedestrian overcrossing
- Designed the westbound shoulder on the Portage Bay Bridge to operate as a managed shoulder that would be used as an auxiliary lane during peak commute hours
- Reduced the posted speed to 45 mph in the Seattle portion of the corridor and reduced the overall footprint by narrowing the shoulders
- Reconfigured Montlake Boulevard between SR 520 and the Montlake Cut to include transit/HOV lanes
- Increased the overall size and length of the lid located in the Montlake area
- Reconfigured the west approach bridges (eastbound and westbound structures) to have a wider gap between them
- Lowered the roadway height on the floating bridge

Seattle

As described in the SDEIS, SR 520 would connect to I-5 in a configuration similar to the way it connects today. Improvements to the I-5/SR 520 interchange would include a new reversible HOV ramp connecting the new SR 520 HOV lanes to existing I-5 reversible express lanes. The project would include an enhanced bicycle/pedestrian crossing spanning I-5 near Roanoke Street, and landscaped lids across SR 520 at 10th Avenue East and Delmar Drive East, and in the Montlake area to help reconnect the communities on either side of the roadway.

The new Portage Bay Bridge design under the Preferred Alternative would have two general-purpose lanes and an HOV lane in each direction, plus a managed westbound shoulder. In response to community interest and public comment on the SDEIS, the width of the new Portage Bay Bridge at the midpoint has been reduced, and a planted median would separate the eastbound and westbound travel lanes. The Preferred Alternative design of the Portage Bay Bridge would operate traffic at 45 mph as a boulevard.

Under the Preferred Alternative, the SR 520 interchange with Montlake Boulevard would be similar to today's interchange, connecting to the University District via Montlake Boulevard and the Montlake bascule bridge. A new bascule bridge would be added to Montlake Boulevard NE parallel to the existing bridge. Montlake Boulevard would be restriped and reconfigured between SR 520 and the Montlake Cut to include two general-purpose lanes and one HOV lane for improved transit connectivity. A large new lid would be provided over SR 520 in the Montlake area, configured for transit and bicycle/pedestrian connectivity. The lid would function as a vehicle crossing for eastbound SR 520 traffic exiting to Montlake Boulevard and Lake Washington Boulevard. The lid would also serve as a pedestrian crossing, a landscaped area, and open space. The Lake Washington Boulevard ramps and the Montlake Freeway Transit Station would be removed.

The SR 520 roadway would maintain a constant slope profile rising from the east portal of the new Montlake lid, through Union Bay, across Foster Island, out to the west transition span of the Evergreen Point Bridge. This profile is most similar to the profile described in the SDEIS for Option L, but is slightly steeper for improved stormwater management.

Lake Washington

Floating Bridge

The alignment of the floating bridge is the same as evaluated in the SDEIS. The floating span would be located approximately 190 feet north of the existing bridge at the west end and 160 feet north at the east end.

The pontoon layout for the new 6-lane floating bridge is the same as evaluated in the SDEIS. The new floating bridge would be supported by 21 longitudinal pontoons, 2 cross pontoons, and 54 supplemental stability pontoons. As described in the SDEIS, the longitudinal pontoons would not be sized to carry future high-capacity transit (HCT), but would be equipped with connections for additional supplemental stability pontoons to support HCT in the future.

The new bridge would have two 11-foot-wide general-purpose lanes in each direction, one 12-foot-wide HOV lane in each direction, 4-foot-wide inside shoulders, and 10-foot-wide outside shoulders. As a result of comments on the SDEIS, the height of the bridge deck above the water has been lowered to reduce visual effects. At midspan, the floating bridge would now rise approximately 20 feet above the water, compared to approximately 30 feet for the design described in the Draft EIS and SDEIS. The roadway would be about 10 feet higher than the existing bridge deck. At each end of the floating bridge, the roadway would be supported by rows of concrete columns. The remainder of the roadway across the pontoons would be supported by steel trusses.

Bridge Maintenance Facility

The new bridge maintenance facility would be as described in the SDEIS. Routine access, maintenance, monitoring, inspections, and emergency response for the floating bridge would be based out of a new bridge maintenance facility located underneath SR 520 between the east shore of Lake Washington and Evergreen Point Road in Medina. This bridge maintenance facility would include a working dock, an approximately 7,200-square-foot maintenance building, and a parking area.

Eastside Transition Area

The SR 520, I-5 to Medina project and the SR 520, Medina to SR 202: Eastside Transit and HOV Project (SR 520, Medina to SR 202 project) overlap between Evergreen Point Road and 92nd Avenue NE in Yarrow Point. Work planned as part of the SR 520, I-5 to Medina project between Evergreen Point Road and 92nd Avenue NE would include moving the Evergreen Point Road transit stop west to the lid (part of the SR 520, Medina to SR 202 project) at Evergreen Point Road, adding new lane and ramp striping from the Evergreen Point lid to 92nd Avenue NE, and moving and realigning traffic barriers for the new lane striping. The restriping would transition the SR 520, I-5 to Medina project improvements into the improvements completed as part of the SR 520, Medina to SR 202 project.

When will the project be built?

Construction for the SR 520, I-5 to Medina project is planned to begin in 2012, after project permits and approvals are received. In order to maintain traffic flow in the corridor, the project would be built in stages. Major construction in the corridor is expected to be complete in 2018. The most vulnerable structures (east and west approaches and floating portion of the Evergreen Point Bridge and Portage Bay Bridge) would be built in the first stages of construction, followed by the

less vulnerable components (Montlake and I-5 interchanges).
Exhibit 1-3 provides an overview of the anticipated construction stages and durations identified for the SR 520, I-5 to Medina project.

A Phased Implementation scenario was discussed in the SDEIS as a possible delivery strategy to complete the SR 520, I-5 to Medina project in phases over an extended period of time. Since publication of the SDEIS, WSDOT has adopted a construction schedule to complete all major project improvements by 2018, and is developing a finance plan. This full corridor delivery strategy would complete all major construction in approximately the same amount of time as the delivery schedule outlined in the SDEIS. Therefore, the Final EIS will not address the Phased Implementation scenario as it is no longer applicable.

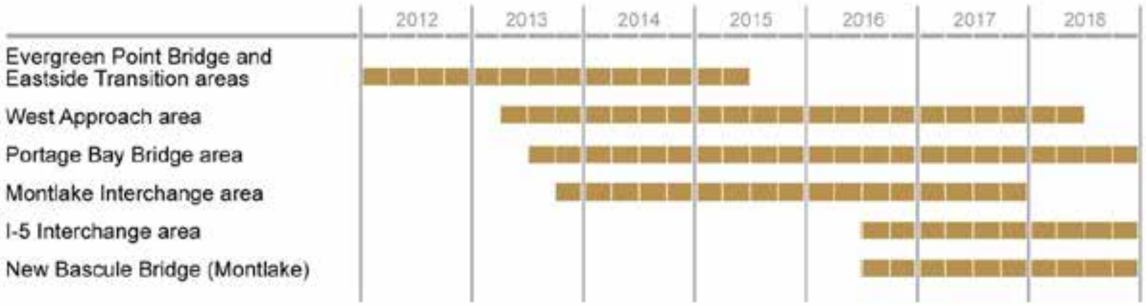


Exhibit 1-3. **Preferred Alternative Construction Stages and Durations**

Are pontoons being constructed as part of this project?

As described in the SDEIS, WSDOT is in the process of planning and permitting a facility that would build and store the 33 pontoons needed to replace the existing capacity of the floating portion of the Evergreen Point Bridge in the event of a catastrophic failure. If the bridge does not fail before its planned replacement, WSDOT would use the 33 pontoons constructed and stored as part of the SR 520 Pontoon Construction Project in the SR 520, I-5 to Medina project. An additional 44 pontoons would be needed to complete the new 6-lane floating bridge planned for the SR 520, I-5 to Medina project. The additional pontoons could be constructed at the Port of Tacoma and/or at the pontoon construction facility in Grays Harbor. Final pontoon construction locations will be identified at the discretion of the contractor. For additional information about project construction schedules and pontoon construction, launch, and transport, please see the Construction Techniques and Activities Discipline Report Addendum and Errata (WSDOT 2011b).

Chapter 2—Key Findings

What is in this chapter?

This chapter presents key findings of the transportation effects analysis for the SR 520, I-5 to Medina project. The analysis includes freeway operations, local roadway operations, nonmotorized facilities, transit, parking, construction effects, and cumulative effects. These topics are summarized below and described in detail in Chapters 5 through 12 of this Transportation Discipline Report.

What is traffic currently like on SR 520?

The existing configuration of SR 520 does not meet current WSDOT design guidelines, which affects the freeway's capacity to provide reliable and safe travel for buses and carpools (HOV) and general-purpose traffic. Roadway capacity in the SR 520 corridor is constrained by:

- Narrow shoulders and lanes on the corridor and across the bridge
- Short acceleration lane lengths at the SR 520/Montlake interchange and Lake Washington Boulevard on-ramps
- Limited sight distance at roadway curves, resulting in slower posted and operating speeds

These constraints, coupled with high traffic volumes on SR 520, result in regular congestion at the following locations:

- Westbound approaching the bridge (near the HOV lane termination in Medina)
- Westbound on the Portage Bay Bridge between I-5 and the SR 520/Montlake interchange
- Eastbound approaching the west approach span of the Evergreen Point Bridge

Several bottlenecks along the I-5 and I-405 corridors limit the amount of traffic that can access westbound SR 520. In Seattle, these areas include northbound I-5 through downtown Seattle and southbound I-5 across the Lake Washington Ship Canal Bridge (Ship Canal Bridge). The capacity of the I-405/SR 520 interchange and I-405 main line through downtown Bellevue also limits the amount of traffic that can enter or exit the SR 520 corridor westbound.

How would travel on SR 520 and I-5 change by the year 2030 with and without the project?

Between today and the year 2030, the population of the region is anticipated to grow by 1 million people, add over 640,000 new jobs, and need to accommodate close to 40 percent more traffic (PSRC 2006).

With the forecasted increases in population and employment, traffic volumes would also increase on major transportation facilities. Person demand at all cross-lake roadways would increase substantially more than vehicle demand, indicating a growth in HOV travel (carpools and buses) in year 2030 compared to today.

With the Preferred Alternative, daily vehicle demand on SR 520 would decrease by 5 percent compared to the No Build Alternative. Traffic volumes on alternative routes would increase slightly as a result of the SR 520 toll implementation. The two corridors most affected would be SR 522 and I-90. SR 522 traffic volumes would increase by about 2 percent, and I-90 traffic volumes would increase by about 1 percent compared to the No Build Alternative. Traffic demand on SR 520 would primarily decrease during the off-peak periods when the alternative routes are less congested, making drivers more likely to use those routes to avoid a toll.

In the year 2030 (No Build Alternative), peak-period traffic demand on SR 520 would increase compared to today by 11 percent in the morning and 9 percent in the evening. Without improvement in the corridor, congestion would continue to worsen. Total traffic demand volumes would be similar with the Preferred Alternative during peak periods. This traffic demand would occur even with a toll on the corridor because the congestion on SR 522 and I-90 would be severe enough to encourage drivers to pay the toll and cross SR 520, especially if it is the most direct route.

However, with the Preferred Alternative, the following changes in travel would occur:

- Congestion is present on the SR 520 corridor for 13 fewer hours during the morning and evening commute periods due to shoulder improvements and overall corridor geometry. For example, in the No Build Alternative, there are several key bottlenecks that result in substantial congestion during the commute periods. One of these is the westbound bridge approach where congestion is present for 4 hours during the morning commute and 4.5 hours during the evening commute; as a result, this section of roadway alone has congestion for 8.5 hours during the commute periods. With the Preferred Alternative, there is no congestion at this location during the commute periods; therefore, congestion is present for 8.5 fewer hours during the commute periods. Taking into account all such locations in the No Build Alternative and Preferred Alternative results in 13 fewer hours when congestion is present.
- More people would be traveling in higher occupancy modes, such as HOV (three or more passengers) lanes or transit (less general-purpose trips).
- With the Preferred Alternative, the number of people on the SR 520 corridor who would use HOV (carpools with three or more people and buses) would increase by approximately 19,000 (39 percent) compared to the No Build Alternative. General-purpose vehicle demand would decrease approximately 11,000 vehicles per day (10 percent) for the Preferred Alternative compared to the No Build Alternative. These changes would occur because of the corridor toll, improved HOV reliability, and reduced HOV travel times that would increase the incentive to carpool or take the bus.

As more people travel in higher vehicle-occupancy modes such as HOV and transit, the Preferred Alternative can have similar total vehicle trips while serving more persons than the No Build Alternative. The Preferred Alternative serves 15 to 17 percent more persons than the No Build Alternative in the morning and evening peak periods, respectively, as well as serving 5 to 10 percent more vehicles. This increase would occur because the Preferred Alternative includes additional HOV capacity from Medina to I-5; moreover, by providing an HOV lane, the general-purpose lanes also operate with less congestion.

By reducing congestion or bottlenecks on SR 520 with construction of the Preferred Alternative and improvement in throughput, I-5 would operate differently as follows:

- Today and in the year 2030 congestion on eastbound SR 520 adversely affects traffic flow on northbound I-5. By the year 2030, on northbound I-5 between I-90 and SR 520 congestion would be present for 3 hours of the morning commute period as a result of the eastbound SR 520 traffic volume with the No Build Alternative. Travel times from Seattle to Bellevue would be about 44 minutes. Completing the SR 520, I-5 to Medina project would alleviate congestion points on SR 520 and improve the Seattle-to-Bellevue travel time to 11 minutes.
- In the afternoon, I-5 southbound is congested through downtown Seattle from the SR 520 interchange area to the I-90 collector-distributor in the No Build Alternative. Travel time from Bellevue to Seattle is up to 41 minutes during the peak of the commute. With the congestion relief on SR 520 provided by the Preferred Alternative, up to 200 more vehicles per hour (vph) would be able to reach I-5 southbound during the peak hour. This 200-vph increase in traffic on I-5 would result in some increase in congestion on I-5 southbound. However, with the Preferred Alternative's improvements to the SR 520 corridor, the travel time between Bellevue and Seattle would still improve to 28 minutes during the peak of congestion. This is a 12-minute improvement compared to the No Build Alternative.

What are the safety benefits of this project?

Today, the highest number of vehicle crashes shown in the SR 520, I-5 to Medina project analysis occur between I-5 and the 24th Avenue East undercrossing (in both directions). This section of SR 520 had higher crash rates than the SR 520 corridor average of 1.11 crashes/million vehicle miles traveled (mvmt) in both the eastbound and westbound directions. This result is likely due to the congested conditions because 83 percent of the eastbound crashes and 86 percent of the westbound crashes are congestion-related (rear-end and side-swipe incidents) along this section.

This project would improve the ramp designs in the SR 520 study area to current design guidelines, which would help to resolve current safety issues.

The main safety benefits of this project are summarized below. The improved traffic flow and reduced congestion may have other minor benefits as well.

- A decrease in overall crash frequencies and crash rates as a result of widening the roadway and improving traffic operations
- A decrease in fixed-object crashes as a result of widened shoulders, which would provide increased recovery area for errant vehicles
- A decrease in some ramp crashes as a result of improved designs that more closely meet current design guidelines

What is traffic like at the Montlake Boulevard interchange area today?

The SR 520/Montlake Boulevard interchange area, which provides access to and from SR 520, is congested during the morning and afternoon peak hours. This congestion is partially related to traffic flow on SR 520 (which can affect traffic flow on the local street network), and traffic flow on the local street network (which can affect traffic flow on SR 520).

During the morning and afternoon commutes, traffic typically backs up on southbound Montlake Boulevard approaching the on-ramp to eastbound SR 520. Traffic congestion can extend across the Montlake Bridge to the Montlake Boulevard/NE Pacific Street intersection and as far back as 25th Avenue NE near University Village (approximately 1 mile). Congestion can also occur on NE Pacific Street eastbound, extending back through the NE Pacific Place intersection. The following factors contribute to the congestion in the SR 520/Montlake Boulevard interchange area:

- Freeway traffic operations on SR 520 are managed by using the eastbound on-ramp meter to control the flow of traffic entering SR 520. On-ramp traffic volumes at this location exceed the storage capacity on the ramp and queue onto Montlake Boulevard. At times, congestion on SR 520 exceeds a level that can be managed by the ramp meter, which means congestion from SR 520 spills back through the merge point and past the ramp meter.

- Traffic congestion associated with the eastbound SR 520 on-ramp can extend back across the Montlake Bridge. When traffic is backed up in the outside right lane, Montlake Boulevard southbound is constrained to one lane for drivers destined for areas to the south of SR 520.
- Drivers traveling northbound on Montlake Boulevard NE to access SR 520 westbound must make a U-turn at the Montlake Boulevard/East Hamlin Street intersection. These vehicles often spill out of the U-turn pocket. This congestion blocks the inside northbound lane on Montlake Boulevard, which constrains through traffic to a single lane. This, in turn, affects traffic exiting the eastbound off-ramp and other intersections to the south.
- Some drivers who use the SR 520 westbound off-ramp want to travel southbound on Montlake Boulevard or reach the Shelby/Hamlin neighborhood west of Montlake Boulevard. These drivers stop at the end of the westbound off-ramp to wait for a gap in traffic to aggressively merge across the two northbound through lanes and access the U-turn at the East Hamlin Street intersection. Accommodating this movement can worsen northbound congestion and create backup on the westbound off-ramp.
- Montlake Bridge openings can have long-lasting effects on traffic flow in this area. The bridge does not open during the morning and afternoon peak periods; however, if the bridge opens at the end of the midday period (3:30 p.m.), it can affect traffic operations throughout the afternoon commute. Bridge openings compound whatever congestion is present on the local street network and can cause congestion to spill back onto the SR 520 main line. When congestion reaches the SR 520 corridor, eastbound traffic can then become so congested that it affects traffic on I-5.
- An average of 10 bridge openings occurs during a typical summer weekday (fewer openings occur during other times of the year). Bridge openings typically last 4 to 5 minutes, but can extend up to 6 minutes on occasion (WSDOT 2008a).
- Montlake Bridge opening delays make it difficult for bus drivers to keep to their schedules, affecting bus travel times and reliability. Additional discussion on the effects on bus travel times is provided in Chapter 8—Transit Operations.

- Montlake Boulevard NE is an important transit corridor, serving both local and regional buses between the SR 520/Montlake interchange and the University District. Montlake Boulevard NE, NE Pacific Street, and 15th Avenue NE are considered Urban Village Transit Network corridors as identified in the Seattle Transit Plan (SDOT 2005). Today minimal transit priority is provided along the Montlake corridor. A transit or HOV ramp meter bypass lane is provided at the eastbound on-ramp. Queue jumps are also provided for northbound transit after the bus stop at Montlake Boulevard/East Shelby Street and from the HOV lane along NE Pacific Street turning southbound at the Montlake Boulevard/NE Pacific Street intersection.
- The Montlake Boulevard/Lake Washington Boulevard/SR 520 eastbound ramps intersection operates at Level of Service (LOS) E during both the morning and afternoon peak hours, with legs of the intersection operating near or over capacity. LOS E represents moderate to high delay; LOS is further described in Chapter 4. Congestion from this signal spills back into the off-ramp deceleration lane, which affects SR 520 mainline operations as drivers slow approaching the off-ramp. Southbound queues at times extend back between East Hamlin Street and East Shelby Street limiting access to the westbound on-ramp. Northbound queues at times extend through the East Roanoke Street intersection.

What would traffic be like at the Montlake interchange in 2030 with and without the project?

Traffic volumes at the Montlake interchange area are forecasted to increase up to 15 and 23 percent in the morning and afternoon, respectively, by the year 2030 for either the No Build or Preferred Alternative. However, travel patterns within the interchange area would be different for the Preferred Alternative compared to the No Build Alternative. These changes are a result of the modified interchange configuration and highway access points for HOV and general-purpose traffic.

Changes in travel patterns as part of the Preferred Alternative include the following:

- More people from the University District area destined to I-5 would travel along Montlake Boulevard southbound and across Portage Bay westbound than under the No Build Alternative. This increased travel would occur because southbound travel along Montlake Boulevard would be improved due to reduced queuing from the westbound on-ramp.

- Access to SR 520 from the south would be relocated to the Montlake loop ramp (for general-purpose trips) and at 24th Avenue East (for HOV trips). Relocating this access point adds 640 vph to the Montlake Boulevard/Lake Washington Boulevard intersection during the evening peak hour. Fifty percent of these trips to and from SR 520 would divert to Montlake Boulevard rather than travel along Lake Washington Boulevard.

The Preferred Alternative also includes improvements in geometry and signal timing at key intersections. The Preferred Alternative would improve traffic operations at the following intersections compared with the No Build Alternative.

- Montlake Boulevard/Lake Washington Boulevard/SR 520 eastbound ramps would operate at 20 percent over capacity in the afternoon peak hour under the Preferred Alternative instead of 50 percent over capacity under the No Build Alternative. This improvement is associated with the addition of lanes at the intersection. However, in the morning the intersection would operate at LOS F and 10 percent over capacity with the Preferred Alternative compared to LOS E and 5 percent over capacity with the No Build Alternative. The additional capacity provided at the intersection was determined through the Engrossed Substitute Senate Bill (ESSB) 6392 process and constrained due to adjacent land use. Additional coordination between WSDOT and the City of Seattle may be needed to manage operations at the intersections.
- Montlake Boulevard/East Shelby Street would improve from an LOS F with the No Build Alternative to an LOS D in the afternoon peak hour for the Preferred Alternative. This improvement is the

result of additional capacity (the HOV lane) extending through the intersection.

- Montlake Boulevard/NE Pacific Street would improve from operating at 20 percent over capacity with the No Build Alternative to operating at 15 percent over capacity with the Preferred Alternative in the afternoon peak hour. This improvement is the result of better signal timing and coordination along the Montlake corridor.

How would travel through the Arboretum change in the year 2030 with and without the project?

During the morning and evening commutes today, traffic through the Washington Park Arboretum (Arboretum) is at a level of 1,590 and 1,400 vph, respectively. Based on projected land use growth estimates from the Puget Sound Regional Council (PSRC) model, year 2030 No Build traffic volumes are estimated to reach levels of 1,950 and 1,730 vph in the morning and evening commutes, respectively. The Preferred Alternative would remove the Lake Washington Boulevard ramps from their current configuration and provide more restrictive access at the 24th Avenue East crossing of SR 520. This change in interchange configuration would result in levels of traffic at 1,330 and 1,410 vph during the morning and evening commutes, respectively. This shows that there would be less traffic in the Arboretum in the year 2030 with the Preferred Alternative than there is today.

What are the key findings for nonmotorized travel?

The new Evergreen Point Bridge would include a 14-foot-wide dedicated right-of-way bicycle/pedestrian path across the bridge to Montlake Boulevard NE. The SR 520 regional bicycle path would connect to regional and local bicycle and pedestrian facilities on both sides of the lake. Nonmotorized travel times could improve because bicyclists and pedestrians would no longer have to wait for buses to cross the lake. Bicyclists and pedestrians would continue to reach the SR 520 corridor in Seattle via a combination of trails and on-street bicycle lanes.

The project would improve the nonmotorized travel experience by providing two landscaped lids at:

- Montlake Boulevard and 24th Avenue East
- 10th Avenue East and Delmar Drive East

These lids would help reconnect the communities on either side of the SR 520 corridor.

In the Montlake interchange area, the Preferred Alternative would also improve connectivity for bicyclists and pedestrians to other modes of transportation via the Montlake Multimodal Center and University Link light rail station by expanding the pedestrian and bicycle facilities across the Montlake Cut. In addition to providing a new connection on the lid along 24th Avenue East, improved crossings of the freeway would be provided via a widened sidewalk across the new bascule bridge on the Montlake Cut, a new path along Lake Washington under SR 520 connecting to the Arboretum, and a grade-separated connection under Montlake Boulevard to the Bill Dawson Trail.

At the I-5/Roanoke Street bridge crossing, a new path on the south side of Roanoke Street and new crosswalks at the Harvard Avenue East/Roanoke Street intersection would improve safety in an area where bicyclists typically share the roads with vehicular traffic.

The goals for nonmotorized travel in the project vicinity are to provide access across Lake Washington between Seattle and the Eastside communities, as well as to improve bicycle/pedestrian connections between the neighborhoods of North Capitol Hill, Roanoke/Portage Bay/Montlake and the University District. The proposed project would fulfill these goals by constructing a bicycle/pedestrian path on the new Evergreen Point Bridge, as well as bicycle/pedestrian path connections under SR 520 and across the new lids that would increase nonmotorized travel across SR 520. These features are part of a larger, comprehensive transportation system, including connections to the City of Seattle Bicycle Master Plan routes.

What are the key findings for transit?

Transit reliability and travel times in the SR 520 corridor would improve with the Preferred Alternative due to changes and improvements in transit infrastructure. The project's transit infrastructure changes and improvements are as follows:

- Completion of inside HOV lanes in both directions across the Evergreen Point Bridge to I-5.
- Addition of an HOV lane (transit and carpools with three or more passengers) as a direct connection to I-5 express lanes that would operate westbound-to-southbound in the morning and northbound-to-eastbound in the afternoon.
- Addition of a transit and HOV direct access ramp connection between 24th Avenue East and SR 520 to and from the east.
- Removal of the Montlake Freeway Transit Station.
- Addition of eastbound and westbound transit stops on the Montlake lid. During the off-peak periods, these stops can accommodate buses that currently use the Montlake Freeway Transit Station stop.
- Addition of new equipment for traffic signal control compatible with transit signal priority at five intersections:
    1. Direct access ramp/24th Avenue East
    2. Direct access ramp/Montlake Boulevard NE
    3. East Shelby Street/Montlake Boulevard NE (southbound)
    4. East Hamlin Street/Montlake Boulevard NE (northbound)
    5. NE Pacific Street/Montlake Boulevard NE (eastbound)
- Addition of an inside HOV lane on Montlake Boulevard northbound from SR 520 across the Montlake Bridge
- Addition of an outside HOV lane on Montlake Boulevard southbound from NE Pacific Street to across the Montlake Bridge

Between now and the year 2030, transit service within the greater Seattle area and across SR 520 would change. Transit agencies have indicated that transit service with the Preferred Alternative would be the same as for the No Build Alternative and would include the following elements:

- Central Link light rail between South 200th Street and Lynnwood
- East Link light rail across I-90 between downtown Seattle and downtown Redmond
- Consolidation of SR 520 bus routes to serve East Link and eliminate low ridership routes, resulting in 14 instead of 23 SR 520 bus routes. Eight routes would provide service between Eastside cities and downtown Seattle and six routes between Eastside cities and the University District/north Seattle
- All-day transit service would continue to be provided by King County Metro (Metro) Routes 255 and 271 and Sound Transit Routes 540 and 545
- Improvements in route headways for remaining SR 520 bus service to maintain levels of service, providing approximately 645 bus trips across SR 520 between 6:00 a.m. and 6:15 p.m. (compared to 575 today); on average, a bus would cross SR 520 every 1 to 2 minutes during the peak periods and every 3 to 4 minutes during midday
- Pedestrian and bicycle infrastructure improvements at the Montlake Triangle to accommodate the addition of 23,000 passenger boardings and alightings per day at the University of Washington (UW) light rail station

Site Restoration and Station Facility Plan for Sound Transit University Link Station

The intersection of this transit service with the Preferred Alternative's transit infrastructure changes and improvements would result in the following changes and improvements to transit service in the SR 520 corridor between I-5 and Medina:

- Transit travel times and reliability would improve. The HOV lanes would operate at or near free-flow conditions throughout the day, including during the peak periods. HOV travel times would be 14 to 15 minutes between I-5 and SR 202, even during the peak hour of the peak period.

- Travel times for eastbound buses would improve by 12 minutes during the evening commute (compared to the No Build Alternative between I-5 and SR 202). Completing the eastbound HOV lanes would allow transit to reliably bypass congestion associated with I-405 that is forecasted to extend back onto SR 520 eastbound by the year 2030.

- Daily transit person trips would increase about 33 percent, from 9,900 in the No Build Alternative to 13,200 person trips. Transit person trip demand would increase 11 percent during the morning commute and 14 percent during the afternoon commute. These increases are due to the HOV lane completion and a toll on general-purpose traffic.

- The function of the Montlake Freeway Transit Station would be replaced in part by westbound and eastbound bus stops on the new Montlake lid, which would allow 430 bus trips to access the Montlake interchange area compared to 645 in the No Build Alternative (between 6:00 a.m. and 6:15 p.m. on weekdays).

- Eastside/University District bus routes would serve the Montlake lid bus stops all day, providing approximately 305 bus trips. Eastside/downtown Seattle bus routes would serve these stops at midday, providing approximately 120 additional bus trips (between approximately 6:00 a.m. and 6:15 p.m. with bus service continuing until approximately 12:00 a.m.). Eastside/downtown Seattle bus routes would also serve these stops during evenings and weekends.

- During peak periods, when Eastside/downtown Seattle buses would not serve the Montlake lid stops, riders would be expected to make the following changes:

    - Some Eastside westbound riders would be required to transfer between Eastside/downtown Seattle and Eastside/University District bus routes at the Evergreen Point Freeway Transit Station. An Eastside/University District bus would arrive every 3 to 4 minutes and most riders would be able to board any University District route.

    - Some Montlake or University District residents traveling to and from downtown Seattle would be required to change their transit route from SR 520 buses to light rail or other local bus routes.

  - Some eastbound riders coming from the University District would also be required to transfer at the Evergreen Point Freeway Transit Station from a University District route to a route to their final destination, such as Route 311 or 424. If riders do not consult bus schedules, they could wait up to 45 minutes for their specific route.

- Connections between SR 520 bus service and local bus service in the Montlake interchange area would be similar to the No Build Alternative. The Montlake Boulevard northbound bus stop at the SR 520 westbound off-ramp would be relocated 100 feet to the south on the Montlake overpass. The Montlake Boulevard southbound bus stop at the SR 520 eastbound on-ramp would be relocated 270 feet to the south to near East Roanoke Street. Because the Montlake lid stops would be at-grade with these stops, the walk distance between SR 520 bus service and the northbound stop would be approximately 150 feet less than in the No Build Alternative while the walk distance to the southbound stop would be approximately 250 feet less from the westbound stop but approximately 330 feet more from the eastbound stop.

- The Preferred Alternative includes an inside HOV lane on Montlake Boulevard northbound across the Montlake Bridge and an outside HOV lane on Montlake Boulevard southbound from NE Pacific Street across the Montlake Bridge. The addition of HOV lanes on Montlake Boulevard NE between SR 520 and the Montlake Bridge, and other transit/HOV priority treatments, would improve local bus travel times compared to the No Build Alternative.

What are the key findings for parking?

The Preferred Alternative would require removal of 172 parking spaces. Most of the affected parking is in the Montlake area, with the exception of the lot at Bagley Viewpoint near I-5.

Exhibit 2-1 lists the existing parking supply, the number of spaces expected to remain after the Preferred Alternative is constructed, and the number of spaces removed at each location.

Exhibit 2-1. **Estimated Effects on Parking Supply in the Study Area**

Location	Existing/No Build Parking Supply	Preferred Alternative Parking Supply	Spaces Affected by the Preferred Alternative
Lot at Bagley Viewpoint	10	0	10
NOAA Northwest Fisheries Science Center	132[a]	94	38
MOHAI and East Montlake Park	150	26	124

[a] Parking supply includes 38 spaces located on WSDOT right-of-way under the existing Evergreen Point Bridge.

The affected parking spaces would include removal of the existing lot in Bagley Viewpoint Park due to construction of the 10th and Delmar lid. WSDOT is considering replacement of part or all of this parking. At the National Oceanic and Atmospheric Administration (NOAA) property, only the portion of the facility parking lot located on WSDOT right-of-way under the Evergreen Point Bridge structure would be removed. Most of the affected parking spaces are located at the Museum of History and Industry (MOHAI), which would be relocated under the Preferred Alternative. Some parking spaces at the existing MOHAI site would be replaced, supporting access to East Montlake Park.

What are the key findings for construction effects?

The following sections describe construction effects on local streets, the regional freeways, transit, nonmotorized modes of travel (i.e., bicycles and pedestrians), and parking.

Construction of the project, including demolition of structures and use of some areas for contractor staging, would require adjustments to the existing lanes and intersections on roadways. Construction activities would occupy a portion of the transportation right-of-way. During off-peak traffic periods, haul truck traffic would be present on the roadways, and some travelers would encounter lane closures. Some local street delays can be expected during reconstruction of the Montlake Boulevard East bridge, but during most of construction, congestion is expected to remain similar to existing conditions.

The most substantial construction effects are related to closure of the Lake Washington Boulevard ramps to and from SR 520. When the ramps are closed, more traffic would travel through the Montlake/SR 520 interchange during periods of construction, until new portions of the project are complete. There is limited transportation right-of-way available in the Montlake interchange area to accommodate construction activities; moreover, existing transportation conditions are congested. WSDOT would make improvements along Montlake Boulevard during construction to accommodate the temporarily increased activity and traffic.

Local Street Traffic Operations

Traffic on most local streets in the project vicinity would continue to flow during construction as it does today.

Throughout construction of the Preferred Alternative, there would be intermittent, short-term local ramp and road closures that would only be allowed during times of off-peak traffic. There would be one long-term, temporary road closure of the 24th Avenue NE bridge over SR 520. The bridge closure on 24th Avenue NE would not initially affect traffic operations, but it would improve intersection operations on Montlake Boulevard when reconstructed with the new westbound SR 520 off-ramp. During construction of the Preferred Alternative, the Lake Washington Boulevard ramps to and from SR 520 would be closed and traffic would use the Montlake interchange instead.

Because of the temporary roadway changes that would be needed, traffic volumes would increase on some roadway segments and decrease on others periodically as the stages of construction progress, particularly on local streets in the Montlake interchange area. Other locations in the project vicinity would not be substantially affected.

Traffic operations on local streets are expected to remain similar to existing conditions during most of the construction period. The temporary improvements along Montlake Boulevard would accommodate traffic volume changes and prevent substantial increases in congestion. Delay would increase at three locations during a portion of the construction timeline:

- SR 520 westbound ramps/Montlake Boulevard East, during years 3 and 4 in the AM and PM peak hours—change from LOS B to C
- Lake Washington Boulevard/eastbound SR 520 ramps/Montlake Boulevard East, during year 6 in the AM peak hour—change from LOS E to F

- East Shelby Street/Montlake Boulevard East, during year 7 in the AM peak hour—change from LOS B to C

Freeway Traffic Operations

Traffic conditions on the freeways would remain similar to existing conditions during the most congested times of the day. Intermittent delays can be expected due to isolated construction events, but activities that reduce freeway capacity would not be allowed during the daytime. When the Lake Washington Boulevard ramps are closed and other ramps are shifted temporarily, the locations of existing congestion on SR 520 would change while overall delay would remain much as it is today. Congestion due to the Lake Washington Boulevard ramps would no longer be present, but some increased congestion at the Montlake Boulevard ramps can be expected. This change would not be substantial for the westbound off-ramp. At the eastbound on-ramp merge to SR 520, increased traffic volumes would result in a change from LOS D to E during the AM peak hour for about 3 years of construction.

Construction Truck Volumes

Construction trucks would use designated truck routes and arterial streets to access work sites and construction staging areas. Direct access to work sites from SR 520 and the ramps would be provided where possible. Construction truck traffic would be necessary on City of Seattle streets in the project vicinity. Some local streets on the Eastside would also need to be used on a limited basis during construction of the Evergreen Point Bridge and Eastside transition area; however, most trucks would access the SR 520, Medina to SR 202 work site directly from the freeway and would leave the site through a direct access back to the freeway.

During typical construction days, the daily volume of project construction trucks on local streets would be less than 1 percent of total vehicle volumes on the streets. The existing daily volumes of trucks and buses on local streets range from about 1 to 4 percent of total vehicle volumes, with most locations just over 2 percent. On typical construction days, the project would not substantially increase truck activity on local streets.

On days when peak construction activities occur, the volume of project trucks added to local streets would be similar to the existing volumes of trucks and buses at most locations. The additional trucks would typically range from 2 to 4 percent of existing vehicle volumes, with only East Roanoke Street beyond that range at 6 percent. At the Eastside locations, additional trucks during peak construction would be less than 3 percent of existing vehicle volumes.

The existing total vehicle volumes, including trucks and buses on freeways, are much greater than on arterial streets; therefore, the additional project trucks would not have a substantial effect. Most construction trucks would travel during off-peak traffic conditions because road congestion would delay arrivals and reduce construction productivity. On average construction days, the trucks added to freeway traffic due to project activities would be negligible at all locations. During peak construction days, the estimated additional trucks would amount to 0.5 percent, or less, of total vehicles.

Transit

Construction would affect bus stops and operations on local streets in the study area, and could affect transit stations and associated bus operations along SR 520. Much like general traffic operations, most transit effects would be on the local streets rather than the freeway.

The most substantial change to transit during construction would be the closure of the Montlake Freeway Transit Station. When the station is closed, some transit riders would need to use different routes and bus stops as follows:

- People traveling to Montlake/UW from the east side of Lake Washington would need to transfer to University District buses at one of the Eastside freeway transit stations.
- People traveling to the east side of Lake Washington would need to board a University District bus on NE Pacific Street or on Montlake Boulevard East instead of using the freeway transit stop.
- People who use the Montlake Freeway Transit Station to travel between Montlake and downtown Seattle would need to ride a different local bus during the construction period.

Some riders could require an additional transfer to reach their destination. Additional bus service between the University District and the Eastside, such as Sound Transit Route 542, would accommodate the passengers affected by the closure of the Montlake Freeway Transit Station. During construction of the Preferred Alternative, the

Evergreen Point Road Freeway Transit Station would remain open to allow passengers to transfer between buses bound for Seattle and the University District.

The existing bus stops on Montlake Boulevard at SR 520 would be moved to nearby locations beginning at about year 3 of construction. Users transferring to and from SR 520 buses could transfer at the Montlake Triangle or East Shelby Street instead. The existing local bus stop on southbound 10th Avenue East would remain open during construction, but would require a minor relocation while the 10th Avenue East bridge is reconstructed.

Transit operations and facilities would be affected by temporary lane alignments and reconstruction of the bridges over SR 520 at 10th Avenue East and Montlake Boulevard East. Metro operates electric trolley buses in both locations. These buses are powered by fixed aerial wires above the travel lanes. When the lane alignments are changed, temporary overhead trolley wires would need to be installed or other transit facility provisions would be required to maintain service on the routes served by trolley buses.

Transit operations during construction would be affected by the same conditions that affect overall local street operations. Travel times are not expected to change substantially through year 4 of construction. Travel times would improve during year 5 due to temporary roadway improvements along Montlake Boulevard. In year 6, the Montlake Boulevard East bridge would be reconstructed. Southbound routes to SR 520 on Montlake Boulevard could incur travel time increases of 2 to 4 minutes. During year 7, the eastbound SR 520 loop ramp would be closed for construction. The resulting temporary road configurations would improve travel times for some routes and reduce travel times for others. Routes with reduced travel times would be the southbound Montlake Boulevard routes going to SR 520 and the northbound local routes on Montlake Boulevard.

Nonmotorized Facilities

The presence of construction activities in the Montlake area would affect bicycle and pedestrian access, particularly for north-south travel. The Bill Dawson Trail and the 24th Avenue East bridge would be closed for most of the construction period. Bicyclists and pedestrians would be detoured to Montlake Boulevard, which would remain open for non-motorized travel throughout construction.

The Bill Dawson Trail would be occupied by a construction access road during construction of the Portage Bay Bridge and portions of the Montlake lid. The trail would be rebuilt near the end of the construction period. The 24th Avenue East bridge would be demolished in year 2 of construction. Although the bridge would reopen within 2 years, access north of the bridge and the westbound SR 520 off-ramp would not be available due to construction activities.

During construction of the west transition span, the portion of the Foster Island Trail currently under the bridge would be closed. The trail would remain open at other times during construction. Access to the Foster Island Trail from East Montlake Park would not be affected.

Parking

Construction would affect parking at six locations in the study area. Four of the locations would not be substantially affected by the reductions in parking because utilization is low or the remaining parking supply would be sufficient to meet demand. These locations include Bagley Viewpoint, MOHAI/East Montlake Park, 24th Avenue East near MOHAI, Husky Stadium lot E11, and the WSDOT Public Lot on Lake Washington Boulevard.

The on-street parking along Lake Washington Boulevard, east of Montlake Boulevard would be unavailable during construction of the Montlake Lid. This area accommodates parking for about 35 vehicles.

The remaining parking area, at NOAA Northwest Fisheries Science Center, utilizes 38 spaces located on WSDOT right-of-way under Portage Bay Bridge. These spaces would not be available during construction and an additional 15 spaces on NOAA property are estimated to be occupied by construction activities. Alternative parking would be needed for approximately 40 vehicles at this site.

What are the key findings for cumulative effects?

This analysis determines the effects of the Preferred Alternative in combination with other improvements to regional transportation facilities that were not included in the direct effects analyses described in Chapters 5 through 10. Because the analysis year for direct effects was 2030, the results included effects of projects that were planned and programmed (funded) to be completed by that time. The cumulative effects analysis also includes projects that are planned to be completed by 2030, but were not programmed or funded at the time of the direct effects analysis. This analysis includes the evaluation of reasonably foreseeable regional pricing strategies by the year 2030 for the I-90, I-405, and SR 99 corridors, as well as the SR 520 toll included in the Preferred Alternative.

WSDOT drew the following conclusions about travel demand in the cumulative effects scenario of the project:

- Total traffic crossing the SR 520 corridor is forecasted to increase by 7 percent in the cumulative effects scenario compared to the Preferred Alternative. This is a 1 percent increase in total traffic compared to the No Build Alternative. All of the increase in volume compared to the No Build Alternative would occur in the HOV lanes. The SR 520 corridor HOV lane would have adequate capacity to accommodate this level of increase. This means that if the regional projects assumed in the cumulative effects scenario are implemented in conjunction with the SR 520, I-5 to Medina project, more person trips would likely be made across Lake Washington using SR 520. In addition, traffic conditions within the SR 520 corridor may fall somewhere between what has been estimated with the No Build and Preferred Alternatives in the Final EIS.
- Because the SR 520 Program completes the HOV lane system between Redmond and Seattle, and assuming carpools and transit would not be required to pay a toll, a considerable increase in HOV demand would occur along SR 520 with the Preferred Alternative compared to the No Build Alternative. The combination of reduced travel time and cost avoidance is a powerful incentive for carpool and transit use. An additional, but smaller, increase in carpool demand is also projected in the cumulative effects scenario compared to the Preferred Alternative, which introduces a toll on I-90.
- Total net peak and daily cross-lake vehicle travel under the cumulative effects scenario would be lower when compared with the No Build Alternative and Preferred Alternative. However, the number of peak and daily cross-lake HOV vehicle trips is expected to increase while the number of cross-lake, general-purpose trips would decrease.

- Cross-lake vehicle trips would decrease at a higher rate than person trips. This means that more people would be moved by fewer vehicles under the cumulative effects scenario than with the No Build Alternative and Preferred Alternative.
- Total cross-lake HOV travel would increase under the cumulative effects scenario compared to the No Build Alternative and Preferred Alternative. This increase is due to the increasing shift to HOV travel that would result from the implementation of tolls on both SR 520 and I-90.

Internal traffic circulation on the Eastside would improve and more trips would likely remain on the Eastside. These effects would be due to the introduction of tolls on SR 99 and I-90, as well as capacity improvements along regional corridors such as I-405 and SR 167. Therefore, the volume across the cross-lake screenline is expected to decrease, while volumes across screenlines on the Eastside are projected to increase under the cumulative effects scenario.

Chapter 3—Travel Demand Modeling

What is in this chapter?

This chapter provides a general overview of travel demand models, how these models estimate future traffic volumes, why there can be multiple versions, and when the most opportune time is to change models during a project's life time. It also documents the history of the SR 520 demand models and the strategy for potential future changes to travel demand modeling efforts. Chapter 4 describes travel demand modeling assumptions used in the analysis for the SR 520, I-5 to Medina project.

What is travel demand?

Travel demand refers to the number of people who want to go from one location to another by each mode of travel. Travel demand is based on a theory of how land use, people, and the transportation network interact. It is estimated using the *4-Step Process,* which is shown in Exhibit 3-1 and described below.

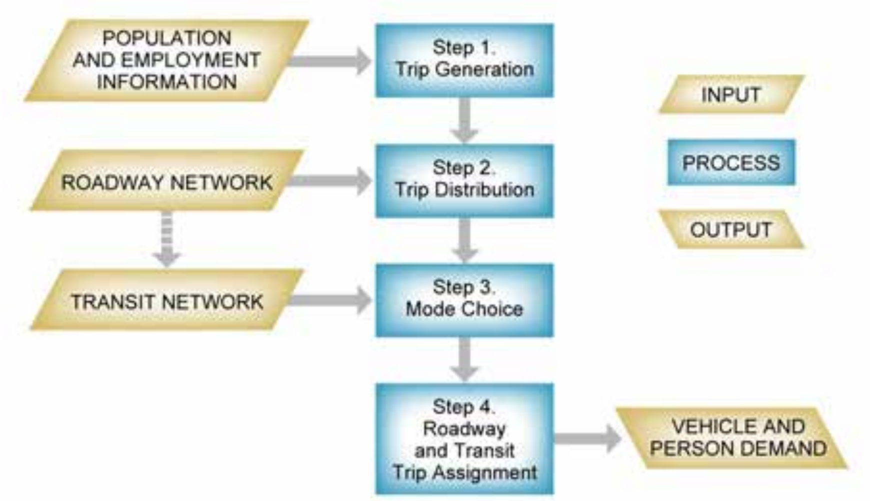


Exhibit 3-1. **4-Step Process for Estimating Travel Demand**

Trip generation – The first step in the *4-Step Process* estimates the number of trips that result from a particular place, such as a shopping mall, a residential neighborhood, a business district, and many others.

Trip distribution – The trips generated by each place go to a variety of different areas. This second step estimates the proportion of trips from a given area that goes to each of the other areas in the region. Specific routes and travel modes are not yet determined. Put simply, the number of people who want to go from place to place is determined, but not how they will travel.

Did you know?

Travel "mode" refers to the type of transportation vehicle or means of moving from one point to another. For example, cars, buses, trains, bicycles, and walking are different travel modes.

Mode choice – The third step estimates the proportion of trips that will use each travel mode. For example, while steps 1 and 2 estimate the number of people that will travel from one area to another, mode choice estimates the percentage of people who decide to drive alone, take the bus, or ride their bicycles. The mode choice is based on different factors that people consider when choosing how they want to travel for a particular trip. These factors include the cost of parking, travel time, and comfort of the trip.

Trip assignment – The last step determines the specific routes that trips will take through the transportation network from one area to another. The routes are usually freeways and arterial roadways, but may include other alternatives such as railways and passenger ferries.

What is a regional travel demand model?

A regional travel demand model is a software tool that applies the *4-Step Process* to large, complex networks of neighborhoods and transportation facilities. These types of models are used by transportation planners to estimate how people are likely to travel throughout a region and how travel patterns in the region would change as a result of different planning actions under consideration. These actions can include changes such as:

- Adding roadway capacity (lanes)
- Adding or changing transit service
- Tolling roadways
- Closing roadways
- Increasing parking rates
- Providing incentives for transit use (e.g., bus passes)
- Changing land development conditions

A regional travel demand model has three primary components: land use data, transportation network, and a variety of mathematical formulas (or algorithms) that determine the amount of interaction among the transportation network elements.

Land use data consist of population and employment forecasts for any given region. The forecasts are prepared at levels of geographic detail that can be further broken down to perform model analysis for specific purposes.

The transportation network includes freeways, highways, arterials, and bus/rail/ferry transit routes. Local roadways, specific intersection design, and traffic signal operations are not generally included in regional travel demand models.

The mathematical algorithms are formulas or rules that determine how travel demand will be distributed among the various destinations, modes, and routes that people can use to complete their trips.

Who creates this regional travel demand model?

PSRC is the Metropolitan Planning Organization (MPO) for the four-county region of Snohomish, King, Kitsap, and Pierce counties. PSRC works with the state, ports, transit agencies, tribes, local governments, businesses, and citizens to create a long-term vision for the region with respect to land use, economic development, and transportation.

Did you know?

Metropolitan Planning Organizations (MPOs) are required by federal regulation for urban areas, with a population larger than 50,000, which receive federal transportation funds. Each MPO has a board that represents local agencies and a staff of planners and other professionals who develop the regional transportation plan.

PSRC is responsible for distributing federal transportation funding, developing policies, and making decisions on regional issues. Among other planning activities, PSRC develops and updates a region-wide transportation plan and a regional travel demand model.

The regional travel demand model covers PSRC's four-county jurisdiction and includes broad information about land use (population and employment data) and primary roadways in the region's transportation network. Because of the geographic expanse of the model, localized land use data and roadways are excluded.

Can there be more than one version of a regional travel demand model?

There are a variety of reasons to have different models depending upon the scope of analysis, geography of interest, and the level of detail required in outputs. The goal of every analysis is to answer a specific set of questions that are unique to the situation being examined. Depending on the questions that are being asked, a variety of different tools can be used.

At the core, a model is a complex set of calculations that help estimate the differences resulting between proposed alternatives. As long as the same tools are used to estimate results among a set of alternatives, these alternatives can be compared to each other in a valid way. Thus, it is important to ensure that there is a consistent set of assumptions for the general demographic forecast—the foundation of the model.

Why do models change?

Regional travel demand models can change over time for a variety of reasons. Some are as simple as updates to the model networks and population and employment forecasts. Other changes can be more complicated and involve the overall model structure, including changes to functions that estimate how many people will travel between certain locations and how they will choose modes of travel. One example is the addition of tolling into the model, which would affect a person's decision to drive or take transit as a mode of travel.

Did you know?

Traditional gravity models analyze aggregate, or grouped, trips from one area to another. The number of trips between areas is based on distance between areas, the cost of the trip, and the "weight" of each area. Weight refers to density of population or employment in an area.

Activity-based models estimate the behavior of people based on the activities that typical individuals engage in throughout the day. These models use complex sets of economic data describing how people make decisions about how they will travel based on the value of trips.

Yet another potential reason for multiple versions of a travel demand model is a change in the type of model, such as transitioning from a traditional gravity-based model to a next generation activity-based model. Many metropolitan agencies, including PSRC, are changing to activity-based models, which allow them to answer more detailed questions about changes in land use and transportation.

The process of transitioning to a new type of model can take several years to complete due to the volume of data involved and the complexity of the testing process. This lengthy process requires that two travel demand models be used by different projects in the region at the same time so that valid analyses can be performed using the previous model while the new model is being tested and validated.

Because there can be multiple versions of a regional travel demand model at one time, a public agency or project could have a variety of versions from which to choose. The selection of a demand model version depends on the consistency of the demand model inputs and structure with the assumptions and purpose of the project. Every travel demand model is validated and calibrated for a specific project, at a specific time, and for a specific purpose.

What are project-level models?

Individual projects that focus on a specific area of the region use the PSRC regional travel demand model as a base model or starting point. Details are then added to develop a *project-specific* travel demand model. Examples of these details include local roads and intersections, interchange ramps, additional elements of the transit system, and adjustments to reflect how people access the transportation network.

This project-level analysis is the most common reason why multiple versions of a travel demand model are used. Regional travel demand models are built to test long-range plans and transportation policies at the broader four-county scale. As such, they are generally validated to a set of regional measures. This is sufficient for analysis that reports details at the county or regional level; however, further analysis and validation are required at a much finer scale to understand how the model works for localized, project-level improvements.

Corridor projects generally focus on a much smaller subsection of the region. As an example, even though the Evergreen Point Bridge has an effect on regional traffic movements, it is still only one small piece of the overall transportation network. The effects of SR 520 corridor changes on parallel facilities and smaller roadways that connect to it need to be understood, but the emphasis at the project level is on the effects of changes near the study area itself.

The scope of every project is different, and it is likely that every project will have some variation in its model. The key component that makes all the models consistent with one another is the long-range demographic forecast.

Can the project travel demand models change during the life of the project?

The project travel demand model can change during the course of the project. When the duration of a project spans several years, modeling information and assumptions become outdated. In these cases, making changes to update the project travel demand model is considered appropriate and desirable.

It is necessary to make changes to the project travel demand model at a specific point or points on the planning timeline. These points occur between phases of the project, after the results of one analysis are complete, and before a new analysis begins. For example, on the SR 520, I-5 to Medina project, a logical time to update the travel demand model occurred between the release of the Draft EIS and the analysis of project design options included in the SDEIS. The timing of these changes is important because of the way the model results are used.

The primary result provided by travel demand models is the *change* in demand associated with a particular action. Travel demand models are not intended to provide an absolute traffic volume forecast. This is because travel demand models include only major roadways and exclude minor roadways that carry traffic as well. Thus, although travel demand models can provide an approximate estimate of future travel demand, the emphasis should be placed on the *relative difference* between planning alternatives that are being compared. This difference is the *effect* of implementing an alternative.

Because the conclusions of an analysis are based on the *relative difference* between alternatives, different versions of the travel demand model can yield slightly different results for a single alternative. Therefore, it is important to use the same version of the model when comparing each alternative to accurately identify its effects.

How has the SR 520 travel demand model changed and how do the versions relate to each other?

Several travel demand models for the SR 520, I-5 to Medina project have been created to answer questions at different stages of the planning process. The first SR 520, I-5 to Medina project demand model was based on the 1998 PSRC regional travel demand model and was used for the Draft EIS. The primary purpose of this model was to estimate the change of travel demand on the SR 520 corridor given the completion of a 4-lane, 6-lane, or 8-lane Alternative. Each alternative included a toll on the SR 520 corridor as part of its definition.

Prior to analysis for the SR 520, I-5 to Medina SDEIS, the project demand model was updated to represent the most current transportation network, tolling assumption, land use, and transit data. The SR 520 demand model used for the SDEIS was the same version as the Draft EIS, but with the updates that were developed after publication of the Draft EIS. Several other planning efforts involving travel demand modeling have been completed for the SR 520 corridor. These planning efforts include the HCT Plan, the SR 520 Finance Plan, the Lake Washington Congestion Management Project, and the Tolling Implementation Committee (TIC). The common element in all these versions is that, even though the math may be slightly different among models, the basic inputs are the same. The same land use forecasts as well as local and regional highway and base transit assumptions are internally consistent among the analyses.

Did you know?

A Tolling Implementation Committee (TIC) was required by state legislation to evaluate the regional effects of various tolling alternatives on SR 520 and I-90 crossing Lake Washington.

The HCT planning effort used the SR 520, I-5 to Medina project travel demand model as a base to conduct transit forecasting. The HCT travel demand model included modifications and infrastructure changes that were assumed to be in place if high capacity transit is added to SR 520 in the future.

Did you know?

The Urban Partnership Agreement is part of a federal program to study and evaluate congestion management strategies for SR 520, including tolling. It may result in federal funding for congestion relief elements on SR 520.

The SR 520 Finance Plan was released in January 2008 to inform legislators about possible funding that could result from several sources, including tolling. A different version of the SR 520 demand model was developed for that effort to estimate the effects of several tolling scenarios on SR 520 travel patterns. This version of the SR 520 demand model minimized the estimated travel demand on SR 520 to avoid over-estimating revenue.

A related study was completed for the TIC in 2008 to answer questions regarding the effects of tolling cross-lake travel. Transportation data generated by the TIC were used in the Environmental Assessment produced for the Urban Partnership Agreement. The TIC focused on the differences between several cost structures for tolls. The models used in these studies were based on PSRC's Version 1.0a travel demand model.

Did you know?

The PRSC Version 1.0a model, released in early 2008, was an interim release of the new PSRC Version 2.0 demand model. It included fundamental changes to address prior limitations in evaluating the effects of tolling projects.

Although several versions of the SR 520 demand model exist, each version was appropriate at the time of the analysis and for its intended purpose. They allowed a sound comparison of the relative differences among alternatives to identify the effects of a particular action.

Which model version is being used for the Final Environmental Impact Statement?

For the SR 520, I-5 to Medina project Final EIS, the decision was made to update PSRC's Version 1.0a travel demand model (also known as Version 1bb). This model was selected, in part, because it was the current version available for use at the time the Final EIS transportation analysis was initiated; moreover, it is the same version used to support the 2008–2009 SR 520 Finance Plan, Lake Washington Congestion Management Project, and TIC planning efforts described above.

For this model, both highway and transit networks were updated again to reflect base year (2006) conditions. In addition, a detailed model update, refinement, and validation process was applied to the primary travel corridors, including and surrounding the SR 520 corridor, to enhance the model's performance for base year (2006) conditions. This update included a sensitivity test and comparison of actual and estimated trip ends between 2006 and 2010. The validated 2006 model was refined and enhanced to ensure that a solid foundation had been laid for developing future forecasts to support the Final EIS transportation analysis.

What is the strategy for future SR 520 travel demand model efforts?

WSDOT will continue to coordinate with all other planning efforts that use travel demand modeling to answer questions about the SR 520 corridor. Examples of such efforts could include an update to the SR 520 Finance Plan and selection of future toll rates for SR 520. Project administrators will communicate with PSRC, King County, Sound Transit, and the City of Seattle to ensure that modeling assumptions for SR 520 are compatible with current regional planning assumptions.

These agencies will help identify and establish the base PSRC model version and any other data updates, including transportation network changes. If another new PSRC version is adopted in the future, these agencies will help to assess the potential need to replace the travel demand model.

Chapter 4—Transportation Forecasts and Operations Analysis Methodology

What is in this chapter?

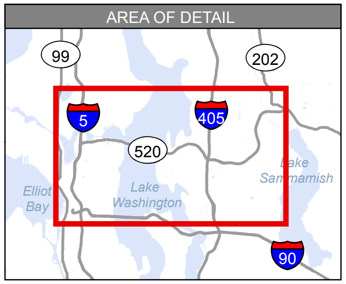
This chapter describes the methodologies used in the project's transportation analysis. The first part of the chapter describes the methods for forecasting *freeway* traffic volumes and analyzing freeway operations in year 2030 without and with the project. The second part describes the methods for forecasting year 2030 *local street* volumes and analyzing intersection operations without and with the project.

Study Area

Although the project itself is limited to replacing SR 520 between I-5 and Medina, the transportation study area extends beyond project construction boundaries onto I-5 and I-405 to account for traffic interactions between the freeways. Exhibit 4-1 illustrates the difference between the project limits and study area. Traffic volumes and congestion are discussed for SR 520, I-5, and I-405 because SR 520 is affected by how the other two highways operate. The study area for this analysis included the following freeway segments and associated ramps and interchanges:

- SR 520 between I-5 in Seattle and SR 202 in Redmond
- I-5 in Seattle between NE 45th Street and south of the I-90 collector-distributor north connection to the main line
- I-5 express lanes between Northgate and 5th Avenue/ Columbia Street in Seattle
- I-405 between NE 70th Street in Kirkland and NE 4th Street in Bellevue

AREA OF DETAIL



- ○ Analyzed Interchange Area
- 🟥 I-5 to Medina Project Limits
- 🟦 Medina to SR 202 Project Limits
- 🟧 Transportation Study Area in addition to Project Limits
- 🟩 Interchange Influence Area

Source: King County (2008) GIS Data (Streams, Streets and Waterbodies) and CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 4-1. **Transportation Analysis Study Area**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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Analysis Process

The process of forecasting travel and analyzing traffic operations consists of a series of steps in which each one builds upon information from the previous step. A simple depiction of this process is shown in Exhibit 4-2. The following sections provide an overview of data collection, travel demand modeling, traffic forecasting, and traffic operations analysis. This process of forecasting and analysis culminates in the documentation of freeway and local street transportation effects contained in Chapters 5 and 6 of the Transportation Discipline Report.

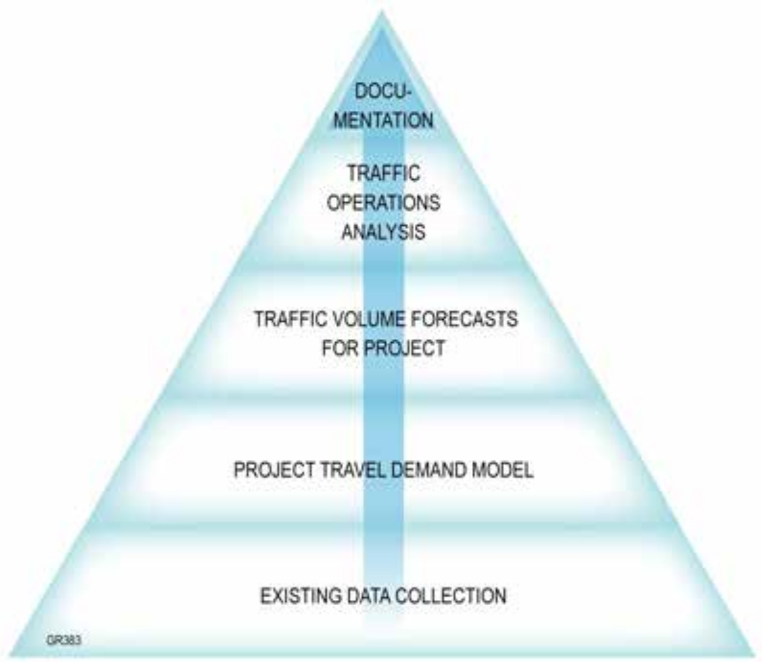

Exhibit 4-2. **Forecast and Operations Analysis Process**

How were travel demand and traffic patterns determined?

As described in Chapter 3, the project travel demand model was used to forecast year 2030 freeway traffic volumes without and with the project. These forecasts were used to assess the potential project effects on roadway operations throughout the study area. Travel demand models consider changes to the transportation network as well as changes in population and employment.

The SR 520 Bridge Replacement and HOV Project Base Year Validation Analysis Technical Memorandum (WSDOT 2010b) describes the attributes that were updated and refined specifically for this project, such as ramp connections, numbers of lanes, and roadway speeds.

The project travel demand model was used to forecast future traffic volumes and patterns. Existing travel usage must be well understood and represented by the model before future travel can be forecasted.

WSDOT collected existing traffic volume data for the study area freeways and major local streets for use in the travel demand modeling and traffic volume forecasting. The existing data was first used to verify that the regional travel demand model correctly represented existing regional traffic volumes and patterns—a process known as validation. The travel demand model output was calibrated to within 10 percent of existing traffic count data across select checkpoints (screenlines), which is considered standard practice for this type of analysis.

After the model was calibrated for existing conditions, it was updated to represent year 2030 No Build Alternative conditions. The No Build Alternative includes regional roadway and transit network improvements that were planned and programmed (funded) at the time of analysis. Projects that were proposed but not programmed at the time of analysis are included in the transportation cumulative effects analysis described in Chapter 11. The year 2030 No Build Alternative for the SR 520, I-5 to Medina project is based on the assumption that the following key transportation projects will be completed as planned:

Freeway

- SR 520—SR 520, Medina to SR 202 project, which will expand the HOV system, improve transit time and reliability, and enhance public safety
- SR 520—West Lake Sammamish Parkway to SR 202 Project, which will widen SR 520 in Redmond from two to four lanes in each direction
- I-90—Two–Way Transit and HOV Operations Project, which will add HOV lanes to the I-90 outer roadway between Seattle and Bellevue
- I-405—Widening and interchange improvements as funded by the Nickel funding package (enacted by the 2003 State Legislature) and the Transportation Partnership Act package (enacted by the 2005 State Legislature)

- SR 99—Alaskan Way Viaduct Replacement Project, which would replace the current elevated structure with a bored tunnel beneath downtown Seattle

Local Projects

- Mercer Corridor Improvement—Phase 1
- Spokane Street Viaduct
- Northup Way—120th to 124th Avenue NE eastbound widening project

Transit

- Light rail between Federal Way and Lynnwood
- Light rail station at Husky Stadium
- Light rail between Seattle and Overlake
- Tacoma Light Rail
- Seattle Streetcar
- Sounder Commuter Rail between Everett and Seattle
- Sounder Commuter Rail between Lakewood and Seattle
- King County Transit Now

The Final EIS Year 2030 Cumulative Effects Definition Technical Memorandum (WSDOT 2010c) contains detailed information about these travel demand model assumptions. They include all projects that were assumed to be complete by 2030, planned transit service, and other assumptions coded into the project's travel demand model for the No Build Alternative.

Adjustments were also made to reflect expected changes in inflation and land use,[1] specifically future population and employment growth forecasts, for the year 2030. These elements are major factors that influence travel behavior and patterns.

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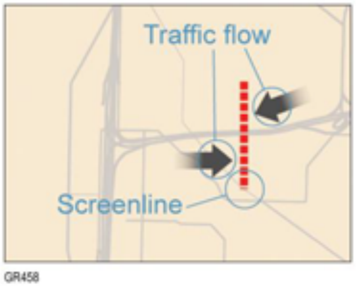
[1] Land use information was developed and provided by PSRC.

The project's travel demand model was then used to estimate changes in regional traffic demand volumes and patterns between now and the year 2030 with the No Build Alternative. Traffic demand volumes were forecasted at several "checkpoints" (screenline locations) along the freeway and at interchange influence areas. Interchange influence areas include the local streets and intersections surrounding an interchange that could be affected by changes to SR 520.

Did you know?

A **screenline** is an imaginary line across a section of freeway or arterials. Screenlines are often used in traffic analyses to determine how much volume is entering or exiting a particular area based on how much traffic crosses the screenline.



The percent growth in traffic demand between now and the year 2030 was then applied to existing traffic count data to forecast detailed traffic volumes within the study area. Existing traffic count data were used as a baseline so that forecasts were built on actual volumes and travel patterns.

After forecasting travel demand for the year 2030 No Build Alternative, the transportation network for the Preferred Alternative was coded into the travel demand model. The *network* for the Preferred Alternative describes the features of the roadways such as numbers and types of lanes (general-purpose and HOV), intersections, and interchange ramp configurations. In addition to the transportation networks, the following operational assumptions were included in the Preferred Alternative:

- Electronic tolling on SR 520 between I-5 and I-405
- Toll rates vary by time of day on a fixed schedule
- Transit and carpools (3+ persons) exempt from tolling
- No change in transit service compared to the No Build Alternative

Complete details about the travel demand modeling for the Preferred Alternative are published in the No Build and Preferred Alternatives Technical Memorandum (WSDOT 2010d).

After the networks and assumptions were coded, the process described for the No Build Alternative was then repeated to determine how the Preferred Alternative would affect traffic demand compared to the No Build Alternative.

Identifying Freeway Screenline Locations

Screenlines were selected to determine key travel patterns adjacent to and within the project limits. Screenlines on SR 520 between I-5 and I-405 represent the locations where traffic enters and exits the study area. Screenlines adjacent to the I-405 and I-5 interchanges with SR 520 were necessary to determine travel patterns to and from the adjacent freeways. A screenline at the middle of Lake Washington on SR 520 was chosen to determine vehicle demand crossing the lake. Screenlines on I-405 and I-5 provide information about the effects that changes on SR 520 might have on adjacent travel routes.

Identifying Interchange Area Boundaries

Interchange influence areas were identified as areas where similar growth in traffic was expected. Each influence area includes one or more interchanges. Some interchanges were grouped because of their similarities in serving traffic to and from adjacent neighborhoods.

The following interchange influence areas near SR 520 and I-5 were identified:

- SR 520/Montlake Boulevard. Traffic on SR 520 destined to the University District, Madison Park, Capitol Hill, Central District, and Madrona may take either Lake Washington Boulevard or Montlake Boulevard; therefore, these interchanges were grouped together.
- I-5/NE 45th Street. This is a single interchange area, and the growth patterns were assigned based solely on information from this location.
- SR 520/I-5/East Roanoke Street. This interchange area serves the neighborhoods adjacent to I-5, north Capitol Hill, and Eastlake. Traffic growth in these areas is similar, and they were combined to assess an overall local growth rate for this area.
- I-5/Mercer Street. This interchange serves neighborhoods north of downtown Seattle, including Queen Anne, and the growing South Lake Union neighborhood.
- I-5/Stewart Street. This interchange serves traffic to downtown Seattle and has connections to the I-5 main line and express lanes.

What time periods were evaluated and why?

Traffic volumes were forecasted for three time periods: daily, morning, and afternoon. Daily volumes were forecasted for one location on SR 520, I-90, and SR 522 to provide information on overall cross-lake travel changes without and with the project. Morning and afternoon commute period forecasts were completed for the SR 520 main line, ramps, and adjacent arterials to use in the operations models. Comparing the relationship between daily and peak period traffic volumes helps define how people might react to increases in congestion (longer travel times) and changes in travel costs (tolling).

Morning and afternoon traffic forecasts were prepared for two 5-hour periods: 5 a.m. to 10 a.m. and 2:30 p.m. to 7:30 p.m. Congestion currently occurs along SR 520 for several hours during both the morning and afternoon commutes. Because traffic volumes are expected to increase over the next 30 years, a 5-hour peak period was selected for traffic volume forecasting and analysis. This selection allowed WSDOT to determine how the peak period might change with traffic volume increases by the year 2030. Traffic forecasts and operational analysis results are reported here for the peak 3 hours (6:00 to 9:00 a.m. and 3:00 to 6:00 p.m.).

In what terms do we discuss traffic volumes and patterns?

Traffic forecast volumes are generally described in terms of vehicle demand, person demand, and mode choice. The purpose and need statement for the SR 520 Bridge Replacement and HOV Project states: "…the purpose of the project is to improve mobility for people and goods across Lake Washington." The best way to measure the improvement of mobility is two-fold. First, assess the person demand associated with any specific action on the corridor; second, measure how many of those people are actually served during a specified time period.

The process of forecasting traffic volumes estimates person demand with the year 2030 No Build Alternative and Preferred Alternative, while the freeway operations analysis measures how many people are served, or throughput. Demand is discussed below and throughput is discussed in more detail later in this chapter.

Demand

Demand refers to the number of vehicles or people that want to use the freeway during a given time period. Traffic demand volumes are based on the project's travel demand model. Person-trip demand was calculated based on the HOV (carpool and bus) and general-purpose vehicle demand and throughput, including the assumed average vehicle occupancy (AVO) that was consistent with the project travel demand model.

Mode Choice

Mode choice refers to the type of transportation a person chooses to use, such as driving alone (general-purpose), taking a bus, or carpooling. Person demand and vehicle demand can both be described by mode (i.e., the number of people taking the bus or the number of vehicles that can be classified as carpools). The mode choices used in the traffic forecasts include general-purpose, carpool (3+), and bus.

Did you know?

AVO (average vehicle occupancy) is a term used to describe the average number of persons per vehicle.

The following AVO assumptions were made for the operations analyses:

1.33 persons per general-purpose vehicle

3.15 persons per HOV vehicle

65 persons per bus

How was transit demand estimated?

Vehicle- and person-trip forecasts for buses were based on the travel demand model forecasts. The number of buses was estimated using the following information provided by the transit agencies:

- For Metro, it was assumed that the increase in transit service planned for the Transit Now program will account for growth between 2006 and 2016, and a 1 percent per year increase in service hours between the year 2016 and 2030.
- For Sound Transit, it was assumed there would be an approximate 14 percent increase in total service hours between the base year (2006) and 2013 (or about 1/2 percent per year), but no increase after 2013.

The transit person demand forecasts were not constrained by transit volume and service forecasts. In other words, the transit demand volumes represent how many people would choose transit regardless of how many buses were forecasted to be on the roadway. This provides data for the local transit agencies to use when determining future bus service, such as route changes (additions, deletions, extensions in routes), improved frequencies, or bus type (standard or articulated).

How were freeway traffic operations analyzed?

Travel demand forecasts help to determine how many vehicles and people would like to use the roadway. These volumes are input into a traffic simulation model to help engineers determine how much of the vehicle and person demand may actually be served by the proposed roadway design. The amount of traffic served is referred to as throughput. While the travel demand model uses planning level roadway capacity to estimate route travel time information (two of the biggest factors that influence corridor demand), it does not consider the more detailed throughput effects of roadway operations such as lane changes, grades, merges, and shoulder widths.

The freeway operations analysis in the Final EIS and SDEIS used the same methodology as in the Draft EIS, with the exception of the following two elements:

1. In the Draft EIS, the CORSIM software model included I-5 south to Spokane Street. However, in the Final EIS and SDEIS, the analysis ended at the northern terminus of the collector-distributor lanes, just south of the Convention Center. The operations analysis leading into the Draft EIS included the 8-Lane Alternative, which affected traffic volumes on I-5 near I-90 when compared to the No Build Alternative. The 8-Lane Alternative is not being considered further in the Final EIS or SDEIS. The 6-Lane Build Alternative had similar volumes as the No Build Alternative south of downtown Seattle and north of the I-90 collector-distributor ramps, so the additional travel demand modeling was not necessary.
2. The Final EIS and SDEIS include the 6th Street HOV ramps in downtown Bellevue, which were constructed following the Draft EIS analysis.

The CORSIM software program was used, which is a micro-simulation package developed by FHWA to simulate traffic operations on the SR 520 corridor as well as sections of the I-5 and I-405 corridors. CORSIM provides detailed simulation output, including animation and performance data, for freeway, ramp, and HOV operations. This information was used to evaluate operational differences between the No Build Alternative and the Preferred Alternative. Exhibit 4-3 shows an example of the CORSIM model animation screen.

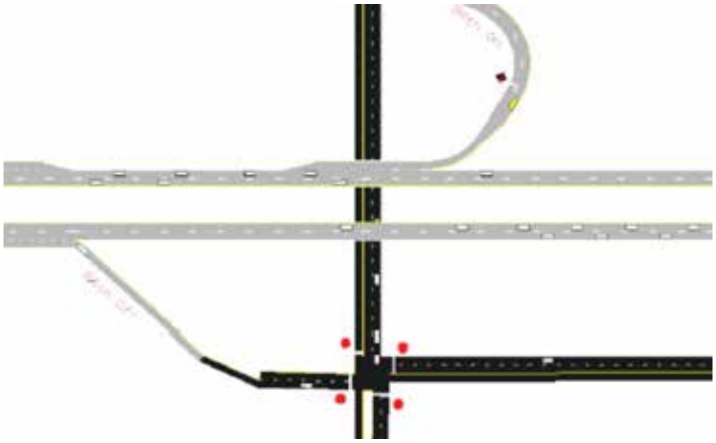


Exhibit 4-3. **CORSIM Micro-Simulation Model Animation Screen**

Exhibit 4-4 outlines the process used to analyze the alternatives. The first step in the process was to verify that the simulation model correctly represented existing freeway operations—a process known as calibration. The CORSIM model was calibrated against existing WSDOT freeway count data to ensure that the model's output for the morning and afternoon peak periods was accurately representing current volumes and operations of the freeway main line and ramps. Most locations were calibrated to within 5 percent of actual volumes. Congestion and travel times verified from the model reasonably matched field observations and data from WSDOT loop detectors. Existing data from October 2008 were used in the calibration effort.

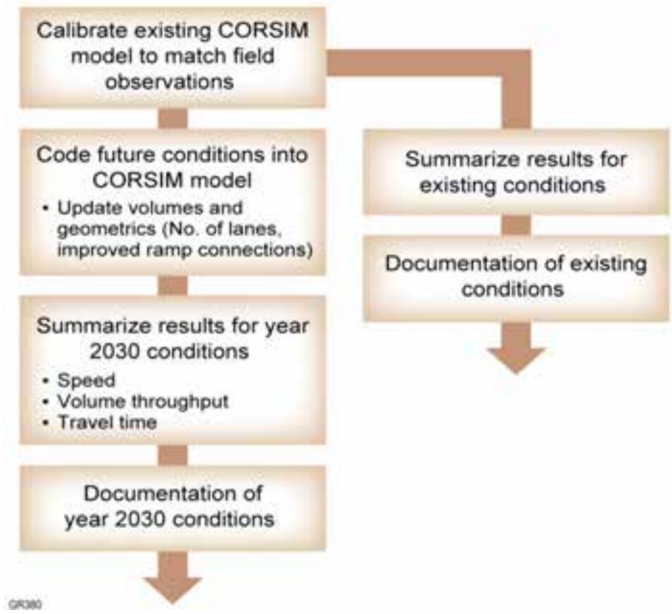


Exhibit 4-4. **Alternatives Analysis Process**

What are the measures of effectiveness for the freeway operational analysis?

WSDOT developed the following five measures of effectiveness (MOEs):

1. Congestion (queuing)
2. Speed
3. Travel times
4. Vehicles served (or vehicle throughput)
5. Persons served (or person throughput)

These MOEs were used to evaluate and compare traffic operations between the No Build Alternative and Preferred Alternative. Exhibit 4-5 shows how the MOEs were used to define freeway congestion. Each MOE is described in greater detail below.

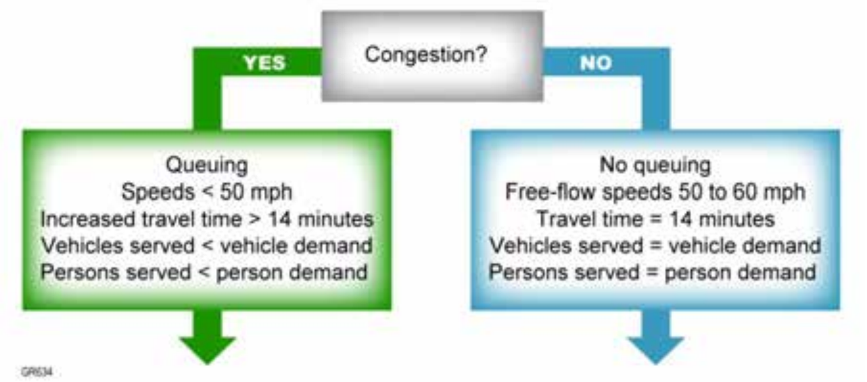


Exhibit 4-5. **Understanding Congestion and Measures of Effectiveness**

Congestion

Congestion and backups occur at locations where traffic demand exceeds the capacity of the roadway, limiting how many vehicles and people can be served. Congestion is defined as taking place in freeway sections that operate at speeds of less than 50 mph. Congestion may occur at on- or off-ramps because of weaving activity or changes in the number of lanes, lane widths, grades, or other physical characteristics.

Congestion is measured by its duration (minutes or hours) and its length (in feet or miles). Congestion locations were identified for the

No Build Alternative and Preferred Alternative based on CORSIM model results.

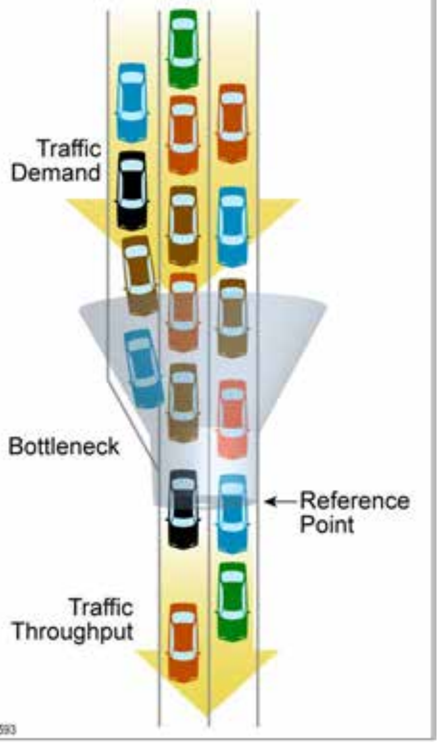
Speed

Travel speeds are a function of congestion and roadway design. Freeway traffic operating at speeds exceeding 50 mph is considered a free-flow condition. Traffic operating at speeds between 30 and 50 mph indicates moderate congestion, while speeds below 30 mph indicate a highly congested condition. Traffic operations along the freeways are summarized in 10-mph intervals between zero and 50+ mph.

The CORSIM model provided speed data in 15-minute intervals at each location along the SR 520 corridor. The data were then plotted on charts at various locations to provide a three-dimensional perspective of corridor operations, including time, space, and speed. These charts are called congestion diagrams and are shown for SR 520 in Chapter 5, which also presents the results of the CORSIM analysis.

Did you know?

A congestion point is similar to a funnel. If you pour in more liquid (demand) than can exit (traffic served, or throughput), then the funnel overflows (congestion occurs).



Travel Time

The team calculated travel time for the No Build Alternative and Preferred Alternative to measure the delay that drivers would experience on the corridor. Travel time is directly related to corridor speed, which was calculated using the CORSIM model corridor speed data. Travel time was calculated between I-5 and SR 202, which extends beyond the project limits. The study area was extended to SR 202 because some of the benefits of the Preferred Alternative would be realized outside of the project limits. Comparing the travel times between SR 202 and I-5 is an effective way to identify those benefits.

Throughput

Throughput refers to the number of vehicles or people that are moving beyond a point of reference during a given time period. This number is compared to the forecasted vehicle and person demand, which helps determine the effectiveness of the Preferred Alternative compared to the No Build Alternative.

Vehicle throughput is controlled by the roadway capacity, which is determined by several factors, including number of lanes, roadway geometry, and traffic control devices. For uncongested locations, vehicle demand equals vehicle throughput. For congested locations, demand is always higher than throughput because of over-capacity conditions. Demand that cannot “get through” is not served and backs up, creating congestion. These vehicles are eventually served during later time periods. A funnel analogy showing the relationship between traffic demand and throughput is illustrated in the right-hand column.

Person throughput is controlled by two factors: vehicle throughput and vehicle occupancy. Vehicle occupancy refers to the average number of people traveling in a vehicle. If more people travel in each vehicle, person throughput increases. The capacity for person throughput may be thought of as the number of available “seats” in vehicles. This is why transit is very effective at moving people—because transit vehicles have many seats, they have the capacity for high occupancy per vehicle. When HOVs are included in the transportation system, an analysis of mode choice is performed to estimate how many people are likely to choose alternative modes of travel, such as buses. When people choose to travel by high-occupancy modes, the people-moving capacity of the roadway is increased.

How were local traffic volumes forecasted?

Using the same methodology as the Draft EIS and SDEIS, the following steps were taken:

1. Identify growth rates for interchange influence areas. Growth in local traffic volumes was calculated using an area-wide growth rate that encompassed major arterials within an interchange influence area.

2. Identify interchange peak hour. Future traffic volumes were forecasted on local streets for one morning and one afternoon peak hour within the peak periods identified for the freeway.

3. Distribute freeway ramp traffic. Future freeway volumes were distributed through the local roadway system during the morning and afternoon peak hours using existing intersection turning movement ratios.

4. Forecast local traffic. After ramp traffic was distributed through the system, local traffic volumes not associated with the freeway ramps (e.g., people traveling between their home and a local shopping area) were increased to reach the growth rate identified in the influence area.

How did we apply our methodology to local traffic forecasts?

Growth in local traffic volumes was calculated using an area-wide growth rate that encompassed many local roads within each interchange influence area. The interchange area boundaries were drawn where the influence of the freeway ramp volumes on the local street system is the same between the No Build Alternative and the Preferred Alternative. This process is discussed further later in this chapter.

Identifying the Interchange Peak Hour

The volume of traffic on local streets not accessing the freeway can peak at different times in different areas regardless of when the adjacent freeway is peaking. Generally, local arterials peak for a single hour in the morning and in the afternoon.

Exhibit 4-6 depicts the relationship between the peak period and peak hour.

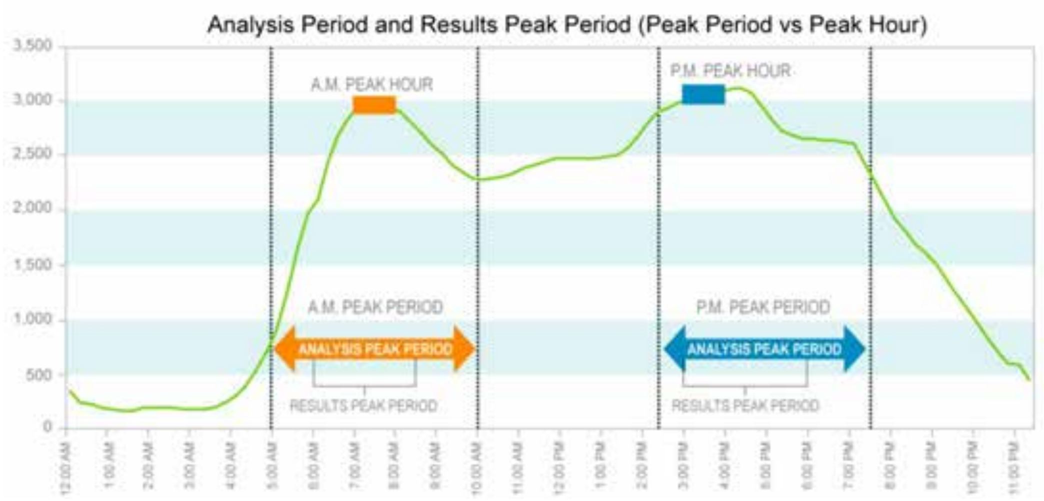


Exhibit 4-6. **Peak Hour Versus Peak Period**

Distributing Freeway Ramp Traffic

Traffic on local streets consists of two types: 1) traffic using local streets to primarily access the freeway, and 2) traffic using local streets to access other local locations. Traffic patterns were identified for both types by reviewing existing travel patterns and traffic volumes, and by considering the effect of new road connections and facilities.

Once the interchange peak hour and travel patterns were identified, freeway-related traffic volumes were distributed through the local network based on existing turning movement ratios observed at the intersections. For example, under existing conditions, if 10 percent of vehicles turn left at a given freeway ramp intersection, 60 percent go through, and the remaining 30 percent turn right, it was assumed that these ratios would be similar in the future.

Forecasting Local Street Traffic

After freeway traffic was distributed through the system, the target growth rate for the local area was applied to the local access traffic volumes. Local access traffic volumes were assumed to follow patterns similar to existing conditions, meaning that the turning movement ratios would not change substantially in the future except for where project options change the roadway network. For options that change the local roadway network, turning movement ratios were adjusted to reflect the new travel patterns based on changes to local traffic volumes throughout the interchange area.

Forecasting Pedestrian Volumes

Future pedestrian volumes were forecasted based on the North Link Final SEIS Addendum: Technical Memorandum on Traffic Operations Analysis and Construction Transportation Analysis (Sound Transit 2010a). This forecast includes pedestrian activity related to the Husky Stadium light rail station.

How were local traffic operations analyzed?

Traffic operations analyses were performed at intersections where the total approaching traffic is forecasted to increase by 5 percent or more for the Preferred Alternative compared to the No Build Alternative. The forecasts for the Preferred Alternative indicated that traffic volumes changed less than 1 percent with the Preferred Alternative at several intersections analyzed for the SDEIS. The intersections located in the following interchange areas were not analyzed for the Final EIS: SR 520/I-5/East Roanoke Street, I-5/NE 45th Street, I-5/Mercer Street, and I-5/Stewart Street.

The forecasted year 2030 traffic volumes were input into a model that analyzed intersection operations. Project engineers studied traffic operations at each ramp terminal intersection in the study area.

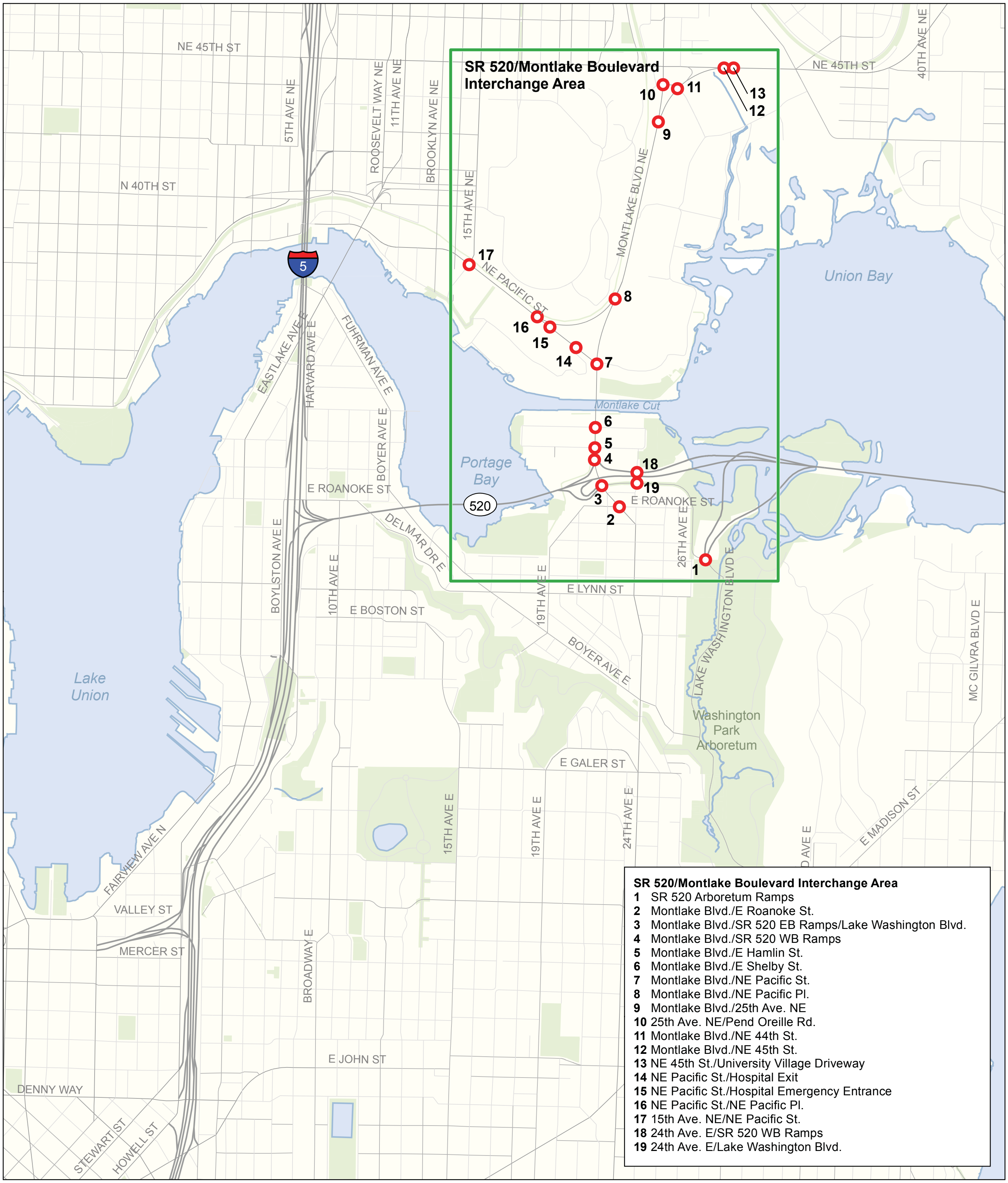
Exhibit 4-7 shows the interchange areas and intersections that were included in the traffic analysis for the Final EIS. The engineers also studied intersections adjacent to the ramp terminal intersections that would be affected by the project alternatives.

Current local street traffic operations were analyzed to provide a point of comparison to estimated future operations. The analysis results will enable local jurisdictions to know if, and to what degree, each alternative would meet their established standards for traffic operations.

A traffic modeling software package called Synchro was used to analyze local street traffic operations. Intersection operations were also evaluated because intersections control the capacity of the local street network. The evaluation used the forecasted traffic volumes during peak commute periods (specifically morning and late afternoon) for conditions in the base year (2008) and the design year (2030). Peak-hour traffic volumes were collected from the City of Seattle. WSDOT conducted traffic counts for those areas where traffic volume data were not readily available.

Traffic conditions for street systems are typically measured for a single peak hour during the longer morning and afternoon weekday commute peak periods. During the morning commute period, traffic volumes in the study area generally peak from 7:15 to 8:15 a.m.; during the afternoon commute period they peak from 5:00 to 6:00 p.m. Peak-hour local traffic volumes were compared with peak-hour freeway ramp volumes to ensure that the operations analysis included data that would represent the most conservative conditions (when both local street and freeway ramp volumes are at their highest).

The analysis of existing intersection operations used current signal timing and phasing information obtained from local jurisdictions. All operational analyses for future conditions used optimized signal and network settings (except phasing) to provide a similar comparison of operations for the alternatives. Signal phasing was also revised and optimized at a few freeway ramp intersections to improve operations. Intersection level of service was used to compare traffic operations between the No Build Alternative and the Preferred Alternative. At locations where the operations fell to LOS F, critical volume-to-capacity (V/C) ratios and queue spillback locations were used to compare traffic operations between the alternatives. LOS, V/C ratio, and queue spillback are defined and described below.



SR 520/Montlake Boulevard Interchange Area

1 SR 520 Arboretum Ramps
2 Montlake Blvd./E Roanoke St.
3 Montlake Blvd./SR 520 EB Ramps/Lake Washington Blvd.
4 Montlake Blvd./SR 520 WB Ramps
5 Montlake Blvd./E Hamlin St.
6 Montlake Blvd./E Shelby St.
7 Montlake Blvd./NE Pacific St.
8 Montlake Blvd./NE Pacific Pl.
9 Montlake Blvd./25th Ave. NE
10 25th Ave. NE/Pend Oreille Rd.
11 Montlake Blvd./NE 44th St.
12 Montlake Blvd./NE 45th St.
13 NE 45th St./University Village Driveway
14 NE Pacific St./Hospital Exit
15 NE Pacific St./Hospital Emergency Entrance
16 NE Pacific St./NE Pacific Pl.
17 15th Ave. NE/NE Pacific St.
18 24th Ave. E/SR 520 WB Ramps
19 24th Ave. E/Lake Washington Blvd.

Source: King County (2008) GIS Data (Streams, Streets and Waterbodies) and CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 4-7. **Interchange Areas and Intersections Included in the Local Operations Analysis**

Using the Level-of-service Rating

The LOS scale rates the quality of traffic operations on a given transportation facility. This rating scale uses letter grades A through F (Exhibit 4-8). The letter grades are based on the levels of delay that drivers experience at an intersection, with the letter A representing the least-delayed conditions and the letter F representing the most delayed.

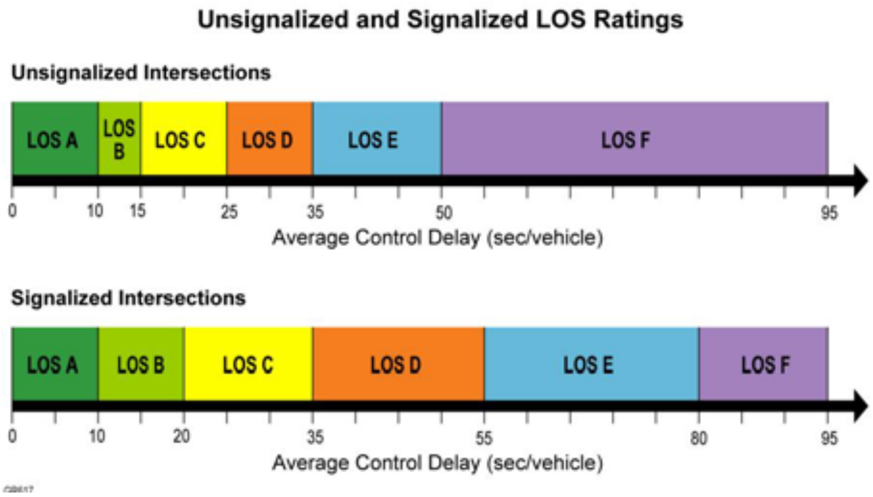


Exhibit 4-8. **Delay Ranges Associated with LOS Rating**

For intersections controlled by signals and all-way stops, LOS represents an average delay for the entire intersection. LOS is what is reported for the SR 520 local traffic analysis.

For two-way, stop-controlled intersections, LOS is typically reported for the most delayed leg of the intersection. For this report, the overall intersection LOS is reported for all unsignalized intersections, regardless of the type of intersection (four-way, two-way, or uncontrolled ramp termini where left turns yield to oncoming traffic). For two-way, stop-controlled, and uncontrolled yield intersections, Synchro provides an average delay (in seconds per vehicle) for the overall intersection, and a letter LOS only for the approach that must either stop or yield. The average intersection delay range (Exhibit 4-8) was used to apply an overall intersection LOS and provide a relative comparison between stop or yield intersections and other types of intersections (signalized, all-way, and stop-controlled).

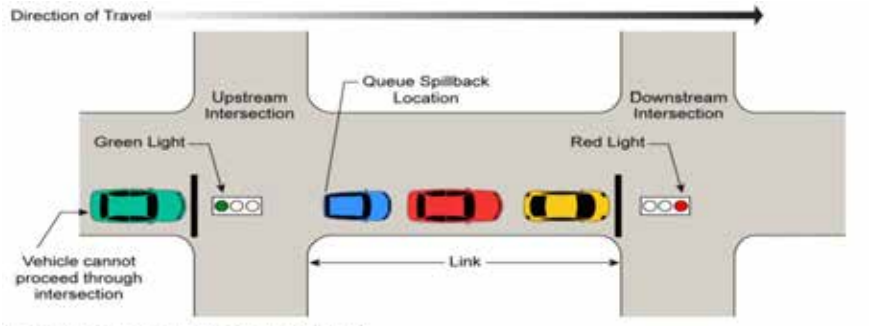
Comparing the Volume-to-capacity Ratio

The V/C ratio compares the amount of traffic on a roadway (traffic volume) to the roadway's available capacity. If the V/C ratio is greater than 1.0, it means that the traffic volumes exceed the roadway capacity. Conversely, if the V/C ratio is less than 1.0, it means the roadway is carrying less than its full capacity. For instance, a V/C ratio of 1.07 means that traffic volumes exceed the roadway capacity by 7 percent.

At intersections, the capacity of a single lane depends on its physical layout (width, uphill/downhill grade, etc.) as well as the type and duration of traffic control (stop sign, signal, cycle length, and other factors). For instance, the longer a signal is set for green in a given intersection, the more vehicles can move through the intersection and thus the greater its capacity.

Identifying the Queue Spillback

A queue spillback occurs in an area where vehicles cannot proceed through an intersection because vehicles ahead are backed up from the next intersection. As shown in Exhibit 4-9, the location at which a vehicle is blocked from moving through an intersection is referred to as the queue spillback location. Queue spillback also happens when vehicles exiting via off-ramps back onto the freeway. This latter type of queue spillback was identified on this project.



Source: Based on Synchro User Guide, Version 610, Trafficware Company, Albany, CA

Exhibit 4-9. **Queue Spillback Location**

How were transit operations analyzed?

Transit operations through the Montlake interchange area were analyzed using the VISSIM software program—a micro-simulation packaged developed by PTV. This program was used to simulate traffic operations on SR 520 as well as Montlake Boulevard between NE Pacific Place to the north and East Roanoke Street to the south. The model also included NE Pacific Street between NE Pacific Place and Montlake Boulevard.

Transit operations were analyzed by measuring travel time differences between existing conditions and the No Build and Preferred Alternatives. The analysis examined conditions through the Montlake interchange during the peak hour (5:00 to 6:00 p.m.) and the off-peak hour (3:00 to 4:00 p.m.). The off-peak period included a simulated 5-minute bridge opening that prevented vehicles from crossing the Montlake Bridge. The opening was simulated at 3:25 p.m., which is the latest time the bridge can open.

Chapter 5—Freeway Volumes and Operations

What is in this chapter?

This chapter presents WSDOT's findings for the Final EIS freeway analysis. It describes freeway traffic volumes and operations on the SR 520 freeway main line and ramps during morning (AM) and afternoon (PM) peak (highest use) periods. The chapter also discusses the results of the freeway traffic volume forecasts and operations analysis of the No Build Alternative and the Preferred (Build) Alternative.

Did you know?

Freeway traffic volume refers to how many vehicles and/or people use or would like to use a freeway.

Freeway traffic operation refers to how traffic is moving or flowing, and is discussed in terms of speeds, travel times, and congestion.

What is traffic currently like on SR 520?

The existing configuration of SR 520 does not meet current WSDOT design guidelines, which affects the freeway's capacity to provide reliable and safe travel for buses and carpools (HOV) and general-purpose traffic. Roadway capacity in the SR 520 corridor is constrained by:

- Narrow shoulders and lanes on the corridor and across the bridge
- Short acceleration lane lengths at the SR 520/Montlake interchange and Lake Washington Boulevard on-ramps
- Poor sight distance at roadway curves, resulting in slower speeds

These constraints, coupled with high traffic volumes on SR 520, result in regular congestion at the following locations:

- Westbound approaching the floating bridge (near the HOV lane termination in Medina)
- Westbound on the Portage Bay Bridge between I-5 and the SR 520/Montlake interchange
- Eastbound approaching the west approach span of the Evergreen Point Bridge

Did you know?

Reliability is defined by how travel times vary over time. On any given day, unusual circumstances such as crashes can dramatically change the performance of the roadway, affecting both travel speeds and throughput volumes. Commuters who take congested highways to and from work are well aware of this. When asked about their commute they will say, "It takes me 45 minutes on a good day, but an hour and 15 minutes on a bad day."

Unreliable traffic conditions affect how and when people choose to travel. For example, if a road is known to have highly variable traffic conditions, a traveler using that road to catch an airplane routinely leaves "extra" time to get to the airport. In other words, the "reliability" of this traveler's trip is directly related to the variability in the performance of the route he or she takes.

Reliability, or the ability to predict trip travel time with some certainty, is important. If a commuter has a routine activity that must occur every day—such as picking up children from day care—he or she must plan an extra amount of trip time just to prevent a late arrival. The same goes for local trucking firms engaged in pickup and delivery of goods.

Several bottlenecks along the I-5 and I-405 corridors limit the amount of traffic that can access SR 520. In Seattle, these areas include northbound and southbound I-5 across the Ship Canal Bridge and through downtown Seattle. The capacity of the I-405/SR 520 interchange and I-405 main line through downtown Bellevue also limits the amount of traffic that can enter or exit the SR 520 corridor. Traffic volumes and congestion at these locations are discussed in more detail later in this chapter.

What are the current safety concerns along SR 520?

WSDOT evaluated historical crash data for the entire SR 520 corridor, including the main line and ramps, to identify safety concerns. Crash data were obtained for a recent 3 full years of data (January 2006 through December 2008). Crash data provide information about the frequency, severity, and type of crashes for a given section of the corridor. This section summarizes the crash data for the SR 520, I-5 to Medina study area.

SR 520 Main Line

Exhibit 5-1 shows eastbound and westbound crash rates, including the nature of the crash, along the SR 520 main line between I-5 and Medina. The highest crash rates from the project analysis were between I-5 and the 24th Avenue East overcrossing of SR 520 (in both directions). This section of SR 520 had higher crash rates than the SR 520 corridor average of 1.11 crashes/ mvmt in both the eastbound and westbound directions. This result is likely due to the congested conditions because 83 percent of the eastbound crashes and 86 percent of the westbound crashes are related to congestion (rear-end and side-swipe incidents) along this section.

Fixed-object crashes can result from drivers losing control because of roadway conditions or excessive speed, the proximity of roadside barriers to moving traffic, narrow shoulders, and the avoidance of other traffic. Roadside barriers help to avert more serious crashes and injuries. The placement of roadside barriers close to the roadway is necessary due to the limited width of the SR 520 corridor.

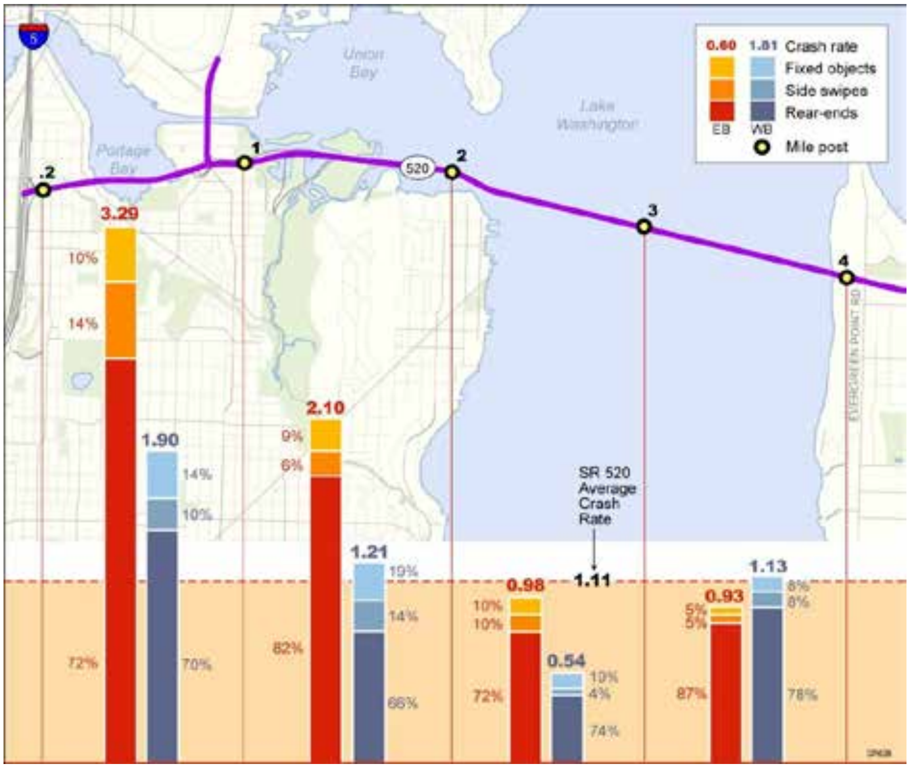


Exhibit 5-1. **Distribution and Type of Eastbound and Westbound Crash Rates along SR 520**

SR 520 crashes are attributed to traffic congestion and narrow roadway design. In most cases, safety could be improved by improving traffic flow and designing the freeway to meet current state and federal standards. In many cases, improved design could reduce the potential for crashes along the SR 520 main line and ramps. This is especially true in areas where current design limitations could be updated to improve the roadway and/or reduce areas of severe congestion through a more efficient design.

SR 520 Ramps

WSDOT also reviewed crash data for the interchange ramps between I-5 and Evergreen Point Road/76th Avenue NE. Several ramps with higher concentrations of crashes are discussed below.

SR 520 Eastbound Off-Ramp to Montlake Boulevard

Of the 11 crashes that occurred on this off-ramp in a 3-year period, 55 percent were intersection-related (versus ramp-related). These crashes occurred at the off-ramp intersection with Montlake Boulevard, including two accidents involving pedestrians.

SR 520 Eastbound On-Ramp from Montlake Boulevard

Twenty-seven crashes occurred on this on-ramp in a 3-year period. The majority of the rear-end crashes (64 percent) occurred at the beginning of the ramp where traffic from both directions of Montlake Boulevard merges. Possible causes include congestion, inadequate signing, driver inattention, and/or driver expectancy.

SR 520 Eastbound On-Ramp from Lake Washington Boulevard

Fourteen crashes occurred on this on-ramp from 2006 to 2008, of which 29 percent were rear-end crashes and 64 percent were fixed-object crashes. The majority of the fixed-object crashes (78 percent) occurred in the curve near the merge end of the ramp. Possible contributing circumstances for these fixed-object crashes are roadway design (super-elevation, shoulder width, signing, etc.), pavement condition, and/or driver inattention.

SR 520 Westbound Off-Ramp to Lake Washington Boulevard

All of the 12 crashes occurring on this off-ramp were fixed-object crashes, and 92 percent of those occurred on wet pavement. The majority of the crashes on this ramp (67 percent) occurred in the sharp horizontal curve at milepost 0.2. Possible contributing circumstances for these fixed-object crashes are roadway design (super-elevation, drainage, shoulder width, signing, etc.), pavement condition, and/or driver inattention.

SR 520 Westbound On-Ramp from Montlake Boulevard

Twenty-three crashes occurred on this on-ramp from 2006 to 2008, of which 87 percent were rear-end and 13 percent were fixed-object accidents. The majority of the rear-end crashes (75 percent) occurred after the merge point with the SR 520 main line, which is indicative of issues likely caused by the short merge distance, the congested mainline conditions, or a combination of both.

What are the safety benefits of this project?

This project will improve the ramp designs in the SR 520 study area to current design guidelines, which will result in improvements to current safety issues.

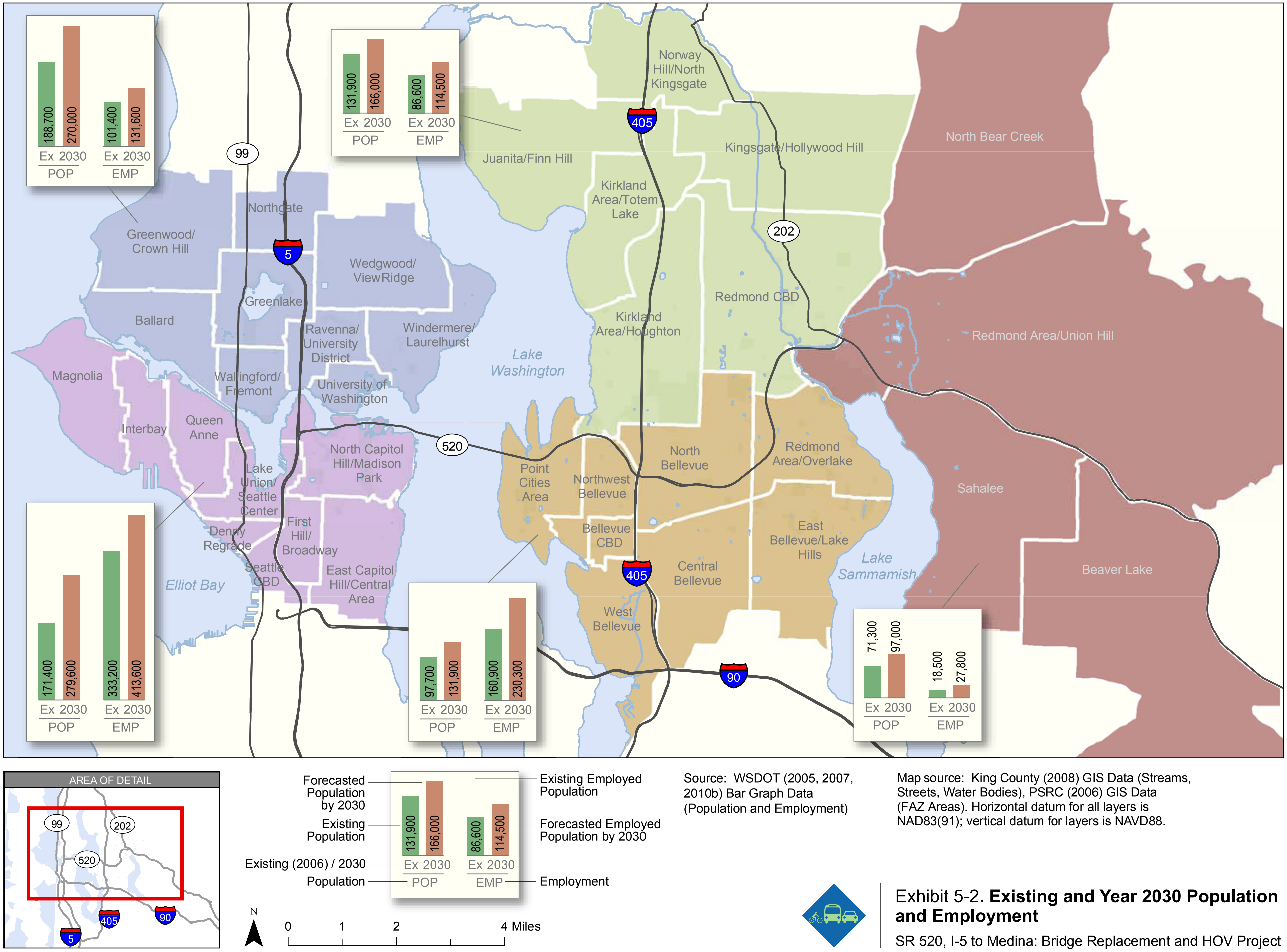
The main safety benefits of this project are summarized below. The improved traffic flow and reduced congestion may have other minor benefits as well.

- A decrease in overall crash frequencies and crash rates as a result of widening the roadway and improving traffic operations
- A decrease in fixed-object crashes as a result of widened shoulders, which will provide increased recovery area for errant vehicles
- A decrease in some ramp crashes as a result of improved designs that more closely meet current design guidelines

How are population and employment expected to change by the year 2030?

Between today and the year 2030, the population of the region will grow by 1 million people, add over 640,000 new jobs, and need to accommodate close to 40 percent more traffic (PSRC 2006). Exhibit 5-2 shows the projected population and employment growth for selected Seattle and Eastside areas. Both Eastside and Seattle forecasts are shown because regional travel patterns, including traffic across SR 520, are influenced by population and employment changes on both sides of Lake Washington.

The largest increases in population and employment in Seattle are forecasted in the South Lake Union, Denny Regrade/Triangle, and downtown Seattle areas. The largest forecasted increases on the Eastside are downtown Redmond, the Redmond/Overlake area, downtown Bellevue, and the Beaver Lake area.



Source: WSDOT (2005, 2007, 2010b) Bar Graph Data (Population and Employment)

Map source: King County (2008) GIS Data (Streams, Streets, Water Bodies), PSRC (2006) GIS Data (FAZ Areas). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 5-2. **Existing and Year 2030 Population and Employment**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

\\simba\proj\Parametrix\180171\GRAPHICS\x_FEIS_Westside\TRAN\FEIS_DR_TRAN_Ex05-02_GR555_ForecastGrthPop-Emp_5apr11.ai

How would cross-lake travel change?

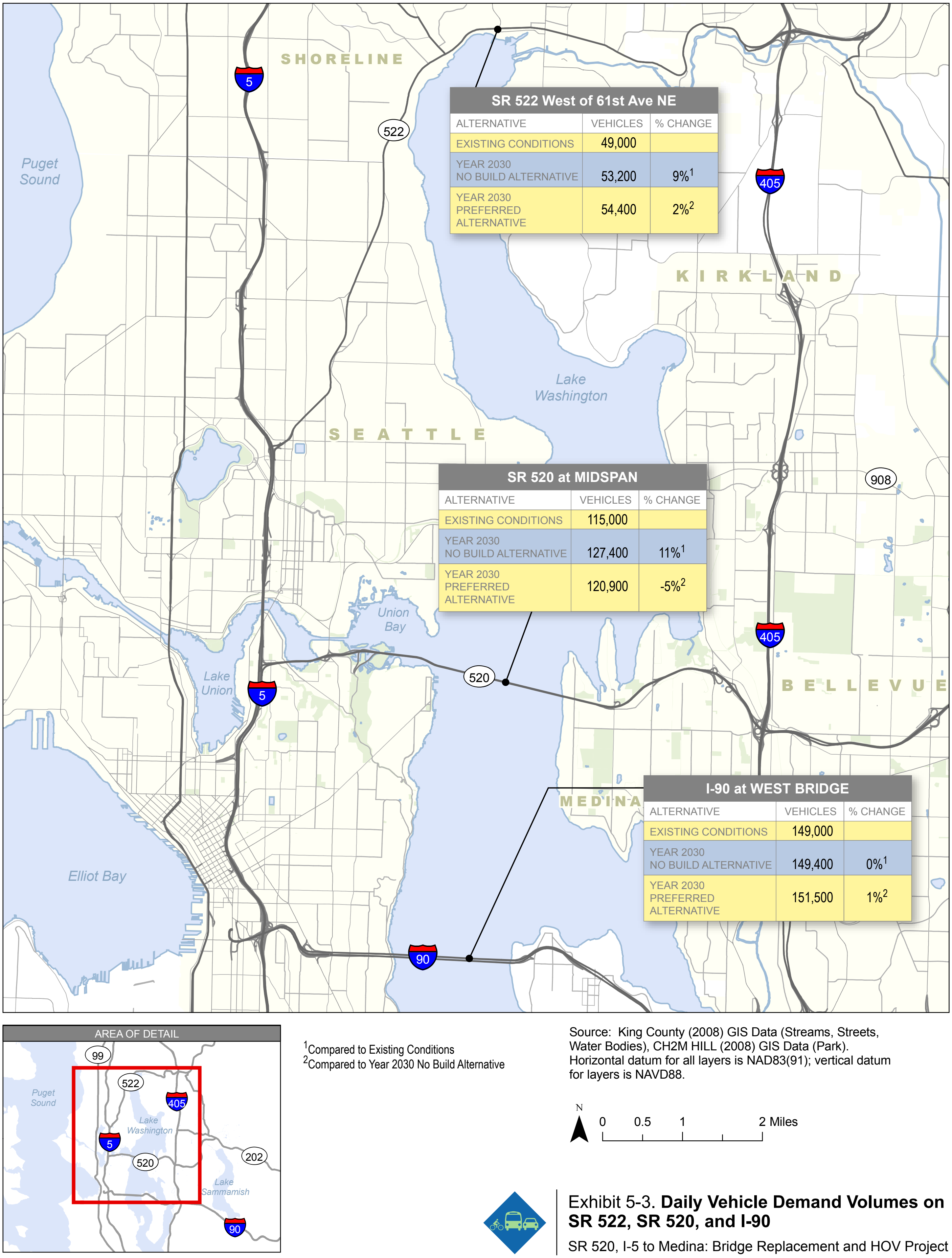
Daily Travel

With the forecasted increases in population and employment, traffic volumes would also increase on major transportation facilities. Exhibit 5-3 shows the forecasted changes in daily vehicle demand volumes on SR 522, SR 520, and I-90 for the No Build Alternative and the Preferred Alternative. Person demand at all cross-lake roadways would increase substantially more than vehicle demand, indicating a growth in HOV travel (carpools and buses) in the year 2030 compared to today. Year 2030 forecasts assume HOV occupancy of 3 or more persons.

With the Preferred Alternative, daily vehicle demand on SR 520 would decrease 5 percent, SR 522 would increase 2 percent, and I-90 would increase 1 percent compared to the No Build Alternative. Traffic demand on SR 520 would primarily decrease during the off-peak periods when alternative routes are less congested, making drivers more likely to use those routes to avoid a toll.

Exhibit 5-4 provides more detail regarding changes in daily vehicle and person demand by mode across the Evergreen Point Bridge for both the No Build Alternative and the Preferred Alternative.

With the Preferred Alternative, the person demand for HOV (carpool and bus) would increase by approximately 19,000 (39 percent) compared to the No Build Alternative. General-purpose vehicle demand would decrease approximately 11,000 vehicles per day (10 percent) for the Preferred Alternative compared to the No Build Alternative. This decrease would occur because the toll, improved HOV reliability, and reduced HOV travel times would increase the incentive to carpool or take the bus.



SR 522 West of 61st Ave NE

ALTERNATIVE	VEHICLES	% CHANGE
EXISTING CONDITIONS	49,000	
YEAR 2030 NO BUILD ALTERNATIVE	53,200	9%[1]
YEAR 2030 PREFERRED ALTERNATIVE	54,400	2%[2]

SR 520 at MIDSPAN

ALTERNATIVE	VEHICLES	% CHANGE
EXISTING CONDITIONS	115,000	
YEAR 2030 NO BUILD ALTERNATIVE	127,400	11%[1]
YEAR 2030 PREFERRED ALTERNATIVE	120,900	-5%[2]

I-90 at WEST BRIDGE

ALTERNATIVE	VEHICLES	% CHANGE
EXISTING CONDITIONS	149,000	
YEAR 2030 NO BUILD ALTERNATIVE	149,400	0%[1]
YEAR 2030 PREFERRED ALTERNATIVE	151,500	1%[2]

[1] Compared to Existing Conditions
[2] Compared to Year 2030 No Build Alternative

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

N 0 0.5 1 2 Miles

Exhibit 5-3. **Daily Vehicle Demand Volumes on SR 522, SR 520, and I-90**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

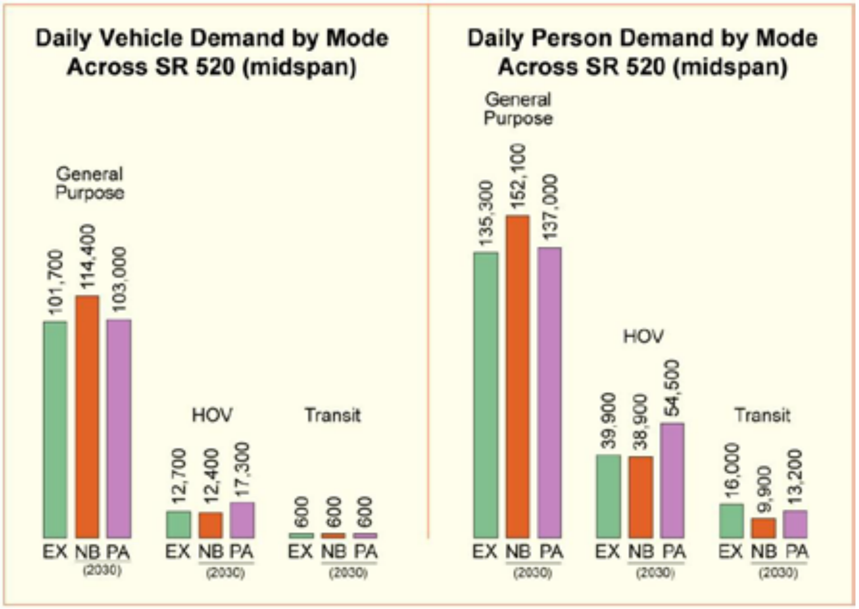
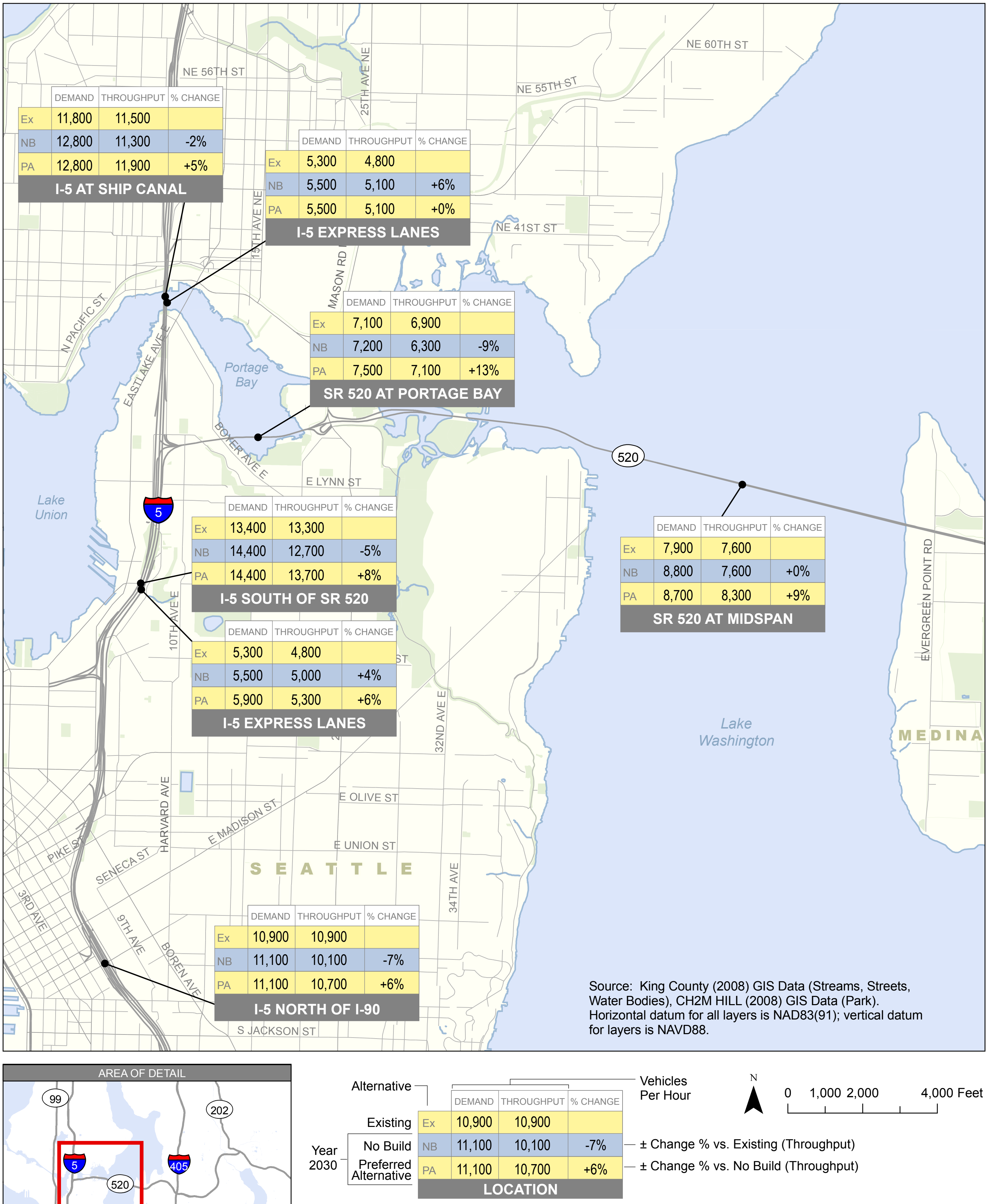


Exhibit 5-4. **Daily Vehicle and Person Demand by Mode across SR 520 (midspan)**

Peak Period Travel

In the year 2030 (No Build Alternative), peak period traffic demand would increase compared to today on SR 520 by 11 percent in the morning and 9 percent in the evening. In the morning, however, due to existing congestion on the SR 520 corridor and I-5 or I-405, no additional trips would be served. This means that the increase in traffic would add to existing congestion. In the evening, about half of the increase in cross-lake traffic would be served (4 percent increase in throughput, 9 percent increase in demand).

During the morning and afternoon commute periods, total vehicle trip demand across SR 520 (eastbound and westbound combined) in the year 2030 for the Preferred Alternative would be similar to the No Build Alternative (within 1 percent). Total traffic demand volumes would be similar with the Preferred Alternative during peak periods because congestion on the other two primary cross-lake routes (SR 522 and I-90) would make drivers just as likely to choose SR 520, especially if it is the most direct route. Vehicle trip demand and throughput for the morning and afternoon commutes are shown on Exhibits 5-5, 5-6, and 5-7.



I-5 AT SHIP CANAL

	DEMAND	THROUGHPUT	% CHANGE
Ex	11,800	11,500	
NB	12,800	11,300	-2%
PA	12,800	11,900	+5%

I-5 EXPRESS LANES

	DEMAND	THROUGHPUT	% CHANGE
Ex	5,300	4,800	
NB	5,500	5,100	+6%
PA	5,500	5,100	+0%

SR 520 AT PORTAGE BAY

	DEMAND	THROUGHPUT	% CHANGE
Ex	7,100	6,900	
NB	7,200	6,300	-9%
PA	7,500	7,100	+13%

I-5 SOUTH OF SR 520

	DEMAND	THROUGHPUT	% CHANGE
Ex	13,400	13,300	
NB	14,400	12,700	-5%
PA	14,400	13,700	+8%

SR 520 AT MIDSPAN

	DEMAND	THROUGHPUT	% CHANGE
Ex	7,900	7,600	
NB	8,800	7,600	+0%
PA	8,700	8,300	+9%

I-5 EXPRESS LANES

	DEMAND	THROUGHPUT	% CHANGE
Ex	5,300	4,800	
NB	5,500	5,000	+4%
PA	5,900	5,300	+6%

I-5 NORTH OF I-90

	DEMAND	THROUGHPUT	% CHANGE
Ex	10,900	10,900	
NB	11,100	10,100	-7%
PA	11,100	10,700	+6%

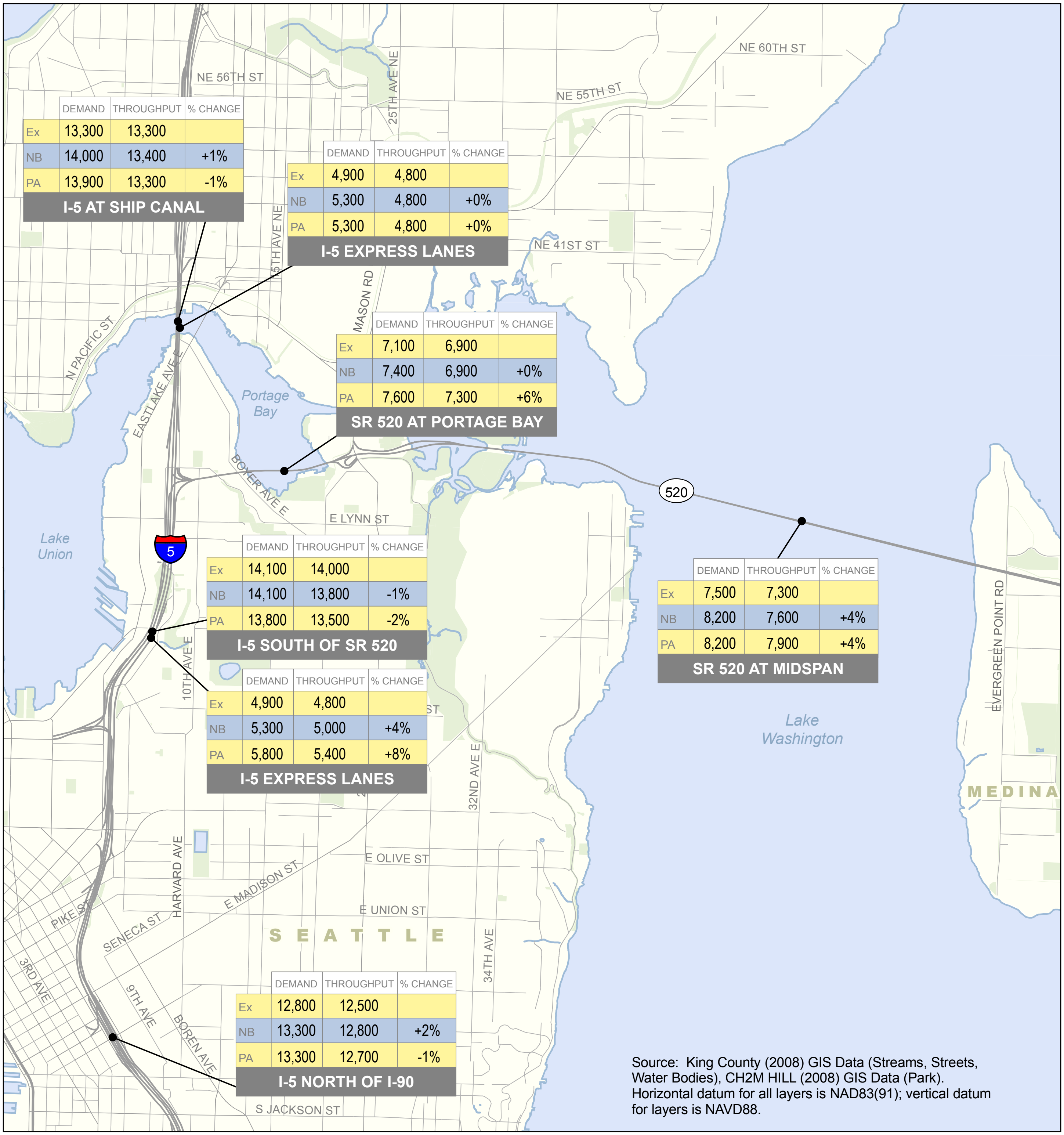
Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

LOCATION

	DEMAND	THROUGHPUT	% CHANGE
Ex	10,900	10,900	
NB	11,100	10,100	-7%
PA	11,100	10,700	+6%

Exhibit 5-5. **Vehicle Trip Demand and Throughput – SR 520 and I-5 during the AM Peak Period**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project



I-5 AT SHIP CANAL

	DEMAND	THROUGHPUT	% CHANGE
Ex	13,300	13,300	
NB	14,000	13,400	+1%
PA	13,900	13,300	-1%

I-5 EXPRESS LANES

	DEMAND	THROUGHPUT	% CHANGE
Ex	4,900	4,800	
NB	5,300	4,800	+0%
PA	5,300	4,800	+0%

SR 520 AT PORTAGE BAY

	DEMAND	THROUGHPUT	% CHANGE
Ex	7,100	6,900	
NB	7,400	6,900	+0%
PA	7,600	7,300	+6%

I-5 SOUTH OF SR 520

	DEMAND	THROUGHPUT	% CHANGE
Ex	14,100	14,000	
NB	14,100	13,800	-1%
PA	13,800	13,500	-2%

SR 520 AT MIDSPAN

	DEMAND	THROUGHPUT	% CHANGE
Ex	7,500	7,300	
NB	8,200	7,600	+4%
PA	8,200	7,900	+4%

I-5 EXPRESS LANES

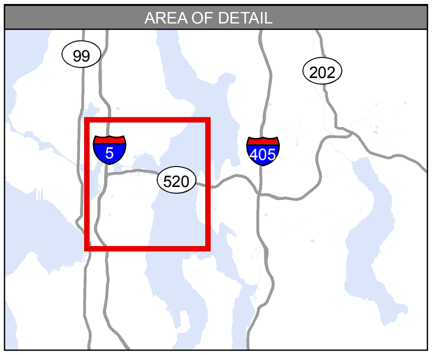
	DEMAND	THROUGHPUT	% CHANGE
Ex	4,900	4,800	
NB	5,300	5,000	+4%
PA	5,800	5,400	+8%

I-5 NORTH OF I-90

	DEMAND	THROUGHPUT	% CHANGE
Ex	12,800	12,500	
NB	13,300	12,800	+2%
PA	13,300	12,700	-1%

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

AREA OF DETAIL



Alternative — Vehicles Per Hour

		DEMAND	THROUGHPUT	% CHANGE	
Existing	Ex	13,300	13,300		
Year 2030 No Build	NB	14,000	13,400	+1%	± Change % vs. Existing (Throughput)
Year 2030 Preferred Alternative	PA	13,900	13,300	-1%	± Change % vs. No Build (Throughput)
	LOCATION				

N

0 1,000 2,000 4,000 Feet

Exhibit 5-6. **Vehicle Trip Demand and Throughput – SR 520 and I-5 during the PM Peak Period**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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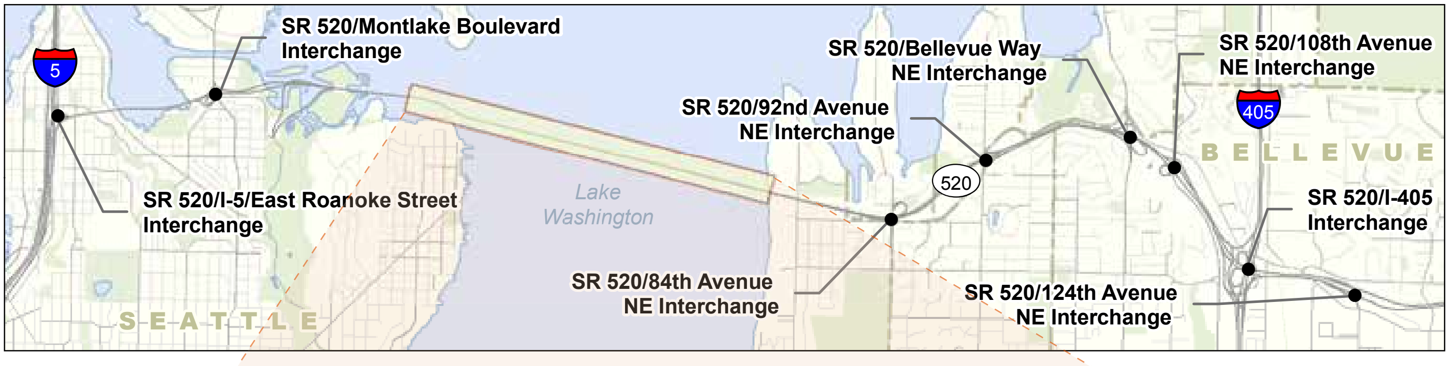

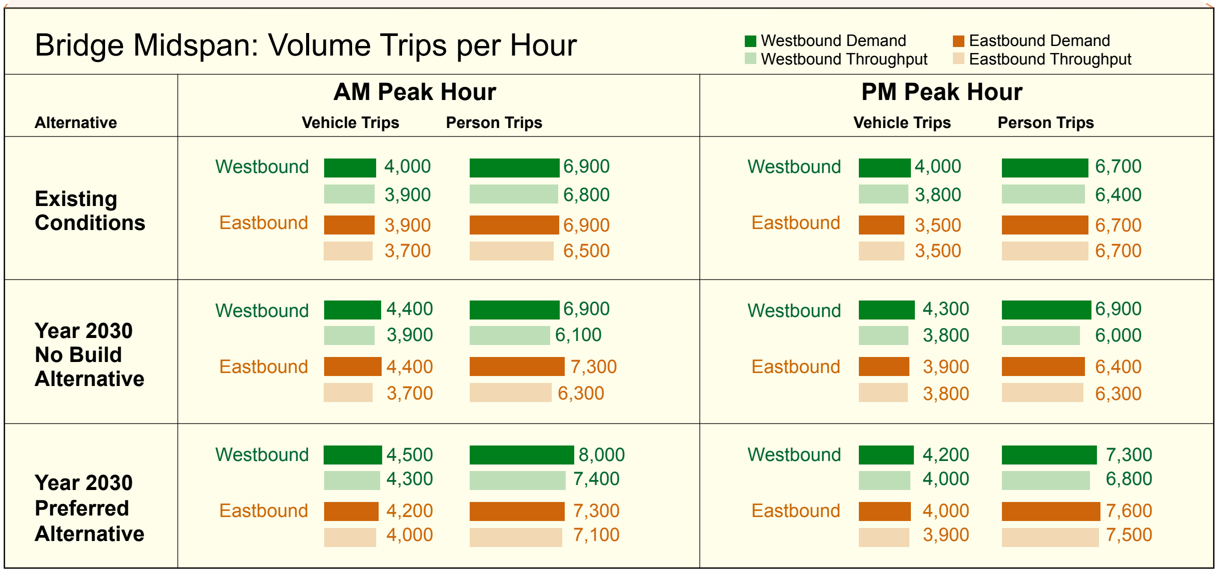

Bridge Midspan: Volume Trips per Hour

🟩 Westbound Demand
🟩 Westbound Throughput
🟧 Eastbound Demand
🟧 Eastbound Throughput

Alternative		AM Peak Hour Vehicle Trips	AM Peak Hour Person Trips	PM Peak Hour Vehicle Trips	PM Peak Hour Person Trips
Existing Conditions	Westbound	4,000	6,900	4,000	6,700
		3,900	6,800	3,800	6,400
	Eastbound	3,900	6,900	3,500	6,700
		3,700	6,500	3,500	6,700
Year 2030 No Build Alternative	Westbound	4,400	6,900	4,300	6,900
		3,900	6,100	3,800	6,000
	Eastbound	4,400	7,300	3,900	6,400
		3,700	6,300	3,800	6,300
Year 2030 Preferred Alternative	Westbound	4,500	8,000	4,200	7,300
		4,300	7,400	4,000	6,800
	Eastbound	4,200	7,300	4,000	7,600
		4,000	7,100	3,900	7,500

N
0 0.5 1 Miles

Map Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 5-7. **Vehicle and Person Trip Demand and Throughput – SR 520 Cross-lake during the AM and PM Peak Periods**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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However, with the Preferred Alternative, the following changes in travel would occur:

- Less people would be stuck in congestion on SR 520 (similar demand, but higher throughput with the Preferred Alternative)
- More people would be traveling in higher occupancy modes, such as HOV 3+ or transit (less general-purpose trips)

As more people travel in higher modes such as HOV 3+ and transit, the Preferred Alternative can have similar total vehicle trips while serving more persons than the No Build Alternative. The Preferred Alternative serves 15 to 17 percent more persons than the No Build Alternative in the morning and evening peak periods, respectively, and serves 5 to 10 percent more vehicles. This increase would occur because the Preferred Alternative includes additional HOV capacity from Medina to I-5; moreover, by providing an HOV lane, the general-purpose lanes also operate with less congestion.

Effects on I-5

By reducing congestion or bottlenecks on SR 520 with the construction of the Preferred Alternative, as well as improving throughput, I-5 would operate differently as described in the following paragraphs.

In the morning, the year 2030 No Build Alternative would exhibit substantial congestion from the Montlake area on SR 520 back onto mainline I-5. As a result of the SR 520 congestion, on I-5 northbound between I-90 and SR 520 congestion would be present for over 3 hours of the morning commute with the No Build Alternative. Travel time from Seattle to Bellevue would be over 44 minutes at the peak of the commute.

Improvements made to the SR 520 corridor as part of the Preferred Alternative would result in near free-flow conditions on I-5 northbound during the morning. Travel times for this same trip between Seattle and Bellevue would be improved to 11 minutes—a savings of 33 minutes compared with the No Build Alternative.

Under the No Build Alternative, in the afternoon I-5 southbound is congested through downtown Seattle from the SR 520 interchange area to the I-90 collector-distributor roadway. Travel time from Bellevue to Seattle is up to 41 minutes during the worst congestion.

With the congestion relief on SR 520 provided by the Preferred Alternative, up to 200 vph more would be served on I-5 southbound. A 200-vph increase on I-5 is an increase in volume of about 3 percent in the downtown Seattle area. Because this section of roadway is operating at capacity today, this increase in trips would result in some increase in congestion on I-5 southbound with congestion lasting an hour longer than under the No Build Alternative. However, with the improvements to the SR 520 corridor, the travel time between Bellevue and Seattle would still improve to 28 minutes during the peak of the evening commute with the Preferred Alternative. This is a 13-minute improvement compared to the No Build Alternative.

This analysis assumes that by the year 2030, light rail would be constructed on I-90. Transit trips for the year 2030 No Build Alternative would decrease along SR 520 compared to today as riders shift to rail. When the SR 520, I-5 to Medina project is completed, some of these transit riders would shift back to the corridor to use the improved HOV system.

Did you know?

WSDOT's Traffic System Management Center (TSMC) collects traffic volume data along the state highways that can be used to create speed-flow diagrams (congestion diagrams) to visually determine areas of congestion. These surface plots, similar to a topographical map, plot average vehicle speeds against time and space and create speed contour plots.

These plots help engineers determine the intensity, duration, and length (queue) of congestion throughout the day. The SR 520 transportation team worked with WSDOT's NW Region traffic engineers to develop these diagrams. These speed-flow diagrams show that congestion occurs on SR 520, I-5, and I-405 for several hours each day at a number of locations.

How would westbound SR 520 operate during the morning commute?

Without the project, the SR 520 westbound general-purpose lanes would continue to be congested approaching Lake Washington and the end of the HOV lane. With the SR 520, I-5 to Medina project, this congestion would be substantially reduced because the HOV lanes would be completed across the bridge to the I-5 express lanes. As a result, vehicle and person throughput across the Evergreen Point Bridge would increase.

Volumes and Mode Share

As shown in Exhibit 5-8, the Preferred Alternative would serve up to approximately 1,300 more people than the No Build Alternative (a 20 percent increase) in only 400 more vehicles (a 9 percent increase). With both the No Build Alternative and Preferred Alternative, not all the forecasted traffic demand for SR 520 would be served because of congestion on I-5 and I-405.

Exhibit 5-8. **Westbound AM Vehicle and Person Trips**

The westbound HOV lane connection to the southbound I-5 express lanes in the morning would allow carpools and buses to bypass congestion on the I-5 main line. The SR 520 to I-5 express lane connection would serve 400 vph (transit and HOV), which equals approximately 2,000 persons per hour.

Congestion Points

WSDOT developed speed-flow diagrams using model output to provide a graphic representation of the congestion that would occur with and without the project. Exhibits 5-9 and 5-10 show where congestion would occur on the SR 520 corridor with the No Build Alternative and Preferred Alternative during the westbound morning commute. The worst of the congestion points shown in these diagrams (indicated by the red/orange areas) are discussed below, including a description of how the Preferred Alternative operates compared to the No Build Alternative.

Bridge Approach at the Eastern Lake Shore

As shown in Exhibit 5-9, today the most severe congestion on westbound SR 520 occurs between the east bridge approach, near the 84th Avenue NE on-ramp and the westbound HOV lane termination, and the SR 520/104th Avenue NE interchange area. This section of roadway remains congested for approximately 3-1/2 hours during the morning commute period, and limits the amount of traffic that can cross the bridge.

Did you know?

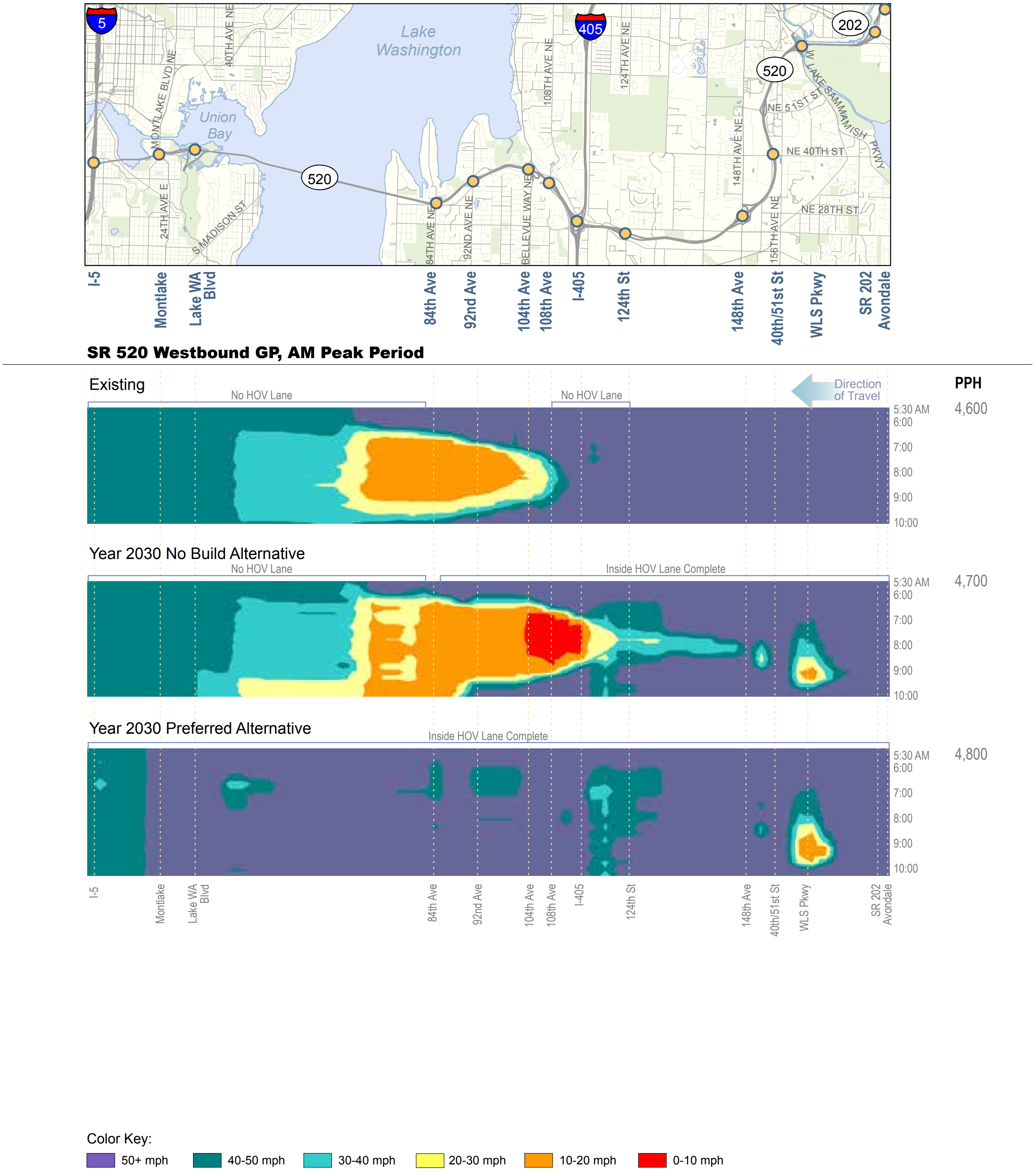
A travel time under 14 minutes indicates near free-flow speeds.

A travel time of 30 minutes indicates average speeds of 25 mph.

A travel time of over an hour indicates average speeds of less than 15 mph.

Congestion at the bridge approach would worsen in the year 2030 under the No Build Alternative with the increase in vehicle demand. Congestion would extend from I-405 to the lake shore and affect general-purpose operations. The No Build Alternative includes the SR 520, Medina to SR 202 project so the HOV lane would be moved to the inside. This configuration means the HOV trips would bypass this congestion and experience near free-flow conditions approaching the lake. After the HOV lane terminates, both general-purpose and HOV trips would experience some congestion across the lake.

With the Preferred Alternative, the westbound HOV lane would be extended across the Evergreen Point Bridge to I-5, eliminating congestion at this point for both HOV and general-purpose traffic.



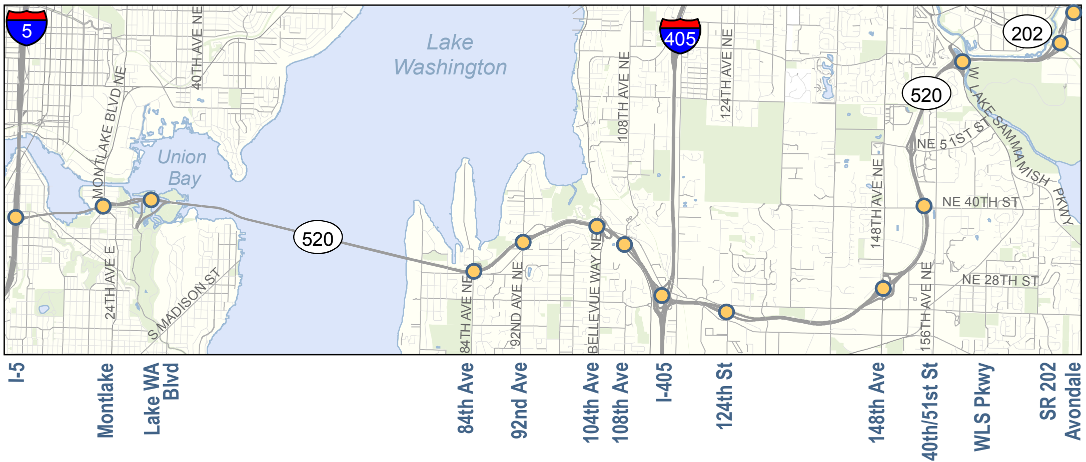
Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

N

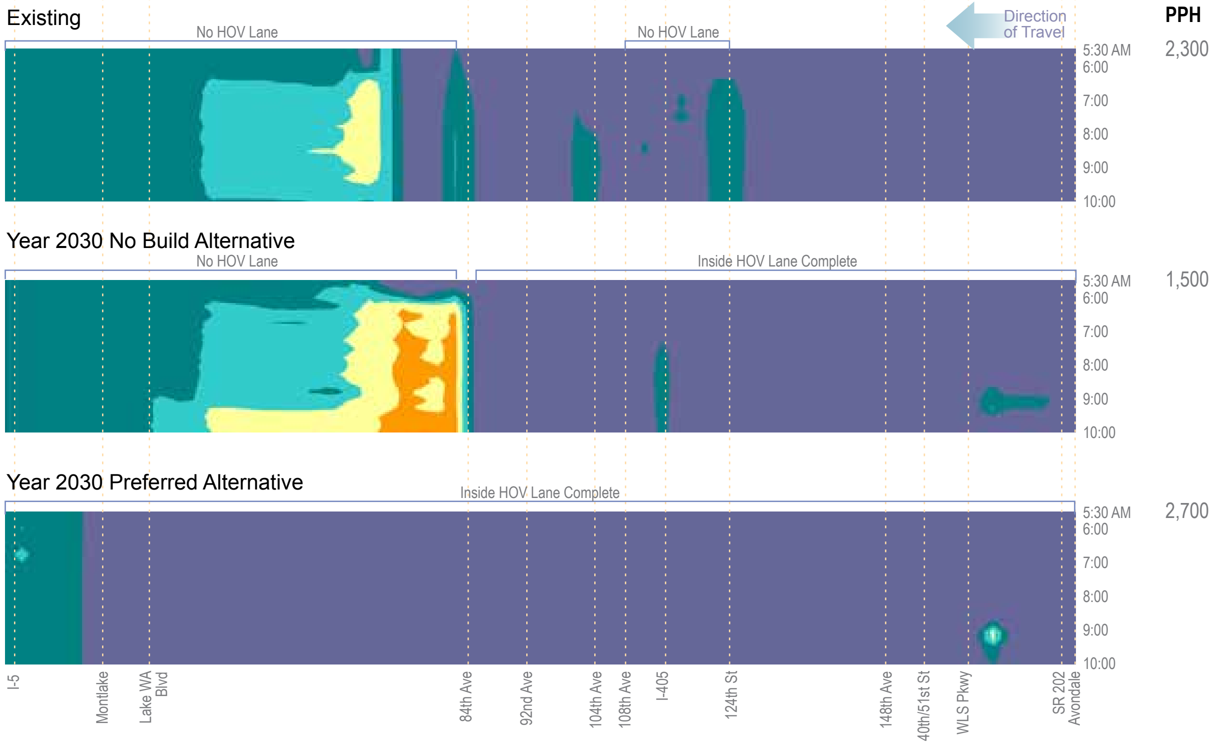
PPH = Persons per hour
(average during the peak period)

Exhibit 5-9. **General-Purpose Travel Speeds – Westbound SR 520 during the AM Peak Period**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project



SR 520 Westbound HOV, AM Peak Period



Color Key:

🟪 50+ mph 🟩 40-50 mph 🟦 30-40 mph 🟨 20-30 mph 🟧 10-20 mph 🟥 0-10 mph

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

PPH = Persons per hour
(average during the peak period)

Exhibit 5-10. **HOV Travel Speeds – Westbound SR 520 during the AM Peak Period**
SR 520, I-5 to Medina: Bridge Replacement and HOV Project

Travel Time and Speed

The average travel time between SR 202 and I-5 is currently 16 to 22 minutes during the westbound morning commute (averaging 40 to 50 mph) for both general-purpose and HOV traffic (Exhibit 5-11). The floating span and Portage Bay section of the Evergreen Point Bridge have little to no congestion during the westbound morning commute. HOV travel is slightly faster than general-purpose travel (up to 6 minutes savings in travel time).

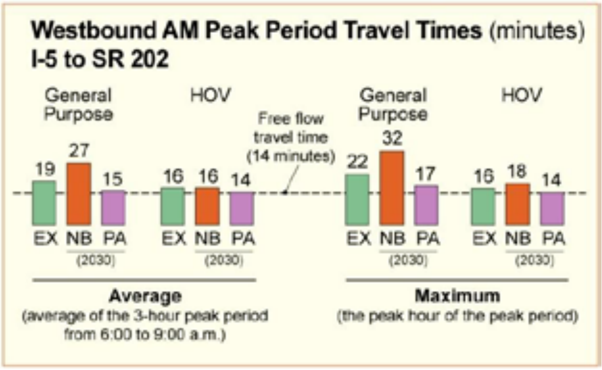


Exhibit 5-11. **Travel Time by Mode – Westbound SR 520 during the AM Peak Period**

As shown in Exhibit 5-11, travel times would increase under the No Build Alternative by the year 2030 for both general-purpose and HOV traffic. Travel time for general-purpose trips would increase to 27 minutes with a peak travel time of 32 minutes from SR 202 to I-5. Travel time for HOV trips would be about 10 minutes faster than general-purpose trips.

With the Preferred Alternative, general-purpose and HOV average travel time would improve, operating better than today's conditions or up to 15 minutes in savings compared to the year 2030 No Build Alternative.

Travel times on SR 520 outside of the study area are also reported because some of the benefits of the Preferred Alternative will be realized outside of the project limits. An effective way to capture these benefits is to compare the travel times between SR 202 and I-5.

How would eastbound SR 520 operate during the morning commute?

Without the project, SR 520 eastbound would continue to be congested between I-5 and the western approach to the Evergreen Point Bridge in Seattle. With the project, the SR 520 main line would be improved and an eastbound HOV lane would be added between I-5 and Medina. As a result, congestion at this location would be substantially reduced and vehicle and person throughput would increase.

Did you know?

Under stop-and-go conditions, 100 cars indicate about a half mile of congestion in one lane or a quarter mile of congestion in two lanes.

Volumes and Mode Share

The Preferred Alternative would serve 800 more people per hour (a 23 percent increase) and 300 more vehicles (an 8 percent increase) than the No Build Alternative (Exhibit 5-12). With the HOV lane improvements and the toll, 30 percent more people would be traveling by carpool and bus. None of the options would be able to serve all of the forecasted traffic demand because of congestion on I-5 and I-405.

Exhibit 5-12. **Vehicle and Person Trip Demand and Throughput—Eastbound SR 520 Cross-lake during the AM Peak Period**

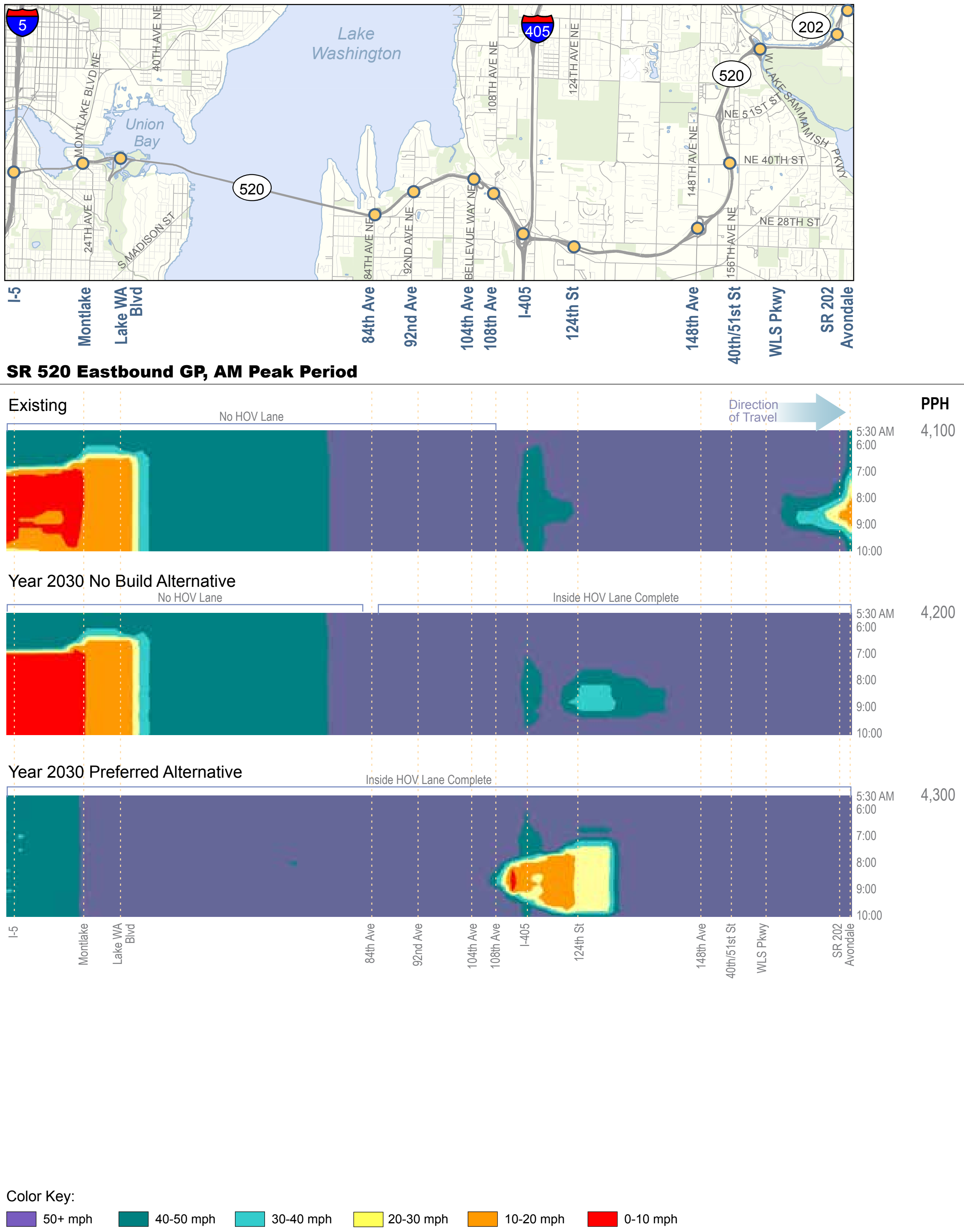
Congestion Points

The speed-flow diagrams displayed in Exhibits 5-13 and 5-14 provide a graphic representation of the congestion that occurs today, as well as with the No Build Alternative and Preferred Alternative during the eastbound morning commute. The worst of the congestion points shown in these diagrams (indicated by the red/orange areas) are discussed below, including a description of how the Preferred Alternative operates compared to the No Build Alternative.

West Approach and Lake Washington Boulevard On-Ramp Merge

Congestion currently occurs approaching the west approach span of the Evergreen Point Bridge because of several reasons: the added volume and short acceleration lane for traffic merging from the Lake Washington Boulevard on-ramp, the mainline grade change approaching the western approach span, substandard shoulder widths, and visual distractions associated with the lake. The congestion at this location is present for approximately 3 hours of the morning commute period and extends back to I-5. Travel speeds are reduced to below 10 mph.

With the No Build Alternative, these conditions would remain and congestion would be worse than today. Traffic entering from the Lake Washington Boulevard on-ramp would increase by 30 percent from today to the year 2030 No Build Alternative. Congestion from SR 520 would spill back onto I-5 northbound, and operations between I-90 and SR 520 would be affected by congestion for over 3 hours during the morning commute period.

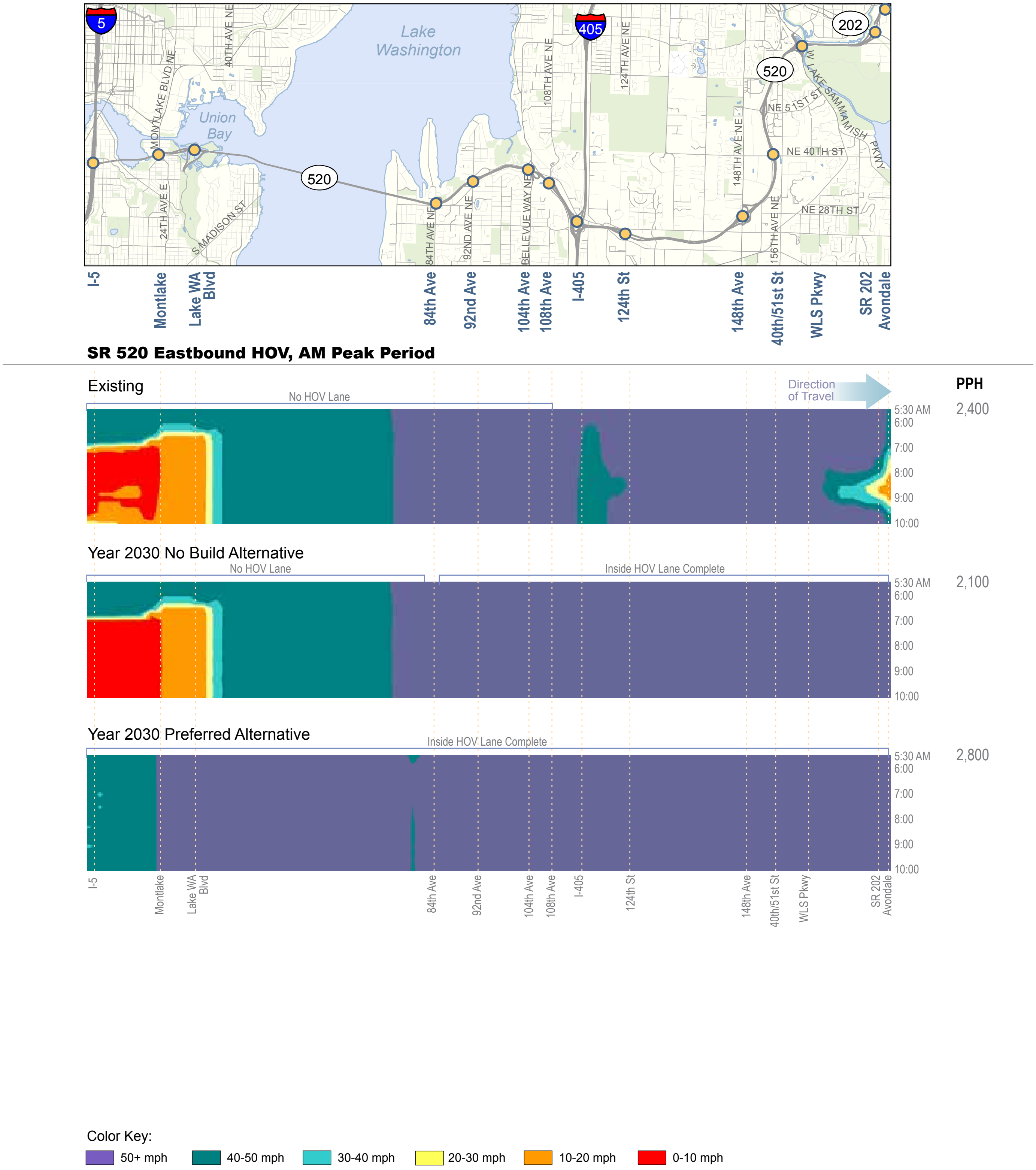


Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

PPH = Persons per hour
(average during the peak period)

Exhibit 5-13. **General-Purpose Travel Speeds – Eastbound SR 520 during the AM Peak Period**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project



Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

PPH = Persons per hour
(average during the peak period)

Exhibit 5-14. **HOV Travel Speeds – Eastbound SR 520 during the AM Peak Period**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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With the Preferred Alternative, improvements to the SR 520 main line and the removal of the Lake Washington Boulevard on-ramp, as well as the additional capacity provided by the HOV lane, would eliminate this congestion on SR 520 and its effects on I-5 operations.

I-405 Northbound Merge

In the year 2030, minor congestion would occur at the merge from I-405 northbound to SR 520 eastbound in the outside lanes with the No Build Alternative.

With the Preferred Alternative, congestion on the west side of the lake would be reduced, allowing more traffic to cross the bridge; however, this would increase congestion on SR 520 eastbound at the merge from northbound I-405. Congestion would be present at this location for approximately 2 1/2 hours during the morning commute period. As shown in Exhibit 5-14, HOV and transit traffic would be able to bypass this congestion because it occurs in the outside general-purpose lanes.

SR 520 Termination at SR 202/Avondale Road

Congestion currently occurs at the east end of the SR 520 corridor, but does not extend into the project limits (between I-5 and Medina). Congestion occurs at this location because freeway traffic volumes exceed the traffic signal's capacity at the NE Union Hill Road/SR 520/Avondale Road intersection. Congestion is present for approximately 2 hours during the morning commute period and extends back to near the SR 202 exit.

By the year 2030, congestion at this location would be substantially reduced due to completion of the SR 520, Medina to SR 202 project. The Preferred Alternative would not affect this area.

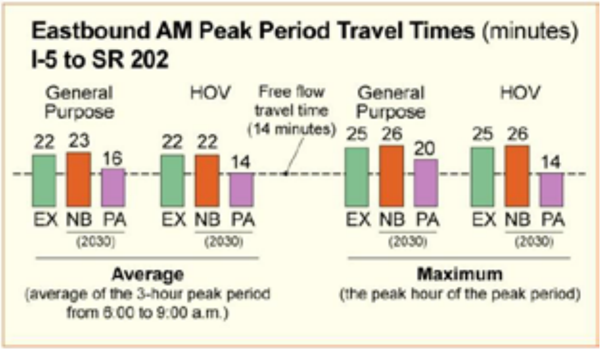


Exhibit 5-15. **No Build Alternative Travel Times on SR 520**

Travel Time and Speed

As shown in Exhibit 5-15, No Build Alternative travel times on SR 520 are expected to be similar to today.

With the Preferred Alternative, the additional capacity provided across the lake with the HOV lane would improve operations and travel time for both HOV and general-purpose traffic.

Average travel times would improve by up to 7 minutes for general-purpose trips and up to 12 minutes for HOV trips (with speeds above 50 mph) from I-5 to SR 202.

With the Preferred Alternative, improvements to SR 520 would substantially reduce spill back onto I-5 northbound. Travel time between Seattle and Bellevue would improve from 44 minutes at the peak of congestion with the No Build Alternative to 11 minutes with the Preferred Alternative.

How would southbound I-5 express lanes operate during the morning commute?

The reversible express lanes on I-5 operate southbound in the morning and northbound in the afternoon. The limits of the express lanes are between the Northgate area and downtown Seattle.

Today, in the morning commute, the express lane operates with congestion approaching the SR 522 on-ramp where the corridor is reduced from three lanes to two. Congestion also occurs in the central business district (CBD) in the two lanes open to general-purpose traffic. In the first lane from the outside (or right side), queues from the signals at Mercer Street and Stewart Street affect the express lanes. In the third lane, a significant queue forms for traffic exiting to the I-5 main line.

The second lane that exits to Pike Street and the fourth lane that exits to 5th Avenue and Columbia Street are HOV/transit lanes. The two HOV and transit lanes operate under free-flow conditions through this area.

By the year 2030, planned population and employment increases that are independent of the project would result in traffic demand volumes 5 percent higher than currently exists in the morning peak period. The increase in demand results in increased congestion at these bottlenecks. This increase in traffic demand is expected due to increases in employment and population in the region between now and the year 2030.

In the year 2030 No Build Alternative, congestion would be present for 4 hours of the morning commute period beginning north of SR 522, where the three-lane corridor narrows to two lanes. This congestion extends north to the express lane entrance at Northgate. The express lanes between the Ship Canal Bridge and the southern exit back to the

I-5 main line would operate similarly to today. This is because with the increased congestion at the northern SR 522 bottleneck, additional traffic would not be able to get through to the south.

In the HOV/transit lanes from the Ship Canal Bridge to the end of the express lanes, speeds would be free flow.

The Preferred Alternative includes an HOV/transit ramp connection between SR 520 and the I-5 express lanes. The Preferred Alternative would reduce the number of lanes from four to three in the express lanes across the Ship Canal Bridge to provide space for a single new HOV/transit ramp to and from SR 520. To reduce the section to three lanes to accommodate the SR 520 HOV/transit ramp, the 42nd Street NE on-ramp would be converted to a merge rather than an add lane.

In the year 2030 Preferred Alternative, the 42nd Street NE on-ramp is expected to carry up to 250 vph during the morning peak period. This is a low volume for an interstate ramp and vehicles can reasonably merge to the express lanes. Because of upstream congestion, the volume throughput across the Ship Canal Bridge is expected to be similar to today, which is a volume of traffic (5,000 vph) that can be served in the three lanes across the Ship Canal Bridge.

The SR 520/I-5 direct access ramp included in the project would add 400 buses and carpools per hour in the morning commute period. Because these additional trips are HOV and transit using the free-flow lanes, the resulting I-5 express lane operations with the SR 520/I-5 direct access ramp are similar to the No Build Alternative, as shown in Exhibit 5-16.

Exhibit 5-16. **I-5 Express Lanes, Morning Commute Peak Travel Times (minutes)**

	Existing	Year 2030 No Build Alternative	Year 2030 Preferred Alternative
General-Purpose Trips			
I-5 Express Lanes Southbound from Northgate to I-5 Main Line	26	31	31
HOV and Transit Travel			
I-5 Express Lanes Southbound from SR 520 Interchange to Stewart Street	NA	NA	1
I-5 Main Line Southbound from SR 520 Interchange to Stewart Street	2	5	5

How would I-5 main line operate during the morning commute?

In the No Build configuration, eastbound SR 520 traffic would back up from the Lake Washington Boulevard on-ramp onto I-5 where congestion would be present for over 3 hours during the morning peak period, which is similar to today. This backup limits throughput on the northbound I-5 main line and doubles the existing travel time from I-90 to NE 45th Street by year 2030. Westbound SR 520 congestion caused by the bottleneck at the Evergreen Point Bridge limits the throughput to the floating bridge and I-5 during the morning commute.

Removing the Lake Washington Boulevard access ramps and building a continuous 6-lane freeway section with inside HOV lanes will reduce congestion and increase throughput on SR 520 with the Preferred Alternative. These improvements to SR 520 will remove the eastbound congestion that backs up the northbound and southbound on-ramps from I-5. The Preferred Alternative also improves northbound and southbound I-5 main line by improving SR 520 conditions.

The Preferred Alternative will improve the Seattle to Bellevue travel time to 11 minutes. That is a 33-minute travel time savings (compared to the No Build Alternative) for Seattle to Bellevue traffic using eastbound SR 520. The average speed for travel from Seattle to Bellevue would improve from 15 mph under the No Build Alternative to 50 mph with the Preferred Alternative.

Improvements to westbound SR 520 would also allow over 200 more vehicles per hour to reach southbound I-5. The increase in westbound throughput (more vehicles) combined with the reduction in congestion from eastbound SR 520 backing onto I-5 southbound results in similar travel times between the No Build Alternative and Preferred Alternative, as shown in Exhibit 5-17. Travel between NE 45th Street to I-90 will decrease from 19 minutes under the No Build Alternative to 17 minutes with the Preferred Alternative (Exhibit 5-17).

Exhibit 5-17 also summarizes the existing and projected peak travel times on I-5 and between Seattle and Bellevue during the morning commute.

Exhibit 5-17. **Morning Commute Peak Travel Times—General-Purpose Trips (minutes)**

	Existing	Year 2030 No Build Alternative	Year 2030 Preferred Alternative
I-5 Northbound (Main Line) from I-90 to NE 45th Street	9	31	7
I-5 Southbound (Main Line) from NE 45th Street to I-90	11	19	17
Seattle to Bellevue (I-5 at University Street to I-405 at NE 4th/8th Streets)	25	44	11
Bellevue to Seattle (I-405 at NE 4th/8th Streets to I-5 at University Street)	19	25	13

How would westbound SR 520 operate during the afternoon commute?

In the year 2030 without the project, the SR 520 westbound general-purpose lanes would continue to be congested approaching the bridge on the east side because of the HOV lane merge near 84th Avenue NE in Medina. With the project, congestion at this location would be substantially reduced and vehicle and person throughput would increase.

Volumes and Mode Share

As shown in Exhibit 5-18, the Preferred Alternative would serve 800 more people per hour (a 13 percent increase) than the No Build Alternative with an increase of only 200 vehicles (5 percent). With the Preferred Alternative's HOV lane improvements and toll, up to 50 percent more people would be traveling by carpool and bus compared to the No Build Alternative. None of the alternatives would be able to serve all of the forecasted traffic demand because of congestion on I-5 and I-405.

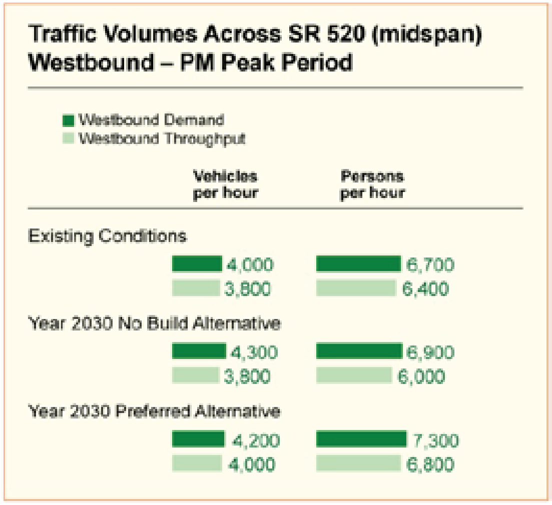


Exhibit 5-18. **SR 520 Westbound Vehicle and Person Trips during the PM Peak Period**

The northbound I-5 express lane connection to SR 520 eastbound in the afternoon would serve 550 vph (transit and HOV), which equals 2,500 persons per hour.

Congestion Points

WSDOT developed speed-flow diagrams using existing data and model output to provide a graphic representation of the congestion that occurs today and in the year 2030. Exhibits 5-19 and 5-20 show where congestion would occur on the SR 520 corridor with the No Build Alternative and Preferred Alternative during the westbound afternoon commute. The worst of the congestion points shown in these diagrams (indicated by the red\orange areas) are discussed below, including how the Preferred Alternative operates compared to the No Build Alternative.

Bridge Approach at the Eastern Lake Shore

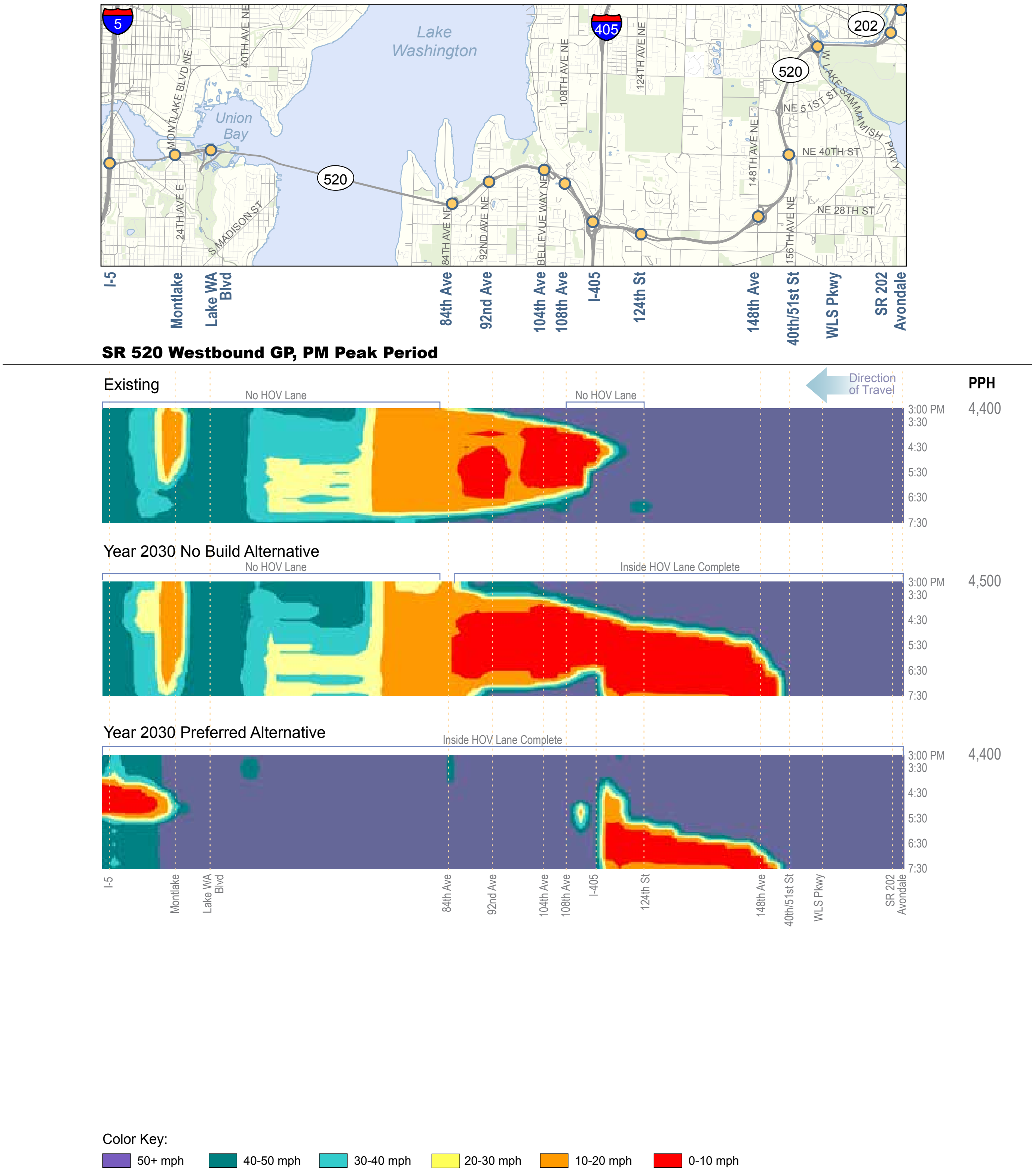
As shown in Exhibit 5-19, the most severe congestion on westbound SR 520 occurs between the east approach to the Evergreen Point Bridge, near the 84th Avenue NE on-ramp and the HOV lane termination, and the I-405 interchange. The congestion at this location is present for approximately 4 hours during the evening commute, and limits the amount of traffic that can cross the bridge.

This congestion would increase by the year 2030 with the No Build Alternative. With the SR 520, Medina to SR 202 project, the HOV lane would be relocated to the inside (compared to today). This action would allow the HOV trips to bypass some of the congestion.

With the Preferred Alternative, the HOV lane would be extended across the Evergreen Point Bridge to I-5, eliminating congestion at this point for both HOV and general-purpose traffic. This action would result in improved travel for both modes of transportation.

I-405 Northbound and Southbound

The I-405 northbound and southbound main lines are currently congested during the afternoon commute. I-405 congestion causes the I-405/SR 520 interchange ramps to back up onto SR 520 westbound, causing congestion that extends back to 124th Avenue NE. Congestion limits the amount of traffic that can exit from SR 520 to I-405, and also determines how much traffic can enter SR 520 from I-405.



SR 520 Westbound GP, PM Peak Period

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

N

PPH = Persons per hour
(average during the peak period)

Exhibit 5-19. **General-Purpose Travel Speeds – Westbound SR 520 during the PM Peak Period**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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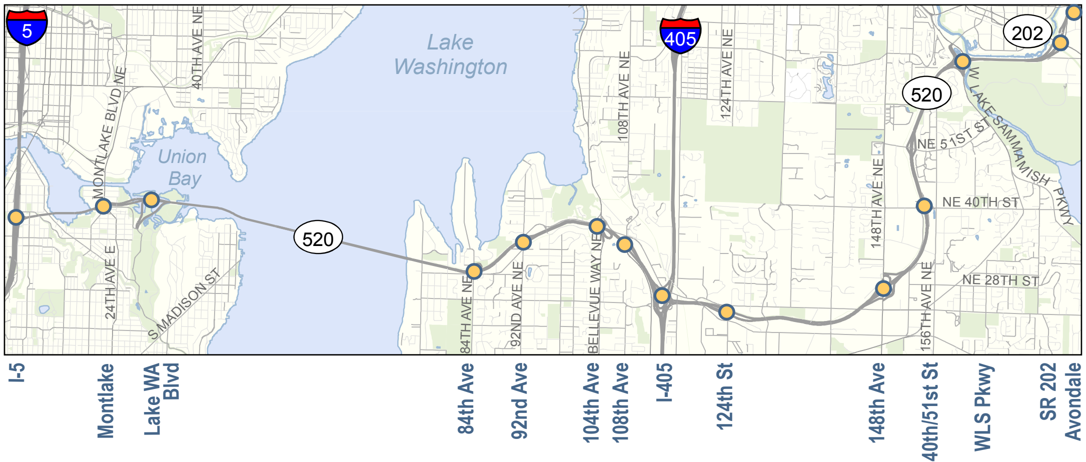
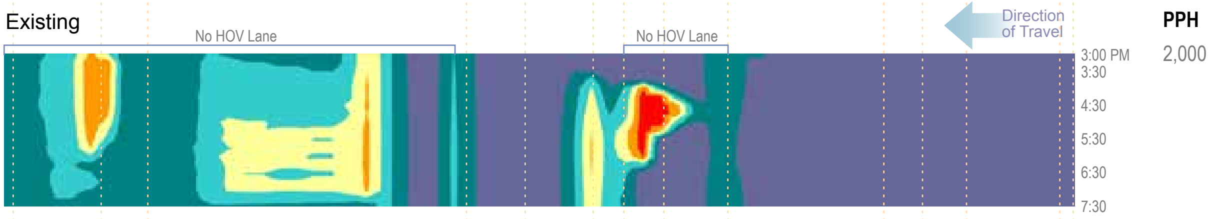
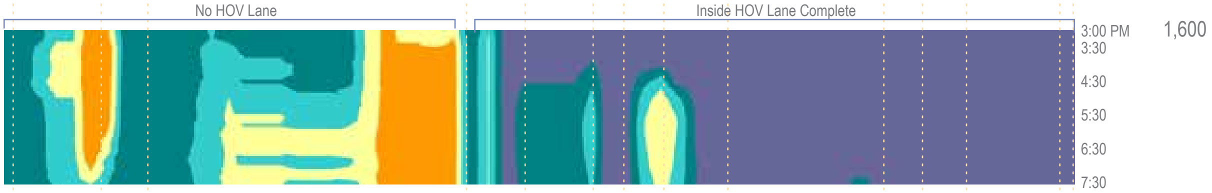


SR 520 Westbound HOV, PM Peak Period

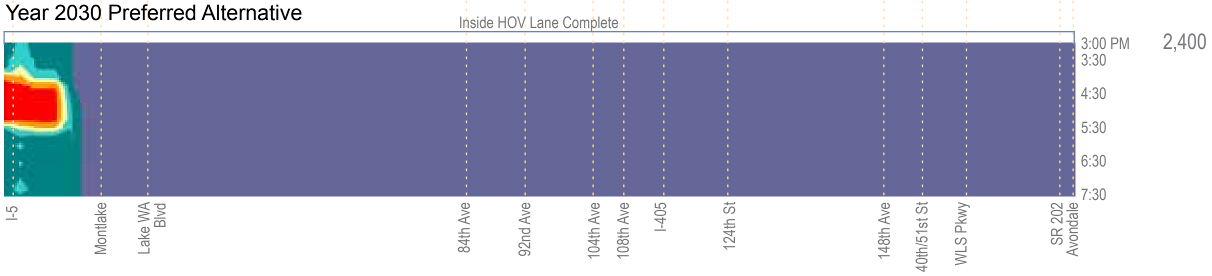
Existing



Year 2030 No Build Alternative



Year 2030 Preferred Alternative



Color Key:

🟪 50+ mph 🟩 40-50 mph 🟦 30-40 mph 🟨 20-30 mph 🟧 10-20 mph 🟥 0-10 mph

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

PPH = Persons per hour
(average during the peak period)

Exhibit 5-20. **HOV Travel Speeds – Westbound SR 520 during the PM Peak Period**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

In the year 2030 No Build Alternative, queues that begin from the eastern lake shore would compound the congestion in this area. The resulting congestion would extend back to the NE 40th/51st Street interchange area and would be present for nearly 3 1/2 hours of the evening commute. Carpools and buses would be able to bypass this congestion in the inside HOV lane.

I-405 traffic would still back up onto SR 520 with the Preferred Alternative. However, because the congestion is eliminated at the eastern lake shore, the resulting queue would not be as extensive as under the No Build Alternative. With the Preferred Alternative, the congestion from I-405 would affect SR 520 operations between the 148th Avenue NE interchange area and I-405 and would be present for 3 1/2 hours during the evening commute.

Across Portage Bay Bridge

Today, there is moderate congestion on SR 520 between the Montlake Boulevard on-ramp merge point and I-5 due to the short acceleration lane. Drivers cannot get up to freeway speeds and drivers on the SR 520 main line must slow down to accommodate entering vehicles. Drivers changing lanes to access the I-5 off-ramps and congestion spilling back from I-5 also contribute to congestion in this area. Traffic speeds average 30 mph for approximately 2 to 3 hours (refer to Exhibits 5-17 and 5-19).

With the No Build Alternative, Portage Bay Bridge would operate similarly to its operation today (refer to Exhibits 5-17 and 5-19) with reduced speeds lasting for 3 hours during the evening commute. While traffic demand for this area increases, traffic volume throughput is significantly reduced by the congestion on the east side of the lake.

The Preferred Alternative includes a hard-shoulder-running auxiliary lane between Montlake and I-5, which would operate during the peak commute periods. The Preferred Alternative also improves the transit access points (transit can access the direct access ramp from the HOV lane rather than crossing the general-purpose lanes), and includes a ramp meter on the westbound on-ramp from Montlake. With these geometric capacity improvements between the western lake shore and I-5, the corridor would operate better overall in the shoulder periods (before 4 p.m. and after 6 p.m.). During the peak of the evening commute, however, enough traffic would be served across SR 520 to have the I-5 interchange ramps operating at over capacity. This means for about an hour and a half during the evening commute, congestion from I-5 would be present on SR 520.

Travel Time and Speed

The average travel time today between SR 202 and I-5 during the westbound afternoon commute is approximately 33 minutes for general-purpose trips and 23 minutes for HOV trips (Exhibit 5-21). The difference in travel times is due to the westbound congestion approaching the bridge in Medina, which HOVs can bypass. Typically, some congestion also occurs in the SR 520/Montlake Boulevard interchange/Portage Bay sections during the afternoon commute.

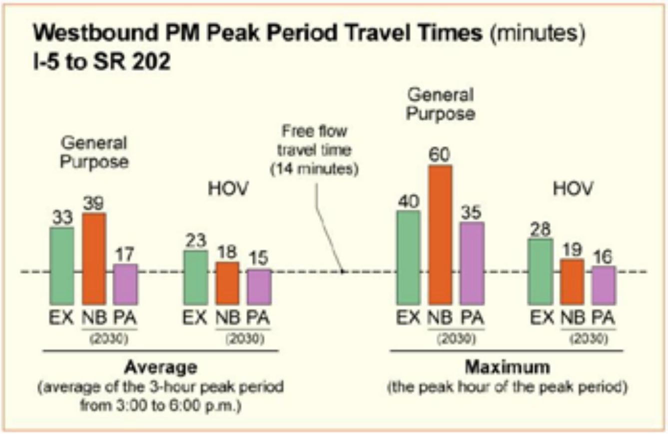


Exhibit 5-21. **Westbound PM Peak Period Travel Times—I-5 to SR 202**

As shown in Exhibit 5-21, general-purpose travel times for the No Build Alternative are expected to increase to 60 minutes at the peak of congestion. The HOV lane, however, will operate better than today due to the SR 520, Medina to SR 202 project improvements. During the peak of congestion, HOV travel times would be 9 minutes faster than today.

The Preferred Alternative would have an improved operation compared to the No Build Alternative between SR 202 and I-5. When congestion is at its peak, the Preferred Alternative would provide a travel time savings for general-purpose travel of 25 minutes (compared to the No Build Alternative). HOV trips would be able to bypass most of the congestion in both the No Build Alternative and Preferred Alternative during the afternoon westbound commute.

How would eastbound SR 520 operate during the afternoon commute?

By the year 2030, traffic congestion on the I-405 main line would have some effects on the SR 520 eastbound afternoon commute. Congestion would occur near the Montlake Boulevard and Lake Washington Boulevard interchange areas. Improvements associated with the Preferred Alternative would result in better operation on the western side of Lake Washington.

Volumes and Mode Share

The Preferred Alternative would serve 1,200 more people (an 18 percent increase) than the No Build Alternative, with an increase of only 100 (3 percent) more vehicles (Exhibit 5-22). With the HOV lane improvements and toll, up to 75 percent more people would travel by carpool and bus.

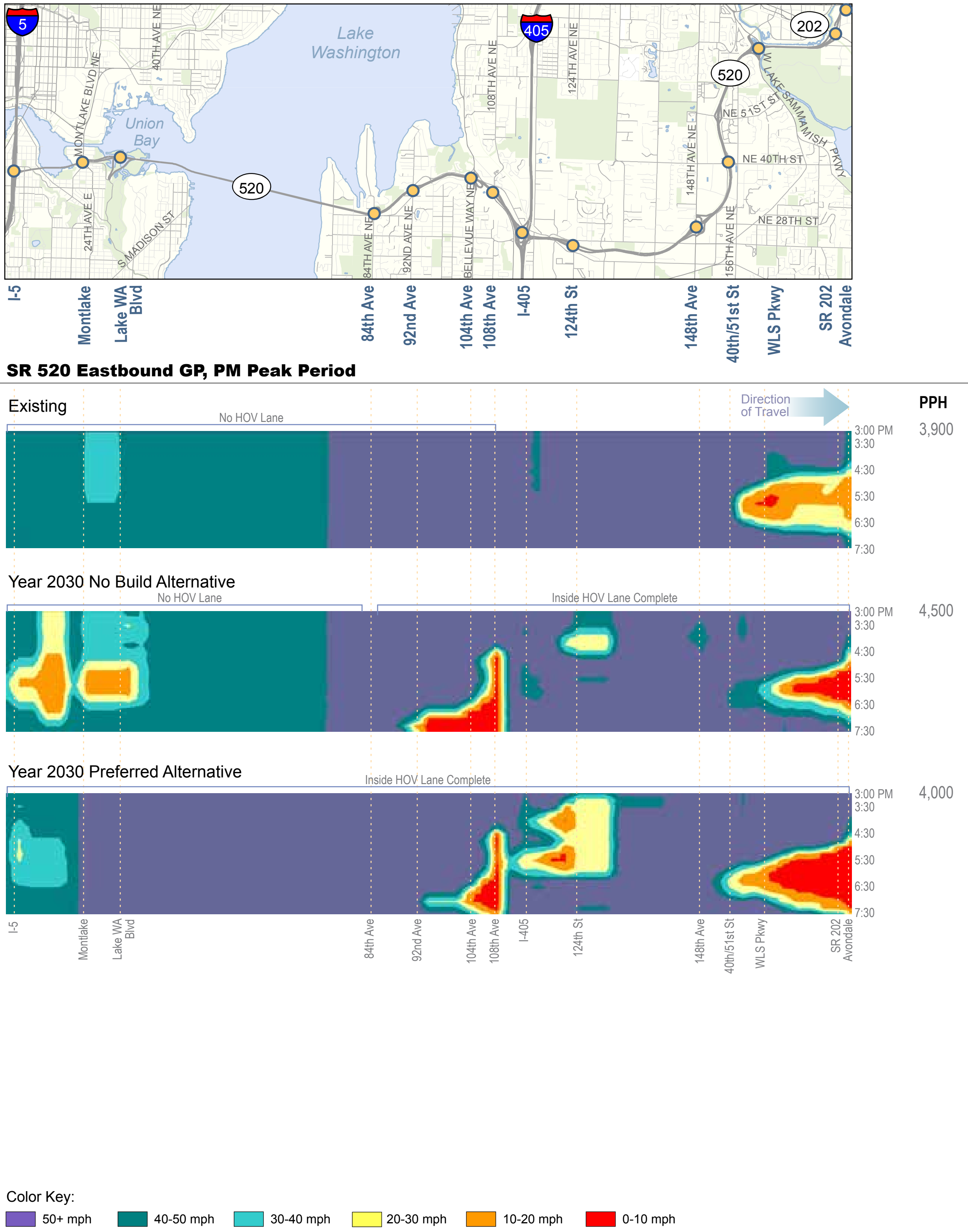
Exhibit 5-22. **Vehicle Demand and Throughput across Eastbound SR 520 (midspan) during the PM Peak Period**

Congestion Points

The speed-flow diagrams displayed in Exhibits 5-23 and 5-24 provide a graphic representation of the eastbound afternoon commute congestion that occurs today and in the year 2030 with the No Build Alternative and Preferred Alternative. These congestion points are discussed below, including a description of what causes the congestion at each location.

Portage Bay Bridge to West Approach

In the year 2030 with the No Build Alternative, congestion would occur from the Montlake interchange to the west approach span of the Evergreen Point Bridge. This congestion would occur because the off-ramp intersection at Montlake would operate over capacity and queue onto SR 520 eastbound. Additional factors causing congestion include the short acceleration lane for traffic merging from the Lake Washington Boulevard on-ramp, the mainline grade change approaching the western approach span, substandard shoulder widths, and visual distractions associated with the lake. Congestion would be present at this location for approximately 4 hours and would at times extend back to I-5. Travel speeds would be reduced to below 10 mph. The congestion would limit the amount of traffic that could cross the bridge, which would prevent some traffic congestion at points farther east on SR 520.



Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

PPH = Persons per hour
(average during the peak period)

Exhibit 5-23. **General-Purpose Travel Speeds – Eastbound SR 520 during the PM Peak Period**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

With the Preferred Alternative, improvements to the SR 520 main line, reduction in access points (closure of the Lake Washington Boulevard on-ramp), improvements to the Montlake interchange arterial operations, as well as the additional capacity provided by the HOV lane would decrease the congestion compared to the No Build Alternative. Traffic speeds for the No Build Alternative are between 10 and 20 mph for most of the peak period. With the Preferred Alternative, traffic speeds would be above 30 mph for the peak period.

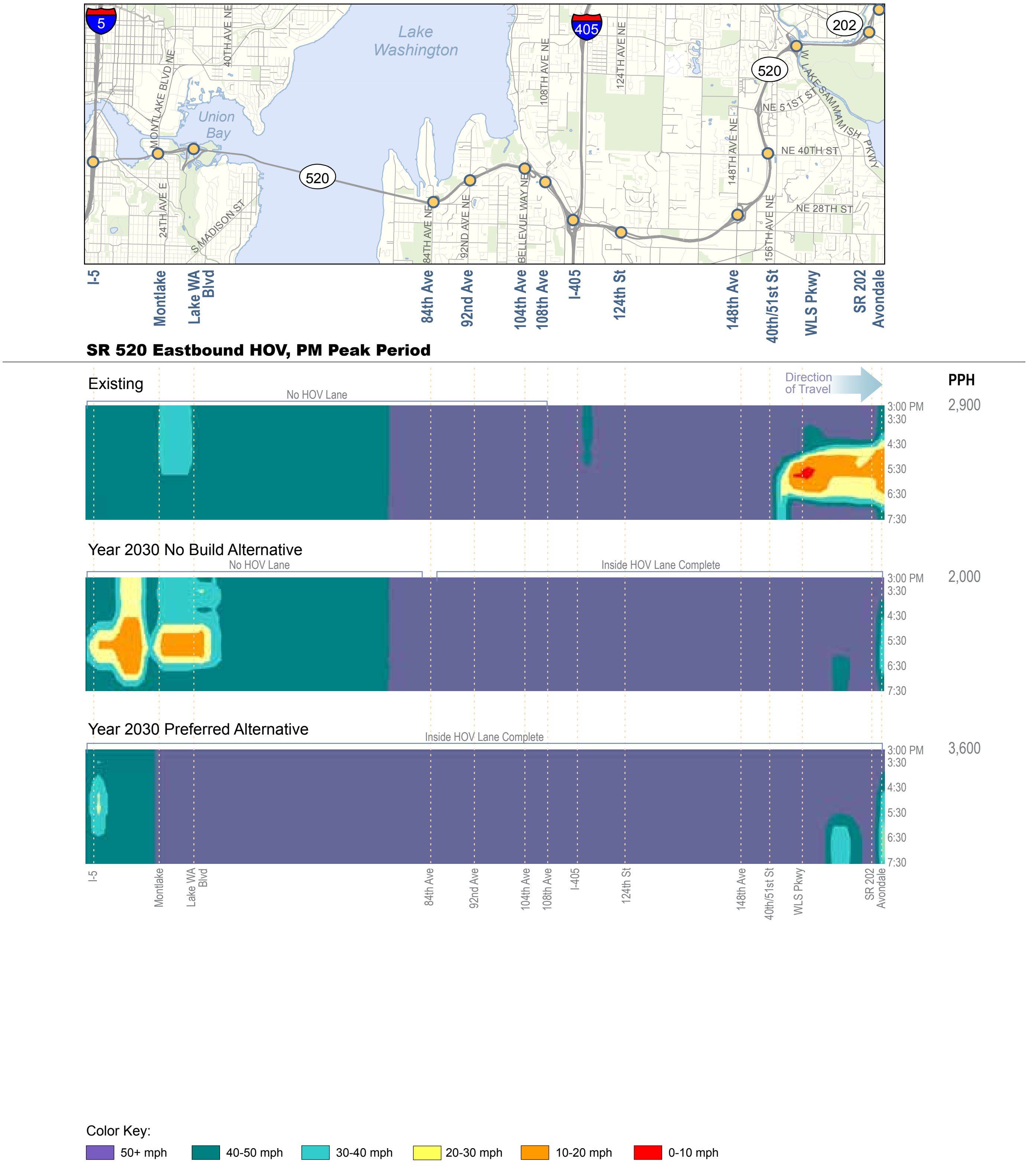
I-405 Northbound and Southbound

Traffic is currently congested on I-405 through downtown Bellevue during the afternoon commute period because traffic volumes exceed roadway capacity. Some moderate congestion occurs northbound on I-405 between NE 4th Street and the SR 520 off-ramps because the I-405 northbound-to-SR 520 eastbound ramp is over capacity. High traffic volumes and merging vehicles between the NE 8th Street on-ramp and the SR 520 off-ramps also contribute to congestion in this area. Although this congestion typically does not affect SR 520 operations, it likely reduces traffic able to access SR 520.

By the year 2030, congestion on SR 520 approaching the SR 520/I-405 interchange would be worse due to I-405 traffic backing up onto the SR 520 ramps. Under the No Build Alternative and the Preferred Alternative, congestion on the SR 520 off-ramp to northbound I-405 would spill back onto the SR 520 main line and cause congestion extending back to the 92nd Avenue NE on-ramp. For both alternatives, the HOV/transit trips would be able to bypass this congestion with the inside HOV lane (Exhibit 5-24).

SR 520 Termination at SR 202/Avondale Road

Congestion currently occurs at the east end of the SR 520 corridor, but does not extend into the project limits (between I-5 and Medina). Congestion occurs at this location because freeway traffic volumes exceed the traffic signal's capacity at the NE Union Hill Road/ SR 520/Avondale Road intersection. Congestion would be present at this location for up to 2 1/2 hours and extend back to the NE 40th Street interchange at its peak.



Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

N

PPH = Persons per hour
(average during the peak period)

Exhibit 5-24. **HOV Travel Speeds – Eastbound SR 520 during the PM Peak Period**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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By the year 2030, congestion at this location would be similar to today. There would be a large increase in traffic demand at the east end of the corridor due to land use changes; however, the effect of increased traffic would be offset with the completion of the SR 520, Medina to SR 202 project.

With the Preferred Alternative, up to an additional 100 vph would reach this area due to improvements on the western end of the corridor. Because the area is over capacity and queued up today, any additional trips would add to that congestion.

Travel Times and Speed

Today, the average travel time between I-5 and SR 202 for general-purpose and HOV traffic is approximately 18 minutes during the afternoon commute (Exhibit 5-25).

By the year 2030 with the No Build Alternative, both general-purpose and HOV travel times would increase due to I-405 mainline congestion backing up onto SR 520. General-purpose travel times would range between 20 (average) and 29 minutes during the peak hour of travel. HOV average travel times would be 14 minutes.

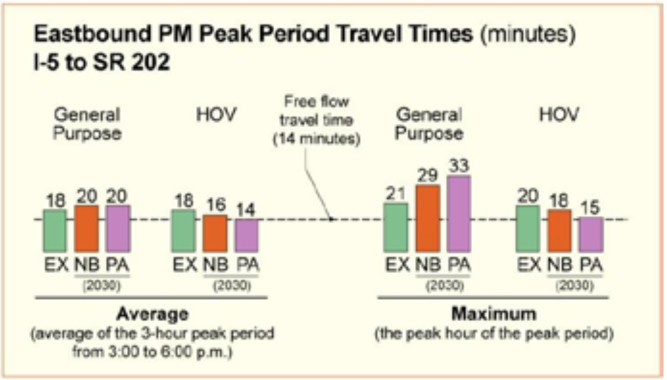


Exhibit 5-25. **SR 520 Eastbound PM Peak Period Travel Times – I-5 to SR 202**

With the Preferred Alternative, the average general-purpose trip would be similar to the No Build Alternative. The maximum travel time would increase to 33 minutes. However, the HOV travel times would decrease by a few minutes compared to the No Build Alternative.

How would northbound I-5 express lanes operate during the afternoon commute?

The reversible express lanes on I-5 operate southbound in the morning and northbound in the afternoon. The limits of the express lanes are the Northgate area and downtown Seattle.

In the evening today, congestion builds in the general-purpose lane at the exit near Northgate and spills back past the SR 522 off-ramp. The HOV lane designation northbound begins at the SR 522 off-ramp so HOV/transit is affected by this congestion. However, once north of the SR 522 off-ramp, HOV/transit operate at free-flow speed.
The remaining portions of the express lanes also operate in free-flow conditions.

By the year 2030, traffic volumes are expected to increase in the express lanes by 10 percent during the afternoon peak period. This increase in demand would result in increased congestion at the existing bottlenecks. This traffic increase is expected due to projected increases in employment and population in the region between now and the year 2030.

In the afternoon, northbound congestion from the I-5 main line at Northgate would affect operations on the express lanes for 4 hours during the evening commute with the peak of congestion extending to the Mercer Street interchange. South of SR 522, where there is no HOV designation, HOV and transit trips would operate with congestion. However, HOV/transit would operate at free-flow speed between SR 522 and Northgate. South of the Mercer Street interchange, operations would be near free flow.

The Preferred Alternative includes an HOV/transit ramp connection between SR 520 and the I-5 express lanes. The Preferred Alternative would reduce the number of lanes from four to three in the express lanes across the Ship Canal Bridge to provide space for a single new HOV/transit ramp to and from SR 520. To reduce the section to three lanes to accommodate the SR 520 HOV/transit ramp, the 42nd Street NE ramp would be converted to a diverge ramp northbound rather than a drop lane.

In year 2030, the 42nd Street NE ramp is expected to carry up to 600 vph during the PM peak hour. The volume throughput across the Ship Canal Bridge is expected to be similar to today, which is a volume of traffic (5,300 vph) that can be served in the three lanes across the Ship Canal Bridge.

In both the Preferred Alternative and No Build Alternative, congestion begins at the northern end and extends near the SR 520 interchange area. With the Preferred Alternative, traffic volumes would only be greater between downtown Seattle and the SR 520 interchange area. For year 2030 under the No Build Alternative and the Preferred Alternative, travel time is the same from the entrance to the I-5 main line in downtown Seattle to Northgate for both alternatives.

Travel for HOVs and transit trips destined to the SR 520 interchange ramp would be better than mainline operations. Mainline I-5 travel times for this same segment would be up to 5 minutes during the peak of congestion. I-5 express lanes would provide a 4-minute travel time savings for transit trips destined to SR 520.

General-purpose travel times in the express lanes and transit travel times between downtown Seattle and SR 520 are shown in Exhibit 5-26.

Exhibit 5-26. **Evening Commute Peak Travel Times**

	Existing	Year 2030 No Build Alternative	Year 2030 Preferred Alternative
General-Purpose Trips			
I-5 Express Lanes Northbound from I-5 Main Line to Northgate	13	34	34
Transit Travel			
I-5 Express Lanes Northbound from Stewart Street to SR 520 Interchange	NA	NA	1
I-5 Main Line Northbound from Olive Street to SR 520 Interchange	3	4	5

How would I-5 main line operate during the afternoon commute?

Under No Build conditions, evening congestion on westbound SR 520 restricts the volume of traffic that reaches the I-5 corridor. The SR 520 throughput to both northbound and southbound I-5 is expected to be noticeably lower than demand, improving conditions on I-5 southbound and northbound from SR 520. Eastbound congestion on SR 520 from the Lake Washington Boulevard on-ramp backs up the I-5 off-ramp to SR 520, slowing the northbound I-5 main line.

Consolidating the Lake Washington Boulevard access to the Montlake interchange, together with a continuous 6-lane freeway section with inside HOV lanes, would reduce congestion and increase throughput on SR 520 under the Preferred Alternative. As a result of this increased throughput during the evening commute, the same section of I-5 would be congested for about an hour longer than the No Build Alternative because more traffic is allowed to reach the I-5 corridor. This is an increase in volume throughput, not an increase in demand. The improvements to SR 520 allow about 200 more vehicles per hour to reach the already existing southbound I-5 congestion, thus extending the severity and duration of congestion.

Despite the increase in travel times during the evening commute, both I-5 and SR 520 would serve more vehicles and more people in these vital segments of the network. Exhibit 5-27 summarizes the peak travel times during the evening commute for existing conditions, No Build Alternative, and Preferred Alternative.

Exhibit 5-27. **Evening Commute Peak Travel Times—General-Purpose Trips (minutes)**

	Existing	Year 2030 No Build Alternative	Year 2030 Preferred Alternative
I-5 Northbound (Main Line) from I-90 to NE 45th Street	11	13	15
I-5 Southbound (Main Line) from NE 45th Street to I-90	22	20	29
Seattle to Bellevue (I-5 at University Street to I-405 at NE 4th/8th Streets)	15	23	19
Bellevue to Seattle (I-405 at NE 4th/8th Streets to I-5 at University Street)	43	41	28

Chapter 6—Local Volumes and Operations

What is in this chapter?

This chapter discusses the results of the SR 520 transportation team's traffic forecasts and operations analysis of local streets adjacent to SR 520. The analysis results were used to compare existing traffic conditions with the effects of the year 2030 No Build Alternative and Preferred Alternative. The No Build Alternative allowed the team to first determine what local street and intersection traffic operations would be like in the future if the project were not built. The Preferred (Build) Alternative was then compared to the No Build Alternative to determine effects on traffic conditions that would result from the project.

As described in Chapter 4, traffic operations were analyzed at intersections where the total approaching traffic is forecasted to increase by 5 percent or more compared to the No Build Alternative. This forecasted increase occurred at some locations in the Montlake interchange area. The Montlake interchange area includes the neighborhoods from north of the Montlake Boulevard/NE Pacific Street intersection to south of the SR 520/Montlake Boulevard interchange. The following detailed analysis documents the projected changes in local traffic operations with the Preferred Alternative compared to the No Build Alternative within this interchange area.

What is traffic like at the Montlake Boulevard interchange area today?

The SR 520/Montlake Boulevard interchange area, which provides access to and from SR 520, is congested during the morning and afternoon peak hours. This congestion is partially related to traffic flow on SR 520 (which can affect traffic flow on the local street network), and traffic flow on the local street network (which can affect traffic flow on SR 520).

Freeway traffic operations on SR 520 are managed by using the eastbound on-ramp meter to control the flow of traffic entering SR 520. On-ramp traffic volumes at this location exceed the storage capacity on the ramp and queue onto Montlake Boulevard. At times, congestion on

SR 520 exceeds a level that can be managed by the ramp meter, meaning congestion from SR 520 spills back through the merge point and past the ramp meter.

Traffic congestion associated with the eastbound SR 520 on-ramp can extend back across the Montlake Bridge. When traffic is backed up in the outside right lane, Montlake Boulevard southbound is constrained to one lane for drivers traveling to the south of SR 520.During the morning and afternoon commutes, traffic typically backs up on southbound Montlake Boulevard approaching the on-ramp to eastbound SR 520. Traffic congestion can extend across the Montlake Bridge to the Montlake Boulevard/NE Pacific Street intersection and as far back as 25th Avenue NE near University Village (approximately 1 mile). Congestion can also occur on NE Pacific Street eastbound, extending back through the NE Pacific Place intersection. The factors described in the following paragraphs contribute to the congestion in the SR 520/Montlake Boulevard interchange area.

Drivers traveling northbound on Montlake Boulevard NE to access SR 520 westbound must make a U-turn at the Montlake Boulevard/East Hamlin Street intersection. These vehicles often spill out of the U-turn pocket. This occurrence blocks the inside northbound lane on Montlake Boulevard, which constrains through traffic to a single lane. This, in turn, affects traffic exiting the eastbound off-ramp and other intersections to the south.

Some drivers who use the SR 520 westbound off-ramp want to travel southbound on Montlake Boulevard or reach the Shelby/Hamlin neighborhood west of Montlake Boulevard. These drivers stop at the end of the westbound off-ramp to wait for a gap in traffic to aggressively merge across the two northbound through lanes and access the U-turn at the East Hamlin intersection. Accommodating this movement can worsen northbound congestion and create backup on the westbound off-ramp.

Montlake Bridge openings can have long-lasting effects on traffic flow in this area. The bridge does not open during the morning and afternoon peak periods; however, if the bridge opens at the end of the midday period (3:30 p.m.), it can affect traffic operations throughout the afternoon commute. Bridge openings compound whatever congestion is present on the local street network and can cause congestion to spill back onto the SR 520 main line. When congestion reaches the SR 520 corridor, eastbound traffic can then become so congested that it affects traffic on I-5.

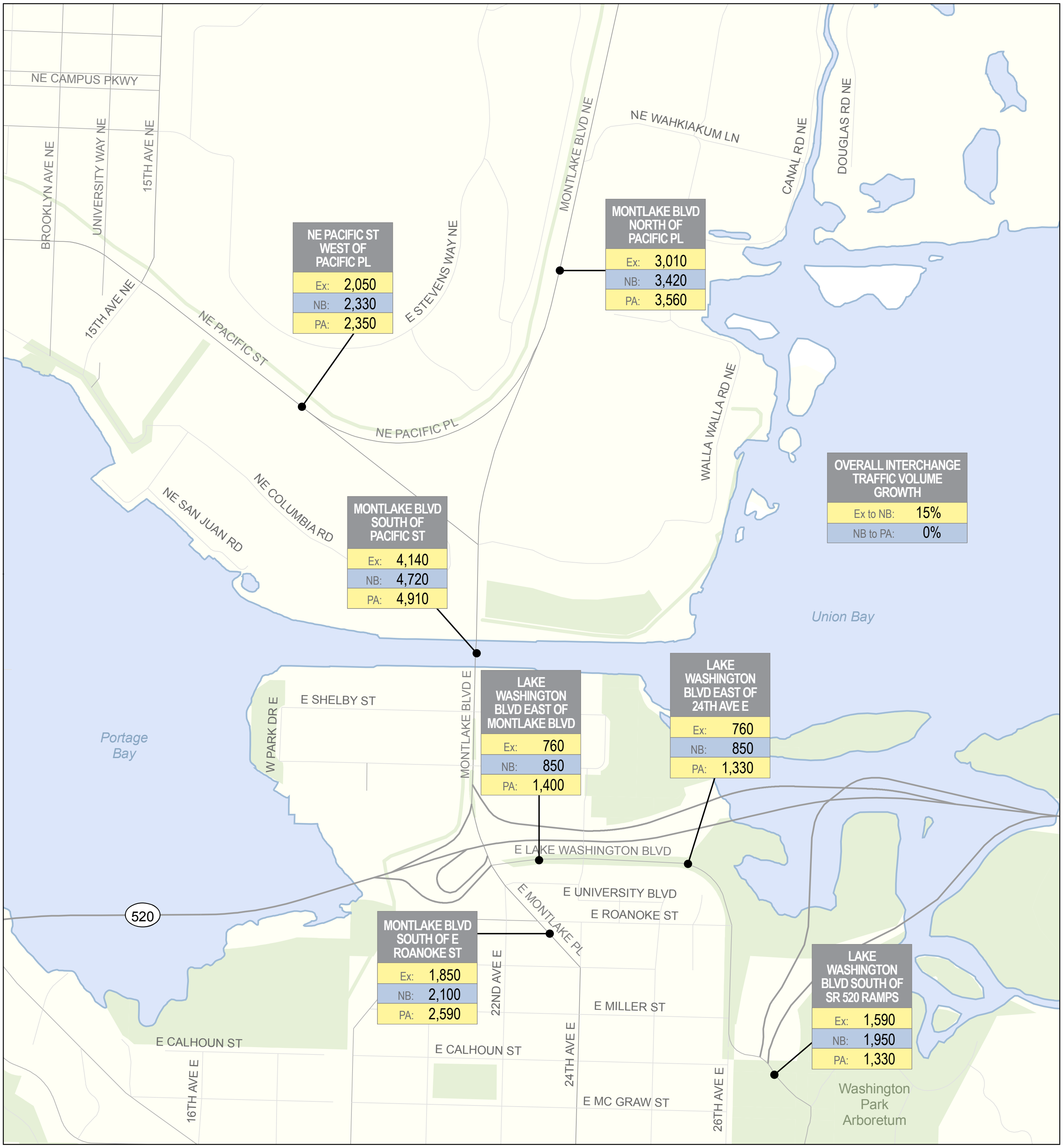
An average of 10 bridge openings occurs during a typical summer weekday (fewer openings occur during other times of the year). Bridge openings typically last 4 to 5 minutes, but can extend up to 6 minutes on occasion (WSDOT 2008a).

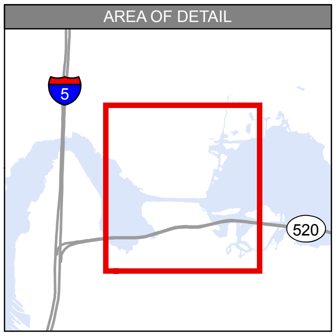
Montlake Bridge opening delays make it difficult for bus drivers to keep to their schedules, affecting bus travel times and reliability. Additional discussion on the effects on bus travel times is provided in Chapter 8.

Montlake Boulevard NE is an important transit corridor, serving both local and regional buses between the SR 520/Montlake interchange and the University District. Montlake Boulevard NE, NE Pacific Street, and 15th Avenue NE are considered Urban Village Transit Network corridors as identified in the Seattle Transit Plan (SDOT 2005). Today, minimal transit priority is provided along the Montlake corridor. A transit or HOV ramp meter bypass lane is provided at the eastbound on-ramp. Queue jumps are also provided for northbound transit after the bus stop at Montlake Boulevard/East Shelby Street and from the HOV lane along NE Pacific Street turning southbound at the Montlake Boulevard/NE Pacific Street intersection.

Morning and afternoon peak-hour traffic volumes on streets within the SR 520/Montlake Boulevard interchange area are shown in Exhibits 6-1 and 6-2.

WSDOT analyzes the study intersection operations and assigns a letter grade (as discussed in Chapter 4). This letter grade represents the operations of that intersection alone assuming all traffic demand can reach that intersection. The letter grade does not include congestion from adjacent intersections or from SR 520 that may spill into that intersection. This process allows engineers to design each intersection to provide sufficient capacity for the traffic demand rather than limit the operations due to external constraints that could or would be removed in the future.





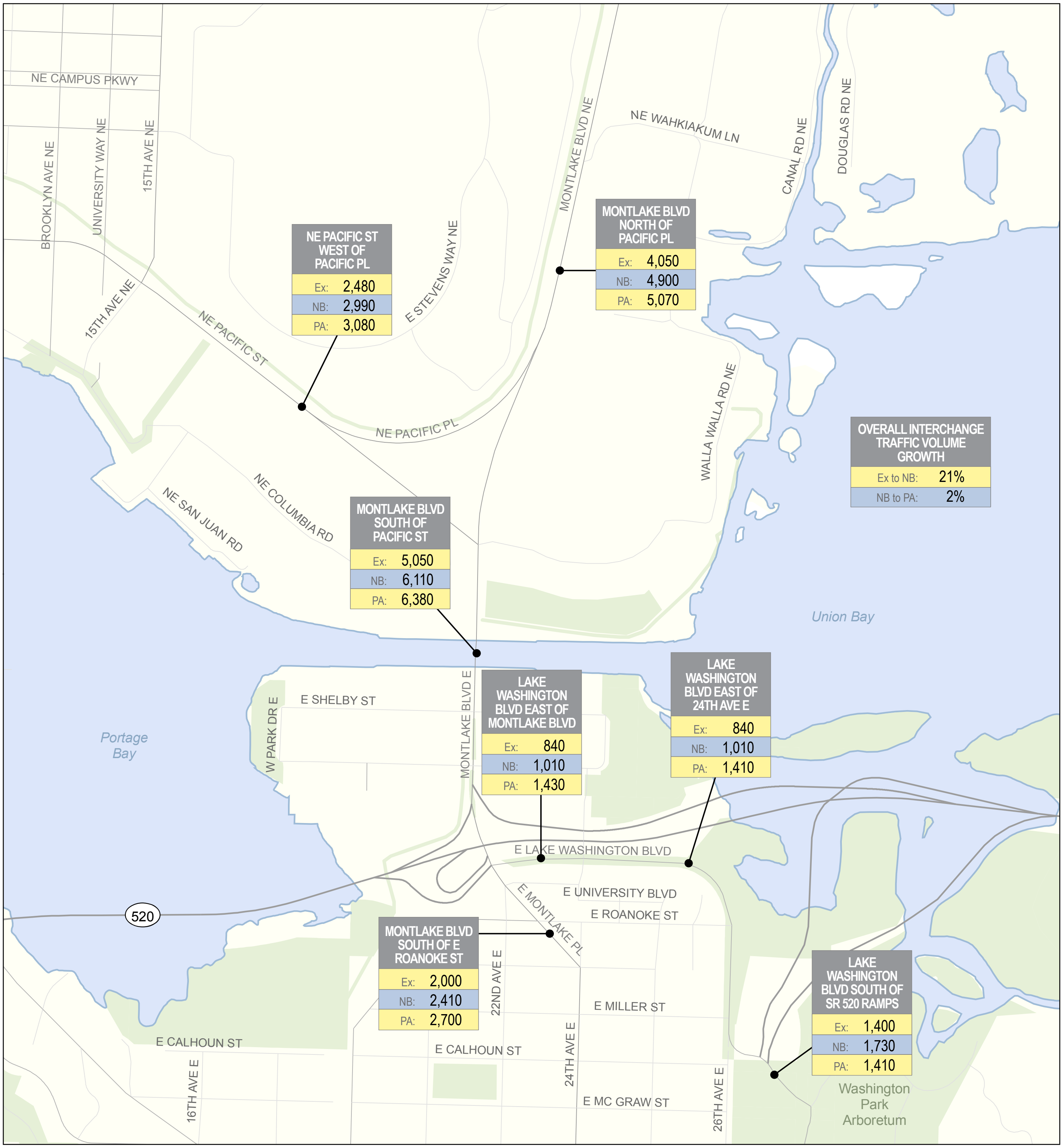
LOCATION
Existing — Ex: Volume
No Build — NB: Volume
Preferred Alternative — PA: Volume
Volumes are totals for both directions

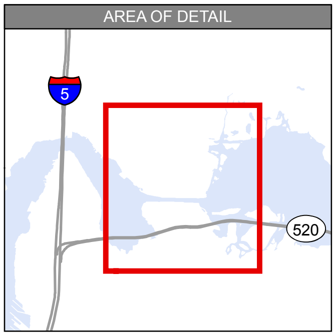
N
0 500 1,000 Feet

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 6-1. **SR 520/Montlake Boulevard Interchange Area – AM Peak Hour Vehicle Volumes**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project





LOCATION

Existing	Ex: Volume
No Build	NB: Volume
Preferred Alternative	PA: Volume

Volumes are totals for both directions

N

0 500 1,000 Feet

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 6-2. **SR 520/Montlake Boulevard Interchange Area – PM Peak Hour Vehicle Volumes**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

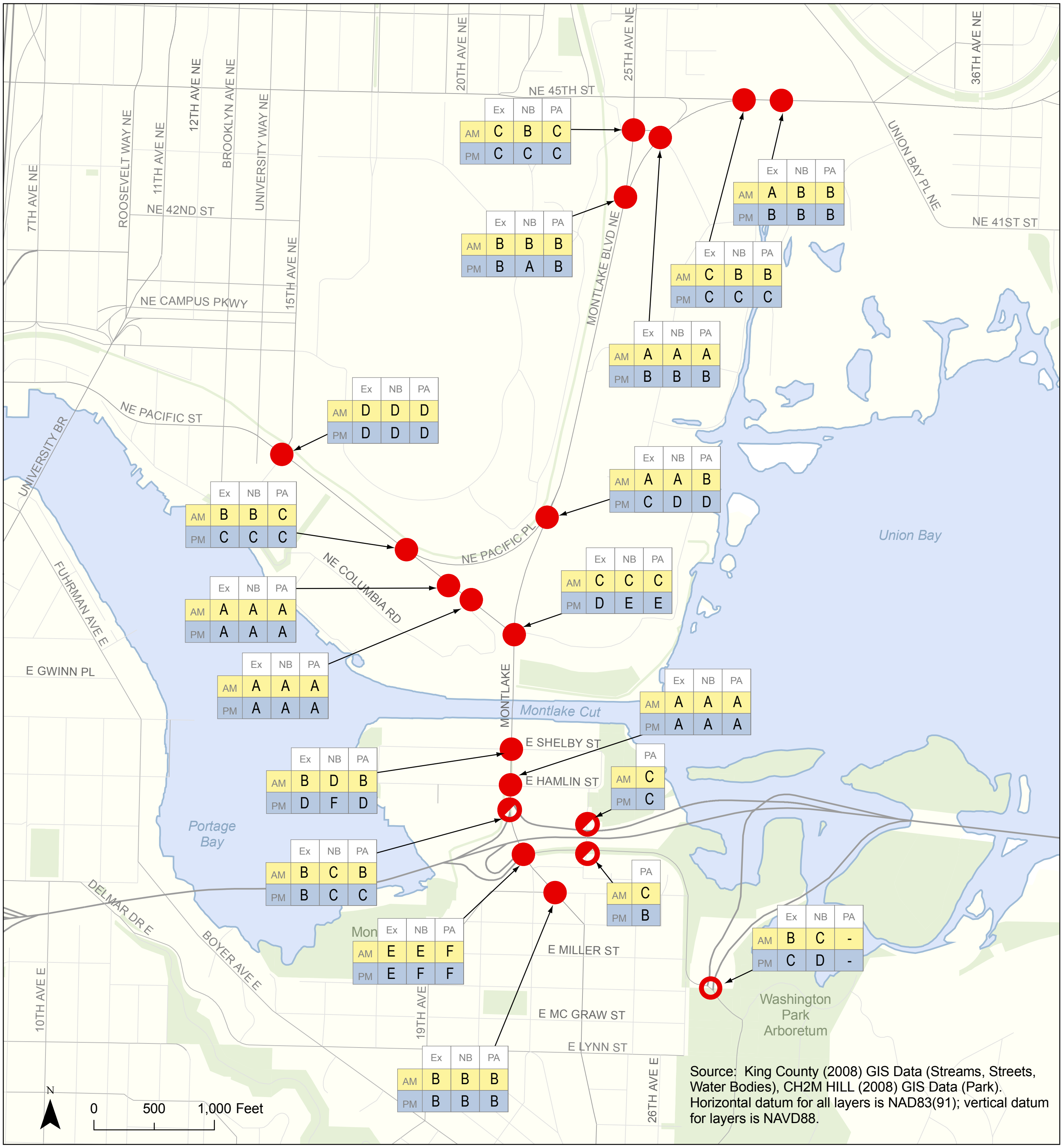
Exhibit 6-3 shows that most intersections in the SR 520/Montlake Boulevard interchange area currently operate at LOS D or better during the morning and afternoon peak hours (refer to Chapter 4 for a description of LOS). However, the Montlake Boulevard/Lake Washington Boulevard/SR 520 eastbound ramps intersection operates at LOS E during both the morning and afternoon peak hours, with legs of the intersection operating near or over capacity. Congestion from this traffic signal spills back into the off-ramp deceleration lane, which affects SR 520 mainline operations as drivers slow when approaching the off-ramp. Southbound queues, at times compounded by SR 520 congestion, extend back between East Hamlin Street and East Shelby Street. Northbound queues at times extend through the East Roanoke Street intersection.

What would traffic be like at the Montlake interchange in 2030 without the project?

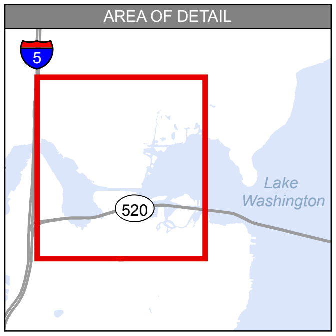
As discussed in Chapter 5, the region will grow by 1 million people by 2030, add over 640,000 new jobs, and need to accommodate close to 40 percent more traffic (PSRC 2006). Chapter 5 summarizes population and employment changes between now and the year 2030. Because of these increases, traffic volumes at the Montlake interchange area are forecasted to increase between 15 and 21 percent in the morning and afternoon, respectively, by the year 2030 independent of the SR 520, I-5 to Medina project.

The peak-hour volumes shown in Exhibits 6-1 and 6-2 for the SR 520/Montlake Boulevard interchange area show how traffic volume changes within the larger interchange area would affect specific streets.

With these increases, congestion is expected to worsen compared to today’s conditions. The following subsections describe areas where congestion occurs or where traffic volumes have been a concern to the communities. Intersections in the SR 520/Montlake Boulevard interchange area where traffic operations would degrade to worse than LOS D under the No Build Alternative are also described in detail below. Exhibit 6-3 shows the LOS designations for the intersections in the study area.



Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.



No Build
Existing
Preferred Alternative

		Ex	NB	PA
AM Peak Hour	AM	B	B	C
PM Peak Hour	PM	C	C	C

Alternatives Year 2030

○ Unsignalized Intersection

● Signalized Intersection

◐ Signalized Intersection with Project

LEVEL OF SERVICE

A-C	No/Little Congestion
D	Moderate Congestion
E	Heavy Congestion
F	Severe Congestion/Over Capacity

Exhibit 6-3. **SR 520/Montlake Boulevard Interchange Area – AM and PM Peak Hour LOS**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

Lake Washington Boulevard through the Arboretum

Of the vehicles that travel through the Arboretum today and in the year 2030, about half the trips travel to and from SR 520. Today, the volume on Lake Washington Boulevard through the Arboretum is highest in the morning peak period, with about 1,590 trips per hour. Because of population and employment growth, this volume would increase by 23 percent to 1,950 vph in the year 2030. Today, in the afternoon peak period, there are 1,400 vph traveling through the Arboretum. This rate would increase to 1,730 vph in the year 2030 under the No Build Alternative. However, with this growth, the intersection of Lake Washington Boulevard with the SR 520 ramps would still operate at LOS D or better in the year 2030.

Montlake Boulevard/Lake Washington Boulevard/SR 520 Eastbound Ramps

As discussed in Chapter 5, eastbound SR 520 is congested for approximately 3 hours during the morning peak period. As a result, congestion backs up through the Montlake Boulevard/Lake Washington Boulevard/SR 520 eastbound ramps intersection and onto adjacent arterials. Congestion on Montlake Boulevard southbound can extend as far back as NE 45th Street.

During the morning peak hour, this intersection operates at LOS E today with an average delay of 60 seconds per vehicle. Today, the intersection receives an LOS E grade because the movements to and from the SR 520 ramps operate over capacity.

Between now and the year 2030 (No Build Alternative), traffic volumes would increase by 15 percent at this intersection. However, most of the growth would occur on the north-south movements. This means the overall intersection would still operate at LOS E in year 2030, but most of the approaches would operate over capacity with an overall delay of 72 seconds per vehicle. Northbound congestion would affect the Montlake Boulevard/East Roanoke Street intersection, and southbound congestion would limit the traffic that could access the westbound SR 520 on-ramp. Congestion on the eastbound off-ramp would not affect SR 520 mainline operations in the morning peak period.

At 55 seconds of delay per vehicle, an intersection earns a LOS E grade. At 80 seconds of delay per vehicle, an intersection earns a LOS F grade. Today's conditions of LOS E with 60 seconds of delay per vehicle is a better operating LOS E than the year 2030 No Build Alternative LOS E with 72 seconds, which is approaching a LOS F.

During the afternoon peak hour, intersection operations would worsen from LOS E today to LOS F (and 51 percent over capacity) in 2030 under the No Build Alternative. At its worst, congestion on the eastbound SR 520 off-ramp would extend back onto the eastbound SR 520 main line. Large queues would occur on all approaches and affect adjacent intersections.

Montlake Boulevard/NE Pacific Street

During the afternoon peak hour, intersection operations would worsen to LOS E with the No Build Alternative because of increases in traffic volumes expected between now and the year 2030. This intersection, which is currently at capacity, would be 20 percent over capacity in 2030 with the No Build Alternative. Congestion at this intersection would continue to affect adjacent intersections, with congestion extending as far north as 25th Avenue NE during the afternoon peak hour.

Traffic operations during the morning peak hour would not operate below a LOS D at this intersection.

Montlake Boulevard/East Shelby Street

During the afternoon peak hour, operations at this intersection would worsen from LOS D today to LOS F under the No Build Alternative. Congestion at this intersection would extend into adjacent intersections to the north and south. However, the effect of this congestion does not change the LOS grade at the adjacent intersections.

What would traffic be like at the Montlake interchange in 2030 with the project?

The Preferred Alternative would make the following changes to the transportation network within the Montlake Boulevard interchange area (Exhibits 6-4 and 6-5):

- Remove the Lake Washington Boulevard ramps that exist today.
- Improve the ramp merge areas on SR 520.
- Provide additional shoulder width on SR 520.
- Provide an inside HOV lane on SR 520.

- Add a new bascule bridge parallel to the existing Montlake Bridge that would add two lanes across the Montlake Cut and connect with the existing lanes on either side.
- Provide a northbound HOV lane on Montlake Boulevard between the SR 520 westbound ramps and the Montlake Cut.
- Provide a southbound HOV lane between Pacific Street and south of the Montlake cut.
- Add access from westbound SR 520 to south of the interchange area via 24th Avenue East.
- Add HOV direct access ramps that extend through 24th Avenue East to Montlake Boulevard from westbound SR 520 and to eastbound SR 520.
- Signalize the Montlake Boulevard/westbound SR 520 ramp intersection, and provide a northbound left turn from Montlake Boulevard to westbound SR 520.
- Add a second general-purpose lane on the westbound on-ramp and include a ramp meter.
- Convert the HOV bypass lane on the eastbound loop on-ramp to a general-purpose lane, resulting in a total of two general-purpose lanes that will be metered.

The design modifications for the SR 520 corridor in combination with the corridor toll would substantially reduce eastbound congestion through the interchange area. This reduction in SR 520 congestion would eliminate the highway-related congestion effects on Montlake Boulevard and improve traffic operations on the local street system.

The Preferred Alternative revises access for HOV/transit trips to and from SR 520 to the east, and for all trips to and from south of the interchange area.

For HOV trips, today the only priority they are provided is a queue bypass lane on the eastbound loop on-ramp. With the Preferred Alternative, trips destined to or from the east can use the direct access ramps.

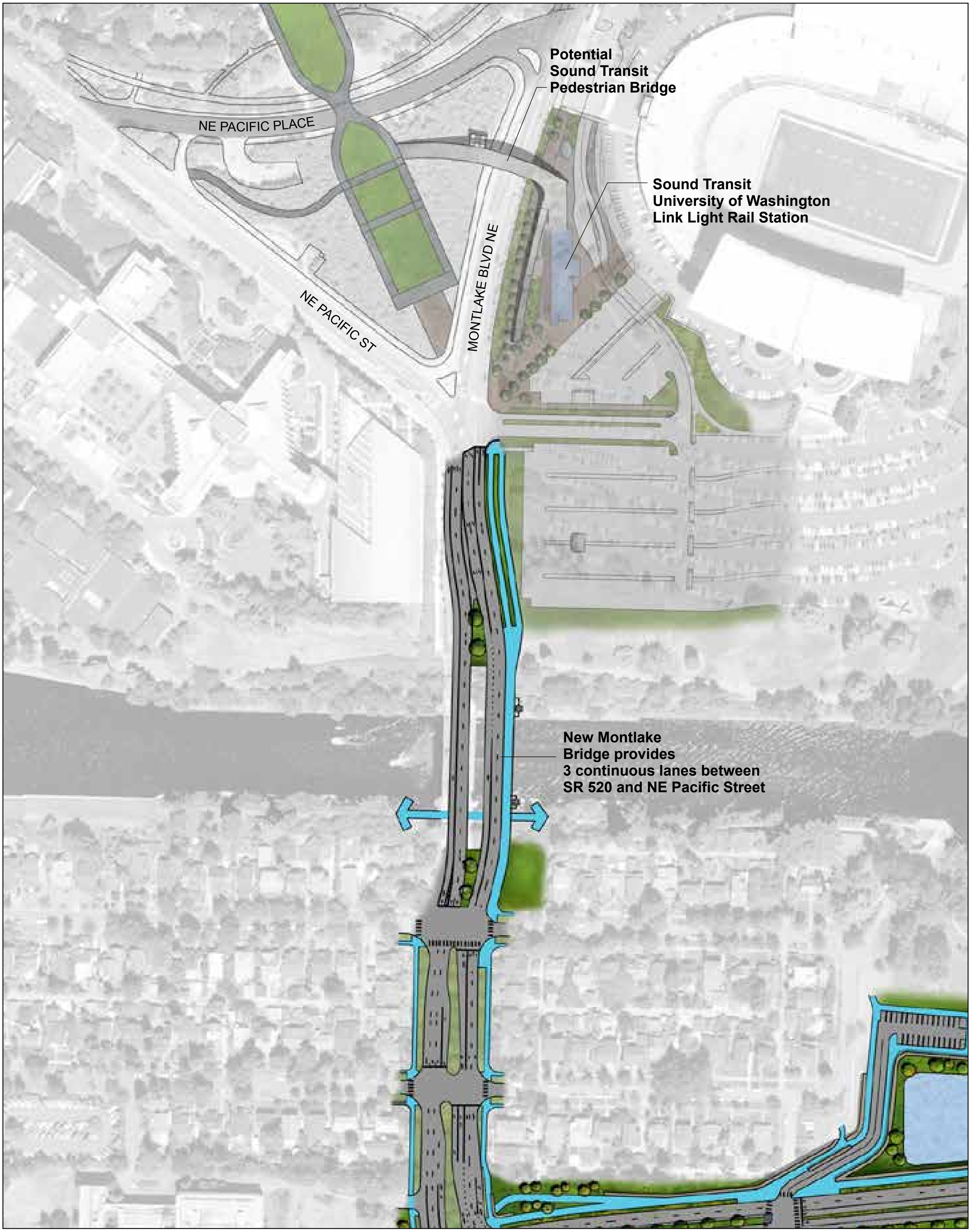


Exhibit 6-4. **Preferred Alternative Design, Montlake Boulevard from Pacific Street to SR 520**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

Exhibit 6-5. **Preferred Alternative Design, Montlake Boulevard Interchange Area**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

For an HOV trip originating from east of Lake Washington to the Montlake area, the driver would stay in the HOV lane on SR 520, and exit from the left onto the direct access ramp. The ramp climbs over SR 520 onto the Montlake lid. The direct access ramp intersects with 24th Avenue East and terminates at Montlake Boulevard. If the trip had a south destination, the driver could turn left onto 24th Avenue East and travel south on either Lake Washington Boulevard or Montlake Boulevard. If the trip had a north destination, the driver would continue through the 24th Avenue East intersection and turn right at the Montlake Boulevard intersection. From here, the direct access ramp ties directly into an HOV lane that extends to the Montlake Cut.

For HOV trips starting in the Montlake area and destined to the Eastside, access directly into the HOV lane on SR 520 would also be provided. For trips traveling from north of SR 520, the driver could turn left from Montlake Boulevard directly onto the direct access ramps at the new Montlake Boulevard/SR 520 westbound ramp intersection. The driver would travel through the 24th Avenue East intersection and merge directly into the HOV lane on SR 520. For trips from the south, the vehicles would travel up Montlake Boulevard or Lake Washington Boulevard and access the direct access ramps from 24th Avenue East.

General-purpose access also changes with the Preferred Alternative for trips between south of SR 520 and east of Lake Washington. Today, those trips are served with the ramps to and from Lake Washington Boulevard. These ramps would be removed with the Preferred Alternative.

For trips south of SR 520 that are destined to the east, the drivers would travel up either Montlake Boulevard or Lake Washington Boulevard and use the loop ramp. For the return trip (westbound on SR 520 to south of SR 520), they would exit at the Montlake Boulevard off-ramp. This ramp climbs up to the lid where it intersects with 24th Avenue East. Trips heading south would then turn left onto 24th Avenue East and have the option to then travel southbound onto Lake Washington Boulevard or Montlake Boulevard.

In the Montlake area, year 2030 traffic forecasts show an overall growth of 15 percent and 23 percent in traffic during the morning and afternoon peak hours, respectively, which is similar to the No Build Alternative. The Preferred Alternative would not generate more regional traffic. However, travel patterns within the interchange area would change compared to the No Build Alternative due to the changes in access described above.

From the north, more trips from the University District to I-5 would travel along Montlake Boulevard southbound and across Portage Bay westbound than under the No Build Alternative. This is because travel along Montlake Boulevard would be improved with the additional capacity across the Montlake Cut, and congestion spilling back from SR 520 would be reduced.

With the Preferred Alternative, access to SR 520 from the south is provided at the Montlake loop ramp (for general-purpose trips) and at 24th Avenue East (for HOV trips). The ramp to SR 520 from Lake Washington Boulevard would be removed. Of the trips that do head north to travel eastbound on SR 520, more of them would use Montlake Boulevard rather than Lake Washington Boulevard to access SR 520. This change would result in less traffic using Lake Washington Boulevard through the Arboretum.

With these design changes, the Preferred Alternative would improve traffic operations at the following intersections compared with the No Build Alternative.

- In the No Build Alternative, significant congestion would spill back onto the Montlake Boulevard corridor, affecting operations at the intersections. This congestion is not quantified in the LOS letter grades. With the Preferred Alternative, this congestion would be removed, resulting in better operations. The effects of SR 520 congestion and its impacts on travel times are further discussed in Chapter 7.
- Montlake Boulevard/Lake Washington Boulevard/SR 520 eastbound ramps (operates at LOS F for both year 2030 scenarios, but improves from 50 percent over capacity with the No Build Alternative to 15 percent over capacity with the Preferred Alternative in the afternoon peak hour)
- Montlake Boulevard/East Shelby Street (improves from a LOS F with the No Build Alternative to a LOS D in the afternoon peak hour)
- Montlake Boulevard/NE Pacific Street (operates at LOS F for both year 2030 scenarios, but improves marginally from 20 percent over capacity to 15 percent over capacity with the Preferred Alternative in the afternoon peak hour)

Exhibit 6-3 summarizes LOS results for all SR 520/Montlake Boulevard interchange area intersections. The Preferred alternative would not degrade intersection operations during either peak hour compared to the No Build Alternative. The following subsections describe changes in traffic operations compared to the No Build Alternative. This description includes intersections that would operate worse than LOS D, which is considered to be below the threshold for acceptable peak period operations.

Lake Washington Boulevard through the Arboretum

Traffic volumes through the Arboretum with the Preferred Alternative in year 2030 would be lower than the No Build Alternative, but similar to today’s conditions because the Lake Washington Boulevard ramps would be removed. About half of the trips that had used the Lake Washington Boulevard ramps from the south to head eastbound would move over to Montlake Boulevard. In the westbound direction, trips heading south would exit at 24th Avenue East and have the option to head south along Lake Washington Boulevard or Montlake Boulevard. Similar to the shift in travel for the eastbound trips, half the westbound trips would travel south along Montlake Boulevard and half on Lake Washington Boulevard. This pattern would be consistent in the morning and afternoon commute periods. The shift in travel to Montlake Boulevard occurs because the access that is provided at 24th Avenue East is fairly close to the Montlake corridor.

Today, the volume on Lake Washington Boulevard through the Arboretum is highest in the morning peak period, with about 1,590 trips per hour. Trips on Lake Washington Boulevard through the Arboretum would increase to 1,950 vph in the year 2030 without the project. Traffic volumes through the Arboretum would decrease to 1,330 vph in the morning, which is less than today’s volumes with the Preferred Alternative that includes closing the Lake Washington Boulevard ramps.

Today, in the afternoon commute period, there are 1,400 vph traveling through the Arboretum. This rate would increase to 1,730 vph in the year 2030 with the No Build Alternative due to land use growth. With the Preferred Alternative, traffic volumes would be reduced to 1,410 vph in the afternoon peak hour, similar to today’s conditions.

Montlake Boulevard/Lake Washington Boulevard/SR 520 Eastbound Ramps

With the Preferred Alternative, up to an additional 640 vph (Exhibit 6-6) would travel through this intersection with the closure of the ramps to/from SR 520 and Lake Washington Boulevard. The Preferred Alternative also includes additional capacity at this intersection to help serve those trips. The capacity improvements provided in this area were reviewed through the ESSB 6392 Workgroup process and limited by adjacent properties. The Preferred Alternative includes an additional northbound left lane and a westbound left-turn lane, and adds an eastbound left turn from the off-ramp.

Exhibit 6-6. **Volume Entering Montlake Boulevard/Lake Washington Boulevard/ SR 520 Eastbound Ramps Intersection, Year 2030 AM Peak Hour**

Alternative	AM Peak Hour	PM Peak Hour
Year 2030 No Build Alternative	4,550 vph	5,410 vph
Year 2030 Preferred Alternative	5,190 vph	5,760 vph
Preferred Alternative minus No Build Alternative	640 vph	350 vph

With this additional capacity, the Preferred Alternative would operate at LOS F and 10 percent over capacity in the morning peak period, and 20 percent over capacity in the afternoon peak period. The afternoon peak operations are a significant improvement compared to the No Build Alternative, which operates at 50 percent over capacity. The morning peak operations are similar to or slightly worse than the No Build Alternative (that operates at 5 percent over capacity) with the channelization reviewed in the ESSB 6392 Workgroup process. As described in Chapter 12, WSDOT may continue to work with the City of Seattle to manage the intersection such that SR 520 operations are not negatively affected.

With the improvements to the SR 520 main line and the addition of a second general-purpose lane on the on-ramp (by converting the HOV lane to general-purpose and shifting HOV to a dedicated ramp), congestion on the eastbound on-ramp would be reduced and would no longer back up onto Montlake Boulevard, substantially reducing the congestion on Montlake Boulevard southbound. However, because the intersection would operate at LOS F, there would still be congestion on the northbound, southbound, and westbound approaches to the intersection. Northbound congestion would queue through the

Montlake Boulevard/ East Roanoke Street intersection, and southbound congestion would affect the trips able to access the westbound SR 520 on-ramp intersection.

Montlake Bridge openings can have long-lasting effects on traffic flow in this area. The bridge does not open during the morning and afternoon peak periods; however, if the bridge opens at the end of the midday period (3:30 p.m.), it can affect traffic operations throughout the afternoon commute. Bridge openings compound whatever congestion is present on the local street network and can cause congestion to spill back onto the SR 520 main line. When congestion reaches the SR 520 corridor, eastbound traffic can then become so congested that it affects traffic on I-5.

An average of 8 to 9 bridge openings occurs during a typical summer weekday (fewer openings occur during other times of the year). Bridge openings typically last 4 to 5 minutes, but can extend up to 6 minutes on occasion (WSDOT 2008a).

Montlake Bridge opening delays make it difficult for bus drivers to keep to their schedules, which affect bus travel times and reliability. When the bridge opens during the weekday afternoon, southbound buses are delayed up to an additional 13 minutes (above their typical travel time without a bridge opening) and northbound buses are delayed up to an additional 7 minutes.

Today, it takes up to 40 minutes for northbound congestion to clear and recover to pre-bridge opening conditions. When the bridge opens at 3:30 p.m., the southbound congestion does not clear again before traffic volumes increase and additional congestion builds due to the evening commute.

In the year 2030 No Build Alternative, as traffic volumes increase due to land use changes, congestion and resulting delays due to bridge openings would increase.

With the Preferred Alternative, a parallel new bascule bridge would be constructed. The roadway capacity provided with the new bridge would allow for the Montlake Boulevard corridor to include an HOV lane in each direction and a widened pedestrian path. The two parallel bridges would open together as boats pass underneath. The typical opening would be 10 seconds longer with two parallel bridges compared to a single bridge to allow boats to clear both bridges. However, having two bridges would also allow the queue of traffic that builds during an opening to clear faster.

Travel time delays for today, year 2030 No Build Alternative, and the Preferred Alternative are shown below.

Maximum Delay due to Bridge Opening at 3:30 p.m. and Recovery Time

Proposed Trip	Existing Travel Delay	2030 No Build Alternative	2030 Preferred Alternative
Local southbound transit trip (from NE Pacific Street to south of SR 520)	13 minutes of delay; *congestion would continue through peak commute*	13 minutes of delay; *congestion would continue through peak commute*	7 minutes of delay; *congestion would continue through peak commute*
Local northbound transit trip (from south of SR 520 to NE Pacific Street)	4 minutes of delay; 40 minutes to recover	14 minutes of delay; *congestion would continue through peak commute*	11 minutes of delay; *congestion would continue through peak commute*
SR 520 transit trip (from southbound NE Pacific Street to eastbound SR 520)	12 minutes of delay; *congestion would continue through peak commute*	14 minutes of delay; *congestion would continue through peak commute*	7 minutes of delay; *congestion would continue through peak commute*
SR 520 transit trip (from westbound SR 520 to northbound NE Pacific Street)	7 minutes of delay; 40 minutes to recover	11 minutes of delay; *congestion would continue through peak commute*	4 minutes of delay; 20 minutes to recover
University Village to south of SR 520	3 minutes of delay; 10 minutes to recover	16 minutes of delay; *congestion would continue through peak commute*	15 minutes of delay; *congestion would continue through peak commute*
South of SR 520 to University Village	4 minutes of delay; 30 minutes to recover	13 minutes of delay; *congestion would continue through peak commute*	10 minutes of delay; *congestion would continue through peak commute*

* Delay shown is only the additional delay experienced with the bridge opening. Delay does not include other factors such as signal delay or delay from congestion prior to bridge opening.

Montlake Boulevard NE/NE Pacific Street

During the afternoon peak hour, the Montlake Boulevard NE/NE Pacific Street intersection would operate at LOS E and 21 percent over capacity under the No Build Alternative.

The Preferred Alternative would have similar volumes through this intersection as the No Build Alternative. However, with the Preferred Alternative, a southbound HOV receiving lane along Montlake Boulevard is provided. This configuration allows signal modifications, resulting in slightly better operations.

Montlake Boulevard/East Shelby Street

Intersection operations would improve from LOS F under the No Build Alternative to LOS D with the Preferred Alternative.

Today, north of the Montlake Boulevard/East Shelby Street intersection, the roadway is limited to two lanes in each direction. This requires traffic to narrow from three lanes to two northbound through this intersection. The Preferred Alternative includes additional capacity across the Montlake Cut with a new bascule bridge, resulting in three lanes in each direction. The increased capacity in and out of the Montlake Boulevard/East Shelby Street intersection to and from the north would result in less delay for traffic traveling through this intersection.

Chapter 7—Nonmotorized Facilities

What is in this chapter?

This chapter describes current and proposed pedestrian and bicycle facilities, also known as nonmotorized facilities, within or near the SR 520, I-5 to Medina project. In addition, this chapter identifies effects of the Preferred Alternative on nonmotorized facilities and routes in the study area.

Proposed project improvements would increase mobility options throughout the corridor by completing the SR 520 shared-use path across the Evergreen Point Bridge, creating new connections between local and regional trails, and by improving existing bicycle and pedestrian routes within and around the project site. Public comments on the project have emphasized the benefits of these features to residents in the project vicinity. Improving nonmotorized facilities would simultaneously increase opportunities for physical activity and social interaction, provide viable commuter and recreational alternatives to driving, and reduce greenhouse gas emissions and other air pollutants (Puget Sound Clean Air Agency and Public Health – Seattle & King County 2008).

Since publication of the SDEIS, WSDOT worked collaboratively with the City of Seattle, Seattle Pedestrian Advisory Board, and Seattle Bicycle Advisory Board to develop design refinements for pedestrian and bicycle facilities as a subgroup to the overall ESSB 6392 Workgroup process. This bicycle/pedestrian subgroup identified and evaluated seven key regional and local pedestrian and bicycle connections and corridors in the study area. This chapter includes a qualitative assessment of the effects of the No Build Alternative and Preferred Alternative on these identified routes. All existing and planned bicycle and pedestrian facilities and connections would be maintained in the Preferred Alternative. In some cases, new connections would be created, including links to the SR 520 regional bicycle/pedestrian path.

The SR 520, I-5 to Medina project provides connections to the City of Seattle Bicycle Master Plan routes. Bicycle traffic is expected to increase to and from the Burke-Gilman Trail after construction of the SR 520 regional bicycle/pedestrian path.

What are the nonmotorized design elements?

The project includes many design elements to provide the best possible nonmotorized connections. The following features are proposed at the Evergreen Point Bridge, Montlake Boulevard and 24th Avenue East lid, and 10th Avenue East and Delmar Drive East lid.

Evergreen Point Bridge

A 14-foot-wide bicycle/pedestrian path designed to comply with the Americans with Disabilities Act (ADA) would be built along the north side of SR 520 and follow the highway's grade, connecting with the existing regional path improved by the SR 520, Medina to SR 202 project. The SR 520 regional bicycle/pedestrian path would begin at the SR 520/Montlake Boulevard interchange and continue across the Union Bay Bridge, west approach, and Evergreen Point Bridge.

Five scenic vantage points with pull-outs would be spaced along the north side of the bicycle/pedestrian path. The bicycle/pedestrian path on the bridge structure would be illuminated by recessed lighting in the bridge barrier. All underpass trails would have a wall separating bicyclists and pedestrians from vehicular traffic.

Montlake Boulevard and 24th Avenue East Lid

A large new lid would be built over SR 520 in the Montlake area configured for transit and nonmotorized connectivity. The 1,400-foot-long lid would extend from west of Montlake Boulevard to east of 24th Avenue NE near the Union Bay shoreline. The lid would provide vehicle and pedestrian crossings, landscaped open areas, and connections to regional trails. Exhibit 7-1 shows the details of the nonmotorized design features for the Preferred Alternative.

Source: King County (2008) GIS Data (Streams, Streets and Waterbodies) and CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 7-1. **Preferred Alternative Nonmotorized Design Features Montlake Interchange Area**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

The Preferred Alternative includes the following elements:

- Grade-separated connection under Montlake Boulevard to the Bill Dawson Trail
- Reconstruction of the Bill Dawson Trail within the SR 520 right-of-way
- Path along Lake Washington under SR 520 connecting to the Arboretum
- Improved connection along 24th Avenue East between Shelby Street and Lake Washington Boulevard
- Widened sidewalk across the new bascule bridge for use as a shared-use path
- Improved Foster Island pedestrian access under SR 520
- Improved sidewalks along Lake Washington Boulevard between Montlake Boulevard and the new path under SR 520 connecting to the Arboretum

10th Avenue East and Delmar Drive East Lid

A lid would be constructed over SR 520 between 10th Avenue East and Delmar Drive East. This lid would connect with the new bridge crossings and reconnect the communities on both sides of the SR 520 corridor by providing walkways and open spaces above the highway. The proposed lid structure would be between 500 and 650 feet long and include a recreational meandering path from Bagley Viewpoint to Boyer Way, vista points to overlook Lake Union and Portage Bay, and views eastward and westward.

Exhibit 7-2 shows how a nonmotorized facility could be included in the design of the 10th and Delmar lid. Ongoing coordination among project staff, City of Seattle, and the neighborhoods would help to finalize the layout and connectivity.

I-5/Roanoke Crossing

The Preferred Alternative includes nonmotorized improvements such as a path on the south side of the East Roanoke Street bridge over I-5.

Exhibit 7-2 also shows how such a nonmotorized facility could be included in the design of the I-5/Roanoke crossing. Ongoing coordination between project staff, City of Seattle, and the neighborhoods would help to finalize the layout and connectivity.

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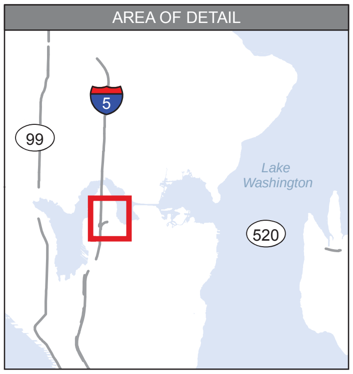

Source: King County (2008) GIS Data (Streams, Streets and Waterbodies) and CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 7-2. **Preferred Alternative Nonmotorized Design Features I-5 Interchange Area**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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What are the existing nonmotorized characteristics of the study area?

The Cascade Bicycle Club counted 400 bicyclists crossing the Montlake Bridge during a weekday morning peak period in 2008 (WSDOT 2008b). This number closely compares with a count of 427 bicyclists on the Burke-Gilman Trail at Stone Way North in July 2001 documented by the Seattle Department of Transportation (SDOT) (City of Seattle 2007).

Metro provided quarterly manual counts in 2002, observing bicycles on buses during morning and afternoon peak periods (King County Metro 2002). The highest total daily bicycle volumes occurred in the summer, including 118 bicyclists at the Evergreen Freeway Transit Station, 90 at the Montlake Freeway Transit Station, and 50 at the Montlake Boulevard bus stop.

The Evergreen Point Bridge poses a considerable challenge for cyclists and pedestrians traveling between Seattle and the Eastside communities. Because of the limited shoulder widths, no pedestrian or bicycle traffic is allowed on the bridge. Bicyclists wishing to cross the lake via SR 520 must board a bus equipped with a bicycle-carrying rack. Bicyclists and pedestrians can reach the SR 520 corridor in Seattle via a combination of paths and on-street bicycle lanes.

To support additional bicycle crossings over the Evergreen Point Bridge, Metro implemented a bicycle demonstration program in 2008 that allowed bicyclists to load their bicycles onto out-of-service buses for free. This program increased the availability of bicycle racks for those crossing the bridge and has been continued through at least 2011 due to its success.

Additionally, Microsoft’s Connector system runs a bicycle shuttle, which can transport 12 bicycles at a time across the bridge. No counts are currently available from this program.

Bicyclists who commute 3 or more days per week may park their bicycles in one of 54 reserved Metro locker spaces at the Montlake Freeway Transit Station on the north side of the bridge. This bicycle locker provides the largest number of spaces in the Metro system, and is likely used the most by weekday commuters. A Metro bicycle rack capable of holding 53 bicycles is

Did you know?

Class I bicycle facilities are paved and have exclusive rights-of-way for the principal use of bicycles, pedestrians, and other nonmotorized means of travel. They are required to be at least 10 feet wide.

Class II bicycle facilities are established within the paved area of arterials for the preferential use of bicycles. These paved bicycle areas, or bike lanes, are striped in widths varying between 4 and 12 feet and are signed as designated bikeways.

Class III bicycle facilities are located along existing arterials (without striping) and are intended to provide continuity within the bikeway system.

also available at the Montlake Freeway Transit Station on a first-come/first-served basis. Bicycle parking information can also be found in the Social Elements Discipline Report (WSDOT 2009a).

The SR 520, I-5 to Medina project vicinity comprises steep terrain, a large water body (Portage Bay), and a dense urban grid of different street types. Residential communities, schools, parks, and commercial areas are adjacent to the highway. Both the I-5/SR 520 interchange and the bridge over the Montlake Cut are busy, important crossroads serving several transportation modes that link the Roanoke/Portage Bay, Capitol Hill, Eastlake, Montlake, and University District neighborhoods.

For more detailed information on regional trails, refer to the King County Bicycling Guide Map *(*King County Department of Transportation 2009*),* which provides a comprehensive overview of the region's bicycle system. For details regarding off-roadway trails in the study area, see the Recreation Discipline Report (WSDOT 2009b).

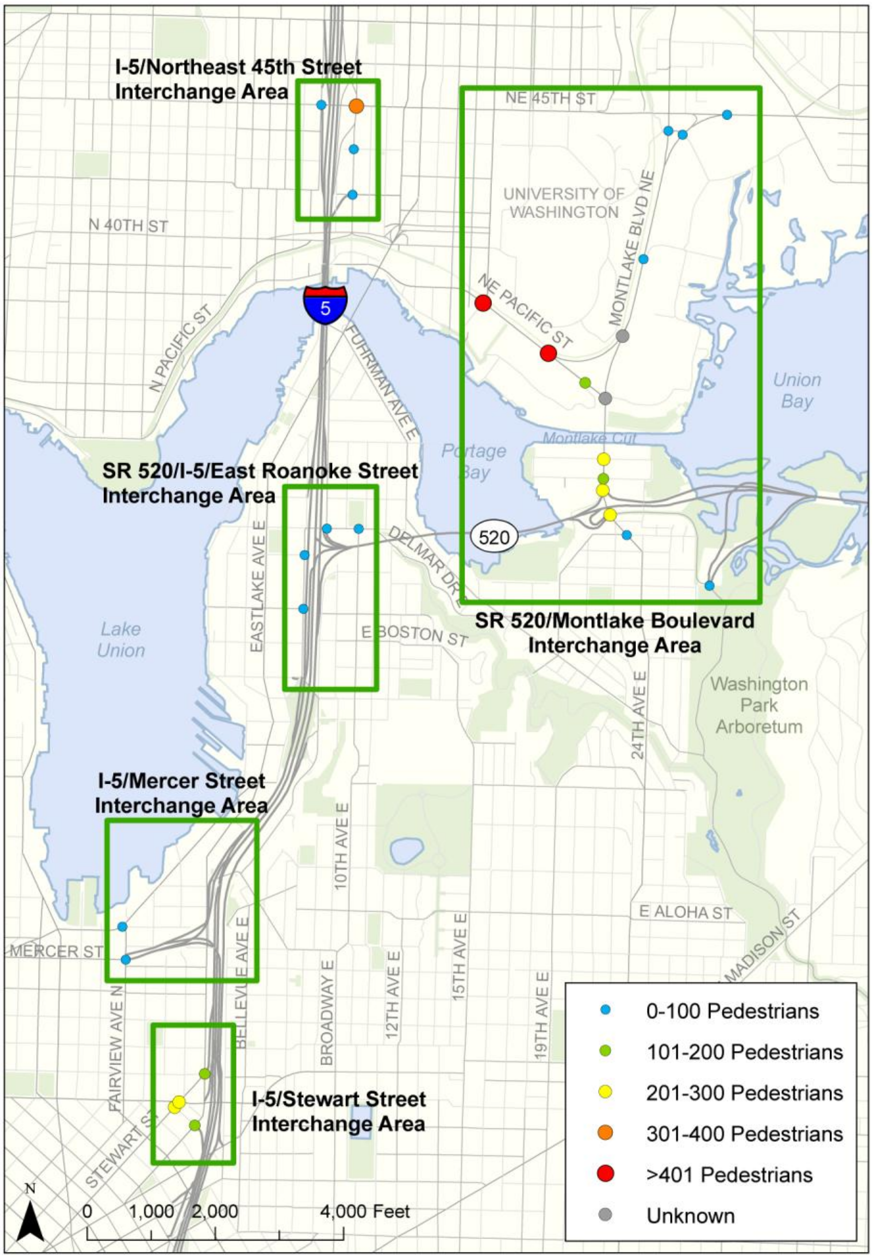
The Burke-Gilman Trail is the only Class I bicycle facility in the study area. Other Class I facilities in the region include the Elliott Bay Trail, the I-90 Trail, the SR 520 regional bicycle/pedestrian path, and the Sammamish River Trail. The Burke-Gilman Trail is a paved, shared-use path and extends 27 miles from west of Gas Works Park in Seattle, around the north end of Lake Washington, to Marymoor Park in the city of Redmond.

According to a 1995 user count, the Burke-Gilman Trail had 2,239 daily bicyclists in the vicinity of the UW. By 2005, the same portion of the Burke-Gilman Trail experienced an increase of 918 (41 percent) trail users.

Several other local trails in the study area may be affected by the project. At the Arboretum, the Waterfront Trail to Foster Island is 0.5 mile long and Azalea Way is 0.75 mile. The Waterfront Trail is less than 0.5 mile between the northern tip of Foster Island to the Graham Visitors Center and Azalea Way. Round trip from MOHAI to Azalea Way is approximately 3 miles.

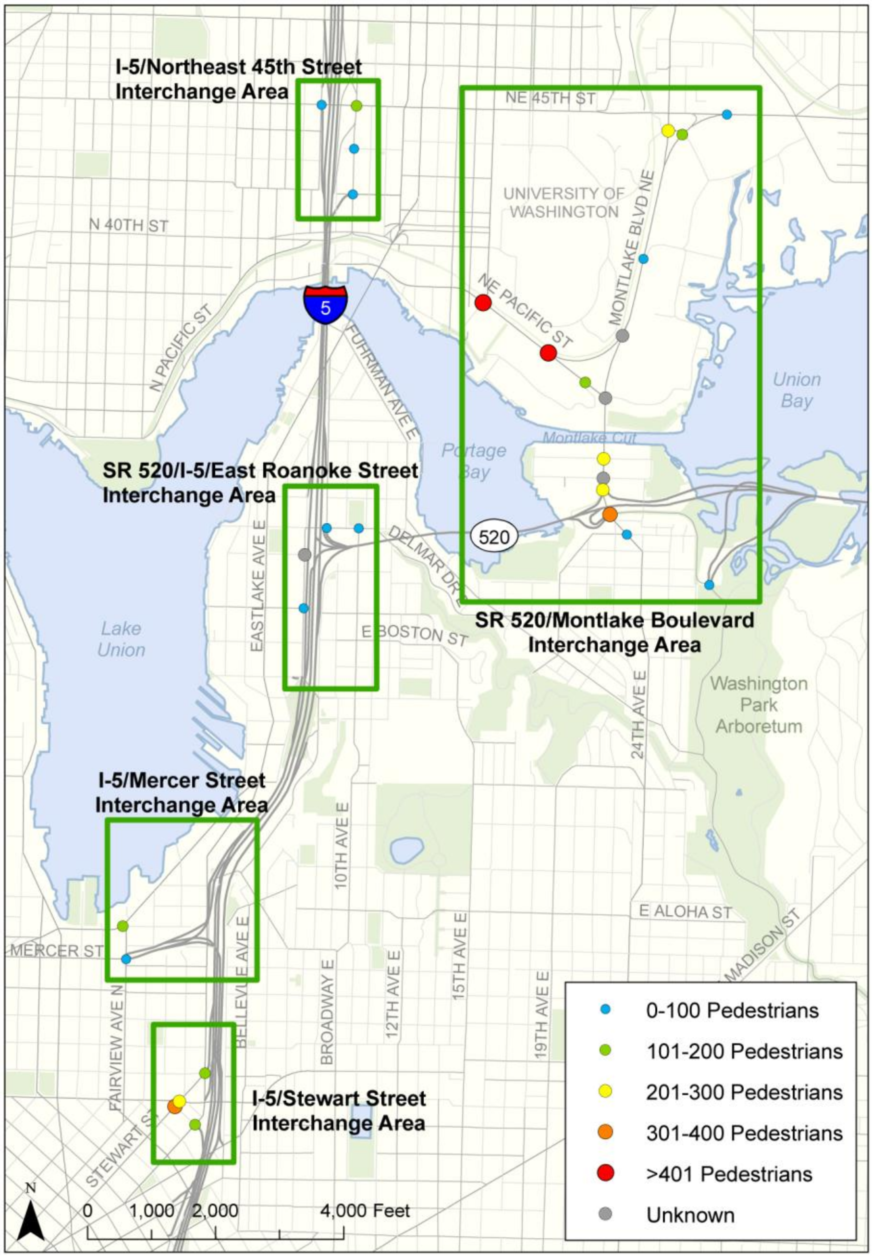
Below are detailed descriptions of current nonmotorized locations, which are organized by interchange within the above-mentioned neighborhoods.

Exhibits 7-3 and 7-4 show pedestrian volumes at several key locations in the study area. The volumes indicate the relative amount of pedestrian activity between the intersection locations.



Sources: Traffic Data Gathering (TDG) and Traffic Counts Consultants (TC^2), January 2007.

Exhibit 7-3. **Pedestrian Volumes during Morning Peak Period**



Sources: Traffic Data Gathering (TDG) and Traffic Counts Consultants (TC^2), January 2007.

Exhibit 7-4. **Pedestrian Volumes during Afternoon Peak Period**

SR 520/Montlake Boulevard Interchange

The Montlake Multimodal Center refers to the area near the triangular intersection of NE Pacific Street, NE Pacific Place, and Montlake Boulevard NE. There is currently substantial pedestrian and bicycle activity around the SR 520/Montlake Boulevard interchange as people travel to, from, or through the University District and the UW.

This interchange area currently provides the following functions for pedestrians and bicyclists:

- A key stop and transfer point for local and regional bus service to and from the University District, including the UW, via the NE Pacific Street bus stops. This point serves 3,500 riders per day based on a 2008 traffic count by WSDOT.
- A link between the Burke-Gilman Trail and Seattle destinations, especially those to the south.
- Access between the UW Medical Center, the Triangle parking garage, UW main campus, and the UW parking area.
- Pedestrians use a traffic island at the corner of the Montlake Boulevard NE/NE Pacific Street intersection to travel between the UW E11 parking lot east of Montlake Boulevard and the UW Medical Center. Pedestrians also cross the Montlake Multimodal Center to travel among the UW central campus, UW Medical Center, and Husky Stadium facilities.

There are six pedestrian facilities located north of the Montlake Multimodal Center:

- Two pedestrian bridges cross NE Pacific Street between Montlake Boulevard NE and 15th Avenue NE.
- Three pedestrian bridges cross Montlake Boulevard—one connects the UW main campus with the Bank of America Arena at Hec Edmundson Pavilion and two others reach the Montlake parking lot.
- One pedestrian tunnel under NE Pacific Street connects the Triangle parking garage to the UW Medical Center.

Bicyclists cross the Montlake Multimodal Center as they travel between areas south of the Montlake Bridge and the UW Medical Center to the main campus and the Burke-Gilman Trail.

The sidewalks, crosswalks, and asphalt path across the Montlake Multimodal Center are designated regional trail connections in the Seattle nonmotorized plan. Approximately 6 percent of UW students and staff bicycle to campus; many travel from the south and cross Montlake Boulevard NE, NE Pacific Street, and NE Pacific Place (UW 2001).

There are currently no dedicated bicycle facilities from north of the Montlake Bridge to the Burke-Gilman Trail and the Lake Washington Bike Loop. However, cyclists have been observed using sidewalks and arterial streets along this route to travel to the Montlake Freeway Transit Station and other destinations to the north and south. Pedestrian and bicycle trails in the vicinity of the SR 520/Montlake Boulevard interchange are shown on Exhibit 7-5.

Montlake Boulevard is one of three north-south connections across SR 520 in the Montlake interchange area. Another north-south connection is the Bill Dawson Trail, which runs under SR 520 along the west side of Montlake Boulevard and connects the Montlake Playfield (south of SR 520 on Portage Bay) and the NOAA Northwest Fisheries Science Center building (north of SR 520).

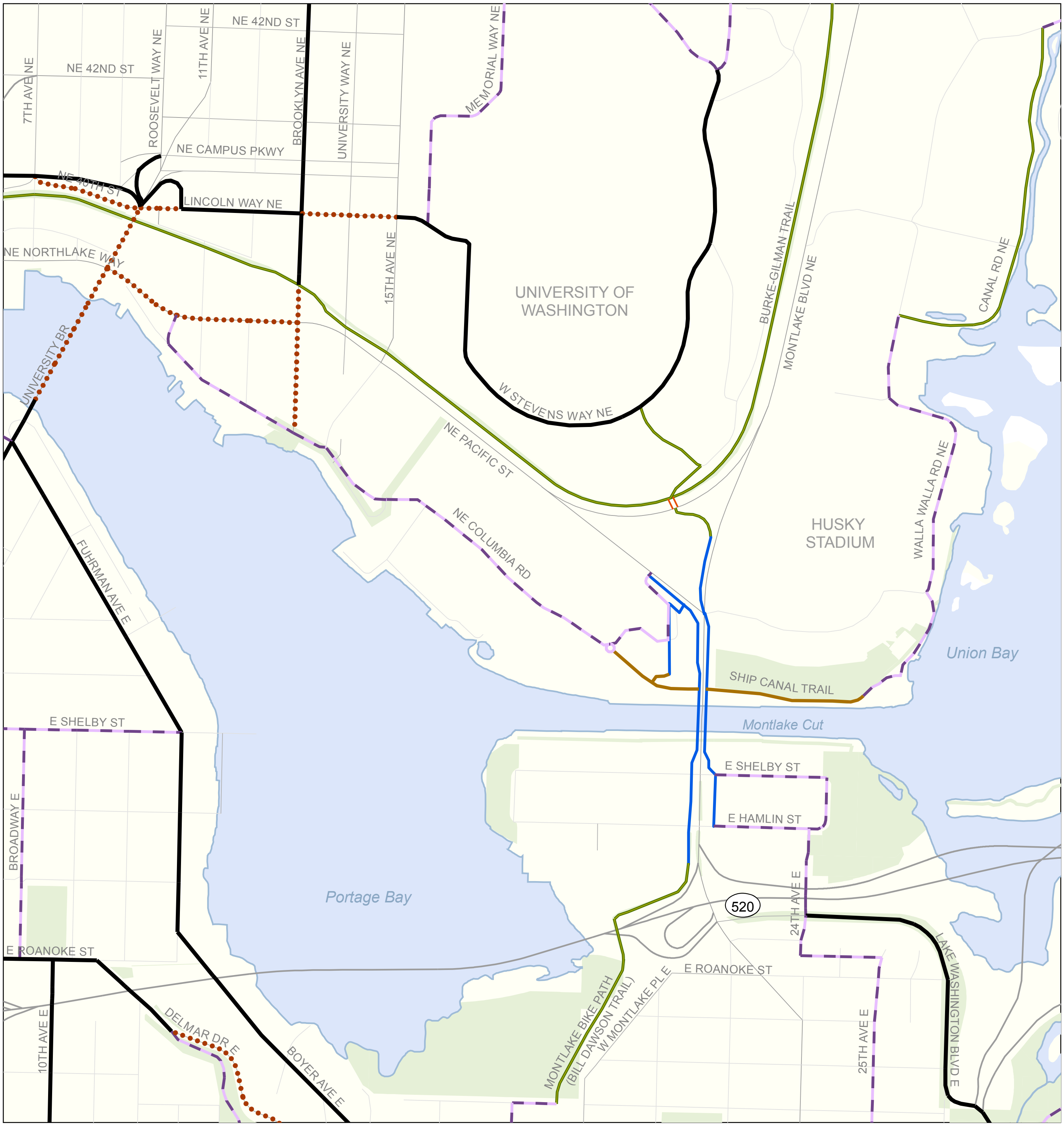
A third crossing is the 24th Avenue East bridge, which connects Lake Washington Boulevard to East Montlake Park. This crossing is part of a proposed City of Seattle Master Bicycle Plan that begins at East Shelby Street and East Hamlin Street along 24th Avenue East. The proposed bicycle boulevard continues south on 25th Avenue East and 26th Avenue East before connecting to the Lake Washington Loop and SR 520/Montlake Boulevard interchange area from the Lake Washington Loop, Arboretum, and Burke-Gilman trails.

SR 520/I-5/East Roanoke Street Interchange

Sidewalks are provided throughout the SR 520/I-5/East Roanoke Street interchange area. Boylston Avenue East, Harvard Avenue East, and East Roanoke Street have sidewalks on only one side of the street where they are adjacent to I-5, except in areas that provide access to bus stops. There are currently no marked pedestrian crossings on the north or west legs of the East Roanoke\Harvard Avenue East intersection, or the north or east legs of the East Roanoke\Boylston Avenue East intersection.

Bicyclists share the roads with vehicular traffic and there are no designated bicycle lanes in the immediate area. Harvard Avenue East, East Roanoke Street, and 10th Avenue East are identified in the Seattle Bicycling Guide Map (City of Seattle 2008) as "arterial streets commonly used by bicyclists.”

Pedestrian volumes along the SR 520/I-5/East Roanoke Street interchange intersections are shown in Exhibits 7-3 and 7-4.



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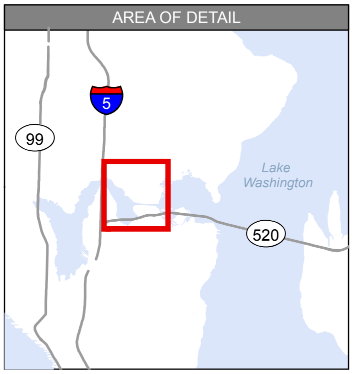

- Sidewalk Connection
- Marked Crosswalk
- Pedestrian Pathway (Bicyclists Permitted)
- Bicycle Path
- Non-Arterial Street (Commonly Used by Bicyclists)
- Arterial Street (Commonly Used by Bicyclists)
- Shared Use Path

Source: King County (2008) GIS Data (Streams, Streets and Waterbodies) and CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

N

0 250 500 1,000 Feet

Exhibit 7-5. **SR 520/Montlake Interchange Area Bicycle and Pedestrian Paths**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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I-5/Mercer Street Interchange

Sidewalks are provided throughout the I-5/Mercer Street interchange area. Pedestrians using Fairview Avenue North must travel on the west side of the street between Roy and Mercer Streets because of the on-ramps and off-ramps from I-5. Pedestrians also cannot cross the west leg of the Valley Street\Fairview Avenue North intersection.

Bicyclists share the roads with vehicular traffic and there are no designated bicycle lanes in the immediate area. A dedicated pedestrian and bicycle pathway located just north of Valley Street connects to other streets commonly used by bicyclists to travel to the Fremont and University District neighborhoods.

Pedestrian volumes along the I-5/Mercer Street interchange intersections are shown in Exhibits 7-3 and 7-4.

I-5/Stewart Street Interchange

Sidewalks are provided throughout the I-5/Stewart Street interchange area. Sidewalks are limited to the west side of Eastlake Avenue East between Mercer and Howell Streets.

Bicyclists share the roads with vehicular traffic and there are no designated bicycle lanes in the immediate area. Eastlake Avenue East and Howell Street are identified in the Seattle Bicycling Guide Map (City of Seattle 2008) as “arterial streets commonly used by bicyclists.”

Pedestrian volumes along the I-5/Stewart Street interchange intersections are shown in Exhibits 7-3 and 7-4.

I-5/NE 45th Street Interchange

Sidewalks are provided throughout the I-5/NE 45th Street interchange area. A sidewalk is located on the west side of 5th Avenue NE within the interchange area. Pedestrians can use sidewalks on both sides of NE 45th Street within the interchange area. Sidewalks are on both sides of 7th Avenue NE except at the I-5 northbound off-ramp area. Pedestrians currently cannot cross the south leg of the NE 42nd Street\7th Avenue NE\I-5 express lanes ramp intersection.

Bicyclists share the roads with vehicular traffic; however, there are no designated bicycle lanes in the immediate area. West of I-5, NE 45th Street is identified in the Seattle Bicycling Guide Map (City of Seattle 2008) as an "arterial street commonly used by bicyclists."

Pedestrian volumes along the I-5/NE 45th Street interchange intersections are shown in Exhibits 7-3 and 7-4.

How are the project's nonmotorized facilities being designed?

Two of the primary considerations when designing a bicycle/pedestrian path are personal safety and comfort on the path. A few of the bicycle/pedestrian path attributes that determine safety and comfort are visibility, paving, grade or slope, signage, and protective barriers.

The WSDOT Design Manual (WSDOT 2009c) includes standards and specifications that address safety and comfort for all aspects of trail design. This project adheres to those standards, as do most regional trails throughout the Puget Sound. The WSDOT Design Manual defines a shared-use path as "…used by pedestrians and bicyclists" (Section 1025, p. 13).

Standards that specify sight distance, drainage, traffic signals, bollards, and structures (overpasses, underpasses, bridges, etc.) are established in the WSDOT Design Manual's section on Bicycle Facilities and the American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities (AASHTO 1999).

During one of several community and stakeholder collaborative design events, representatives of communities along the SR 520 corridor declared that "the ability to walk and ride bicycles around the neighborhood to parks, community facilities, and commercial areas is important. Safety should be addressed and walkways and trails enhanced." Additional information about existing and proposed bicycle/pedestrian facilities can be found in the SR 520 Bridge Replacement and HOV Project: Nonmotorized Planning and Design Report (WSDOT 2004). After hearing public concerns about the existing nonmotorized network, the state has worked to proactively address concerns for newly constructed nonmotorized facilities and thereby achieve maximum benefit as part of a planned interconnected system.

How did project changes after the Supplemental Draft EIS influence the nonmotorized elements?

Input from the public, the City of Seattle, the UW, and environmental regulatory agencies led to a decision for the Preferred Alternative. Under the Preferred Alternative design, bicyclists and pedestrians would have increased connections to modes such as bus rapid transit and light rail in the future.

In the meantime, the ESSB 6392 Workgroup was conducted by managers from WSDOT, the City of Seattle, King County, UW, and Sound Transit. The workgroup was informed by two technical coordination teams established by WSDOT and SDOT to evaluate and discuss design refinements.

The workgroup recommended implementing components of the Montlake area bicycle/pedestrian network included in the Preferred Alternative, and supported the anticipated process to identify future network additions. Components of the recommended Montlake bicycle/pedestrian network include:

- A minimum 14-foot-wide shared-use path between SR 520 and the Burke-Gilman Trail, including an 18-foot path on the new bascule bridge. The project is assuming the implementation of the Rainier Vista Land Bridge project and a bicycle and pedestrian overcrossing of Montlake Boulevard to provide a connection between the east side of Montlake Boulevard and the Burke-Gilman Trail.
- Connection to an enhanced Bill Dawson Trail via a bicycle/pedestrian-only tunnel under Montlake Boulevard.
- The Arboretum Loop Trail Extension, which is a new recreational path under SR 520 connecting the Waterfront Trail to the Arboretum.
- Montlake Boulevard and Lake Washington Boulevard East intersection crossing improvements (i.e., remove the free right-turn slip ramps).
- Improved access to 24th Avenue East across the Montlake lid.

Additional workgroup recommendations require further analysis as well as SDOT-led community outreach in order to reach final decisions:

- Recommending either the Shelby Street two-way bicycle lanes or Montlake Boulevard sidewalk widening to connect the SR 520 regional path to the Burke-Gilman Trail.
- Recommending sidewalk widening or on-street improvements for the east and west sides of Montlake Boulevard.
- Conducting further study evaluating additional pedestrian and bicycle crossings and pathways (including in-street bicycle lanes), as well as traffic operations in the Roanoke Park/North Capitol Hill area.
- Continuing cooperation among WSDOT, the Seattle Bicycle Advisory Board, and the Seattle Pedestrian Advisory Board in decision-informing discussions about bicycle and pedestrian designs and amenities.

How was the Montlake Multimodal Center considered?

The City of Seattle, Metro, Sound Transit, UW, and WSDOT are considering several options to improve connections for transit riders, pedestrians, and cyclists at the intersection of Montlake Boulevard NE and NE Pacific Street. WSDOT coordinated with these agencies during the ESSB 6392 Workgroup process as part of the Montlake Triangle Charrette. WSDOT would continue to coordinate with these agencies to ensure that the Preferred Alternative is compatible with other planned improvements at this location. Key projects that are planned for this area include the following:

Montlake Triangle Charrette

The ESSB 6392 Workgroup team working on design refinements and transit connections developed a separate process, which evaluated opportunities to enhance pedestrian and bicycle connectivity in the Montlake Multimodal Center, while respecting the schedules for the Sound Transit University Link station and the University of Washington Rainier Vista project. The charrette members identified conceptual design options that would provide safe, efficient transfers for bicyclists, pedestrians, and transit users to connect to the Link light rail station near Husky Stadium. Participants in the Montlake Triangle Charrette included representatives from WSDOT, Seattle Department of Transportation, Seattle Design Commission, University of Washington, King County Metro, and Sound Transit.

- **Sound Transit University Link Light Rail Station**—The SR 520, I-5 to Medina project assumes that the Sound Transit University Link light rail station, improved Montlake Boulevard crosswalk, and a potential grade-separated pedestrian connection from the University Link light rail station to the main campus would be constructed separately (Exhibit 7-6). The University Link light rail station and associated features are part of the

University Link project. The station is scheduled to open in 2016.

- **University of Washington Rainier Vista Project—**UW is also considering the Rainier Vista project, which could be integrated with the SR 520, I-5 to Medina project. The Rainier Vista project is expected to include improvements to NE Pacific Place and lowering of NE Pacific Place and the Burke-Gilman Trail. Lids would be built over NE Pacific Place and the Burke-Gilman Trail to provide an at-grade pedestrian/bicycle connection directly to the Montlake Multimodal Center.

These projects are independent of the Preferred Alternative and would proceed regardless of whether the Preferred Alternative is constructed.

Adapted from: Conceptual Station Aerial View, Sound Transit (2010)

Exhibit 7-6. **Rendering of Sound Transit's University of Washington Station Entrance with Pedestrian Bridge (Opening in 2016) (Provided by Sound Transit November 25, 2008)**

How will the project affect nonmotorized transportation?

The Preferred Alternative would provide transportation and livability benefits to the affected neighborhoods and to the region as a whole. Nonmotorized systems may offer connections and enhancements to communities that cannot come from other sources—specifically, from highway systems. Nonmotorized systems may, if carefully designed, reconnect communities that were isolated by construction of the highway. These features are part of a larger, comprehensive transportation system, including connections to the City of Seattle Bicycle Master Plan routes.

The following project features would increase mobility options, create new nonmotorized connections, and improve existing and planned bicycle and pedestrian routes within and around the study area:

- **Evergreen Point Bridge**—The bicycle/pedestrian path across the bridge is the most obvious improvement in connectivity among all benefits listed in this report. Bicyclists and pedestrians would have the ability to travel directly east and west, which is an option they do not have today.

- **Montlake Boulevard and 24th Avenue East Lid**—The Preferred Alternative would allow people to connect through several routes: via the Montlake Boulevard and 24th Avenue East lid to the Evergreen Point Bridge path to the east; Burke-Gilman Trail to the northeast and west; Bill Dawson Trail to the southwest; and Lake Washington Boulevard/Arboretum trails to the southeast. This area would become a primary crossroad for nonmotorized routes and provide many transit connections for nonmotorized users.

- **Montlake Boulevard and NE Pacific Street Intersection**—The Preferred Alternative would improve connectivity for bicyclists and pedestrians with other modes of transportation via the Montlake Multimodal Center and University Link light rail station by expanding the pedestrian facilities across the Montlake Cut. A roadside bicycle/pedestrian path would be provided along the new bascule bridge constructed over the Montlake Cut. Compared to the No Build Alternative, bicyclists would experience fewer conflicts with traffic by using the roadside path.

- **10th Avenue East and Delmar Drive East Lid—**On the 10th Avenue East and Delmar Drive East lid, intersection connections would be improved to provide enhanced safety for bicyclists and pedestrians. The lid surface would offer a more aesthetic connection between neighborhoods adjacent to SR 520 and include a meandering pathway from east to west between 10th Avenue East and Delmar Drive East.

- **I-5/Roanoke Crossing—**The addition of a path on the south side of the Roanoke Street bridge over I-5 and new crosswalks at the Harvard Avenue East/Roanoke Street intersection would improve safety in an area where bicyclists typically share the roads with vehicular traffic.

The Preferred Alternative would also result in the loss of 54 bicycle locker spaces and 53 bicycle rack spaces near the existing Montlake Freeway Transit Station. The area currently occupied by the bicycle lockers is needed during construction in order to widen Montlake Boulevard and build the westbound off-ramp and direct access ramps. WSDOT will relocate the bicycle facilities nearby, and is coordinating with Metro to identify a suitable location.

Performance of Key Travel Routes

During the ESSB 6392 Workgroup process, a pedestrian/bicycle subgroup identified opportunities to enhance connections from the new SR 520 bicycle/pedestrian path to ensure its integration with other regional facilities. These regional facilities include the Sound Transit University Link station, the Burke-Gilman Trail, and other existing and planned City of Seattle bicycle and pedestrian networks.

Seven primary nonmotorized routes in and through the study area, shown in Exhibit 7-7, were identified and evaluated through this collaborative process involving SDOT, Seattle Design Commission, City of Seattle Pedestrian Advisory Board, and Seattle Bicycle Advisory Board. The primary bicycle and pedestrian routes were selected based on identified “desire lines.” Rather than depicting built facilities, they represent the general travel routes that most cyclists and pedestrians want to use through the area. The routes span multiple paths, sidewalks, and roadways.

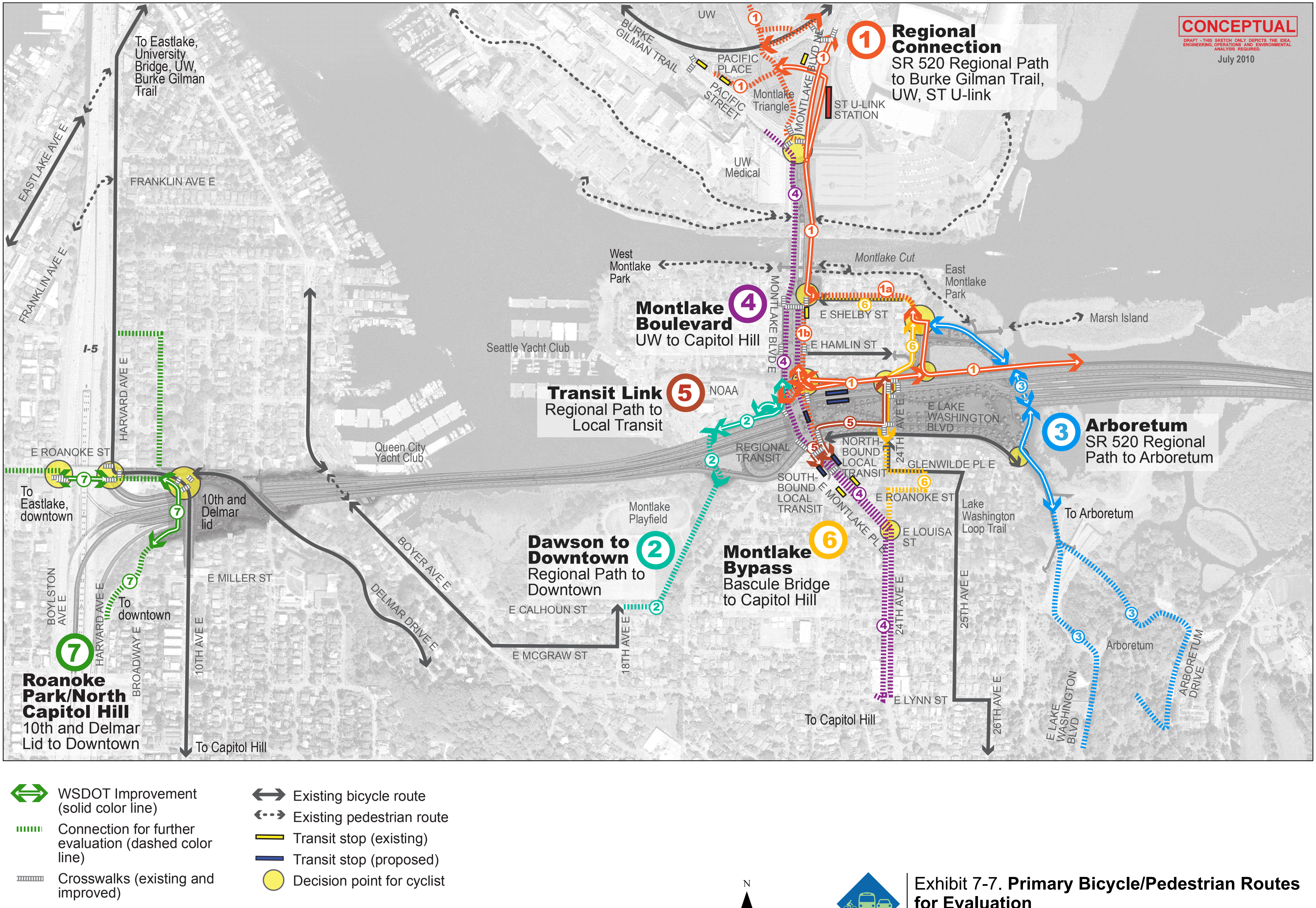

Exhibit 7-7. **Primary Bicycle/Pedestrian Routes for Evaluation**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

The performance of these primary bicycle and pedestrian travel routes was assessed based on the following criteria:

- *Safety* was evaluated based on factors such as the quantity and quality of street crossing locations, low vehicular traffic volumes, and degree of separation between vehicles and nonmotorized uses and between bicycles and pedestrians.
- *Connectivity* was evaluated based on the ability of all users to fully utilize the facility and make desired connections to other routes or popular destinations.
- *Efficiency* was evaluated by determining if routes are direct and intuitive, or if connections are nearby and easily accessible.
- *Capacity* criteria focused on topics of ADA accessibility, separation of pedestrians and bicyclists, and the ability of the system to accommodate growth in nonmotorized use by providing multiple path options or wide multi-use paths.

Exhibits 7-8 through 7-14 summarize the results of the assessment for each route under the No Build Alternative and Preferred Alternative based on these criteria.

The seven primary nonmotorized routes in the study area are described below. These descriptions include a review of the route evaluation under No Build and Preferred Alternative scenarios.

Route 1: Regional Connection—SR 520 Regional Path to Burke-Gilman Trail, UW, and Sound Transit University Link Station

This route forms a vital connection between Seattle and the communities on the east side of Lake Washington. Today, cyclists and pedestrians must use a bus to cross SR 520, detour to the north or south to use their bicycles, or travel on foot.

The Preferred Alternative would build a new section of the SR 520 regional trail system improved by the SR 520, Medina to SR 202 project across the new floating bridge span to Montlake Boulevard. At the Montlake interchange, the path joins the proposed network of sidewalks on the Montlake lid. Trail users have the choice of continuing to Montlake Boulevard and turning north to reach the Montlake Multimodal Center, or using either Shelby Street or

Hamlin Street to reach Montlake via a route with less vehicular traffic.

Exhibit 7-8. **Route 1: Regional Connection—SR 520 Regional Path[a] to Burke-Gilman Trail, UW, and Sound Transit University Link Station**

Performance Measures	Evaluation Criteria	No Build	Preferred Alternative
Safety	1. Few vehicle conflicts or crossing locations		√
	2. Signal-protected crosswalk or grade-separated crossings	√	√
	3. Separate path or landscaping buffer/barriers		√
	4. Cyclists able to separate from pedestrians	√	√
	5. Low vehicle volumes/density in the area	√	√
	6. Pedestrian refuge islands or short crossings	√	√
Connectivity	1. Barrier-free route (ADA accessible)		√
	2. Connection to other modes of travel (transit, parking)	√	√
	3. Support facilities (bicycle storage or vehicle parking)	√	√
	4. Logical/intuitive route alignments		√
	5. Supports recreation areas and primary destinations		√
	6. Supports nonmotorized cross-lake trips		√
Efficiency	1. Direct or non-stop nonmotorized route (≥80% total length)		√
	2. Nearby connections to other modes (transit, parking)	√	√
	3. Direct route to popular destinations		√
	4. Moderate (ADA) grades		√
	5. Pedestrian-activated signals	√	√
	6. Multiple path options under/across interchange		
Capacity	1. Barrier-free route (ADA accessible)		√
	2. Meets design standards (e.g., path width)		√
	3. Cyclists able to separate from pedestrians	√	√
	4. Multiple path options under/across interchange		
	5. Unrestricted sight distance		√
	6. Accommodate future nonmotorized growth		√

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[a] The SR 520 regional bicycle/pedestrian path on the floating span of the Evergreen Point Bridge does not exist under No Build conditions; however, cross-lake trips are possible via transit. There are nonmotorized connections among the Burke-Gilman Trail, Montlake Multimodal Center, and Montlake Boulevard under No Build conditions.

These facilities would connect trail users with an off-street nonmotorized path that would be completed as part of a new bascule bridge across the Montlake Cut. This connection would allow the regional trail to connect with the Burke-Gilman Trail, existing transit stops, and the future University Link light rail station in and around the Montlake Multimodal Center.

Because the Preferred Alternative provides a purely nonmotorized route, it performs much better in the evaluation and provides significant benefits in safety, connectivity, efficiency, and capacity for the nonmotorized network.

Route 2: Dawson Trail to Downtown Seattle—SR 520 Regional Path to Downtown Seattle

The Bill Dawson Trail currently connects Montlake Boulevard to East Calhoun Street near the Montlake Playground and provides connections to Capitol Hill and downtown Seattle. The trail passes under SR 520 on the east side of Portage Bay much as it would in the Preferred Alternative.

The Preferred Alternative would add a tunnel underneath Montlake Boulevard just north of the eastbound ramps that would provide a continuous connection to the SR 520 regional trail. Short connector trails would maintain trail connections to Montlake Boulevard at both ends of the new tunnel alignment. As Exhibit 7-9 indicates, the Preferred Alternative would improve each performance measure, but especially its connectivity to the regional trail and other destinations through the interchange improvements.

Exhibit 7-9. **Route 2: Dawson Trail to Downtown Seattle—SR 520 Regional Path to Downtown Seattle**

Performance Measures	Evaluation Criteria		No Build	Preferred Alternative
Safety	1.	Few vehicle conflicts or crossing locations	√	√
	2.	Signal-protected crosswalk or grade-separated crossings	√	√
	3.	Separate path or landscaping buffer/barriers	√	√
	4.	Cyclists able to separate from pedestrians		
	5.	Low vehicle volumes/density in the area	√	√
	6.	Pedestrian refuge islands or short crossings		

Exhibit 7-9. **Route 2: Dawson Trail to Downtown Seattle—SR 520 Regional Path to Downtown Seattle**

Performance Measures	Evaluation Criteria	No Build	Preferred Alternative
Connectivity	1. Barrier-free route (ADA accessible)	√	√
	2. Connection to other modes of travel (transit, parking)		√
	3. Support facilities (bicycle storage or vehicle parking)		
	4. Logical/intuitive route alignments	√	√
	5. Supports recreation areas and primary destinations		√
	6. Supports nonmotorized cross-lake trips	√	√
Efficiency	1. Direct or non-stop nonmotorized route (≥80% total length)	√	√
	2. Nearby connections to other modes (transit, parking)		√
	3. Direct route to popular destinations		√
	4. Moderate (ADA) grades		√
	5. Pedestrian-activated signals		
	6. Multiple path options under/across interchange		
Capacity	1. Barrier-free route (ADA accessible)	√	√
	2. Meets design standards (e.g., path width)	√	√
	3. Cyclists able to separate from pedestrians		
	4. Multiple path options under/across interchange		
	5. Unrestricted sight distance		
	6. Accommodate future nonmotorized growth		√

Route 3: Arboretum—SR 520 Regional Path to Arboretum

The route from the Arboretum to the Montlake interchange ends in the vicinity of 24th Avenue East. In the No Build Alternative, the route follows Lake Washington Boulevard to Montlake Boulevard. In the Preferred Alternative, a new trail is constructed that crosses under the freeway and connects to 24th Avenue East between Shelby Street and Hamlin Street and is served by a trailhead parking lot. The new trail would greatly enhance the safety of this route for both pedestrians and cyclists by providing an exclusive path separated from the flow of vehicles on Lake Washington Boulevard. Nonmotorized users would still have the option to use 24th Avenue East to cross SR 520. The Preferred Alternative simply increases the number of connection options across SR 520 with the addition of the

Montlake lid, adding capacity and improving efficiency for nonmotorized users.

Exhibit 7-10. **Route 3: Arboretum—SR 520 Regional Path to Arboretum**

Performance Measures	Evaluation Criteria	No Build	Preferred Alternative
Safety	1. Few vehicle conflicts or crossing locations		√
	2. Signal-protected crosswalk or grade-separated crossings		√
	3. Separate path or landscaping buffer/barriers	√	√
	4. Cyclists able to separate from pedestrians		√
	5. Low vehicle volumes/density in the area		√
	6. Pedestrian refuge islands or short crossings	√	
Connectivity	1. Barrier-free route (ADA accessible)	√	√
	2. Connection to other modes of travel (transit, parking)		√
	3. Support facilities (bicycle storage or vehicle parking)		
	4. Logical/intuitive route alignments	√	√
	5. Supports recreation areas and primary destinations	√	√
	6. Supports nonmotorized cross-lake trips		√
Efficiency	1. Direct or non-stop nonmotorized route (≥80% total length)		√
	2. Nearby connections to other modes (transit, parking)	√	√
	3. Direct route to popular destinations	√	√
	4. Moderate (ADA) grades	√	√
	5. Pedestrian-activated signals		
	6. Multiple path options under/across interchange		√
Capacity	1. Barrier-free route (ADA accessible)	√	√
	2. Meets design standards (e.g., path width)		√
	3. Cyclists able to separate from pedestrians		√
	4. Multiple path options under/across interchange		√
	5. Unrestricted sight distance		
	6. Accommodate future nonmotorized growth		√

Route 4: Montlake Boulevard—UW to Capitol Hill

This route follows Montlake Boulevard southbound from NE Pacific Street to the neighborhoods south of Roanoke Street and northbound to the Shelby Street/Hamlin Street neighborhood.

The No Build scenario requires cyclists to use the sidewalk or board a bus to cross the historic bascule bridge because the steel-grated road surface is not safe for bicycles. Even if shared-lane markings, or "sharrows," are added to other stretches of Montlake Boulevard, many cyclists would choose to continue using the sidewalk for the majority of this route. As bicycle traffic increases on Montlake Boulevard, this could become a safety concern for pedestrians. Northbound cyclists must make a similar decision; either ride in-lane with motor traffic or share the sidewalk.

The Preferred Alternative would not add bicycle lanes to Montlake Boulevard, but the City of Seattle may decide to add sharrows to the curb lanes to indicate the shared use of the lane with bicycles. In addition, pedestrians using Montlake Boulevard would have improved crossing locations that would be signal protected and would not expose pedestrians to higher speed free-flow right-turn movements.

Exhibit 7-11. **Route 4: Montlake Boulevard—UW to Capitol Hill**

Performance Measures	Evaluation Criteria		No Build	Preferred Alternative
Safety	1.	Few vehicle conflicts or crossing locations		√
	2.	Signal-protected crosswalk or grade-separated crossings		√
	3.	Separate path or landscaping buffer/barriers		√
	4.	Cyclists able to separate from pedestrians		√
	5.	Low vehicle volumes/density in the area		√
	6.	Pedestrian refuge islands or short crossings	√	
Connectivity	1.	Barrier-free route (ADA accessible)		√
	2.	Connection to other modes of travel (transit, parking)	√	√
	3.	Support facilities (bicycle storage or vehicle parking)	√	
	4.	Logical/intuitive route alignments	√	√
	5.	Supports recreation areas and primary destinations	√	√
	6.	Supports nonmotorized cross-lake trips		√

Exhibit 7-11. **Route 4: Montlake Boulevard—UW to Capitol Hill**

Performance Measures		Evaluation Criteria	No Build	Preferred Alternative
Efficiency	1.	Direct or non-stop nonmotorized route (≥80% total length)		
	2.	Nearby connections to other modes (transit, parking)	√	√
	3.	Direct route to popular destinations	√	√
	4.	Moderate (ADA) grades	√	√
	5.	Pedestrian-activated signals	√	√
	6.	Multiple path options under/across interchange		
Capacity	1.	Barrier-free route (ADA accessible)	√	√
	2.	Meets design standards (e.g., path width)		
	3.	Cyclists able to separate from pedestrians	√	√
	4.	Multiple path options under/across interchange		
	5.	Unrestricted sight distance		√
	6.	Accommodate future nonmotorized growth		

Route 5: Transit Link—Regional Path to Local Transit

This route represents the transit connections that riders make every day between local and regional routes at the Montlake Boulevard interchange. This is also an area where local transit would connect riders to the regional trail system under the Preferred Alternative.

Under No Build conditions, local transit stops are located on Montlake Boulevard just south of Roanoke Street. Transfers to or from the freeway station stops require riders to walk between 600 and 1,300 feet and navigate stairs to transfer. The Preferred Alternative would reduce the walking distances to between 200 and 700 feet with no stairs or ADA barriers.

The Preferred Alternative would move the southbound local transit stops for Routes 43 and 48 to just north of Roanoke Street; moreover, the northbound stop would use its own lane on the new Montlake lid between the eastbound and westbound ramp intersections. Relocating the regional stops to the lid removes the need to navigate stairs and provides a more central location for route transfers.

Exhibit 7-12. **Route 5: Transit Link—Regional Path to Local Transit**

Performance Measures	Evaluation Criteria	No Build	Preferred Alternative
Safety	1. Few vehicle conflicts or crossing locations	√	√
	2. Signal-protected crosswalk or grade-separated crossings	√	√
	3. Separate path or landscaping buffer/barriers	√	√
	4. Cyclists able to separate from pedestrians		
	5. Low vehicle volumes/density in the area		
	6. Pedestrian refuge islands or short crossings	√	
Connectivity	1. Barrier-free route (ADA accessible)		√
	2. Connection to other modes of travel (transit, parking)	√	√
	3. Support facilities (bicycle storage or vehicle parking)	√	
	4. Logical/intuitive route alignments		√
	5. Supports recreation areas and primary destinations	√	√
	6. Supports nonmotorized cross-lake trips		√
Efficiency	1. Direct or non-stop nonmotorized route (≥80% total length)		
	2. Nearby connections to other modes (transit, parking)	√	√
	3. Direct route to popular destinations	√	√
	4. Moderate (ADA) grades		√
	5. Pedestrian-activated signals	√	√
	6. Multiple path options under/across interchange		√
Capacity	1. Barrier-free route (ADA accessible)		√
	2. Meets design standards (e.g., path width)	√	√
	3. Cyclists able to separate from pedestrians		√
	4. Multiple path options under/across interchange		√
	5. Unrestricted sight distance	√	√
	6. Accommodate future nonmotorized growth		√

Route 6: Montlake Bypass—Bascule Bridge to Capitol Hill

With the No-Build Alternative, 24th Avenue East provides a safer alternative to the high traffic volumes of Montlake Boulevard for bicycles and pedestrians. Crossing the freeway at 24th Avenue East maintains close and convenient connections to transit stops at the interchange.

Under the Preferred Alternative, traffic volumes would increase on 24th Avenue East between the westbound off-ramp and Lake Washington Boulevard, reducing the level of safety for cyclists sharing the street and the comfort of pedestrians on the sidewalk. The Preferred Alternative also adds one intersection (with signalized crossings) at the westbound direct access off-ramp intersection with 24th Avenue East that nonmotorized users must negotiate.

Despite these drawbacks, the Preferred Alternative does provide additional paths across the Montlake lid, accommodating more pedestrians and bicyclists and facilitating north-south travel through the Montlake neighborhoods. It also creates more convenient transit connections, and signalizes the intersection of 24th Avenue East and Lake Washington Boulevard.

Exhibit 7-13**. Route 6: Montlake Bypass—Bascule Bridge to Capitol Hill**

Performance Measures	Evaluation Criteria	No Build	Preferred Alternative
Safety	1. Few vehicle conflicts or crossing locations	√	
	2. Signal-protected crosswalk or grade-separated crossings		√
	3. Separate path or landscaping buffer/barriers		
	4. Cyclists able to separate from pedestrians		√
	5. Low vehicle volumes in the area	√	
	6. Pedestrian refuge islands or short crossings	√	√
Connectivity	1. Barrier-free route (ADA accessible)	√	√
	2. Connection to other modes of travel (transit, parking)		√
	3. Support facilities (bicycle storage or vehicle parking)		
	4. Logical/intuitive route alignments		
	5. Supports recreation areas and primary destinations	√	√
	6. Supports nonmotorized cross-lake trips		
Efficiency	1. Direct or non-stop nonmotorized route (≥80% total length)		
	2. Nearby connections to other modes (transit, parking)		√
	3. Direct route to popular destinations		
	4. Moderate (ADA) grades	√	√
	5. Pedestrian-activated signals		√
	6. Multiple path options under/across interchange		√

Exhibit 7-13. **Route 6: Montlake Bypass—Bascule Bridge to Capitol Hill**

Performance Measures	Evaluation Criteria	No Build	Preferred Alternative
Capacity	1. Barrier-free route (ADA accessible)	√	√
	2. Meets design standards (e.g., path width)		
	3. Cyclists able to separate from pedestrians	√	√
	4. Multiple path options under/across interchange		√
	5. Unrestricted sight distance		
	6. Accommodate future nonmotorized growth		√

Route 7: Roanoke Park/North Capitol Hill—10th and Delmar Lid to Downtown Seattle

Today and with the No Build Alternative, the crossings of I-5 and SR 520 make this route serve high traffic volumes and form important connections in the Seattle city grid. The area is also the crossroads of several bicycle routes in the city.

The Preferred Alternative would build a lid between 10th Avenue East and Delmar Drive East, which would provide multiple paths across the lid and a separate trail west of 10th Avenue East. A separate nonmotorized bridge would also be built on the south side of Roanoke Street that would complete a nonmotorized path loop from Boylston Avenue along 10th Avenue East to Harvard Avenue, providing connections to the Capitol Hill neighborhood and downtown Seattle.

Exhibit 7-14. **Route 7: Roanoke Park/North Capitol Hill—10th and Delmar Lid to Downtown Seattle**

Performance Measures	Evaluation Criteria	No Build	Preferred Alternative
Safety	1. Few vehicle conflicts or crossing locations		√
	2. Signal-protected crosswalk or grade-separated crossings	√	√
	3. Separate path or landscaping buffer/barriers	√	√
	4. Cyclists able to separate from pedestrians		√
	5. Low vehicle volumes/density in the area	√	√
	6. Pedestrian refuge islands or short crossings	√	√

Exhibit 7-14**. Route 7: Roanoke Park/North Capitol Hill—10th and Delmar Lid to Downtown Seattle**

Performance Measures	Evaluation Criteria	No Build	Preferred Alternative
Connectivity	1. Barrier-free route (ADA accessible)	√	√
	2. Connection to other modes of travel (transit, parking)	√	√
	3. Support facilities (bicycle storage or vehicle parking)		
	4. Logical/intuitive route alignments	√	√
	5. Supports recreation areas and primary destinations	√	√
	6. Supports nonmotorized cross-lake trips		
Efficiency	1. Direct or non-stop nonmotorized route (≥80% total length)		√
	2. Nearby connections to other modes (transit, parking)	√	√
	3. Direct route to popular destinations		
	4. Moderate (ADA) grades	√	√
	5. Pedestrian-activated signals	√	√
	6. Multiple path options under/across interchange		√
Capacity	1. Barrier-free route (ADA accessible)	√	√
	2. Meets design standards (e.g., path width)		√
	3. Cyclists able to separate from pedestrians		√
	4. Multiple path options under/across interchange		√
	5. Unrestricted sight distance	√	√
	6. Accommodate future nonmotorized growth		√

Summary Effects on Nonmotorized Users

Aside from minor tradeoffs, the Preferred Alternative provides many benefits to the nonmotorized transportation system. The project increases the level of safety, provides more connections and travel options, improves system efficiency, and provides capacity for future growth. In short, the overall effect of the project on nonmotorized users and their travel experience is a benefit.

Chapter 8—Transit Operations

What is in this chapter?

This chapter describes existing and forecasted transit service and facilities on the SR 520 corridor without and with the project. It describes how improving the SR 520 HOV lane system and transit facilities could support WSDOT’s goal of moving more people along the SR 520 corridor and across Lake Washington. The SR 520, I-5 to Medina project would also provide the infrastructure to support Metro’s and Sound Transit’s efforts to meet the region’s growing demand for transit service.

What is the existing infrastructure that supports transit on SR 520?

The transit system consists of built features, or infrastructure, in addition to the buses and other vehicles that carry riders from place to place. At a minimum, buses need roadways and trains need rails to move around the city. Transit has several basic design requirements to operate due to the vehicle sizes, the need for frequent access by riders, and other special considerations. The speed and efficiency of transit operations can be improved by constructing dedicated facilities in addition to the basic requirements needed for operation. Typically, these facilities give priority to transit vehicles so they can keep moving through traffic signals or congested conditions. On a regionally significant highway like SR 520, the most effective built features for transit are HOV lanes.

HOV Lanes

The existing HOV lane system on the SR 520 corridor is shown in Exhibit 8-1. While HOV lanes are provided in a number of locations, they are discontinuous, limiting their effectiveness in providing a reliable transit travel time.

Westbound SR 520 currently has an outside shoulder HOV lane (three or more people) on the Eastside between 108th Avenue NE and Evergreen Point Road. There is no eastbound HOV lane in this section of SR 520.

Between 124th Avenue NE and West Lake Sammamish Parkway, there are outside HOV lanes in both directions of SR 520. HOV lanes are also provided in both directions along I-405, both north and south of the SR 520/I-405 interchange.

In Seattle, an HOV lane is located along short sections of NE Pacific Street (eastbound only) and Montlake Boulevard (southbound only) leading to the Montlake Bridge to help HOVs bypass congestion related to Montlake Bridge openings. The NE Pacific Street HOV lane is for carpools with three or more passengers and transit; the southbound Montlake Boulevard HOV lane is transit only. In addition, the eastbound on-ramp at the SR 520/Montlake interchange includes an HOV bypass lane.

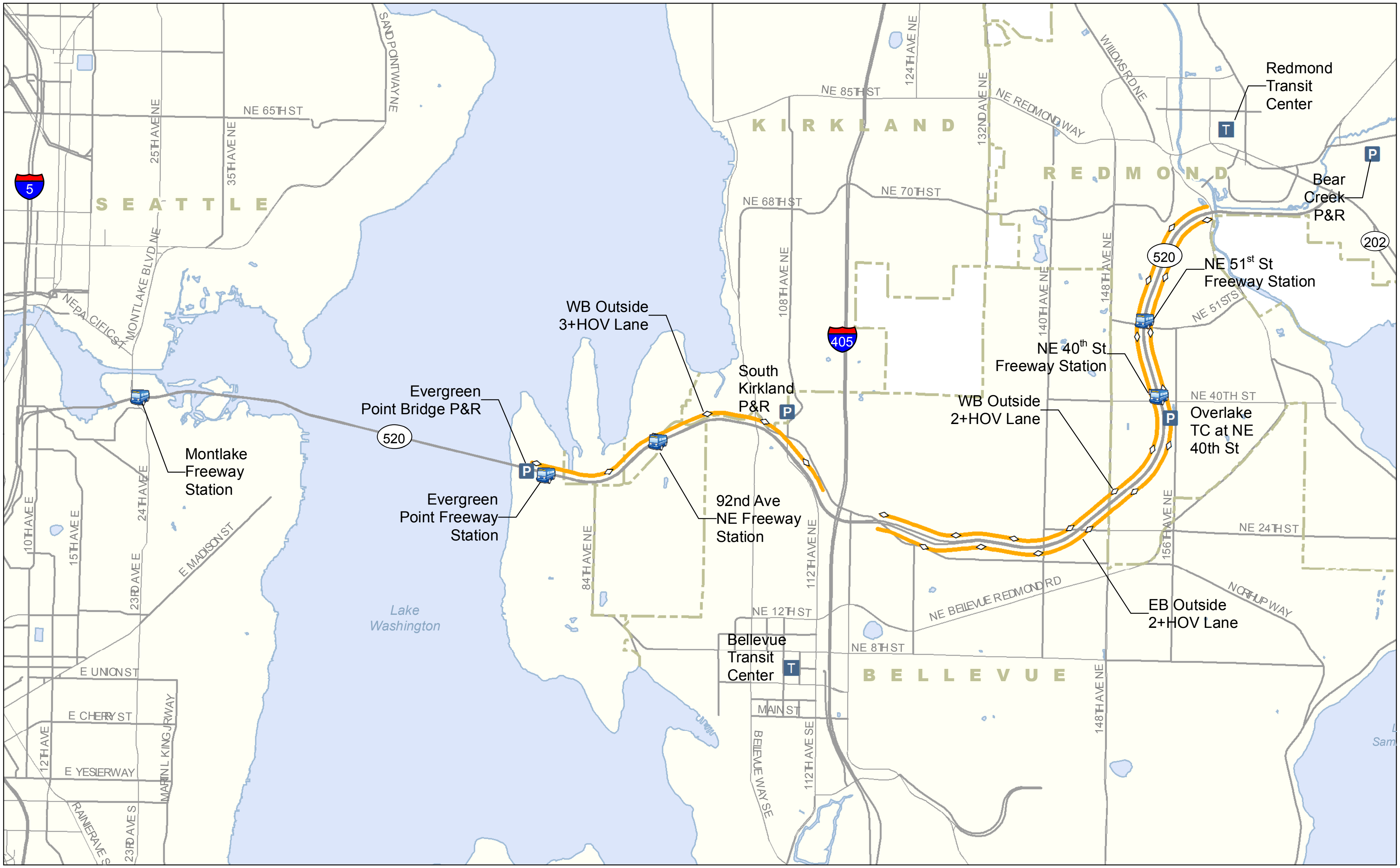
HOV lanes are also provided in some sections on the I-5 main line and express lanes. While useful to existing transit services for bypassing congestion points, these HOV facilities are not continuous and transit vehicles are forced to interact with congested general-purpose traffic.

Other Transit Facilities

Within the study area, there are transit layover spaces at the Montlake Triangle on the southeast curb of NE Pacific Place and a driver comfort station. These facilities are integral to transit operations and serve to keep buses on time and provide mandatory driver breaks.

Overhead electric bus wires (trolley wires) are located around the Montlake Triangle along NE Pacific Street, the eastbound lane of NE Pacific Place, and the southbound outside lane of Montlake Boulevard (between NE Pacific Place and NE Pacific Street). There are also trolley wires on Montlake Boulevard NE south of NE Pacific Street, across the Montlake Bridge, 24th Avenue East, and 10th Avenue East (in Capitol Hill/Roanoke neighborhood). Trolley wire power substations are located in these areas.

Preferential signalization on the eastbound leg of the NE Pacific Street/Montlake Boulevard intersection allows buses and carpools to bypass congestion approaching the north end of the Montlake Bridge. When buses reach the Montlake Boulevard/Lake Washington Boulevard intersection, they are able to make a signal-protected right turn directly into the HOV bypass lane on the eastbound SR 520 on-ramp. These applications have proven helpful in reducing congestion-related delays and improving reliability for eastbound SR 520 bus routes and carpools.



🚌 Transit Stop

P Park & Ride and Transit Center

T Transit Center

HOV Lane

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 8-1. **Existing HOV and Transit Facilities Along SR 520**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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What is SR 520 transit service like today?

Data from Metro show that 24 bus routes serve daily cross-lake demand on the Evergreen Point Bridge—18 Metro routes, 5 Sound Transit Express routes, and 1 Community Transit route. These bus routes are shown in Exhibit 8-2.

Fourteen routes provide service to Eastside communities and downtown Seattle and 10 routes connect to the University District and north Seattle. All-day service is provided by 4 of these 24 routes:

- Metro Route 255 between Kirkland and downtown Seattle
- Metro Route 271 between Issaquah and the University District
- Sound Transit Route 540 between Kirkland and the University District
- Sound Transit Route 545 between downtown Redmond and downtown Seattle

The remaining routes provide peak period service with connections to the University District, downtown Seattle, and other areas to the north and south. One route (Metro Route 280) provides late-night eastbound service across SR 520.

In addition to Metro and Sound Transit routes, Microsoft operates its Microsoft Connector service on SR 520, which provides transportation for Microsoft employees between the company's facilities and Seattle, Bothell, Mill Creek, Issaquah, and Sammamish. The UW Medical Center, Children's Hospital, and the Fred Hutchinson Cancer Research Center all operate shuttles that travel through Montlake and the University District to other Seattle neighborhoods.

Did you know?

A **bus route** is the established path a bus follows between two points.

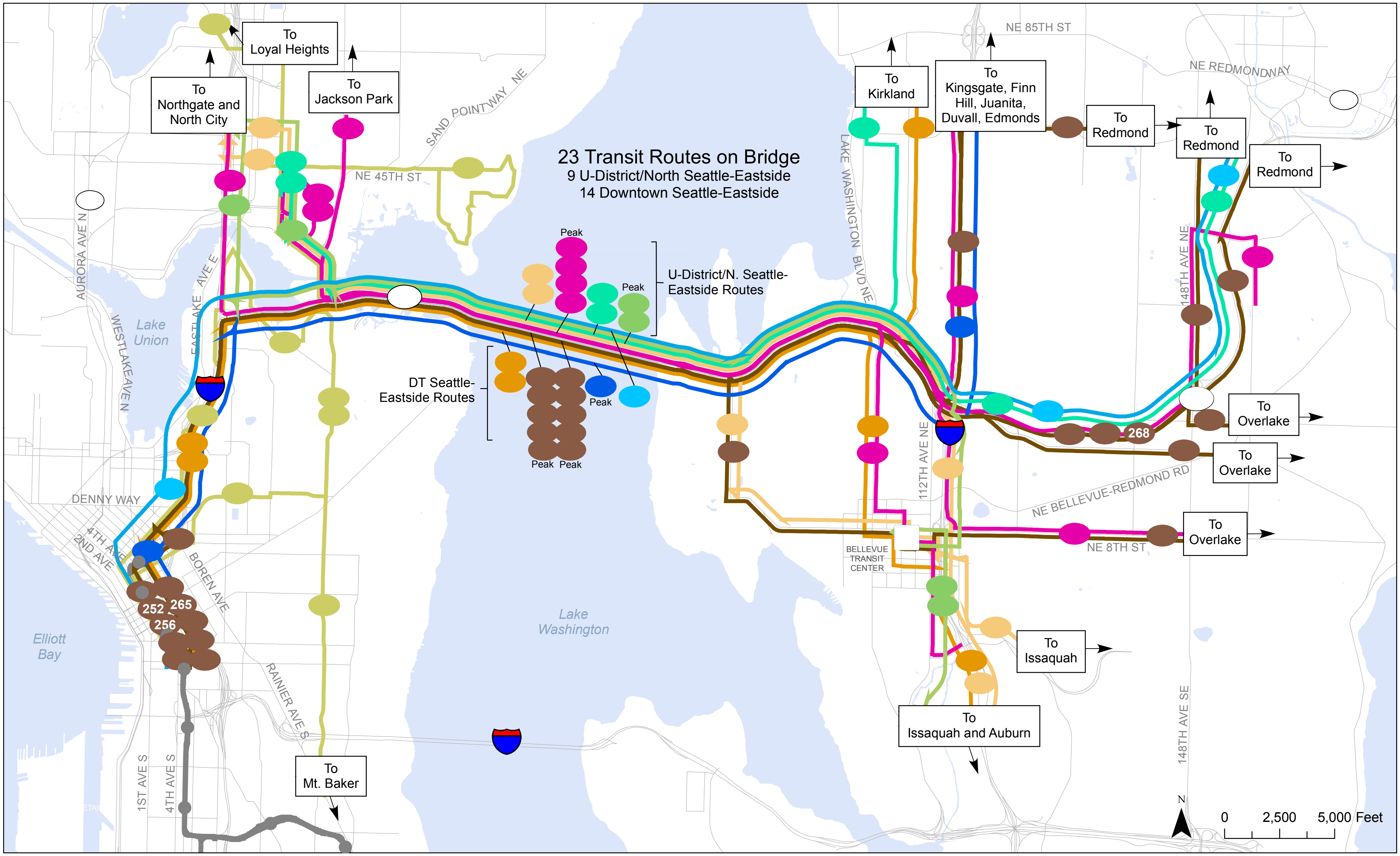
A **bus trip** is the time a bus travels from one end of the route to the other while carrying passengers.

Number of buses refers to the number of buses required to provide the scheduled number of bus trips on each bus route. The factors that influence the number of required buses are the frequency (number of trips in a given time period), round-trip length (in minutes), and recovery time at each end for the bus to return to schedule and provide a driver break. Some buses may provide service on multiple bus routes (see example below).

Example of the difference between number of buses and bus trips

One bus leaves the bus base, and provides a single trip on Route 252 from Kingsgate to Seattle (across SR 520). The bus then drives out of service to Issaquah and provides a bus trip on Route 214 from Issaquah to Seattle (across I-90).

One bus provides two bus trips: one trip on Route 214 and one trip on Route 252.



Metro Transit

North Seattle to Downtown

North Seattle/Eastside

Peak Hour North Seattle/Eastside

Limited Service North Seattle/Eastside

Downtown Seattle/Eastside

Peak Hour Downtown Seattle/Eastside

Sound Transit

North Seattle/Eastside

Peak Hour North Seattle/Eastside

Downtown Seattle/Eastside

Community Transit

Peak Hour Downtown Seattle/Snohomish County

Link Light Rail

Link Light Rail

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 8-2. **Existing Bus Routes Serving the SR 520 Study Area**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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Service Frequencies

Frequencies for individual routes serving SR 520 are shown in Exhibit 8-3. The frequencies for these 24 routes combine to provide a high level of bus frequency for transit riders who need to cross the Evergreen Point Bridge. Exhibit 8-4 shows combined bus headways for Eastside-downtown Seattle and Eastside-University District/north Seattle routes across the Evergreen Point Bridge.

Transit riders traveling between the Eastside and the Montlake/University District can use buses bound for downtown Seattle or the University District by using the Montlake Freeway Transit Station. As shown in Exhibit 8-4, the ability to use both downtown Seattle and Montlake/University District buses results in a bus arriving, on average, every 1 to 3 minutes during the peak period and every 4 to 5 minutes during the midday. Between 6:00 a.m. and 6:15 p.m., approximately 540 SR 520 buses travel between the Montlake interchange area and the Evergreen Point Freeway Transit Station each weekday.

In October 2010, Sound Transit implemented a new extended peak period route, Route 542, serving Redmond, the University District, and Ravenna/Green Lake. The route travels between the Redmond Town Center and the I-5/65th Street Park-and-Ride near Green Lake. It serves the SR 520/NE 51st Street freeway station, the Overlake Transit Center at NE 40th Street, Yarrow Point Freeway Transit Station, Evergreen Point Freeway Transit Station, and six on-street stops in the University District (Sound Transit 2010b). Bus service is every 15 minutes between 6:00 a.m. and 10:00 a.m. and 2:00 p.m. to 7:00 p.m.

Service on this route helps to address overcrowding on Sound Transit Route 545 and will also accommodate expected increases in ridership when vehicle tolls associated with the Urban Partnership Agreement are implemented on the bridge in 2011 (Sound Transit 2010b). This route will also help to address future construction-related traffic effects when construction begins on the SR 520, I-5 to Medina project. As a part of the Urban Partnership Agreement, buses used for Route 542 are being purchased with grant funds from the U.S. Department of Transportation (Sound Transit 2010b).

Exhibit 8-3. **SR 520 Existing Transit Routes and Route Headways**

Route	Service Provider	Name	Peak Headways (minutes)	Midday Headways (minutes)
167	King County Metro	Auburn-Kent-UW (NB)	45	-
242	King County Metro	North City-Overlake (EB)	30	-
243	King County Metro	Jackson Park-Lake City-Bellevue (EB)	60	-
250	King County Metro	Redmond-Overlake-Downtown Seattle (WB)	36	-
252	King County Metro	Kingsgate-Downtown Seattle (WB)	26	-
255	King County Metro	Kingsgate-Kirkland-Downtown Seattle (WB/EB)	13/36	30
256	King County Metro	Overlake-Downtown Seattle (EB)	36	-
257	King County Metro	Brickyard-Downtown Seattle (WB)	30	-
260	King County Metro	Kenmore-Juanita-Downtown Seattle (WB)	60	-
261	King County Metro	Overlake-Bellevue-Downtown Seattle (WB)	45	-
265	King County Metro	Redmond-Houghton-Downtown Seattle (WB)	30	-
266	King County Metro	Redmond-Downtown Seattle (WB)	30	-
268	King County Metro	Redmond-Downtown Seattle (WB)	45	-
271	King County Metro	Issaquah-Bellevue-UW (WB/EB)	26/36	30
271	King County Metro	Eastgate-Bellevue-UW (WB/EB)	45/60	
272	King County Metro	Eastgate-Crossroads-UW	30	90
277	King County Metro	Juanita-Kingsgate-UW (WB)	30	-
311	King County Metro	Duvall-Woodinville-Downtown Seattle (WB)	36	-
424	Community Transit	Snohomish-Monroe-Downtown Seattle (SB)	60	-
540	Sound Transit	Express: Kirkland-UW (WB/EB)	17/45	30
542	Sound Transit	Express: Redmond-UW	15	
545	Sound Transit	Express: Redmond-Downtown Seattle (WB/EB)	10/12	15/14
555	Sound Transit	Express: Northgate-Issaquah	30	-
556	Sound Transit	Express: Northgate-Issaquah	30	-

Route 280 is a night-owl route with one departure and was not included in this exhibit.

Route 542 was not included in the existing conditions travel demand model for the Final EIS.

“-“ indicates route is a peak only route; NB = northbound, EB = eastbound, WB = westbound

Exhibit 8-4. **Combined Bus Headways across the Evergreen Point Bridge Today (between Evergreen Point and Montlake Freeway Transit Stations)**

	AM Peak Period (6 to 9 a.m.)		PM Peak Period (3:15 to 6:15 p.m.)		Midday (9 a.m. to 3:15 p.m.)	
	Bus Trips	**Average Headway (minutes)**	**Bus Trips**	**Average Headway (minutes)**	**Bus Trips**	**Average Headway (minutes)**
Westbound						
Downtown Seattle–Eastside[a]	78	2.3	25	7.2	39	9.6
University District/North Seattle–Eastside[b]	53	3.4	37	4.9	33	11.4
Combined	131	1.4	62	2.9	72	5.2
Eastbound						
Downtown Seattle–Eastside[a]	29	6.2	80	2.3	42	8.9
University District/North Seattle–Eastside[b]	33	5.5	48	3.8	41	9.1
Combined	62	2.9	128	1.4	83	4.5

Notes:

Downtown Seattle–Eastside Bus Routes: Peak—242, 250, 252, 256, 257, 260, 261, 265, 266, 268, 311; All day—255, 545
University District/North Seattle–Eastside Bus Routes: Peak—167, 243, 272, 277, 542, 556; All day—271, 540
Based on King County Metro Spring 2010 Data for Evergreen Point; does not include Community Transit Route 424

[a] These buses serve the Montlake Freeway Transit Station.

[b] These buses exit at Montlake with the first west side stop on Montlake Boulevard/East Shelby Street.

Ridership and Destinations

According to Metro's spring 2010 automated ridership counts and including Sound Transit's Route 542 schedule, Metro and Sound Transit currently provide approximately 660 bus trips across the Evergreen Point Bridge on an average weekday, and carry almost 16,000 riders.

Morning and evening peak period bus trips and ridership are shown in Exhibit 8-5. Bus trip data includes Sound Transit Route 542, which was implemented in October 2010 and operates between downtown Redmond and the University District/Green Lake. Ridership data for Route 542 were not available.

Exhibit 8-5. **Existing Peak Period SR 520 Bus Trips and Ridership**

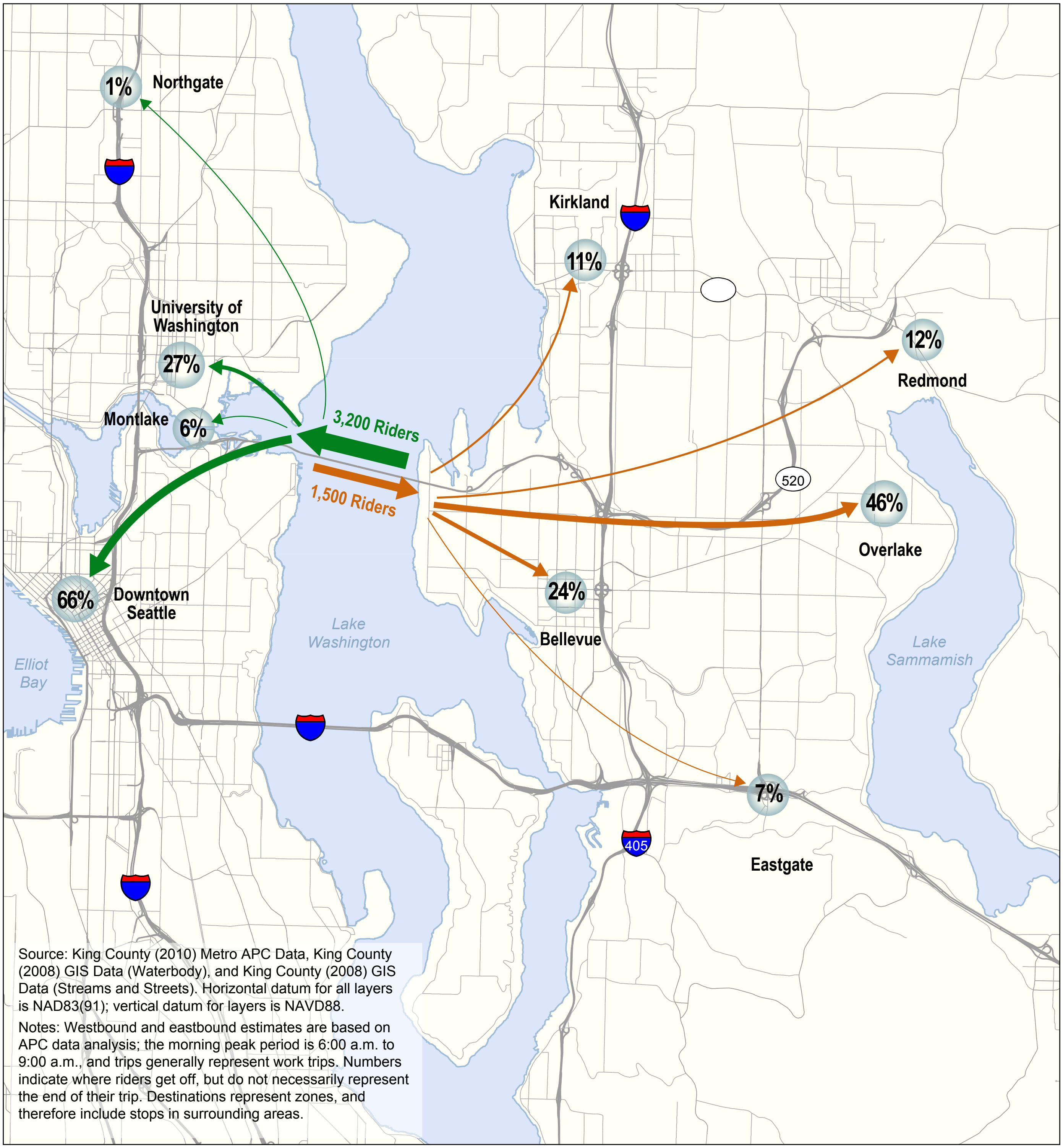
	AM Peak Period (6:00 to 9:00 a.m.)		PM Peak Period (3:15 to 6:15 p.m.)	
	Bus Trips	**Riders**	**Bus Trips**	**Riders**
Westbound	131	3,200	62	1,500
Eastbound	62	1,500	128	3,000

Source: Metro Spring 2010 Automated Passenger Count data and Sound Transit online schedule for Route 542

During the morning peak period (6:00 to 9:00 a.m.), there are approximately 4,700 riders crossing the bridge in both directions in approximately 190 bus trips (not including Community Transit service and school bus routes provided by Metro). Seventy percent of riders are traveling westbound and 30 percent are traveling eastbound.

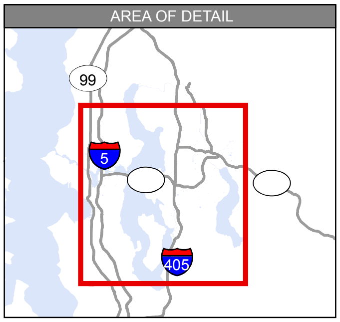
During the afternoon peak period (3:00 to 6:00 p.m.), there are approximately 4,500 riders crossing the bridge in both directions in approximately 190 bus trips. Thirty percent of riders are traveling westbound and 70 percent are traveling eastbound.

Morning and evening peak period destinations are shown in Exhibits 8-6 and 8-7. In the morning, the two primary Seattle destinations are downtown Seattle and UW. The two primary Eastside destinations are Overlake and downtown Bellevue. In the evening, the primary Seattle destinations are downtown Seattle, UW, and Northgate. The two primary Eastside destinations are Kirkland and downtown Redmond. The Montlake location represents those bus riders that use the Montlake Freeway Transit Station. Bus riders that use the East Shelby Street stop are included in the UW percentage.



Source: King County (2010) Metro APC Data, King County (2008) GIS Data (Waterbody), and King County (2008) GIS Data (Streams and Streets). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Notes: Westbound and eastbound estimates are based on APC data analysis; the morning peak period is 6:00 a.m. to 9:00 a.m., and trips generally represent work trips. Numbers indicate where riders get off, but do not necessarily represent the end of their trip. Destinations represent zones, and therefore include stops in surrounding areas.



🟩 Westbound

🟧 Eastbound

Exhibit 8-6. **Morning Peak Transit Ridership Destinations**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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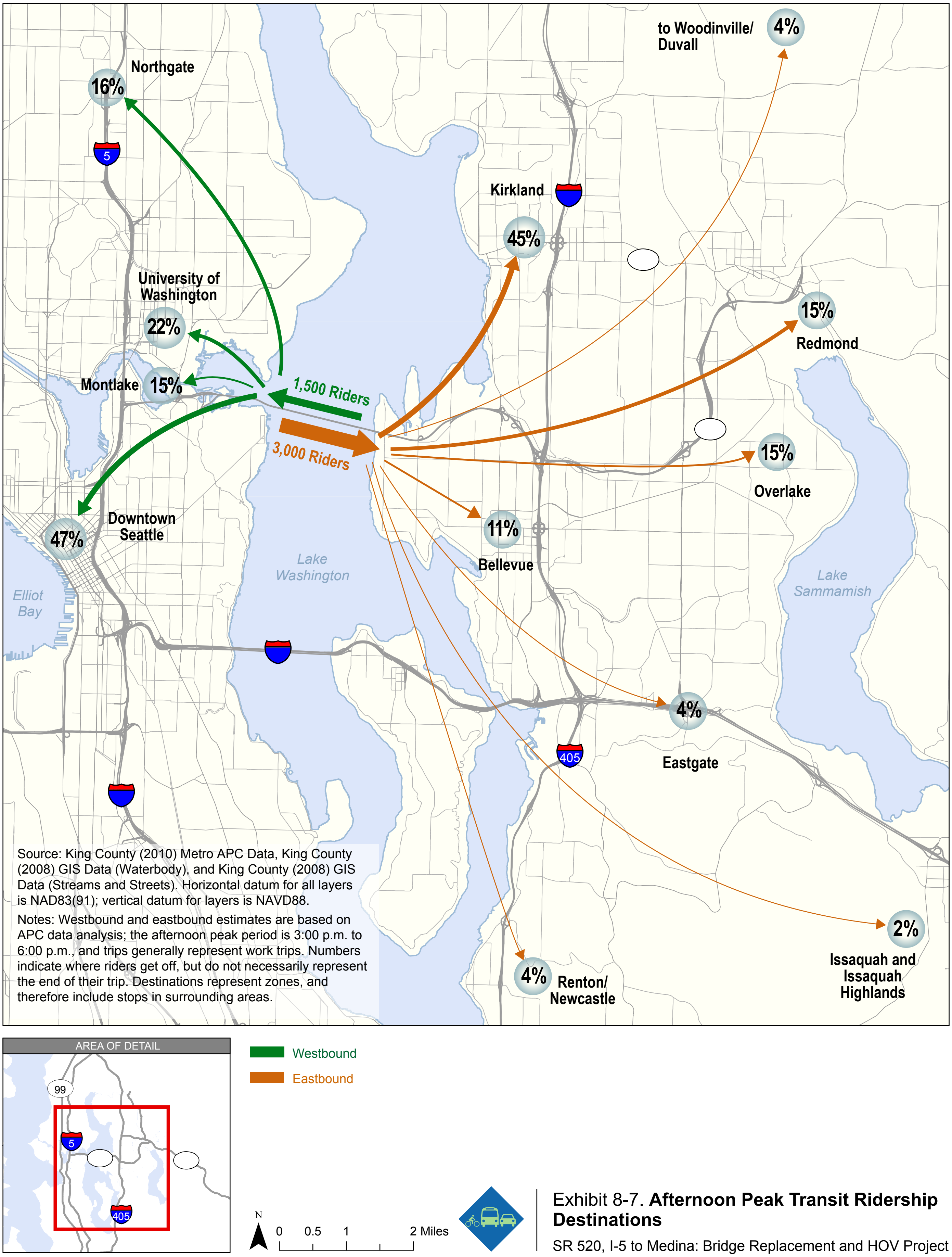


Source: King County (2010) Metro APC Data, King County (2008) GIS Data (Waterbody), and King County (2008) GIS Data (Streams and Streets). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Notes: Westbound and eastbound estimates are based on APC data analysis; the afternoon peak period is 3:00 p.m. to 6:00 p.m., and trips generally represent work trips. Numbers indicate where riders get off, but do not necessarily represent the end of their trip. Destinations represent zones, and therefore include stops in surrounding areas.

🟩 Westbound

🟧 Eastbound

Exhibit 8-7. **Afternoon Peak Transit Ridership Destinations**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

Travel Times and Reliability

General traffic congestion along the SR 520 corridor, combined with frequent and highly unpredictable delays caused by traffic accidents and minor incidents, result in widely varying travel times in both directions throughout much of the day and day-to-day. Recent travel time data reviewed by Metro indicate that bus travel times between NE 51st Street in Redmond and the Montlake Freeway Transit Station (10 miles) during the morning commute can range from 10 to 30 minutes for westbound as well as eastbound trips, with most trips (more than 90 percent) taking an average of 16 minutes in either direction.

During the afternoon commute, eastbound transit travel times are similar to the morning, taking an average of 16 minutes. However, westbound travel times between the Montlake Freeway Transit Station and NE 51st Street can range from 10 to 55 minutes, with an average of approximately 22 minutes. Approximately 20 percent of the westbound transit trips take over 30 minutes to make this trip (King County Metro 2008).

This high variability means that travelers needing to keep a regular schedule must plan for the worst conditions and expect a relatively long travel time. Highly variable travel times make transferring between routes and services difficult and add substantially to the cost of providing bus service. Transit operators must also plan for this variability by operating more buses to maintain schedules.

How do riders access transit service in the Montlake interchange area today?

Exhibit 8-8 shows the existing transit facilities in the Montlake area. The Montlake Freeway Transit Station is the only freeway transit station on SR 520 between I-5 and the Evergreen Point Bridge. It is located at the SR 520/Montlake interchange in Seattle.

The two primary arterials used by transit in this interchange area are Montlake Boulevard and NE Pacific Street, which have been identified in the City of Seattle’s Transit Plan as links in the Urban Village Transit Network. This network represents the backbone of the Seattle transit network, carrying the majority of Seattle transit system riders.

As shown in Exhibit 8-8, there are five transit stops located along Montlake Boulevard that are within the study area. There are also bus stops adjacent to the Montlake Triangle on NE Pacific Street/NE Pacific Place in front of the UW Medical Center. These stops provide neighborhood access to transit and allow transit riders to transfer between local and SR 520 bus service. Walk distances between these stops and the Montlake Freeway Transit Station are shown in Exhibit 8-8. Bus and passenger activity for each stop is described in the following section.

Montlake Freeway Transit Station

The Montlake Freeway Transit Station consists of westbound and eastbound bus platforms and shelters on the shoulders of SR 520 near the SR 520/Montlake interchange. Bus riders access the eastbound platform via stairs from Montlake Boulevard NE, while passengers using the westbound platform access the station using a sidewalk.

Local buses traveling over SR 520 on the Montlake Boulevard undercrossing

Of the 16,000 daily transit riders crossing the Evergreen Point Bridge, approximately 1,700 riders (11 percent) use the Montlake Freeway Transit Station. Transit service at this station is provided by Metro, Sound Transit, and Community Transit. Exhibits 8-9 and 8-10 show the bus routes that serve the Montlake station, and the passenger boardings (ons) and alightings (offs) by route. Sound Transit Route 545 accounts for 60 percent (1,000) of the boarding and alighting activity at the Montlake Freeway Transit Station (total of westbound and eastbound stops). The exhibits also show that the primary activity at the westbound station is riders getting off the bus, while the primary activity at the eastbound station is riders getting on the bus.

Walk distances and times between bus stops

Existing Conditions

Bus stops	Distance (ft)	Time (mins)
A-C	920	4-5
A-D	400	2-3
B-C	300	1-2
B-D	360	2-3

Note: Trolley wires used for some local routes (except for E Roanoke route)

🟦	Bus Stop (Local Route)
🟧	Bus Stop (SR 520 Route)
◪	Bus Stop (Local and SR 520 Route)
◆	HOV Lane
▬	Layover Area
- -	Pedestrian Walk Path
―	Local Route
―	SR 520 Route

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 8-8. **Existing Transit and HOV Facilities within the Montlake Area**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

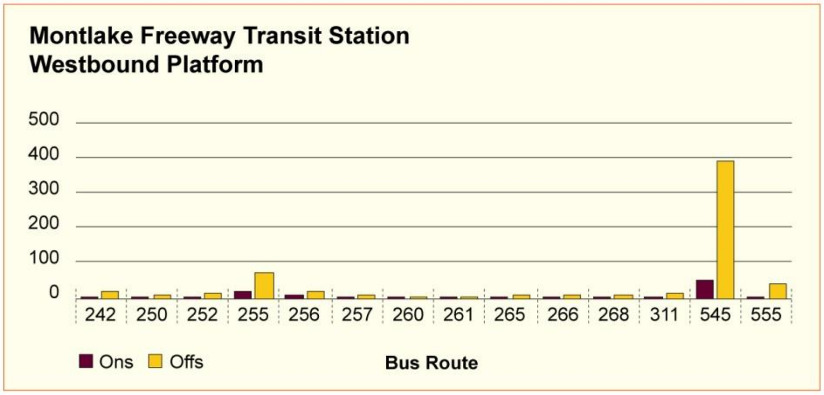


Exhibit 8-9. **Year 2010 Daily Boardings and Alightings by Route at the Montlake Freeway Transit Station—Westbound**

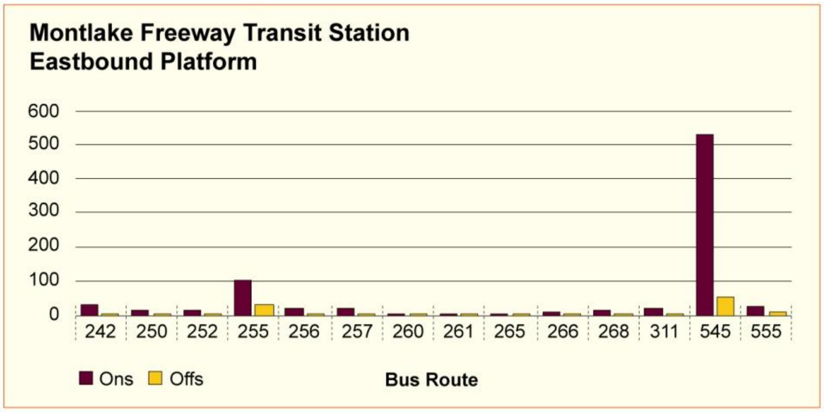


Exhibit 8-10. **Year 2010 Daily Boardings and Alightings by Route at the Montlake Freeway Transit Station—Eastbound**

The existing Montlake Freeway Transit Station serves four functions:

1. It allows westbound riders to use downtown Seattle-bound buses to access the University District, Montlake area, or other neighborhoods via a transfer to local buses, walking, or bicycling.
2. It allows westbound riders to access downtown Seattle buses by transferring from local buses, walking, bicycling, or being dropped off at the Montlake Freeway Transit Station.

3. It allows eastbound riders (from the University District, Shelby Street-Hamlin Street neighborhood, Capitol Hill, Rainier Valley) to access Eastside destinations by transferring from local buses, walking, bicycling, or being dropped off at the Montlake Freeway Transit Station.
4. It allows eastbound downtown Seattle riders to access the Montlake area and transfer to local bus service, walk, or bicycle to other destinations.

More specific information for each stop is described below.

Westbound Station

Exhibit 8-11 shows the number of bus trips and passenger boardings (ons) and alightings (offs) throughout the day at the westbound station. The two most used routes, Sound Transit 545 and Metro 255, are shown in separate colors to indicate how much of the total activity they support.

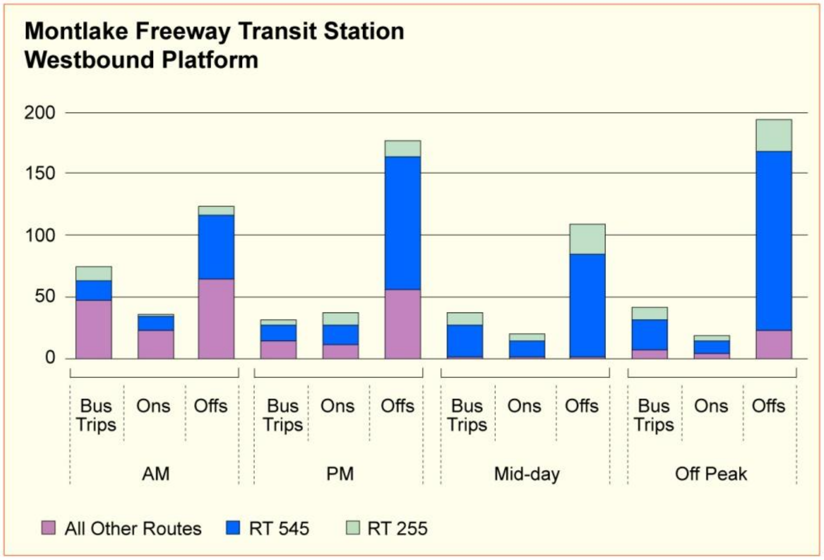


Exhibit 8-11. **Year 2010 Boardings and Alightings by Time of Day at the Montlake Freeway Transit Station—Westbound**

During the morning peak period, there are approximately 40 passenger boardings and 120 passenger alightings over a 3-hour period. The alightings represent Eastside residents traveling to Montlake/UW or other nearby neighborhoods by riding downtown-bound SR 520 buses. These riders then transfer to local bus service on Montlake Boulevard NE, walk, or bike to their destination (EnviroIssues 2005).

The westbound station is not as busy as the eastbound station during the midday. There are more alightings (110 over a 6-hour period or 18 per hour) than boardings and Sound Transit Route 545 accounts for approximately 75 percent of them.

Passenger activity is greatest in the evening (peak and off-peak periods). In the evening peak period, there are approximately 40 passenger boardings and 180 alightings, with most riders using Sound Transit Route 545. It is during the off-peak hours that this station has the most alightings (195), with most (160 or 83 percent) occurring between 6:15 and 9:30 p.m. Sound Transit Route 545 accounts for 77 percent of these alightings.

Eastbound Station

Exhibit 8-12 shows the number of bus trips and passenger boardings (ons) and alightings (offs) throughout the day at the eastbound station. The two most used routes, Sound Transit 545 and Metro 255, are shown in separate colors to indicate how much of the total activity they support. In the morning, the eastbound station is the busier of the two stations, with approximately 235 passenger boardings and 40 passenger alightings over a 3-hour period.

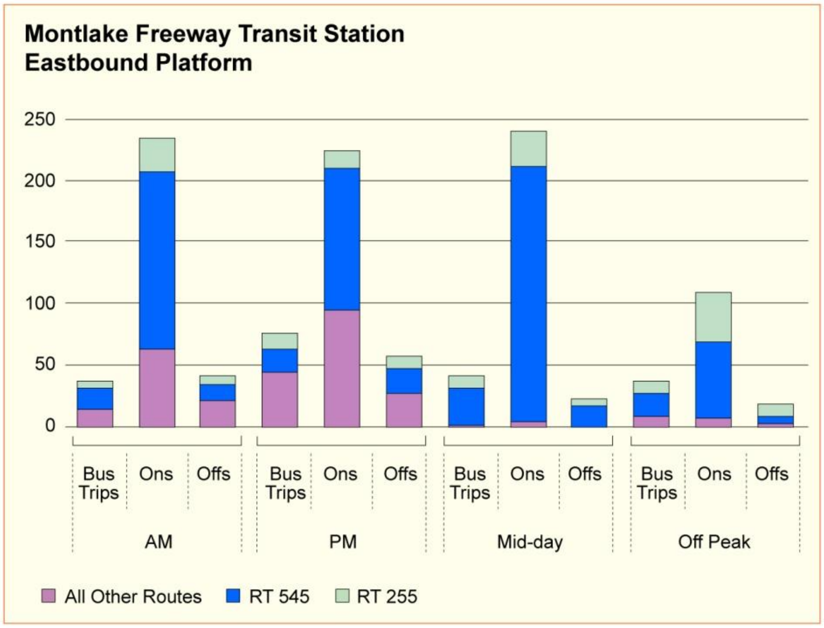


Exhibit 8-12. **Year 2010 Boardings and Alightings by Time of Day at the Montlake Freeway Transit Station—Eastbound**

Approximately 90 percent of the people using the eastbound Montlake Freeway Transit Station in the morning are traveling to work. Approximately 60 percent of these people arrive by bus while another

20 percent arrive by bicycle (EnviroIssues 2005). They transfer to SR 520 buses for the trip to the Overlake area (Route 545), the Kirkland area (Route 255), or other Eastside destinations.

The eastbound stop remains busy during the midday with 240 boardings (ons) over a 6-hour period (or 40 per hour). Sound Transit Route 545 account for 86 percent of these boardings. In the afternoon, 220 passengers board and 60 passengers get off the buses at the eastbound stop. Approximately 65 percent or 140 people arrive from the UW. Approximately 60 percent of these people, or 85 passengers, arrive by bus while almost the entire remaining 40 percent, or 55 passengers, walk to the station (EnviroIssues 2005).

Montlake Boulevard Overpass Bus Stops

The Montlake Boulevard overpass bus stops allow transit riders to transfer between SR 520 and local transit services. The northbound bus stop is located just south of the SR 520 westbound off-ramp and the southbound stop is located at the entrance to the SR 520 eastbound on-ramp.

The northbound bus stop serves three local bus routes with approximately 190 daily bus trips, 230 daily passenger boardings, and 120 daily passenger alightings. Exhibit 8-13 shows that Metro Route 48 is the most used route, followed closely by Metro Route 43.

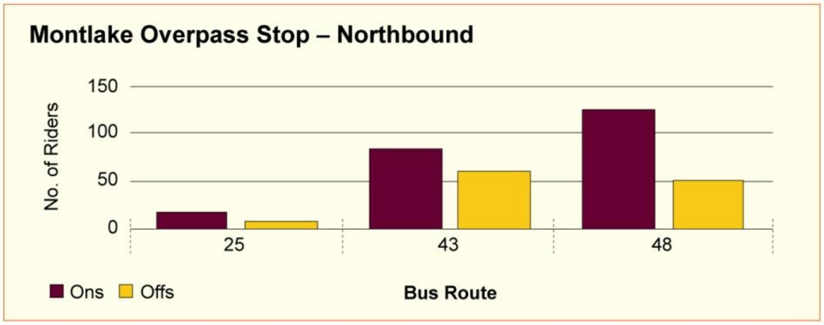


Exhibit 8-13. **Year 2010 Daily Boardings and Alightings by Route at the Montlake Boulevard Overpass Stop—Northbound**

Exhibit 8-14 shows that activity at the northbound stop is fairly evenly distributed throughout the day, with slightly more activity during the evening peak period when many people transfer from SR 520 buses to local routes to complete their trip home.

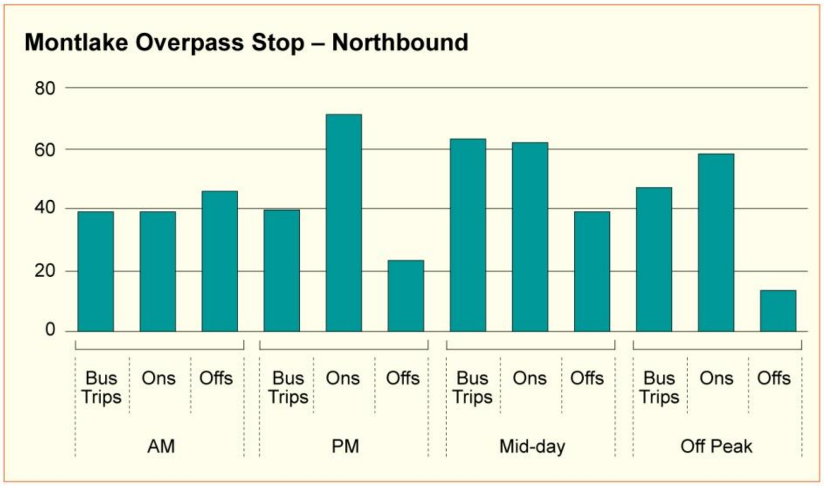


Exhibit 8-14. **Year 2010 Boardings and Alightings by Time of Day at the Montlake Boulevard Overpass Stop—Northbound**

Exhibit 8-15 shows that the southbound bus stop serves three local and seven SR 520 bus routes with 300 daily bus trips, approximately 400 daily passenger boardings, and 380 daily passenger alightings. On a daily basis, passenger boardings and alightings are highest for the local bus routes (Metro Routes 25, 43, and 48). Metro Route 271 is the busiest of the SR 520 routes, providing all-day service connecting the University District, downtown Bellevue, Eastgate, and Issaquah.

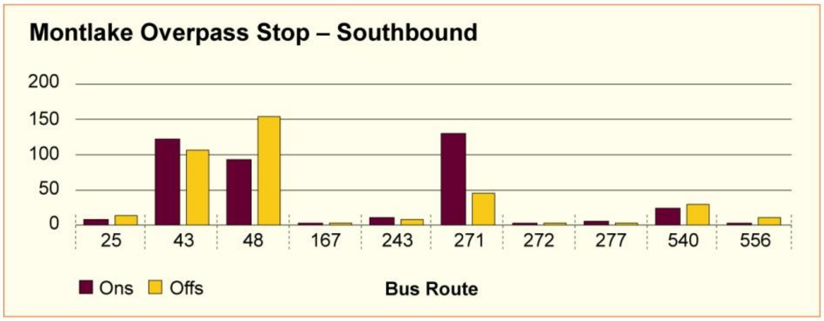


Exhibit 8-15. **Year 2010 Daily Boardings and Alightings by Route at the Montlake Boulevard Overpass Bus Stop—Southbound**

Exhibit 8-16 shows how bus trips and passenger boardings and alightings are distributed throughout the day. Local buses (Metro Routes 43 and 48) account for most of the bus and passenger volumes at this stop, with the exception of the morning peak period and midday boardings. At these times, SR 520 buses account for more of the passenger boarding activity.

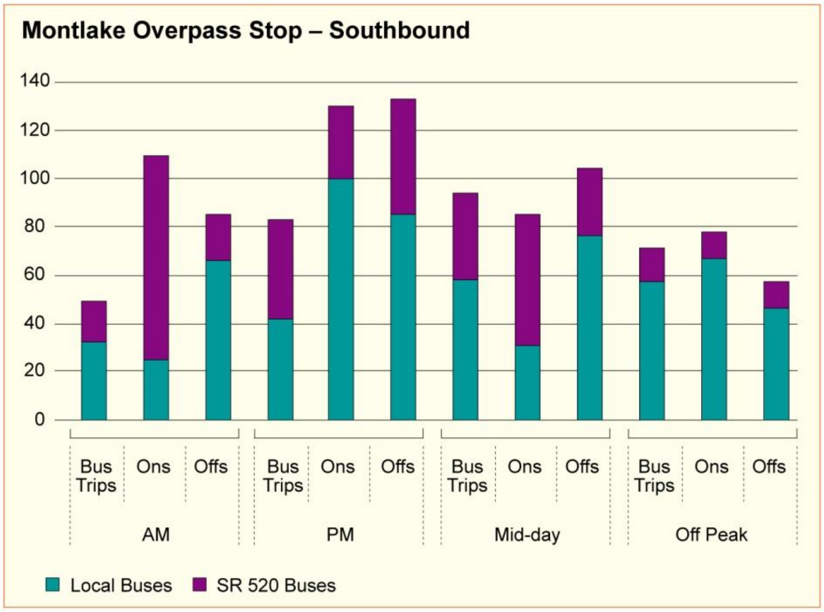
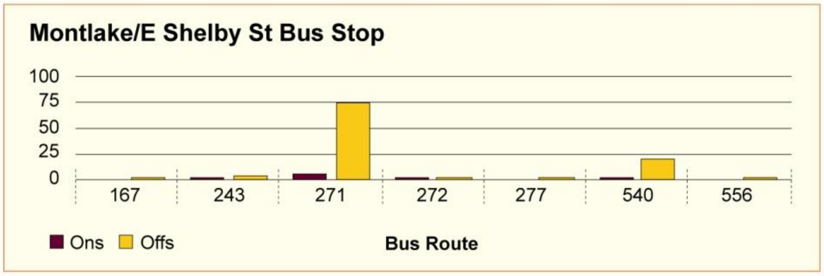


Exhibit 8-16. **Year 2010 Boardings and Alightings by Time of Day at the Montlake Boulevard Overpass Bus Stop—Southbound**

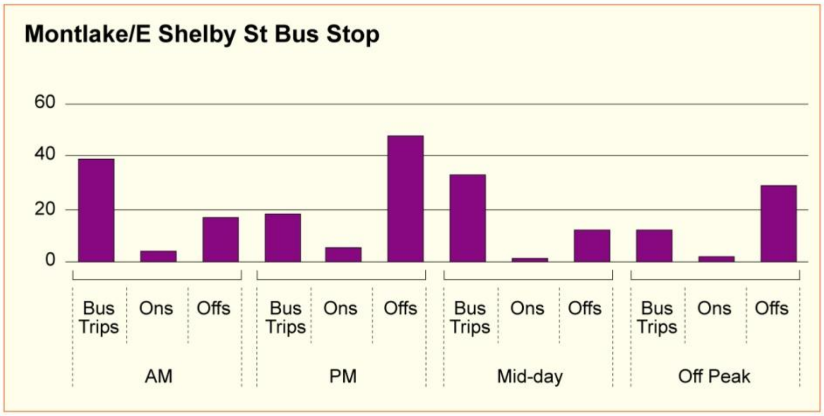
Montlake Boulevard Northbound at East Shelby Street Bus Stop

Exhibit 8-17 shows that the bus stop at East Shelby Street serves seven SR 520 bus routes with 100 daily bus trips that have approximately 10 passenger boardings and 100 passenger alightings per day. Metro Route 271 accounts for most of the passenger activity at this stop. Exhibit 8-18 shows how bus trips and passenger boardings and alightings are distributed throughout the day. This stop is the busiest during the evening peak period.



Note: Sound Transit Route 542 was not included because ridership data were not available.

Exhibit 8-17. **Year 2010 Daily Boardings and Alightings by Route at the Montlake Boulevard/East Shelby Street Bus Stop**



Note: Sound Transit Route 542 was not included because ridership data were not available.

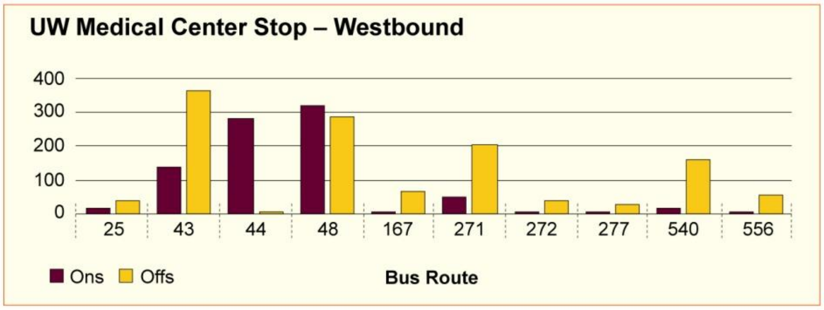
Exhibit 8-18. **Year 2010 Boardings and Alightings by Time of Day at the Montlake Boulevard/East Shelby Street Bus Stop**

Montlake Triangle Area

Bounded by Montlake Boulevard NE, NE Pacific Street, and NE Pacific Place, the Montlake Triangle is the southeastern entry to the UW campus. The transit facilities located at the Montlake Triangle were shown previously in Exhibit 8-8. The UW Medical Center stops (one eastbound and one westbound) are located on NE Pacific Street and are the busiest in the Montlake Triangle area.

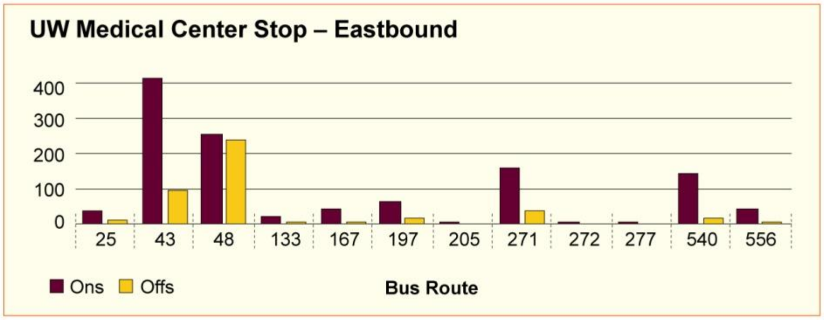
The UW Medical Center stops provide access to the UW Medical Center, UW medical and health sciences academic buildings, the main UW campus, Husky Stadium, and associated parking areas. Transit service is provided by Metro and Sound Transit with 3,800 boardings and alightings (combined) at these stops every weekday. In addition to providing access to the UW, these stops also serve riders transferring between SR 520 and local bus service.

The westbound stop is served by 11 routes (3 local and 8 SR 520 bus routes) and the eastbound stop is served by 13 routes (4 local and 9 SR 520 bus routes). Exhibits 8-19 and 8-20 show which specific routes serve these stops as well the number of passenger ons/offs by route. These exhibits also show that local buses (Metro Routes 43, 44, and 48) account for 70 percent of passenger activity at both stops.



Note: Sound Transit Route 542 was not included because ridership data were not available.

Exhibit 8-19. **Year 2010 Daily Boardings and Alightings by Bus Route at the UW Medical Center Bus Stop—Westbound**

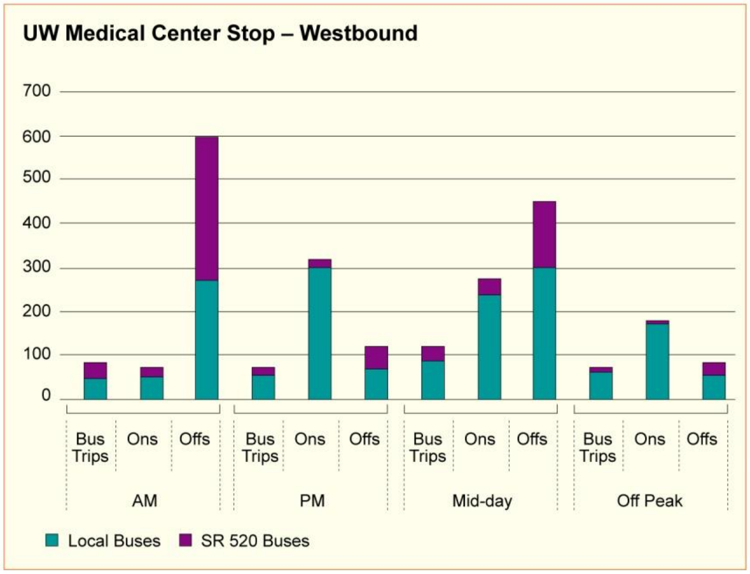


Note: Sound Transit Route 542 was not included because ridership data were not available.

Exhibit 8-20. **Year 2010 Daily Boardings and Alightings by Route at the UW Medical Center Bus Stop—Eastbound**

SR 520 bus routes, especially all-day Routes 271 and 540, account for approximately 30 percent of daily on/off activity at the westbound stop. At the eastbound stop, SR 520 bus routes account for slightly more with approximately 36 percent of daily on/off activity.

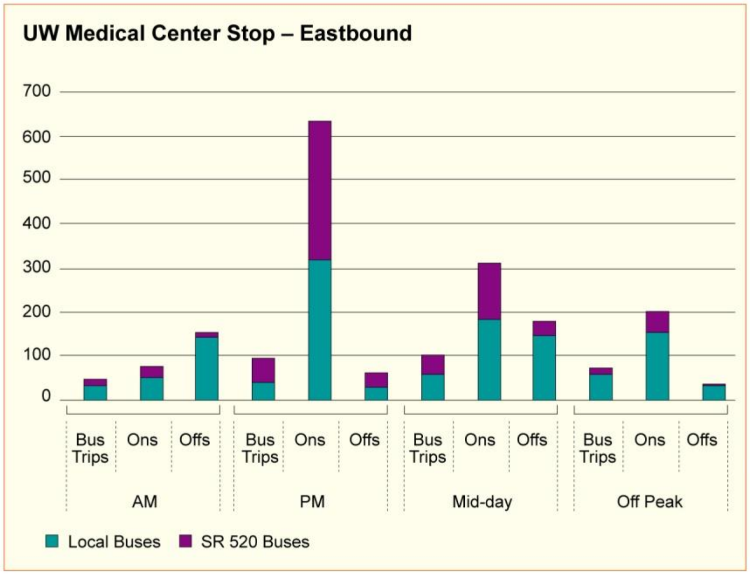
Exhibits 8-21 and 8-22 show how passenger boardings and alightings are distributed throughout the day. At the westbound bus stop, SR 520 bus trips and on/off activity are generally lower than local buses, with the exception of alightings during the morning peak period.



Note: Sound Transit Route 542 was not included because ridership data were not available.

Exhibit 8-21. **Year 2010 Boardings and Alightings by Time of Day at the UW Medical Center Bus Stop—Westbound**

Exhibit 8-22 shows that similar to the westbound bus stop, SR 520 bus trips and on/off activity at the eastbound bus stop are generally lower than local buses, with the exception of boardings at the evening peak period.



Note: Sound Transit Route 542 was not included because ridership data were not available.

Exhibit 8-22. **Year 2010 Boardings and Alightings by Time of Day at the UW Medical Center Bus Stop—Eastbound**

What SR 520 transit services and facilities were assumed in the No Build Alternative?

The SR 520, Medina to SR 202 project is under construction and expected to be completed by 2016; therefore, it was included in the No Build Alternative definition for the SR 520, I-5 to Medina project Final EIS. The following elements of the SR 520, Medina to SR 202 project were assumed to be in place:

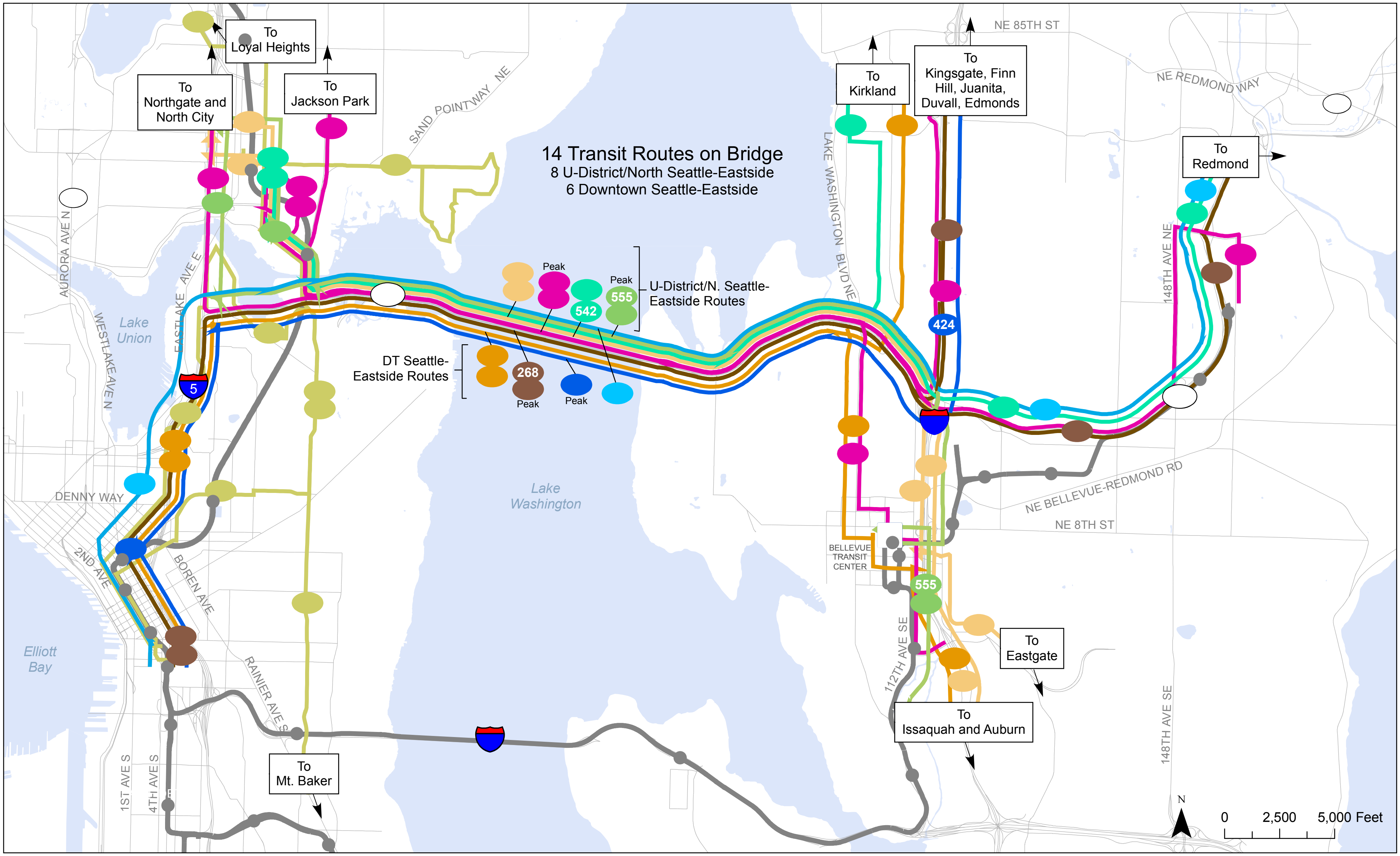
- Inside HOV lanes in both directions between Lake Washington and SR 202
- HOV direct access ramps to and from the west at the 108th Avenue NE interchange
- Inside median transit stops at 92nd Avenue NE and Evergreen Point Road
- A regional bicycle and pedestrian path between 108th Avenue NE and Evergreen Point Road
- New interchange configurations at 84th Avenue NE, 92nd Avenue NE, Bellevue Way, and 108th Avenue NE

The No Build Alternative was assumed to be untolled for all vehicles.

Transit Service Network

The transit network and operating plan assumptions for the 2030 No Build Alternative were provided by Metro and Sound Transit and are consistent with those identified for other corridor projects in the region (see Exhibit 8-23). Key transit network assumptions for the SR 520, I-5 to Medina project include (but are not limited to):

- Sound Transit light rail service between Federal Way (Redondo/Star Lake) and Lynnwood
- Sound Transit light rail service across I-90 between downtown Seattle, downtown Bellevue, and Overlake (Redmond)
- Metro Transit Now/RapidRide programs (Aurora, Ballard, West Seattle, Eastside, and Pacific Highway Bus Rapid Transit)
- Metro and Sound Transit service changes proposed as part of the Urban Partnership Agreement and Sound Transit ST2 plan.
- Seattle streetcar—South Lake Union and First Hill lines



Metro Transit

- North Seattle to Downtown
- North Seattle/Eastside
- Peak Hour North Seattle/Eastside
- Limited Service North Seattle/Eastside
- Downtown Seattle/Eastside
- Peak Hour Downtown Seattle/Eastside

Sound Transit

- North Seattle/Eastside
- Peak Hour North Seattle/Eastside
- Downtown Seattle/Eastside

Community Transit

- Peak Hour Downtown Seattle/Snohomish County

Link Light Rail

- Link Light Rail

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 8-23. **SR 520 Transit Service Assumed with the No Build Alternative**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

The transit service provided by these projects will allow for new transit travel options and change transit travel patterns throughout the region and within the SR 520 corridor. The biggest change in the year 2030 transit network assumptions between the SDEIS and Final EIS analysis is the inclusion of a greater light rail system. It was assumed that the North Link and East Link light rail systems would be operational and connected, providing transit riders with a "one seat" transit trip between Lynnwood, Northgate, and Seattle on the west side of Lake Washington and Mercer Island, Bellevue, and Overlake on the east side. With these changes, some transit riders that today use SR 520 bus service are forecasted to use East Link light rail service across I-90.

Sound Transit plans to begin construction of East Link by 2013. The project may be constructed in stages, with the segment to Bellevue opening by 2020, and to Overlake Transit Center by 2021. The last segment to downtown Redmond would be constructed after 2021.

With this light rail service in place, Metro and Sound Transit would revise bus service to facilitate bus-light rail connections and create transit service efficiencies. These transit agency revisions are included in the Final EIS transit network and those directly related to SR 520 bus service are described below. For a complete list of all transit service revisions that were included in the Final EIS travel demand model, please see the Final No Build Alternative Definition Technical Memorandum (WSDOT 2010e).

With relocation of the HOV lanes and freeway transit stations to the inside of SR 520, Metro has indicated that Route 271 could be re-routed to the 108th Avenue NE HOV direct access ramp that would be constructed as a part of the SR 520, Medina to SR 202 project. This change would allow Route 271 to serve the 92nd Avenue NE and Evergreen Point Freeway Transit Stations and provide midday, off-peak, and weekend service to the Montlake and University District neighborhoods.

Transit Service Frequencies

Metro and Sound Transit assumptions for the No Build Alternative include discontinuing several SR 520 peak period routes by the year 2030 in response to new light rail connections and/or low ridership. As a result, there would be 13 rather than 24 transit routes operating across Lake Washington on SR 520 in the No Build Alternative. Seven of these routes would provide downtown Seattle to Eastside service and six would provide University District/North Seattle to Eastside service. These changes are summarized in Exhibit 8-24.

Exhibit 8-24. **Changes in No Build Alternative SR 520 Bus Service Compared to Existing Conditions**

	Existing		No Build Alternative	
Bus Routes	Number of Routes	Route Numbers	Number of Routes	Route Numbers
Downtown Seattle to Eastside (Serve Montlake Freeway Transit Station)	15	Peak: 242, 250, 252, 256, 257, 260, 261, 265, 266, 268, 311, 424, 555[a] All day: 255, 545	7	Peak: 242, 268, 311, 424, 555 All day: 255, 545
University District/North Seattle to Eastside	8	Peak: 167, 243, 272, 277, 542, 556 All day: 271, 540	6	Peak: 167, 243, 277, 542 All day: 271, 540

[a] Route 555 serves Northgate/University District via I-5 and therefore serves the Montlake Freeway Transit Station.

All-day service across SR 520 would continue to be provided by the four routes that are doing so today (downtown Seattle Routes 255 and 545 and University District Routes 271 and 540).

The specific effects on riders boarding and alighting at the westbound and eastbound Montlake Freeway Transit Station stops are discussed below.

Westbound

- Using Metro's spring 2010 Automated Passenger Count data, the discontinuation of Metro Routes 250, 252, 256, 257, 260, 261, 265, and 266 would affect 40 percent (22 riders per hour) of Montlake Freeway Transit Station users in the morning peak period and 11 percent (8 riders per hour) in the evening peak period.
- As shown previously in Exhibit 8-9, Sound Transit Route 545 accounts for the majority of the remaining passenger boardings and alightings. It is anticipated that some of these riders would switch to new Sound Transit Route 542, East Link light rail, or to other SR 520 University District/North Seattle bus routes, thereby reducing the number of boardings and alightings at this stop.

Eastbound

- The discontinuation of Metro Routes 250, 252, 256, 257, 260, 261, 265, and 266 would affect 8 percent (7 riders per hour) of Montlake Freeway Transit Station users in the morning peak period and 30 percent (27 riders per hour) in the evening peak period.

- As with the westbound stop, Route 545 accounts for the majority of the remaining passenger boardings and alightings (see previous Exhibit 8-10). It is anticipated that some of these passengers would also switch to new Sound Transit Route 542, East Link light rail, or to other SR 520 University District/North Seattle bus routes, thereby reducing the number of boardings at this stop.

It is also anticipated that ridership could decrease on some of the local Metro routes traveling through the Montlake area as transit riders switch to light rail. For example, transit riders traveling between Capitol Hill and the University District on Route 43 might choose to take light rail via the John Street, UW, and Brooklyn stations. Or, transit riders who are traveling between Capitol Hill and Overlake via SR 520 could also choose to take East Link.

Exhibit 8-25 compares existing and projected (year 2030) headways for SR 520 routes in the year 2030 for the No Build Alternative. Individual route frequencies would be substantially improved on all-day Routes 255, 271, and 545. East Link would also provide all-day light rail service between the Eastside, downtown Seattle, and the University District (with service continuing north to Lynnwood).

Exhibit 8-26 shows the estimated combined bus headways for Eastside to downtown Seattle buses and Eastside to University District buses. While there would be eight fewer bus routes operating on SR 520 in the year 2030 No Build Alternative, combined bus headways across the bridge would be similar to or better than today during the peak and midday periods.

Transit Service Hours

Transit service hours are represented by the transit service, routes, and headways provided to WSDOT by Metro and Sound Transit. This information represents transit agency revisions to the transit network based on the East Link implementation plan.

Exhibit 8-25. **Comparison of Existing and Year 2030 No Build Alternative Transit Routes and Route Headways**

		Peak Headways (minutes)		Midday Headways (minutes)		
Route	**Name**	**2008**	**2030 NB**	**2008**	**2030 NB**	**Comments on Year 2030 Service**
Light rail	East Link	NA	7.5	NA	10	Hours of operation would be 5 a.m. to 1 a.m.
Light rail	Central/North Link (Lynnwood-Redondo)	7.5	7.5	10	10	Hours of operation would be 5 a.m. to 1 a.m.
167	University-Renton	45	30	-	-	Peak only
242	Ridgecrest-Overlake	30	20	-	-	Peak only
243	Bellevue-Jackson Park	60	30	-	-	Would use 108th Avenue NE direct access ramp
250	Downtown Seattle-Redmond	36	NA	-	NA	Discontinued due to low ridership
252	Downtown Seattle-Kingsgate	26	NA	-	NA	Discontinued due to low ridership—riders to connect with Route 311
255	Kingsgate-Kirkland-Downtown Seattle (WB/EB)	13/36	10	30	15	
256	Downtown Seattle-Overlake	36	NA	-	NA	Discontinued and replaced by upgraded service on Route 255
257	Downtown Seattle-Kingsgate	30	NA	-	NA	Discontinued—riders to connect with Route 311
260	Downtown Seattle-Finn Hill	60	NA	-	NA	Discontinued due to low ridership
261	Downtown Seattle-Overlake	45	NA	-	NA	Route discontinued for RapidRide
265	Downtown Seattle-Redmond	30	NA	-	NA	Discontinued due to low ridership
266	Express: Downtown Seattle-Redmond Transit Center	30	NA	-	NA	Discontinued due to low ridership—riders to connect with Route 545
268	Seattle-Redmond/Fall City	45	30	-	-	Peak only
271	Issaquah-Bellevue-UW (WB/EB)	26/36	NA	-	NA	Route no longer travels to Issaquah
271	Eastgate-Bellevue-UW (WB/EB)	45/60	10	30	10	Re-routed to 108th Avenue NE direct access ramp
272	Express: University District-Bellevue	30	NA	90	NA	Route discontinued for RapidRide

Exhibit 8-25. **Comparison of Existing and Year 2030 No Build Alternative Transit Routes and Route Headways**

Route	Name	Peak Headways (minutes)		Midday Headways (minutes)		Comments on Year 2030 Service
		2008	2030 NB	2008	2030 NB	
277	University District-Juanita	30	30	30	NA	Low ridership—riders to connect with Route 255
311	Downtown Seattle-Duvall/Woodinville	36	12	-	-	Peak only
424	Seattle-Snohomish/Monroe	60	45	-	-	Peak only
540	Express: Kirkland-UW (WB/EB)	17/45	15	30	30	
542	Express: Redmond-University District-Green Lake	NA	15	30	30	Extended peak
545	Express: Redmond-Downtown Seattle (EB)	12	8	14	10	
545	Express: Redmond-Downtown Seattle (WB)	10	8	15	10	
555	Express: Northgate-Issaquah	30	15	-	-	Route 555 would be truncated to Bellevue
556	Express: Northgate-Issaquah	30	NA	NA	NA	Route 556 discontinued

WB = westbound, EB = eastbound, NB = northbound, NA = not applicable
Peak headways represent 6:00 to 9:00 a.m. and 3:15 to 6:15 p.m. and midday headways represent 9:00 a.m. to 3:15 p.m.
Route 280 is a night-owl route with one departure.

Exhibit 8-26. Combined Bus Headways across the Evergreen Point Bridge for the No Build Alternative (between Evergreen Point and Montlake Freeway Transit Stations)

	AM Peak Period (6 to 9 a.m.)				**PM Peak Period (3:15 to 6:15 p.m.)**				**Midday (9 a.m. to 3:15 p.m.)**			
	Bus Trips		**Headways (minutes)**		**Bus Trips**		**Headways (minutes)**		**Bus Trips**		**Headways (minutes)**	
	EX[a]	**NB[b]**	**EX**	**NB**	**EX**	**NB**	**EX**	**NB**	**EX**	**NB**	**EX**	**NB**
Westbound at the Evergreen Point Freeway Transit Station												
Downtown Seattle–Eastside[b]	78	62	2.3	2.9	25	50	7.2	3.6	39	62	9.6	6.0
University District/North Seattle–Eastside[c]	53	54	3.4	3.3	37	48	4.9	3.8	33	51	11.4	7.4
Combined	131	116	1.4	1.6	62	98	2.9	1.8	72	113	5.2	3.3
Light rail[c]	NA	24	NA	7.5	NA	24	NA	7.5	NA	36	NA	10.4
Total with light rail	NA	140	NA	1.3	NA	122	NA	1.5	NA	149	NA	2.5
Eastbound in the Montlake Interchange Area												
Downtown Seattle–Eastside[b]	29	50	6.2	3.6	80	62	2.3	2.9	42	62	8.9	6.0
University District/North Seattle–Eastside[c]	**33**	**48**	**5.5**	**3.8**	**48**	**54**	**3.8**	**3.3**	**41**	**56**	**9.1**	**6.7**
Combined	62	98	2.9	1.8	128	116	1.4	1.6	83	118	4.5	3.2
Light rail	NA	24	NA	7.5	NA	24	NA	7.5	NA	38	NA	10.0
Total with light rail	NA	122	NA	1.6	NA	140	NA	1.3	NA	156	NA	2.4

EX = existing; NB = No Build; NA = not applicable

Notes:

[a] Existing frequencies estimated using bus trip information from Metro spring 2010 Automated Passenger Count data and Sound Transit online schedule information for Route 542

[b] No Build Alternative frequencies estimated using year 2030 headways shown in Exhibit 8-25, which were provided by Metro and Sound Transit as a part of the No Build Alternative definition process

[c] While East Link will operate on I-90, it will provide an alternative to SR 520 bus service for travel between the Eastside south of SR 520 and downtown Seattle/University District

How would the No Build Alternative affect SR 520 transit demand?

With the implementation of East Link light rail across I-90 serving downtown Seattle, Mercer Island, Bellevue, and Overlake (Redmond), SR 520 transit ridership under the No Build Alternative would decrease 38 percent to approximately 9,900 daily riders compared to 16,000 daily riders today (Exhibit 8-27). During both commute periods, SR 520 ridership would decrease by approximately 50 percent. Transit riders are anticipated to shift from SR 520 buses to East Link to take advantage of a "one-seat ride" and more reliable travel times between Seattle and Eastside destinations. Under the No Build Alternative, East Link travel times between Overlake and UW are estimated to be 40 to 45 minutes while HOV travel times on SR 520 are forecasted to be 20 to 25 minutes during peak periods.

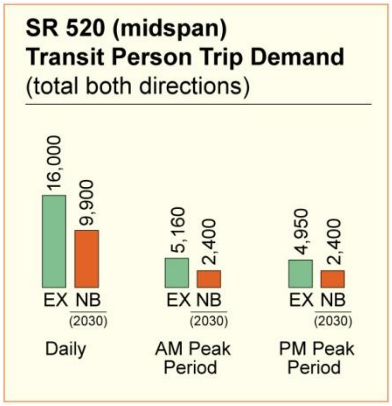


Exhibit 8-27. **SR 520 Transit Person Trip Demand with the No Build Alternative**

This combination of a decrease in ridership with improved bus headways suggests there would be available seat capacity in the SR 520 corridor with the No Build Alternative. Seat capacity and ridership demand is discussed in more detail in the section: *Would there be enough bus service to meet Preferred Alternative demand?*

How would the No Build Alternative affect the Montlake Freeway Transit Station?

In the No Build Alternative, bus service to downtown Seattle would be restructured to support East Link and other Metro transit service changes. These changes would result in fewer bus routes across SR 520 and, therefore, fewer bus routes serving the Montlake Freeway Transit Station. As shown in Exhibit 8-24, the number of downtown Seattle bus routes would be reduced from 15 to 7 by the year 2030, requiring riders to find new routes between Seattle and the Eastside. Riders could switch to other SR 520 bus routes, East Link, or bus routes outside of the SR 520 corridor. On a daily basis, these bus route changes would affect approximately 13 percent of current Montlake Freeway Transit Station users, specifically those on discontinued Metro Routes 250, 252, 256, 257, 260, 261, 265, and 266.

Today, 11 percent of SR 520 transit ridership uses the Montlake Freeway Transit Station. Applying this assumption to the No Build Alternative would result in approximately 1,000 boardings and alightings at the Montlake Freeway Transit Station compared to 1,700 today. However, it is likely that this is a conservative (i.e., high) estimate. The implementation of East Link and Sound Transit Route 542 between Redmond and the University District is anticipated to decrease boardings and alightings at the Montlake Freeway Transit Station. These transit routes provide the option of direct service to the University District, compared to using Route 545 and walking or transferring to another bus at the Montlake Boulevard bus stops.

Montlake Triangle Transit Facilities with the No Build Alternative

Transit stops at the Montlake Multimodal Center under the No Build Alternative would be similar to today, except for the addition of a light rail station near UW's Husky Stadium (Exhibit 8-28). Sound Transit initiated construction of the University Link, or U-Link, segment of light rail between downtown Seattle and the UW Station near Husky Stadium in 2009. University Link and the UW Station are expected to open in 2016. The UW Station will provide access to the UW campus, the UW Medical Center, nearby sports venues, and surrounding neighborhoods.

Sound Transit forecasts that there will be approximately 23,000 total boardings and alightings per day at the light rail station near UW's Husky Stadium in the year 2030. This is compared to the 3,000 total boardings and alightings today at the UW Medical Center bus stops on NE Pacific Street. The new Sound Transit pedestrian bridge over Montlake Boulevard will help to accommodate the additional pedestrian traffic.

The proposed pedestrian bridge over Montlake Boulevard would facilitate connections to the UW Medical Center bus stops on NE Pacific Street by improving safety, user experience, and walk times. Since the publication of the SDEIS, the proposed pedestrian connection associated with Sound Transit's UW Station has changed. The new design includes a pedestrian bridge over Montlake Boulevard between the station and the Montlake Multimodal Center (known today as the Montlake Triangle). This design was evaluated and selected as a part of the ESSB 6392 Workgroup.

Exhibit 8-28**. Rendering of Sound Transit's University of Washington Station (opening in 2016) with Proposed Pedestrian Bridge over Montlake Boulevard NE**

The walk distance between the UW Medical Center bus stops and the Sound Transit station would be approximately 950 feet and take approximately 4 minutes.

The number of routes serving the UW Medical Center would be reduced from seven to six routes (peak Routes 167, 243, 277, 542, and all-day Routes 271 and 540); however, headways would improve as shown in Exhibit 8-25.

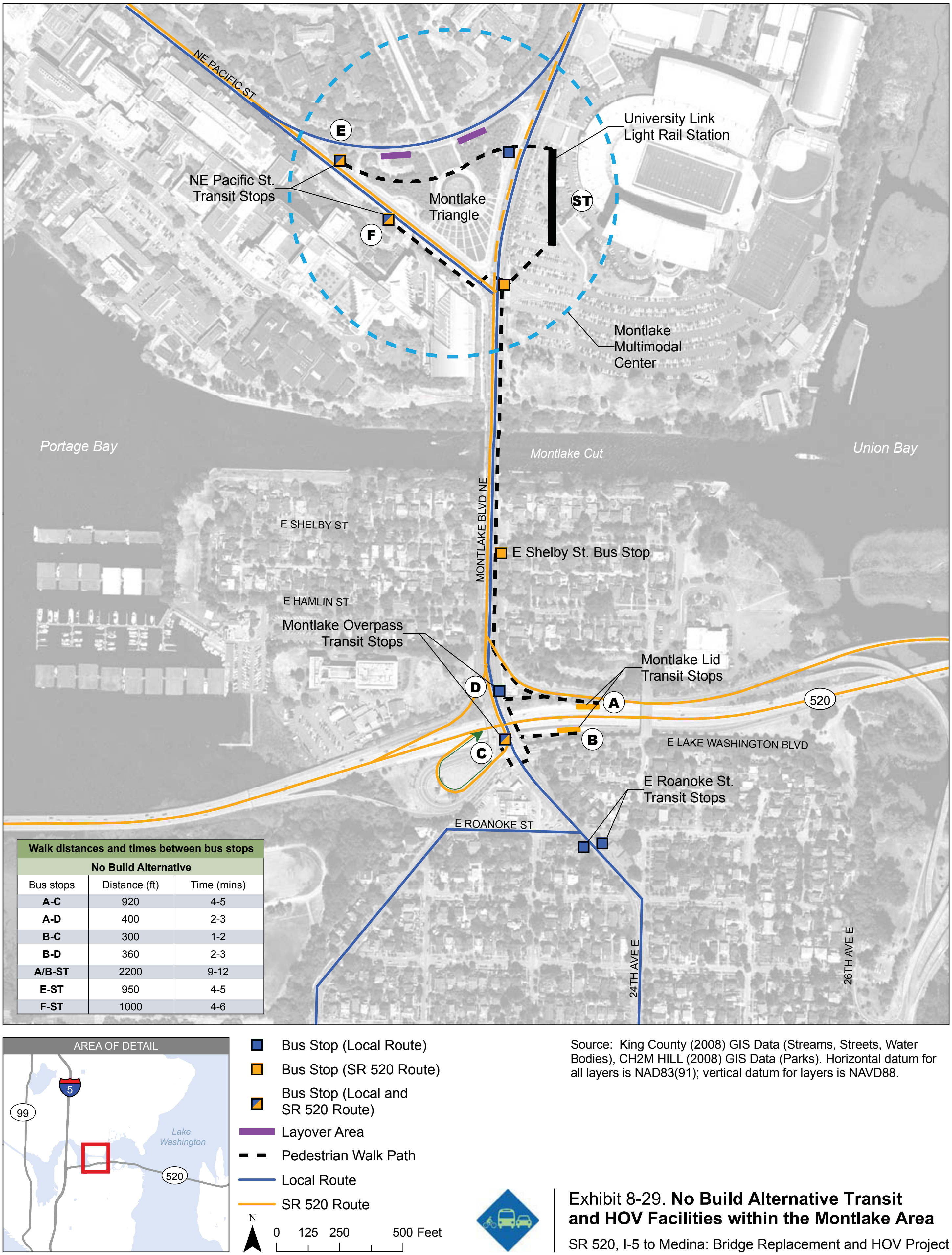
In addition to the current Sound Transit station area plan that is shown in Exhibit 8-28, the UW recently completed the Rainier Vista Concept Plan. Rainier Vista is already a primary gateway to the UW and the addition of the UW light rail station will only make it more so. This southern portion of Rainier Vista would unite the light rail and bus transit operations of the Montlake Multimodal Center with pedestrian and bike paths, and function as a user-friendly gateway between the campus and the surrounding community. This transportation hub would serve daily commuters to UW, as well as Husky Stadium and Hec Edmundson Pavilion event traffic.

In response to ESSB 6099, WSDOT, Sound Transit, and Metro worked in cooperation with UW to prepare the 2008 SR 520 High Capacity Transit Plan (WSDOT 2008c). This plan recommended developing the Montlake Triangle into a multimodal transit hub, referred to as the Montlake Multimodal Center. With the introduction of light rail service, the Montlake Triangle will serve multiple transportation modes—buses, bicycles, pedestrians, and light rail. Several Triangle-area projects are in the planning and design or construction phases, and the SR 520, I-5 to Medina project provides an opportunity to leverage existing plans and projects to maximize investment in the area.

In the summer of 2010, a series of Montlake Triangle Charrettes were held over 5 weeks in response to the work conducted by the ESSB 6392 Workgroup. ESSB 6392 legislation requested that the workgroup evaluate alternative recommendations for transit connections in the SR 520/Montlake interchange vicinity with a distance of less than 1,200 feet. The Montlake Triangle Charrettes included representatives from WSDOT, SDOT, Seattle City Council, UW, Metro, Sound Transit, and the Seattle Design Commission. The charrette participants recommended further design and evaluation of a pedestrian bridge between the Sound Transit UW station and the Montlake Triangle and a number of at-grade pedestrian and bicycle improvements. WSDOT, Sound Transit, Metro, UW, and SDOT are working together at the staff and executive level to advance the Montlake Triangle Charrette recommendations in coordination with the Sound Transit, UW, and SR 520, I-5 to Medina projects. For more information, please refer to the Montlake Triangle Charrette Technical White Paper (WSDOT 2010f).

Montlake Interchange Transit Connections

With the No Build Alternative, transit connections between local bus service on Montlake Boulevard NE and SR 520 bus service at the Montlake Freeway Transit Station would be the same as they are today (Exhibit 8-29). The Montlake Boulevard and East Shelby Street bus stops would be in the same locations as today. The transit agencies indicated that SR 520 Routes 272 and 556 would be discontinued in the No Build Alternative and therefore would no longer serve these stops. This would reduce boardings and alightings at the East Shelby Street and Montlake Boulevard southbound bus stops by less than 1 percent at each stop on a daily basis (these buses do not serve the Montlake Boulevard northbound stop).



Walk distances and times between bus stops

No Build Alternative

Bus stops	Distance (ft)	Time (mins)
A-C	920	4-5
A-D	400	2-3
B-C	300	1-2
B-D	360	2-3
A/B-ST	2200	9-12
E-ST	950	4-5
F-ST	1000	4-6

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 8-29. **No Build Alternative Transit and HOV Facilities within the Montlake Area**

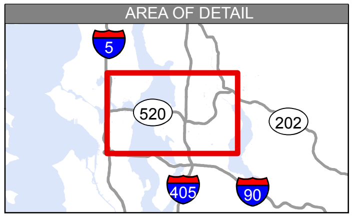
SR 520, I-5 to Medina: Bridge Replacement and HOV Project

What transit facilities and services were assumed in the Preferred Alternative?

Transit Facilities

The Preferred Alternative would result in the following changes to transit and HOV facilities in the SR 520 corridor and Montlake interchange area (Exhibit 8-30):

- Completion of inside HOV lanes in both directions across the Evergreen Point Bridge to I-5
- Addition of an HOV (transit and carpools) direct connection to I-5 express lanes that would operate westbound to southbound in the morning and northbound to eastbound in the afternoon
- Removal of the Montlake Freeway Transit Station
- Addition of a transit and HOV direct access ramp connection between 24th Avenue East and SR 520 to and from the east
- Addition of eastbound and westbound transit stops on the Montlake lid
- Addition of new traffic signal controller equipment compatible with transit signal priority at five intersections:
    1. Direct access ramp/24th Avenue East
    2. Direct access ramp/Montlake Boulevard NE
    3. East Shelby Street/Montlake Boulevard NE (southbound)
    4. East Hamlin Street/Montlake Boulevard NE (northbound)
    5. NE Pacific Street/Montlake Boulevard NE (eastbound)
- Addition of an inside HOV lane on Montlake Boulevard northbound from SR 520 across the Montlake Bridge
- Addition of an outside HOV lane on Montlake Boulevard southbound from NE Pacific Street to across the Montlake Bridge



🚌 Transit Stop

P Park & Ride and Transit Center

◆ HOV Direct Access Ramp

▬ I-5 to Medina: Bridge Replacement and HOV Project

▬ Medina to SR 202: Eastside Transit and HOV Project

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 8-30. **HOV and Transit Improvements Along SR 520 with the Preferred Alternative**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

Based on ongoing discussions with Montlake area residents and the 2008 mediation process, it was decided that the Montlake Freeway Transit Station would not be rebuilt in order to narrow the footprint of SR 520 through the Montlake neighborhood. The effects of this change are discussed in detail in the section: *How would removing the Montlake Freeway Transit Station change transit connections?*

Transit Service Frequencies

Bus routes and frequencies provided by Metro and Sound Transit for the Preferred Alternative were the same as for the No Build Alternative (refer to Exhibit 8-25).

Transit Service Hours

The transit service network and service hours provided by Metro and Sound Transit for the Preferred Alternative were the same as for the No Build Alternative.

How would the Preferred Alternative affect transit demand?

Transit demand for the Preferred Alternative was compared with the No Build Alternative to determine the effects of removing the Montlake Freeway Transit Station, completing the HOV lanes, improving corridor and interchange design, and implementing tolls. Transit person trip demand for the year 2030 No Build Alternative and Preferred Alternative is shown in Exhibit 8-31.

The Preferred Alternative would increase transit person-trip demand over the No Build Alternative by approximately 3,300 people per day, or 33 percent, from 9,900 with the No Build Alternative to 13,200 with the Preferred Alternative. Transit person demand would increase by 41 percent during the morning and evening peak periods.

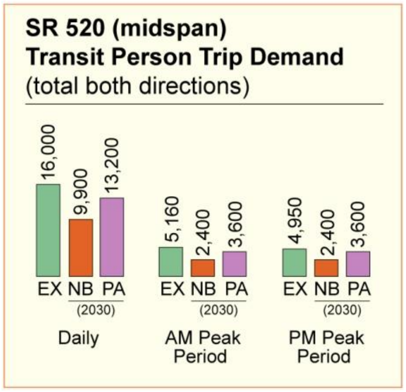


Exhibit 8-31. **SR 520 Transit Person Trip Demand with the Preferred Alternative**

This increase in transit demand reflects the benefit of completing the HOV lanes in both directions across the bridge, the effect of tolls on mode choice, the addition of a reversible connection to the I-5 express lanes, and HOV improvements in the Montlake interchange area.

Would there be enough bus service to meet Preferred Alternative demand?

Using the destination percentages shown earlier in Exhibits 8-6 and 8-7, an estimate was prepared to determine seat capacity versus ridership demand for SR 520 Eastside to downtown Seattle buses and Eastside to University District buses. SR 520 travel demand model forecasts show a slight reduction in ridership to the University District compared to today via SR 520 buses because some riders would choose to use East Link. Therefore, the percentages shown in Exhibits 8-6 and 8-7 provide a conservative estimate for the Eastside to University District buses.

Exhibit 8-32 illustrates the seat capacity and ridership demand to and from downtown Seattle and the University District. The purpose of Exhibit 8-32 is to help determine the effects of removing the Montlake Freeway Transit Station, which will increase ridership on the SR 520 Eastside to University District routes. It does not represent capacity on specific routes. The assumption is that most riders would be able to take any University District bus and, therefore, combined capacity and ridership demand could be considered.

Exhibit 8-32 shows that Eastside to downtown Seattle and Eastside to University District buses would be able to accommodate the transit demand associated with the Preferred Alternative. These estimates indicate that there is sufficient capacity for ridership demand to nearly triple. During the busiest times of the morning and evening commutes, some routes could be close to capacity (i.e., standing room only). As the environmental process proceeds, the SR 520 Bridge Replacement and HOV Program will continue to coordinate with the transit providers in order to understand the effects of the Preferred Alternative on transit service along the SR 520 corridor.

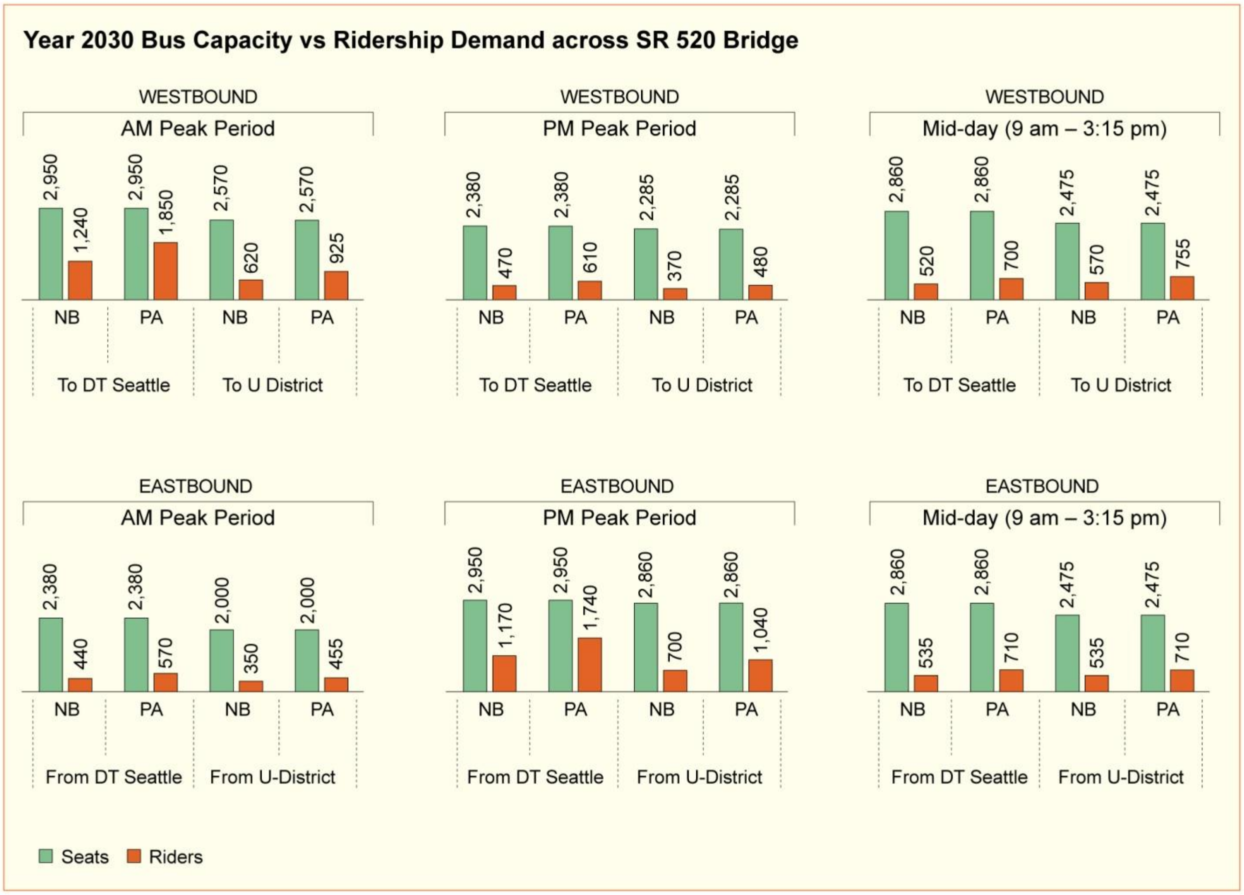


Exhibit 8-32. **SR 520 Year 2030 Transit Seats vs. Riders**

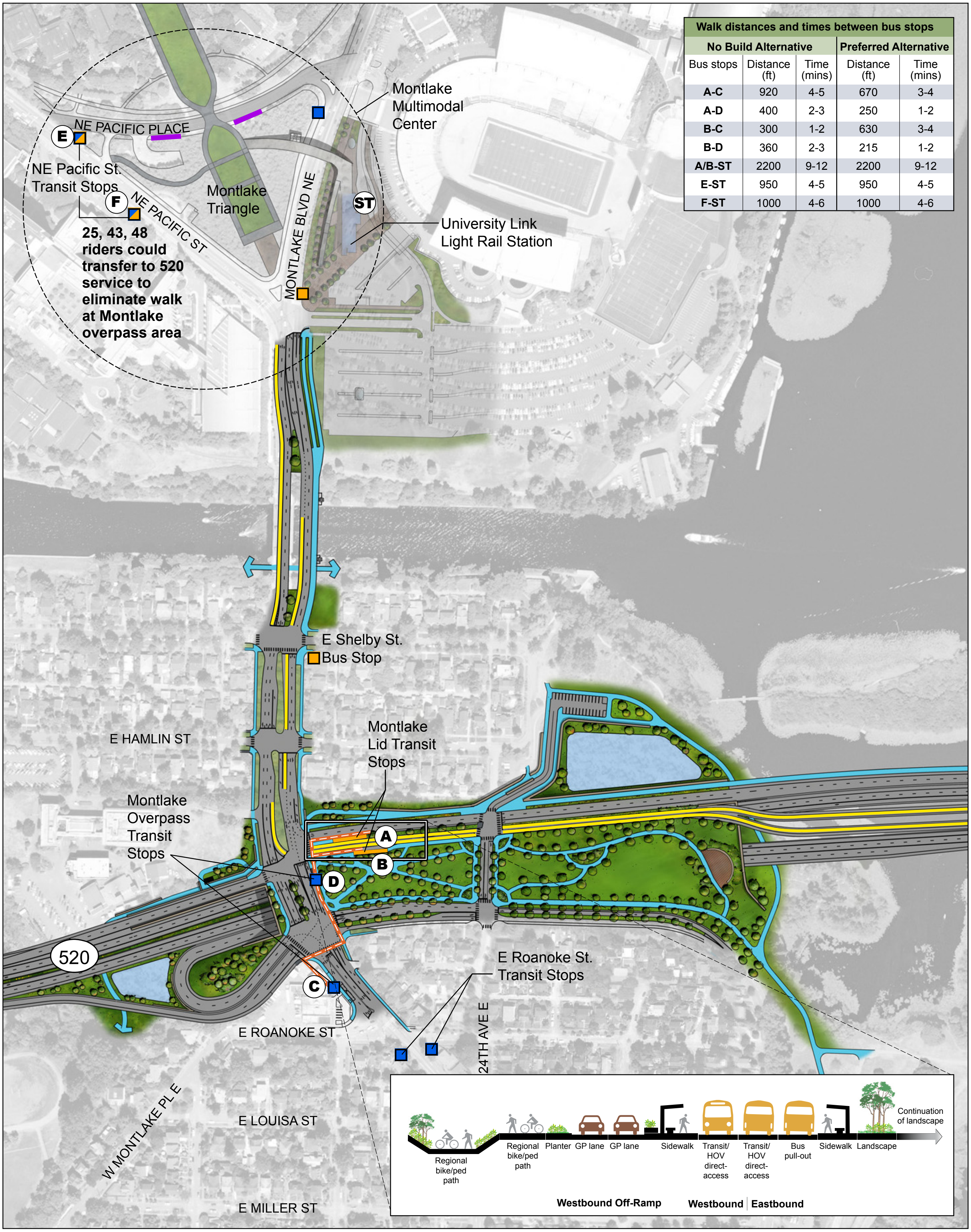
How would the Preferred Alternative affect transit connections?

Because of the reconstruction of the Montlake interchange area, a number of bus stops would be relocated compared to the No Build Alternative (Exhibit 8-33) as described below.

- The Montlake Freeway Transit Station stops would be removed and westbound and eastbound bus stops would be provided on the new Montlake lid. SR 520 buses traveling between the University District and the Eastside would serve this stop during the peak hours. During the midday, evening, and weekend hours, both University District and downtown Seattle SR 520 buses would serve these stops. This would provide the same level of service to the Montlake area as in the No Build Alternative (which includes the Montlake Freeway Transit Station).

- The Montlake Boulevard southbound bus stop at the SR 520 eastbound on-ramp would be relocated 270 feet to the south to near East Roanoke Street. The stop, as currently configured, would be closed because the City of Seattle requested that the project design refinements include elimination of all free right-turn lanes (slip ramps) from the interchange. The existing bus stop is located on a traffic island created by the free right-turn condition from southbound Montlake Boulevard onto the eastbound on-ramp to SR 520. This decision was an outcome of the ESSB 6392 Workgroup design refinement process.
- The Montlake Boulevard northbound bus stop at the SR 520 westbound off-ramp would be relocated 100 feet to the south on the Montlake Boulevard undercrossing. The new bus stop would be designed as a pull-out bus stop to allow buses to stop without affecting local traffic operations.
- The HOV lane on the SR 520 eastbound on-ramp would not be replaced but the function would be replaced with the bus and HOV direct access ramp to and from the east on the Montlake lid.

The effect of these changes on walk distances between transit stops is shown in Exhibit 8-33.



Walk distances and times between bus stops

	No Build Alternative		Preferred Alternative	
Bus stops	Distance (ft)	Time (mins)	Distance (ft)	Time (mins)
A-C	920	4-5	670	3-4
A-D	400	2-3	250	1-2
B-C	300	1-2	630	3-4
B-D	360	2-3	215	1-2
A/B-ST	2200	9-12	2200	9-12
E-ST	950	4-5	950	4-5
F-ST	1000	4-6	1000	4-6

🟦 Bus Stop (Local Route)

🟧 Bus Stop (SR 520 Route)

◩ Bus Stop (Local and SR 520 Route)

▬ Layover Area

▬ HOV Lanes

N

Exhibit 8-33. **Preferred Alternative Transit and HOV Facilities within the Montlake Area**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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How would removing the Montlake Freeway Transit Station change access to the Montlake/University District area?

With the removal of the Montlake Freeway Transit Station, bus riders would no longer be able to use the six downtown Seattle bus routes to travel between the Montlake interchange area and the Eastside during the morning and evening peak periods. This would decrease bus service from the Eastside by approximately 220 bus trips for both peak periods and both directions compared to the No Build Alternative. These SR 520 bus riders would need to use Eastside to University District/North Seattle bus routes (Metro Routes 167, 243, 271, and 277 and Sound Transit Routes 540 and 542). Combined, these routes would provide approximately 200 bus trips during the morning and evening peak periods.

The Montlake Freeway Transit Station westbound and eastbound bus stops would be closed and new westbound and eastbound bus stops would be provided on the new Montlake lid (Exhibit 8-33). This configuration would allow the transit agencies to maintain SR 520 bus service to the Montlake interchange area. SR 520 transit travel patterns would not be substantially affected by this change. Downtown Seattle to Eastside bus routes would have one less stop on their route during the morning and evening peak periods and the University District/North Seattle to Eastside bus routes would continue to exit at the Montlake interchange as they would in the No Build Alternative. They would then stop at the new Montlake lid bus stops. Because downtown Seattle to Eastside bus routes would not serve the Montlake lid bus stops during the AM and PM peak periods, riders would lose access to approximately 320 to 340 bus trips. As a result, transit riders using these stops would have to find alternative stops and/or routes.

As a way to maintain bus access to the Montlake interchange area during the off-peak periods, transit agencies would have the option of routing SR 520 buses through the Montlake interchange. Westbound buses would be able to exit via the new HOV direct access ramps, serve the stop on the Montlake lid, and then continue on westbound SR 520 to downtown Seattle or other destinations via I-5. Eastbound buses would be able to exit SR 520 at the Montlake off-ramp, turn left onto Montlake Boulevard, and then turn right onto the direct access ramps to pick up or drop off passengers. As result, riders would have access to both downtown Seattle to Eastside and University District to Eastside bus routes during midday, evenings, and weekends. The differences in bus trips serving the Montlake interchange area as a result of removing the Montlake Freeway Transit Station are shown in Exhibit 8-34.

Riders who currently transfer between routes at the Montlake Freeway Transit Station could transfer at the Evergreen Point Road or 92nd Avenue NE freeway station.

Exhibit 8-34. **Changes in SR 520 Bus Service to the Montlake Interchange Area with the Preferred Alternative**

Transit Element	Existing	No Build Alternative	Preferred Alternative
Number of SR 520 bus trips serving Montlake interchange *(6 a.m. to 6:15 p.m.)*	575 bus trips • 320 Eastside-downtown Seattle bus trips • 255 Eastside-University District bus trips[c]	660 bus trips[a] • 350 Eastside-downtown Seattle bus trips • 310 Eastside-University District bus trips **increases due to improved headways*	435 bus trips[b] • 120 Eastside-downtown Seattle bus trips (9 a.m. to 3:15 p.m. only) • 310 Eastside-University District bus trips (6 a.m. to 6:15 p.m.)
Bus frequency across Evergreen Point Bridge *(Evergreen Point to Montlake interchange)*	• AM/PM peak: every 1 to 3 minutes • Midday: every 4 to 5 minutes	• AM/PM peak: every 1 to 2 minutes • Midday: every 2 to 34 minutes	• AM/PM peak: every 2 to 3 minutes • Midday: same as No Build

[a] The No Build and Preferred Alternative bus trips were calculated using 2030 headways provided by Metro and Sound Transit, which were assumed to be the same for both alternatives.

[b] The change in bus trips is due to downtown Seattle-Eastside bus trips not serving Montlake lid bus stops during the peak periods.

[c] Includes Sound Transit Route 542

Westbound Montlake Freeway Transit Station Users

Boardings

During the morning and evening peak periods, riders accustomed to using the westbound Montlake Freeway Transit Station to board downtown Seattle buses would have to find alternative routes, such as light rail at the UW Station or local bus service. During midday, evenings, and weekends, westbound riders would be able to board downtown Seattle buses at the new Montlake lid stops.

Today, there are approximately 100 riders per day who use this stop. It is anticipated that this number would decrease with the implementation of University Link and East Link. Light rail service is expected to run every 5 to 15 minutes (Sound Transit 2006). Connecting to light rail service at the UW Station would either lengthen or shorten a rider’s trip by a half mile, depending on whether the rider is traveling from the north or south.

Alightings

During the morning and evening peak periods, the riders who currently use this stop to alight from downtown Seattle buses would also have to find alternative routes, such as one of the seven University District routes or East Link light rail. During midday, evenings, and weekends, riders would be able to alight from downtown Seattle buses at the new Montlake lid stops, should transit agencies choose to route buses through the Montlake interchange.

Today, there are approximately 600 riders per day who use this stop. It is anticipated that this number would decrease with the implementation of Sound Transit Route 542 and East Link. As shown in Exhibits 8-9 and 8-10, Sound Transit Route 545 accounts for 65 percent of these riders.

During the peak periods, riders could transfer at the Evergreen Point Freeway Transit Station to University District bus routes or change their trip to take East Link. For riders transferring at the Evergreen Point station, the average wait for a University District bus would be 3 to 4 minutes between 6:00 a.m. and 6: 15 p.m. in the year 2030 (Exhibit 8-35).

The first stop for westbound riders would be on the new Montlake lid just east of Montlake Boulevard as shown on Exhibit 8-33. From this stop, it would be a walk of approximately 200 feet to the new northbound local bus stop and approximately 500 feet to the new southbound local bus stop on Montlake Boulevard NE (refer to Exhibit 8-33).

Eastbound Montlake Freeway Transit Station Users

Boardings

During the morning and evening peak periods under the No Build Alternative, the riders using this stop to board downtown Seattle buses would need to change their trip with the Preferred Alternative. Riders would instead need to board a University District bus direct to their destination (if available) or would need to take a University District bus to the Evergreen Point Freeway Transit Station to transfer to a bus to their final destination. Riders could board SR 520 University District buses at the eastbound bus stop on the new Montlake lid, which would arrive every 3 to 4 minutes throughout the day (6:00 a.m. to 6:15 p.m.). Some riders may use alternative routes to the Eastside, such as light rail from the UW Station.

Today, there are approximately 800 riders per day who board SR 520 buses at the eastbound transit station. Sound Transit Route 545 accounts for 65 percent of these riders who could use Sound Transit Route 542 (during the peak periods) or East Link. It is anticipated that this number would decrease with the No Build Alternative due to the addition of Sound Transit Route 542, discontinuation of Metro peak period routes, and the implementation of East Link.

Alightings

The riders who currently use this stop to alight from downtown Seattle buses would also have to find alternative routes during the morning and evening peak periods, such as light rail from downtown Seattle to the UW Station. From there, riders could transfer to local bus service at the UW Medical Center bus stops on NE Pacific Street, and walk or bike to their final destinations. During midday, evenings, and weekends, riders could use downtown Seattle buses, which are assumed to serve the Montlake interchange. Today, there are approximately 140 riders per day who use this stop. It is anticipated that this number would decrease with the implementation of East Link.

In the No Build Alternative, riders arriving at the Evergreen Point Freeway Transit Station would have to wait for 1 to 2 minutes during the peak periods and 3 to 4 minutes during the midday periods to board either a downtown Seattle or University District/North Seattle bus to the Montlake Freeway Transit Station. In the Preferred Alternative, wait time at the Evergreen Point Freeway Transit Station would increase to 3 to 4 minutes during the peak periods and would be the same as the No Build Alternative during midday.

The combined bus frequencies shown in Exhibit 8-35 were calculated by combining year 2030 headways for Eastside-downtown Seattle and Eastside-University District SR 520 routes. These frequencies represent the average time between buses destined to each of these two areas and, therefore, the average wait time riders would experience at the Evergreen Point or 92nd Avenue NE freeway stations.

These wait times are based on the assumption that most riders whose trip origin or destination is the Montlake/University District would be able to take any University District bus to and from the Eastside. Once on the Eastside, some riders, such as those traveling to areas other than Bellevue, Kirkland, and Redmond on routes from downtown Seattle, may have to transfer to their specific route at the Evergreen Point Freeway Transit Station. Some riders could wait up to 45 minutes if they do not consult transit schedules.

Exhibit 8-35. **Combined Bus Headways across the Evergreen Point Bridge for the Preferred Alternative (between Evergreen Point and Montlake Freeway Transit Stations)**

	AM Peak Period (6 to 9 a.m.)				PM Peak Period (3:15 to 6:15 p.m.)				Midday[a] (9 a.m. to 3:15 p.m.)			
	Bus Trips		Ave. Headway (minutes)		Bus Trips		Ave. Headway (minutes)		Bus Trips		Ave. Headway (minutes)	
	NB	**PA**	**NB**	**PA**	**NB**	**PA**	**NB**	**PA**	**NB**	**PA**	**NB**	**PA**
Westbound at the Evergreen Point Freeway Transit Station												
Downtown Seattle-Eastside	62	NA	2.9	NA	50	NA	3.6	NA	62	62[a]	6.0	6.0
University District/North Seattle-Eastside[b]	54	54	3.3	3.3	48	48	3.8	3.8	51	51	7.4	7.4
Buses Combined	116	54	1.6	3.3	98	48	1.8	3.8	113	113	3.3	3.3
Light rail (East Link)[c]	24	24	7.5	7.5	24	24	7.5	7.5	36	36	10.4	10.4
Total with light rail	140	78	1.3	2.3	122	72	1.5	2.5	149	149	2.5	2.5
Eastbound in the Montlake Interchange Area												
Downtown Seattle-Eastside	50	NA	3.6	NA	62	NA	2.9	NA	62	62[a]	6.0	6.0
University District/North Seattle-Eastside	48	48	3.8	3.8	54	54	3.3	3.3	56	56	6.7	6.7
Buses Combined	98	48	1.8	3.8	116	54	1.6	3.3	118	118	3.3	3.3
Light rail (East Link)[c]	24	24	7.5	7.5	24	24	7.5	7.5	38	38	10.0	10.0
Total with light rail	122	72	1.5	2.5	140	78	1.3	2.3	150	150	2.5	2.5

NB = northbound, PA = Preferred Alternative

NA indicates that these buses will no longer provide access to the Montlake interchange area/University District due to the removal of the Montlake Freeway Transit Station with the Preferred Alternative; they will continue to stop at the Evergreen Point Freeway Transit Station (westbound and eastbound).

[a] During the midday period, transit agencies would have the option to route downtown Seattle-Eastside buses through the Montlake interchange area to serve the new Montlake lid stops constructed as a part of the Preferred Alternative. In that case, bus trips and headways would be the same as the No Build Alternative.

[b] The first/last stop for University District/North Seattle buses would be at the new bus stops on the new Montlake lid.

[c] While East Link will use I-90 to cross the lake, it will provide service from the Eastside (downtown Redmond, Overlake, downtown Bellevue, South Bellevue, and Mercer Island) to downtown Seattle and the University District (continuing to Northgate and Lynnwood). This service would likely shift transit patterns for some SR 520 bus users.

How would the project affect bus travel times and reliability in the SR 520 corridor?

The SR 520, I-5 to Medina project would complete the SR 520 HOV system and corridor upgrade, which would improve traffic operations for all users in the corridor, especially for buses and HOV lane users. The project would provide the necessary infrastructure to:

- Meet more of the regional cross-lake travel demand
- Improve travel time and reliability for buses and HOV lane users on SR 520 and Montlake Boulevard NE
- Improve cross-lake connectivity between major Seattle and Eastside activity centers and existing and proposed transit networks
- Expand the transit network to include the ultimate development of an SR 520 HCT transit system, which may include exclusive, dedicated transit facilities in the corridor

Freeway Travel Times

These infrastructure improvements would improve freeway and local bus travel times compared to the No Build Alternative. HOV travel times on SR 520 without and with the project are shown in Exhibits 8-36 and 8-37. These exhibits show that the project would keep HOV lane speeds consistently operating at or near free-flow conditions, even during the peak hour of the peak period. As result, HOV travel times would reliably be an average of 14 to 16 minutes between I-5 and SR 202, helping buses to stay on schedule.

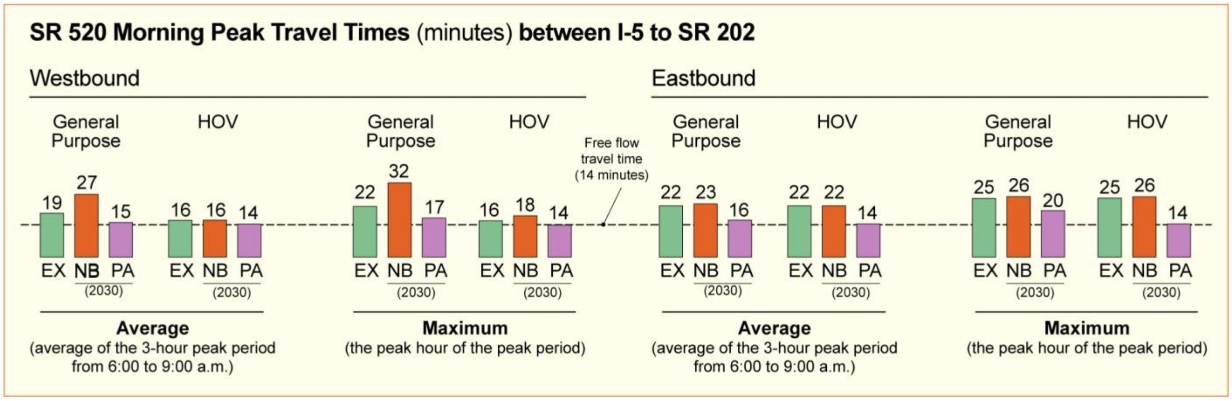


Exhibit 8-36. **SR 520 Morning Peak Travel Times between I-5 and SR 202**

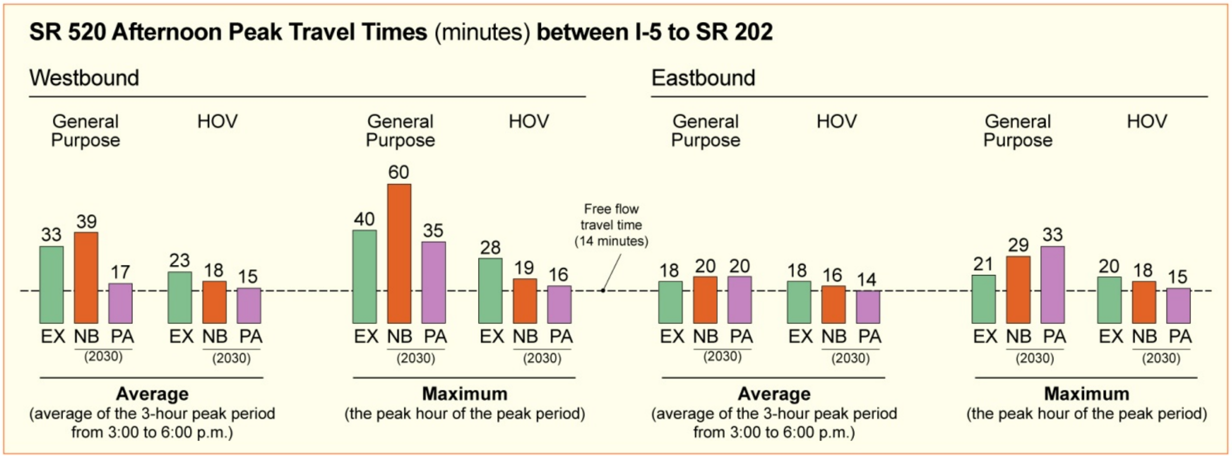


Exhibit 8-37. SR 520 Afternoon Peak Travel Times between I-5 and SR 202

For an explanation of the changes in freeway HOV travel times between the No Build Alternative and Preferred Alternative, please see Chapter 5—Freeway Volumes and Operations.

Local Arterial Travel Times

Under the No Build Alternative and Preferred Alternative, travel times were estimated for buses using Montlake Boulevard NE and NE Pacific Streets to determine how adding a new bascule bridge over the Montlake Cut and implementing Montlake HOV improvements would affect local buses. These travel times are shown in Exhibit 8-38.

Exhibit 8-38. Travel Times for Buses Traveling on Montlake Boulevard NE and NE Pacific Street through the Montlake Interchange Area

Direction of Travel	Peak[a] (minutes)			Off Peak[b] (minutes)			Bridge Opening "worst case"[c] (minutes)		
	EX	NB	PA	EX	NB	PA	EX	NB	PA
Southbound	12	16	11	13	24	15	21	32	20
Northbound	7	19	14	8	19	12	11	28	20

[a] Peak represents average travel time during the AM or PM peak period
[b] Off peak represents average travel time for any vehicle in the system between 3 and 4 p.m.
[c] Bridge opening “worst case” represents those vehicles near or at the back of the queue.

As shown in Exhibit 8-38, the Preferred Alternative would improve travel times for local buses by approximately 5 minutes during the peak period, 7 to 9 minutes during the off-peak period, and 8 to 12 minutes during the worst-case bridge openings. With the project, buses would be able to reliably bypass congestion related to Montlake Bridge openings due to the project’s addition of a new Montlake bridge, HOV lanes on Montlake Boulevard NE from SR 520 to across the Montlake Bridge, and an HOV direct access ramp at the Montlake interchange.

These differences in travel times between the No Build Alternative and Preferred Alternative reflect the local street capacity and level of service improvements associated with the Preferred Alternative that are described in Chapter 6. They also reflect improvements that would be made to the SR 520 corridor, because much of the congestion on local streets today and in the 2030 No Build Alternative is caused by congestion from SR 520 that spills onto the Montlake corridor. Transit travel times were estimated based on the VISSIM micro-simulation models used for the No Build and Preferred Alternatives. The models used a typical weekday evening peak hour and an off-peak hour with a Montlake Bridge opening. Please see Chapter 4—Transportation Forecasts and Operations Analysis Methodology—for a more detailed discussion of the modeling methodologies used for the project's transportation analysis.

Bus Travel Times

Freeway and local arterial travel times are just two components of overall bus travel times. For SR 520 bus passengers, bus travel times can include the following components:

- Bicycle or walk time to the Montlake Freeway Transit Station or other Montlake interchange area stop
- Wait time at the bus stop
- Transfer wait time(s), if any
- In-vehicle time on the freeway and/or local street
- Drive, bicycle, or walk time to a destination

Because the Preferred Alternative would remove the Montlake Freeway Transit Station, some passengers would have a change in mode for a portion of their transit trip that occurs within the Montlake interchange area. In other words, some people who would walk to the Montlake Freeway Transit Station in the No Build Alternative would instead use bus service for the entire trip in the Preferred Alternative.

For example, westbound bus passengers taking Route 545 to the Montlake Freeway Transit Station in the No Build Alternative would need to use University District service, such as Route 542, in the

Preferred Alternative (during the morning and evening peak periods). As a result, a rider's walk time between the Montlake station and the UW would be replaced with in-vehicle time on the local street.

Transit trip times on SR 520 buses could change in many ways as a result of the Preferred Alternative. Exhibits 8-39 and 8-40 illustrate some of these changes for Sound Transit Route 545 and Metro Route 255. These routes account for the majority of boardings and alightings at the Montlake Freeway Transit Station.

Transit Travel Time Changes between the University District and Overlake

Sound Transit Route 545, which provides transit service between Redmond and the University District, accounts for most of the boardings and alighting at the Montlake Freeway Transit Station. There are currently 480 riders using this route that would be affected by the removal of the Montlake Freeway Transit Station during the morning and evening commute periods (total number of boardings and alightings for both westbound and eastbound stops for AM and PM peak periods). With the Preferred Alternative, westbound riders (160 alightings) would need to transfer to a University District bus at the Evergreen Point Freeway Transit Station. Eastbound riders (260 boardings) would need to take a University District bus to the Evergreen Point Freeway Transit Station to transfer to Route 545. Some riders could also switch to Sound Transit Route 542, which provides direct service between Redmond and the University District during the peak periods. The effects of these transfers on transit trip times are shown in Exhibits 8-39 and 8-40.

In Exhibits 8-39 and 8-40, the travel components for an Overlake-to-University District bus trip on Sound Transit Route 545 with the No Build Alternative were represented by the following factors:

- SR 520 freeway travel time between NE 40th Street/NE 51st Street interchange and the Montlake Freeway Transit Station. Travel times were calculated between these two points because the project does not directly affect a rider's travel time outside of these points.
- Walk time to the UW (distance measured to the westbound UW Medical Center bus stop on NE Pacific Street to allow a comparison between bus and light rail trips).

- In-vehicle travel time on Montlake Boulevard NE between SR 520 and the UW Medical Center stops on NE Pacific Street adjacent to the Montlake Triangle.

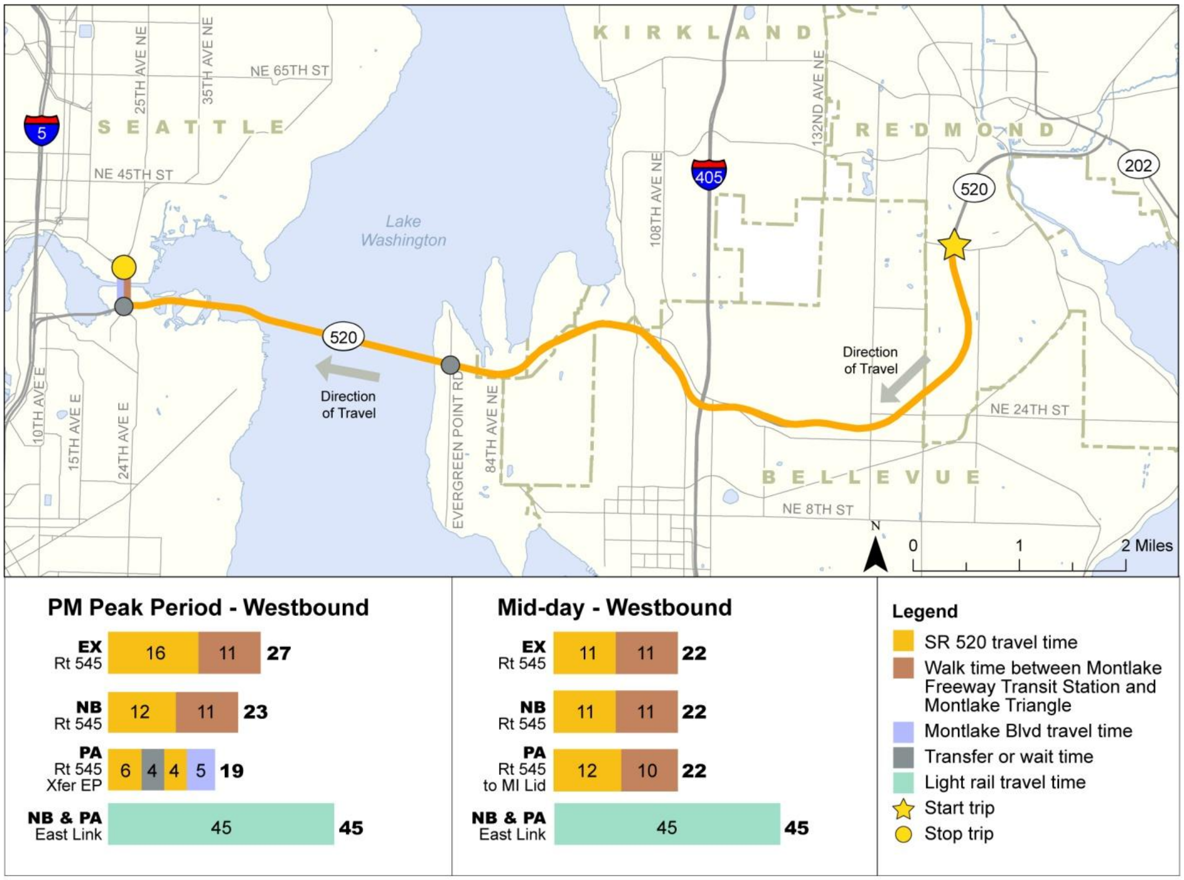


Exhibit 8-39. **Changes in Transit Trip Times with the No Build and Preferred Alternatives—NE 40th/51st Street Interchange to University District**

As shown in Exhibit 8-39, bus trip times would be the same or better with the Preferred Alternative during the evening peak period and midday. The East Link trip time represents travel through Bellevue, across I-90, and through downtown Seattle before arriving at the Montlake Triangle (University Link light rail station).

With the Preferred Alternative, riders using Route 545 (or other downtown Seattle routes) during the peak periods would have to transfer to University District service at the Evergreen Point Freeway Transit Station. Even so, their travel time would also likely improve over (or be similar to) the No Build Alternative from 23 to 19 minutes. This benefit would occur due to improvements in freeway travel times and because their walk time between the Montlake interchange and the Montlake Triangle would be replaced with in-vehicle time.

During the evening peak period, University District routes would arrive every 3 to 4 minutes at the Evergreen Point Freeway Transit Station, resulting in short wait times between buses. All Eastside to University District routes would serve the UW Medical Center stop on NE Pacific Street, making it possible for most riders to board any University District route. Some westbound riders might be able to switch to Route 542 for their entire trip, eliminating the transfer at the Evergreen Point Freeway Transit Station.

During midday, Eastside to downtown Seattle buses would be able to exit at the Montlake interchange and serve the Montlake lid stops, resulting in similar travel times with the No Build Alternative.

As shown in Exhibit 8-40, bus trip times are the same or better with the Preferred Alternative for eastbound trips during the evening peak and midday periods. The East Link travel time represents travel through downtown Seattle, across I-90, and through Bellevue before arriving at Overlake.

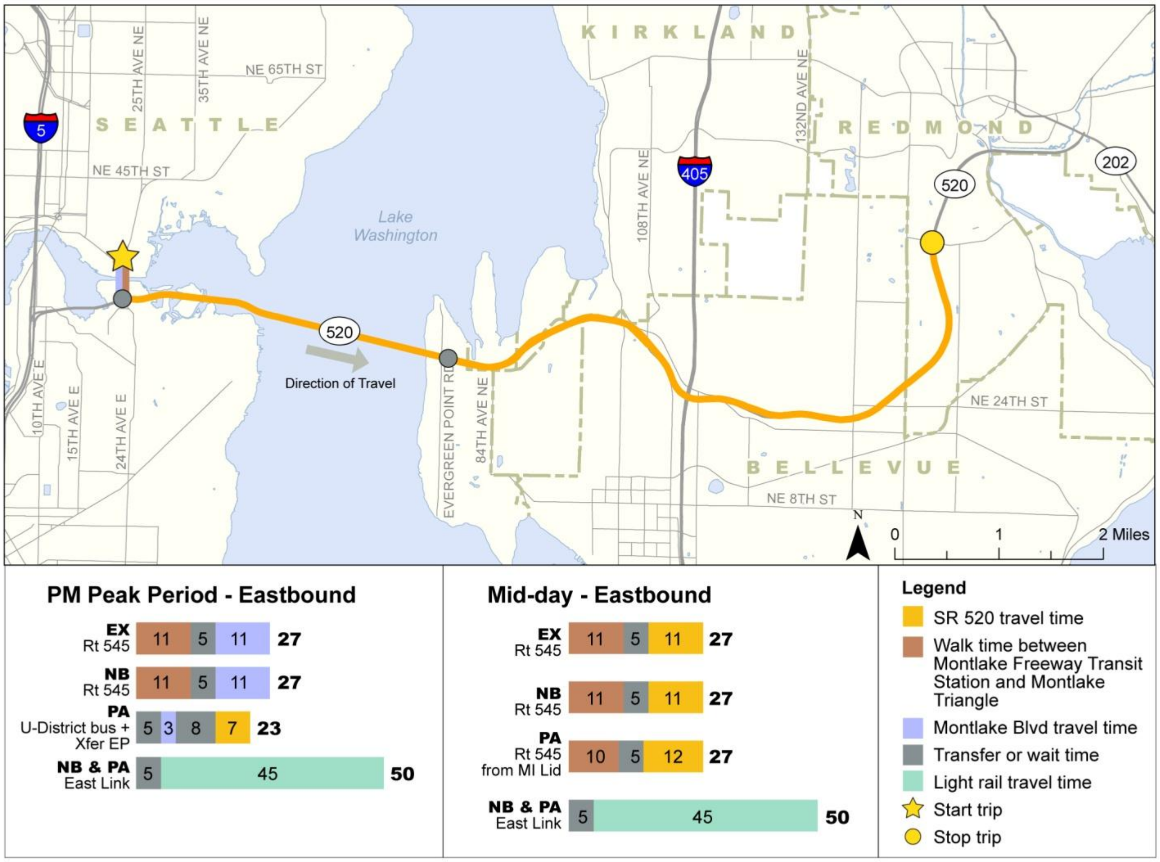


Exhibit 8-40. **Changes in Transit Trip Times with the No Build and Preferred Alternatives—University District to NE 40th/51st Street Interchange**

During the evening peak period, eastbound riders who ultimately need a downtown Seattle route to reach their final destination could board any University District-Eastside bus at the Montlake lid stop (or at the UW Medical Center stop) and transfer at the Evergreen Point Freeway Transit Station. University District-Eastside buses would arrive every 3 to 4 minutes. If transferring to Route 545, the average transfer time at the Evergreen Point Freeway Transit Station would be 8 minutes. Transfer times for other downtown Seattle-Eastside routes would range between 10 and 45 minutes. These transfer times are based on year 2030 headway information for these routes provided by Metro and Sound Transit. Some eastbound riders may also choose to take East Link.

During midday, downtown Seattle-Eastside buses would be able to exit at the Montlake interchange and serve the Montlake lid stops, resulting in similar travel times with the No Build Alternative. Metro Route 255, which provides transit service between Kirkland and the University District, is the route that accounts for the next greatest number of boardings and alighting at the Montlake Freeway Transit Station (second to Sound Transit Route 545). There are currently 90 riders using this route that would be affected by the removal of the Montlake Freeway Transit Station during the morning and evening commute periods (total number of boardings and alightings for both westbound and eastbound stops for AM and PM peak periods). With the Preferred Alternative, westbound riders (30) would need to transfer to a University District bus at the Evergreen Point Freeway Transit Station. Eastbound riders (60) would need to take a University District bus to the Evergreen Point Freeway Transit Station to transfer to Route 255. Some riders could also switch to Sound Transit Route 540, which provides direct service between Kirkland and the University District. The effect of this transfer on transit trip times is shown in Exhibits 8-41 and 8-42.

During midday, transit riders would be able to use Metro Route 255 as they would in the No Build Alternative because downtown Seattle buses would serve the Montlake lid stops during this time period (9:00 a.m. to 3:15 p.m.).

In Exhibits 8-41 and 8-42, the travel components for a Kirkland-to-University District bus trip on Metro Route 255 with the No Build Alternative were represented by the following factors:

- SR 520 freeway travel time between 108th Avenue NE on-ramp and the Montlake Freeway Transit Station. Travel times were calculated between these two points because the project does not directly affect a rider's travel time outside of these points.

- Walk time to the UW (distance measured to the westbound UW Medical Center bus stop on NE Pacific Street).
- In-vehicle travel time on Montlake Boulevard NE between SR 520 and the UW Medical Center stops on NE Pacific Street adjacent to the Montlake Triangle.

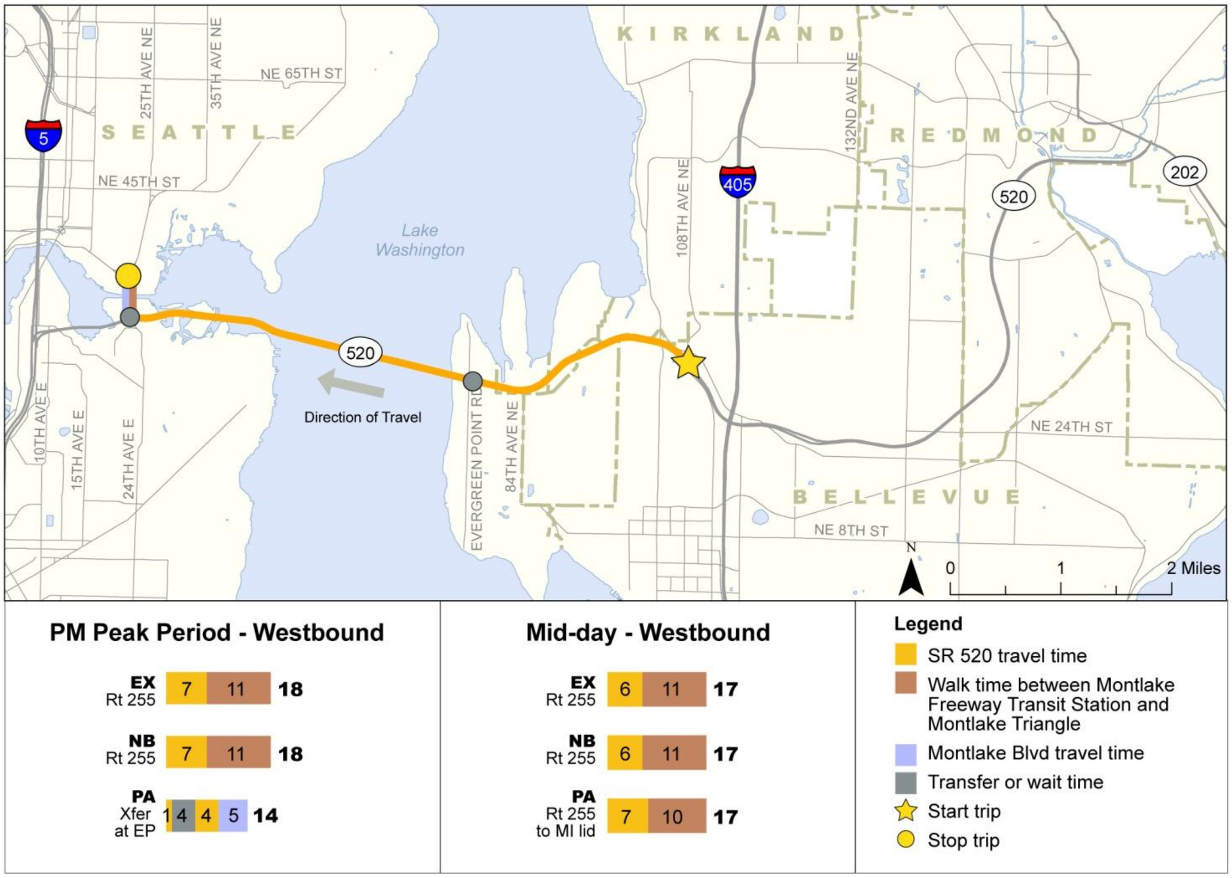


Exhibit 8-41. **Changes in Transit Trip Times with the No Build and Preferred Alternatives—108th Avenue NE Interchange to University District**

As shown in Exhibit 8-41, transit trip times are the same or better with the Preferred Alternative for westbound transit trips for midday and evening peak period. During the evening peak period, riders on Route 255 (or other downtown Seattle routes) would have to transfer to University District service at the Evergreen Point Freeway Transit Station. Even so, their travel time could improve over the No Build Alternative from 18 to 14 minutes (or stay the same) because buses would be arriving frequently and walk times between the Montlake Freeway Transit Station and the Montlake Triangle would be replaced with in-vehicle time. During the evening peak period, a University District route would arrive every 3 to 4 minutes, which is represented by the 4-minute wait time used in Exhibit 8-41.

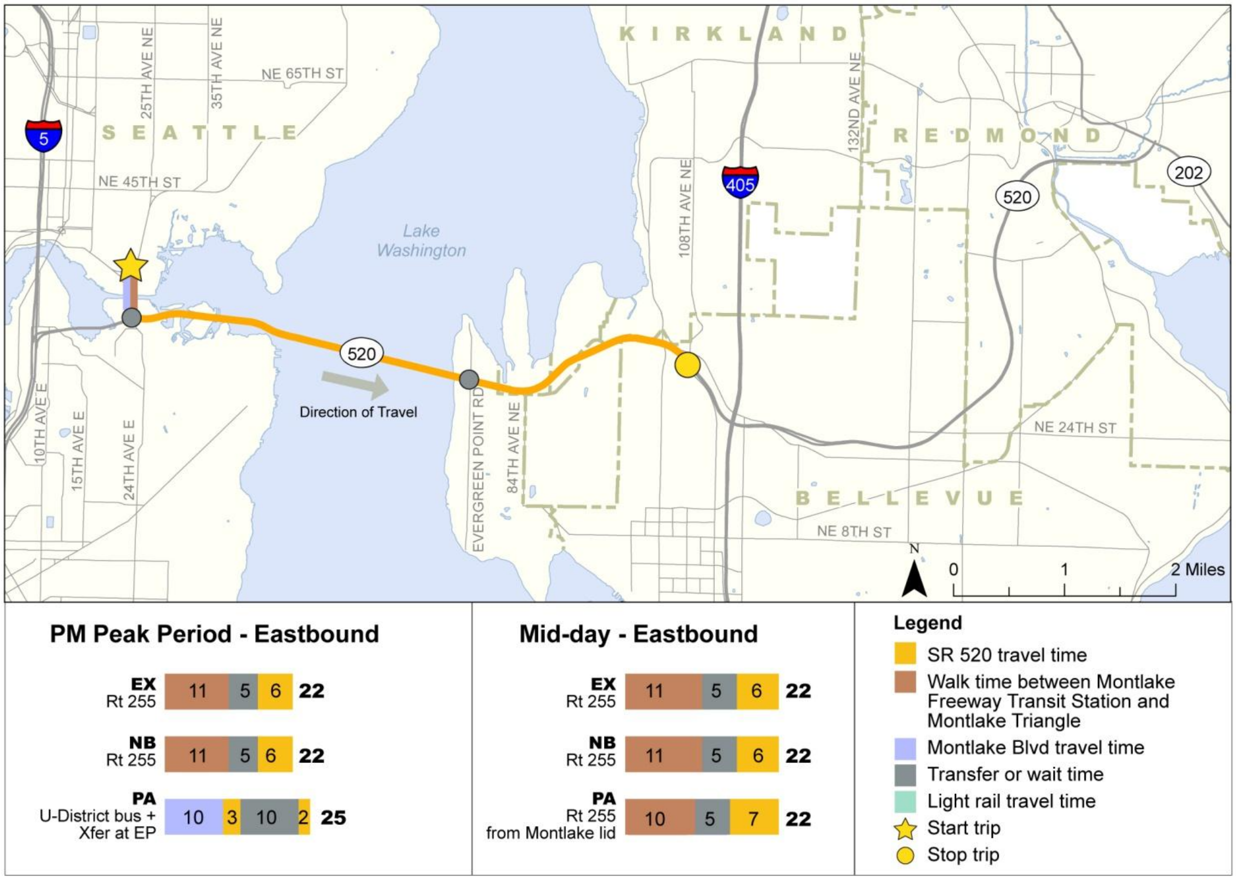


Exhibit 8-42. **Changes in Transit Trip Times with the No Build and Preferred Alternatives—University District to 108th Avenue NE Interchange**

As shown in Exhibit 8-42, transit trip times between the Montlake Triangle and the 108th Avenue NE interchange could be longer with the Preferred Alternative for riders who continue to use Route 255 during the peak period.

All Eastside to University District routes serve the UW Medical Center stop on NE Pacific Street, making it possible for most riders to board any University District route at this location and then transfer to Route 255 at the Evergreen Point Freeway Transit Station. An Eastside to University District route would arrive every 3 to 4 minutes. Based on year 2030 service information provided by Metro, Route 255 would have 10-minute headways during the evening peak period, which would be the maximum wait time at the Evergreen Point station. With the completion of the HOV lane across the Evergreen Point Bridge and the HOV direct connection to the I-5 express lanes, reliability would improve for buses, thereby improving the on-time performance.

Some riders might be able to replace this trip by switching to South Transit Route 540 for their entire trip, which provides direct service between the University District and Kirkland.

During midday, Route 255 buses would be able to exit at the Montlake interchange and serve the Montlake lid stops, resulting in similar travel times to the No Build Alternative.

How does the project affect nonmotorized access to transit?

Some bus riders who use the Montlake Freeway Transit Station are also bicycle riders. With the project, bicycle riders would have the option of riding across the Evergreen Point Bridge, which is likely to reduce their overall travel time. According to Metro’s 2002 ridership counts, bicycle riders are often delayed because of full bicycle racks, sometimes waiting up to 30 to 40 minutes for a bus with bicycle rack space. The project would make bicycle trips more reliable by providing a cross-lake bicycle path and eliminating the need to take a bus. For more discussion on project effects on pedestrian and bicycle travel not associated with transit, please see Chapter 7—Nonmotorized Facilities.

Chapter 9—Parking Supply

What is in this chapter?

This chapter describes the current parking supply, demand, and utilization, including how the Preferred Alternative would affect parking supply in the study area. The study area includes designated public and private parking lots adjacent to the SR 520, I-5 to Medina project. Exhibit 9-1 shows the location of these lots, including existing parking supply and potential parking effects of the Preferred Alternative.

This parking analysis updates the Transportation Discipline Report for the SR 520 Final EIS (WSDOT 2009d) based on the Preferred Alternative design. Affected parking facilities addressed in this analysis include:

- Bagley Viewpoint Lot
- NOAA Northwest Fisheries Science Center
- MOHAI

The following sections discuss these parking lots, potential changes to each lot, and effects of these changes on parking supply. Other parking facilities in the project vicinity that were previously evaluated are also described at the end of the chapter. Those facilities would not be affected by the Preferred Alternative.

How was parking supply information collected?

The Final EIS analysis considered existing parking supply, planning-level design, field observations, and discussions with the project designers to estimate the number of affected parking spaces and new parking for the Preferred Alternative. WSDOT collected supply and demand field data for each parking area that would be affected. Parking demand was determined based on a field survey that measured parking utilization several times at each location during 2 consecutive days in October 2010.

🟧 Parking Area

Source: King County (2008) GIS Data (Streams, Streets and Waterbodies) and CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 9-1. **Potentially Affected Parking Areas**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

The SDEIS parking results were based on data collected in 2004 and did not include field verification, although some supply and utilization rates were verified from other sources or estimated using aerial photography. For the Final EIS, the utilization rates and supply were verified during the October 2010 field survey and were comparable to the Draft EIS utilization rates.

How would the project affect parking in the corridor?

This section describes the existing condition of parking lots that would be affected and summarizes how the Preferred Alternative would affect the parking supply. Most of the affected parking is in the Montlake area, with the exception of the lot at Bagley Viewpoint near I-5. Exhibit 9-2 lists the existing parking supply, average number of spaces in use, estimated utilization rate, and the number of spaces expected to remain after the Preferred Alternative is constructed.

Exhibit 9-2. **Estimated Effects on Parking Supply in the Study Area**

Location	Existing/ No Build Parking Supply	Average Number of Spaces in Use	Utilization Rate	Preferred Alternative Parking Supply
Lot at Bagley Viewpoint	10	1	10%	0
NOAA Northwest Fisheries Science Center	132[a]	119	90%	94
MOHAI and East Montlake Park	150	59	39%	26

[a] Parking supply includes 38 spaces located on WSDOT right-of-way under the existing Portage Bay Bridge.

Lot at Bagley Viewpoint (Delmar Drive East and East Roanoke Street)

Existing and No Build Conditions

This lot, located at Bagley Viewpoint, is just east of the Delmar Drive overcrossing and north of SR 520. It currently has 10 parking stalls, but only one is used on average. Exhibit 9-3 shows the existing parking area, looking north.

Exhibit 9-3. **Bagley Viewpoint Parking Lot—Looking North**

Parking Effects

The Preferred Alternative would remove the existing lot in its entirety. However, the parking supply could be replaced on the 10th and Delmar lid. WSDOT is coordinating with the City of Seattle to further develop design details for the lid. Project plans include a park space and new parking on the proposed lid, but the number of spaces has not yet been identified. Utilization of the 10 parking spaces at the viewpoint is low, so their removal would not have a substantial effect on park access for the community.

NOAA Northwest Fisheries Science Center (2725 Montlake Boulevard East)

Existing and No Build Conditions

NOAA Fisheries has a parking lot containing approximately 132 marked spaces on the south side of its NOAA Northwest Fisheries Science Center building, located south of East Hamlin Street and west of Montlake Boulevard East. The majority of this lot is located within the NOAA property limits, but a portion of the lot is located on WSDOT right-of-way under the Portage Bay Bridge structure. The area within the NOAA property has 94 striped parking spaces (not including lawn parking on the northwest portion of the property). The area located within the WSDOT right-of-way has approximately 38 parking spaces under the bridge. Exhibit 9-4 shows current parking beneath the bridge structure, looking southeast.

Exhibit 9-4. **NOAA Fisheries Lot, Section Under Portage Bay Bridge—Looking Southeast**

Parking Effects

The Preferred Alternative would keep the north edge of the bridge in approximately the same location as it exists today. The current design for the Preferred Alternative will remove all 38 parking spaces located under the existing Portage Bay Bridge. Some parking adjacent to the construction zone would be temporarily lost during construction. Refer to Chapter 10 for details.

None of the parking on NOAA Fisheries property will be affected by the Preferred Alternative. The remaining parking supply at this location would be 94 spaces when the project is complete. The average demand is 119 parking spaces, so alternative parking would be needed for 25 vehicles.

Museum of History and Industry
(2700 24th Avenue East)

Existing and No Build Conditions

MOHAI's parking lot surrounds the museum on all but the south side. The museum is located in both McCurdy Park and East Montlake Park, just east of 24th Avenue East. The lot currently has 150 parking stalls, which are used for both the MOHAI facility and park visitors. Exhibit 9-5 shows the lower parking lot at MOHAI.

Exhibit 9-5. **MOHAI Lower Parking Lot**

Parking Effects of the Preferred Alternative

The Preferred Alternative would eliminate all 150 parking spaces in this lot due to construction of stormwater detention ponds on the site.

Because of the right-of-way needed to construct the stormwater facilities and roadway, MOHAI and its parking lot would need to be moved to a different location. MOHAI has identified a site for relocation and is in the planning stages of developing the site for its use.

Access from this area to East Montlake Park and the Arboretum would be maintained, and parking would be provided for park users. WSDOT has identified a location for a new parking lot with approximately 26 parking stalls just north of the planned stormwater facilities. However, the final number of replaced spaces depends on negotiations with the Seattle Parks and Recreation Department.

Previously Evaluated Parking Facilities

This section describes the existing and no build conditions for the following seven facilities that were previously evaluated in the SDEIS. Parking effects were previously identified for these facilities, but they will not be permanently affected by the Preferred Alternative.

- East Roanoke Street (on-street parking)
- Montlake 76 Gas Station
- Montlake Boulevard Market (parking on west side)
- Montlake Boulevard Market (parking on east side)
- 24th Avenue East (on-street parking)
- Husky Stadium
- WSDOT Public Lot on East Lake Washington Boulevard

East Roanoke Street On-Street Parking (East Roanoke Street and West Montlake Place East)

Existing and No Build Conditions

There are six parking spaces on the north side of East Roanoke Street as it meets West Montlake Place East. Between these six spaces is a fire hydrant, where no parking is allowed. Exhibit 9-6 shows the on-street parking.

Exhibit 9-6. **East Roanoke Street On-Street Parking—Looking West**

Montlake 76 Gas Station (2645 East Montlake Place)

Existing and No Build Conditions

The Montlake 76 gas station on 22nd Avenue East and East Lake Washington Boulevard currently has five parking spaces located on the north side of the Montlake Boulevard Market building.

Montlake Boulevard Market (West Side) (2605 22nd Avenue East)

Existing and No Build Conditions

The back parking lot on the west side of the Montlake Boulevard Market, previously known as the Hop-In Market, is situated southwest of East Lake Washington Boulevard, north of East Roanoke Street, and west of 22nd Avenue East. The lot currently has 17 parking stalls. Exhibit 9-7 shows the existing parking area, looking south.

Exhibit 9-7. **West Side of Montlake Boulevard Market—Looking South**

Montlake Boulevard Market (East Side) (2605 22nd Avenue East)

Existing and No Build Conditions

Parking is available in the front lot on the east side of the Montlake Boulevard Market, located southwest of East Lake Washington Boulevard, north of East Roanoke Street, and on both sides of 22nd Avenue East. There are currently 10 parking spaces at this location. Exhibit 9-8 shows the existing parking area, looking west.

Exhibit 9-8. **East Side of Montlake Boulevard Market—Looking West**

24th Avenue East On-Street Parking (East Hamlin Street and 24th Avenue East)

Existing and No Build Conditions

There are five on-street parking spaces located just west of MOHAI on the west side of 24th Avenue East, just south of East Hamlin Street. Exhibit 9-9 shows a portion of the parking area looking south.

Exhibit 9-9. **24th Avenue East On-Street Parking—Looking South**

Husky Stadium
(3800 Montlake Boulevard)

Existing and No Build Conditions

Parking spaces on the south and west sides of Husky Stadium are separated into two lots, with an access road from NE Pacific Place running between the two. The lots on the west side of the access road contain 398 parking spaces and are grouped into lot E11. The lots to the east of the access road (south of the stadium) contain 882 parking spaces and form lot E12. Both lots are used 100 percent. Lots E11 and E12 are shown in Exhibit 9-10, looking southwest.

Exhibit 9-10. **Husky Stadium Lots E11 and E12—Looking Southwest**

It is expected that Sound Transit's University Link Station (which will be constructed prior to the SR 520, I-5 to Medina project) will affect parking in these lots. Current plans for final restoration after construction of the light rail station would have the following effects:

- The access drive between the two lots will be moved to the east, effectively expanding lot E11 and reducing the size of lot E12.
- Lot E11 will also expand southward, gaining an additional 31 parking spaces to contain a total of 429 spaces.
- Lot E12 will lose approximately 136 parking spaces due to relocation of the access road to the east and will be reduced to approximately 746 spaces.

Overall, the final effects of the light rail station will result in removal of approximately 105 parking spaces between the two lots. This restored condition serves as the No Build condition for the SR 520, I-5 to Medina project.

WSDOT Public Lot (Lake Washington Boulevard East)

Existing and No Build Conditions

This parking lot contains 24 spaces and is located just east of Lake Washington Boulevard East at East Miller Street. The lot accesses a trail that connects to the Arboretum. Exhibit 9-11 shows this lot looking northeast.

Exhibit 9-11. **WSDOT Public Lot—Looking Northeast**

Chapter 10—Construction Effects

What is in this chapter?

The chapter describes how construction of the Preferred Alternative could affect transportation in the study area, particularly near the Montlake interchange. The results include information about traffic operations on local streets and freeways, construction truck volumes, transit connections and travel times, nonmotorized connections, and parking supply.

The results in this chapter are based on likely conditions during construction that could be related to the following activities:

- Changes to freeway access, intersections, and lanes that are needed during construction to build portions of the project while maintaining traffic flow
- Hauling construction materials and equipment on routes including arterial streets and freeways
- Temporary closure of the 24th Avenue East bridge over SR 520
- Presence of construction activities at parking areas
- Changes in access to pedestrian and bicycle facilities and transit stops due to construction activities

This chapter also describes the transportation effects of project construction activities. Additional information on construction activities and methods is provided in the Construction Techniques and Activities Discipline Report (WSDOT 2009e), which was revised as the Construction Techniques and Activities Discipline Report Addendum and Errata (WSDOT 2011b).

How were construction effects evaluated?

WSDOT used preliminary construction staging plans to evaluate how construction activities would potentially affect traffic on SR 520 and adjacent local streets. Preliminary construction staging plans were used to identify changes to local streets and roadways during construction.

Construction process assumptions were obtained from the Construction Techniques and Activities Discipline Report Addendum and Errata (WSDOT 2011b). The construction staging plans were further developed through coordination between traffic engineers and transportation planners.

After identifying construction sequencing for the Preferred Alternative, WSDOT assessed the potential effects that construction would have on traffic operations. Changes of access, temporary road closures, and modifications to lanes and intersections were identified. These changes would affect the way people travel through the project site during construction. WSDOT also estimated how traffic patterns would change based on the conditions during varying stages of construction and then revised the traffic volumes for use in operations analysis.

The potential effects of construction on local street and freeway traffic operations were assessed quantitatively for the peak traffic periods, which are the times of day when most commuting occurs during the typical work week (Monday through Friday). The peak periods are the most critical times of travel each day, when most people need to go from place to place. The analysis was performed using Synchro software, applying a method consistent with the local street operations results discussed in Chapter 6, in which results are reported in terms of level of service.

WSDOT evaluated traffic operations along SR 520 in the Montlake area using Highway Capacity Software (HCS). As with local operations, changes in freeway traffic volumes were estimated using existing peak-period volumes and redistributed to reflect changes in the roads and intersections during construction. Results for SR 520 are also reported in terms of level of service.

Truck trips were estimated using typical production rates for the estimated quantities of earthwork and concrete pours, as well as other construction activities. The estimated construction trucks were then distributed to the roadways on potential haul routes based on locations of access to work sites and directness of travel from freeways. The project volumes of construction trucks at multiple locations were compared to existing truck activity to quantify the project effects.

The construction parking analysis was based on the preliminary construction staging plans, including the parking supply and utilization information reported in Chapter 9. This information was used to determine what effect construction staging and work activities would have on parking in the construction area.

Nonmotorized effects during construction were evaluated based on review of the preliminary construction plans in comparison to existing bicycle and pedestrian routes. The evaluation described closures and access changes that would require bicyclists and pedestrians to use an alternative route during construction.

The effects of construction on transit facilities were evaluated in a method similar to the nonmotorized evaluation. Changes to access and bus stops during construction were identified that would require riders to board or transfer at different stop locations. The effects of closing the Montlake Freeway Transit Station were evaluated in detail. Transit operations during construction would be affected by similar conditions to those reported for local street and freeway traffic operations. In addition to those results, the traffic engineers modeled traffic conditions in the Montlake interchange area to estimate likely changes to transit travel times during construction.

Construction Durations and Sequencing

The Preferred Alternative would be built in stages that give priority first to vulnerable structures and then to other elements of the project. The major project elements are listed in Exhibit 10-1 with their estimated construction durations. Detailed descriptions of these elements are provided in the Construction Techniques and Activities Discipline Report Addendum and Errata (WSDOT 2011b). These elements may be refined and modified as the project is further developed. However, the magnitude of effects on traffic and the relative differences between design options are not expected to change substantially unless the project description itself is changed.

Exhibit 10-1. **Estimated Construction Durations for the Preferred Alternative**

Element	Preferred Alternative
I-5/SR 520 Interchange	26 months
10th Avenue and Delmar Lid	26 months
Portage Bay Bridge (north half—4 lanes)	39 months
Portage Bay Bridge (south half—widen to 6 lanes, includes demolition of existing structure)	31 months
Montlake Interchange and Montlake Lid	56 months
New Bascule Bridge	29 months
West Approach (north half—4 lanes, includes work in Union Bay)	31 months
West Approach (south half—widen to 6 lanes, includes demolition of existing structure)	40 months
Floating Span of Evergreen Point Bridge and East Approach (includes towing, outfitting, and installing pontoons for a 6-lane bridge)	45 months
Bridge Maintenance Facility	24 months

Note:

Construction durations include testing of new systems and facilities, but do not include mobilization or closeout activities. Mobilization includes conducting material procurement, preparing construction staging areas, and moving equipment to the site. Closeout includes demobilization of staging areas and final roadside planting.

Exhibit 10-2 shows how the project elements could be sequenced for construction during the 7- year project timeline. WSDOT evaluated the effects of construction based on this sequencing plan for the Preferred Alternative. The plan was divided into five stages according to key changes in construction conditions that would potentially affect the movement of traffic in the study area. Each stage was analyzed for construction traffic effects. The variation of effects among the stages is shown by year of construction in the results sections below. Exhibit 10-3 shows the concurrent construction activities in the project vicinity.

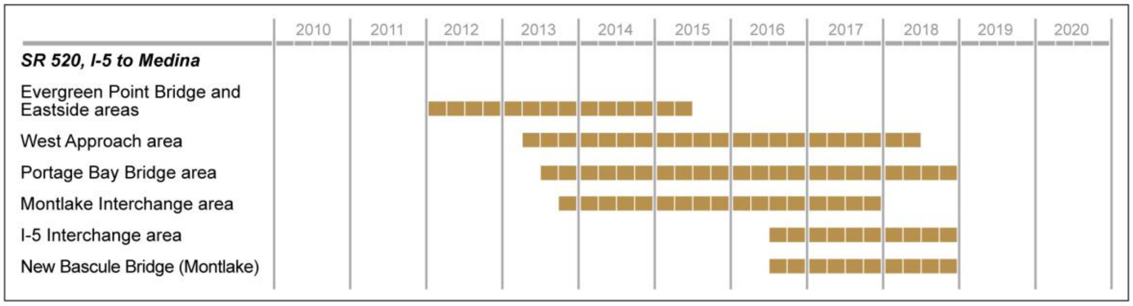


Exhibit 10-2. **Potential Construction Sequencing: Preferred Alternative**

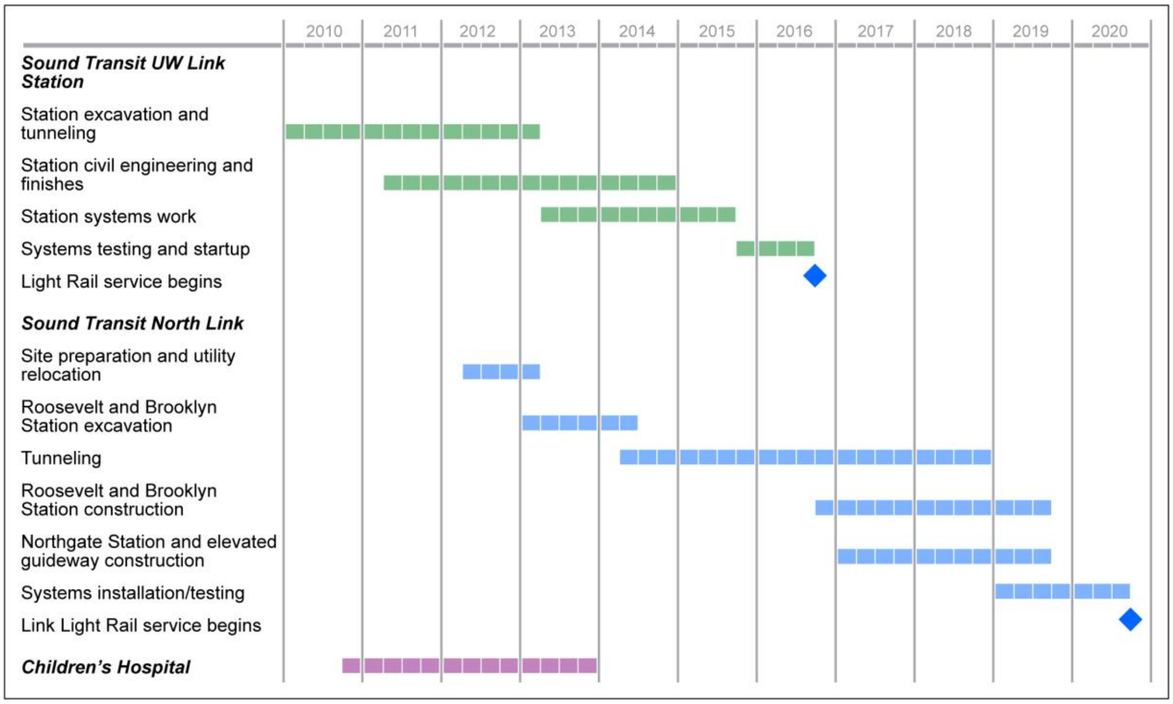


Exhibit 10-3. **Concurrent Construction Activities in the Project Vicinity**

Concurrent Construction Activities

Sound Transit is constructing the University Link light rail station near Husky Stadium, just east of the intersection of Montlake Boulevard NE and NE Pacific Street. Based on current construction schedules, the station is scheduled to have excavation and tunneling completed in 2013, and major construction elements, including pile driving, completed by the end of 2014. Haul traffic for the station construction is expected to be completed before the end of 2015. The SR 520, I-5 to Medina project does not currently identify any active haul routes north of the SR 520/Montlake Boulevard interchange until 2016, although some station construction may be ongoing at the time the Lake Washington Boulevard ramps are closed. In addition, some Sound Transit construction traffic is expected through the interchange. The current construction schedules for the two projects show that there would not be substantial concurrent haul route traffic on Montlake Boulevard NE between the SR 520 interchange and areas to the north. Coordination between WSDOT and Sound Transit has been initiated to minimize project conflicts and concurrent construction effects, and would continue throughout project construction.

How would construction affect traffic operations?

Construction of the project, including demolition of structures and use of some areas for contractor staging, would require adjustments to the existing lanes and intersections on roadways. Construction equipment and activities would occupy a portion of the transportation right-of-way and construction truck traffic would be present on the roadways. These scenarios could affect the capacity of the roadway and pose distractions to drivers.

The conditions that are expected to affect traffic operations the most are changes in the configuration of roadway lanes and intersections that would be required in the Montlake interchange area as construction progresses. When the Lake Washington Boulevard ramps are closed, more traffic would go through the Montlake interchange, resulting in some changes in local street traffic operations. Temporary roadway improvements during construction would allow traffic conditions to remain similar to existing conditions throughout most of the construction period. However, increased traffic from Lake Washington Boulevard, in combination with construction activities along Montlake Boulevard, is expected to increase delay at three locations along Montlake Boulevard during different periods of construction. The increases would be moderate—from LOS B to LOS C at two locations: Montlake Boulevard East/SR 520 westbound off-ramp, and Montlake Boulevard East/East Shelby Street. These effects would occur at these locations for 2 years and 1 year, respectively. A more substantial increase—from LOS E to F—is expected during the AM peak period at Montlake Boulevard East/Lake Washington Boulevard, lasting for up to 1 year. The increased delay at these locations would occur during different periods of construction. These effects are described in more detail below.

Traffic conditions on the freeways would remain similar to existing conditions during the most congested times of the day. Intermittent delays can be expected due to isolated construction events, but activities that close lanes on the highway would not be allowed during the daytime. When the Lake Washington Boulevard ramps are closed and other ramps are shifted temporarily, the locations of existing congestion on SR 520 would change, while overall delay would remain much as it is today.

Throughout construction of the Preferred Alternative, there would be intermittent short-term lane closures along ramps, local streets, and the highway. These closures would be limited to nights and weekends when traffic volumes are lowest. Lane closures are not expected to substantially affect traffic operations during off-peak travel times. However, travelers can expect intermittent delays, and during isolated construction activities, some would need to use alternative routes to reach their destination. WSDOT will notify the public of the times when travel through the study area could be disrupted.

Roadway Access During Construction

The Lake Washington Boulevard ramps to and from SR 520 would be closed permanently during construction. Also, there would be one long-term, temporary roadway closure at the 24th Avenue East bridge over SR 520. Short-term, temporary lane closures would occur to accommodate work on the roadways throughout the construction period. Closures and detour routes on local streets would be coordinated with and approved by the City of Seattle. In addition, WSDOT would work with Metro and Sound Transit to discuss and finalize any detours used during construction.

Two long-term, temporary road closures that were previously evaluated in the SDEIS would not be required for construction of the Preferred Alternative. First, the Delmar Drive East bridge over SR 520 would remain open during construction and traffic would be temporarily shifted onto a portion of the new 10th and Delmar lid while the existing bridge is demolished and rebuilt. Second, NE Pacific Street would remain open throughout construction because its intersection with Montlake Boulevard NE would not be substantially affected by the Preferred Alternative.

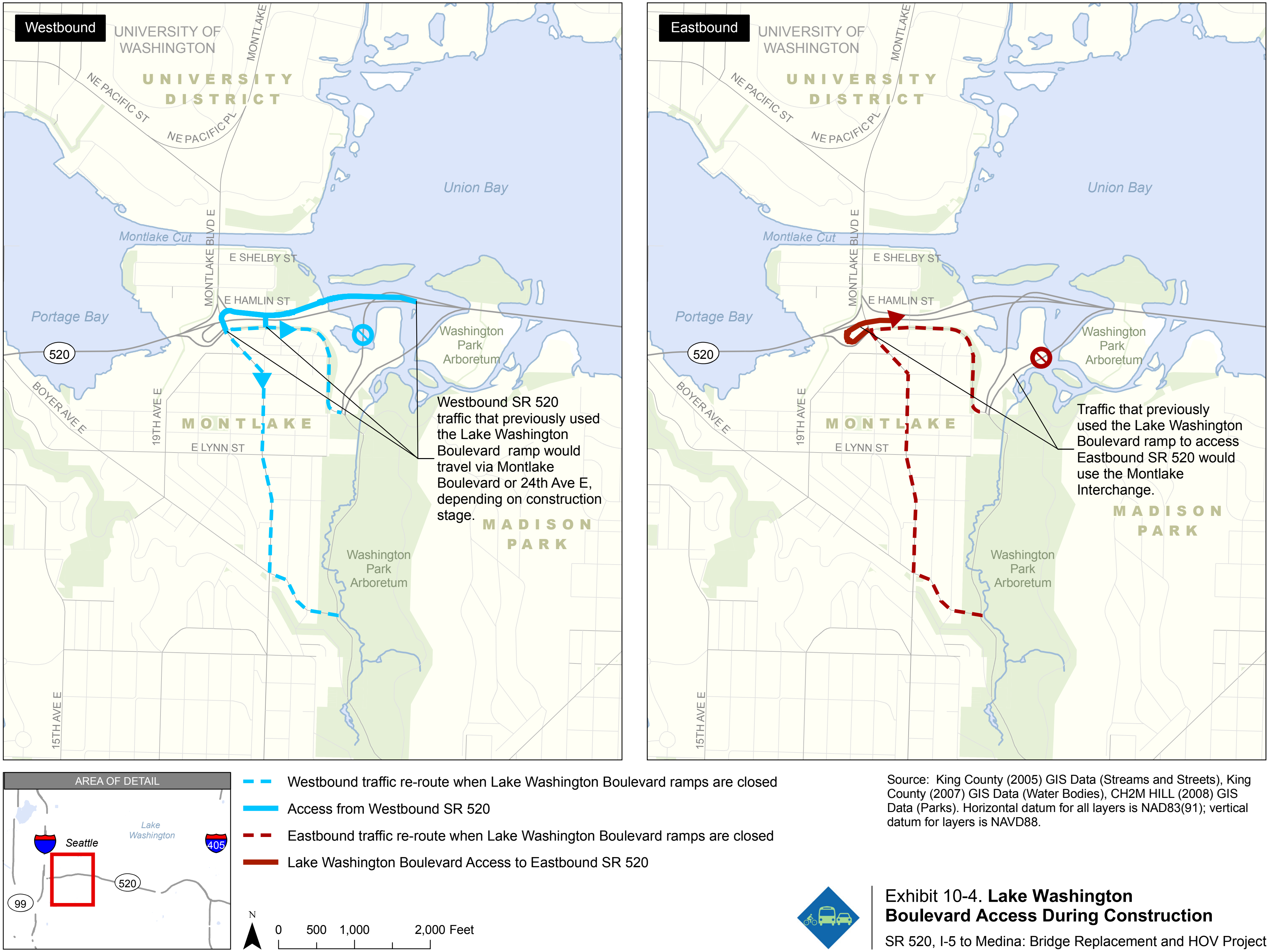
Lake Washington Boulevard Ramps

The first roadway closure that would affect traffic operations is the closure of the westbound Lake Washington Boulevard off-ramp. Construction on the north side of the west approach would require the use of temporary work bridges. The westbound off-ramp to Lake Washington Boulevard must be closed and removed to accommodate the work bridges and construction activities.

The second closure to affect traffic operations would be the eastbound Lake Washington Boulevard on-ramp. After the north side of the west approach is completed, construction activities would move to the south side of the west approach. The eastbound on-ramp would be closed to accommodate the work bridges and construction activities, similar to the process described for the north side of the west approach.

When the Lake Washington Boulevard ramps are closed, traffic that currently uses them would transition to using the Montlake interchange. The Montlake interchange would be the permanent location for access to and from SR 520 in the Montlake vicinity when the Preferred Alternative is completed. However, the configurations of intersections, on-ramps, and off-ramps would change several times during construction before the final roadway configuration is in place. These changes would be necessary due to the right-of-way needed for construction activities.

During construction, drivers who currently use the Lake Washington Boulevard ramps would travel to and from the Montlake interchange on Lake Washington Boulevard or 24th Avenue East. During most of the construction period, traffic that previously used the eastbound Lake Washington Boulevard on-ramp would use the eastbound SR 520 loop ramp from the intersection of Montlake Boulevard East and Lake Washington Boulevard. When the loop ramp and its connection to mainline SR 520 are reconstructed, traffic would access eastbound SR 520 on a temporary ramp in the location of the future HOV direct access ramp. Traffic that previously used the westbound Lake Washington Boulevard off-ramp would use the westbound Montlake Boulevard off-ramp. During early stages of construction, these drivers would travel south on Montlake Boulevard and then choose to reach their destination along Lake Washington Boulevard or 24th Avenue East. Later, when the 24th Avenue East bridge over SR 520 is completed, drivers would be able to access Lake Washington Boulevard from the westbound off-ramp without traveling on Montlake Boulevard. The construction access locations for drivers who currently use the Lake Washington Boulevard ramps are depicted in Exhibit 10-4.



Westbound SR 520 traffic that previously used the Lake Washington Boulevard ramp would travel via Montlake Boulevard or 24th Ave E, depending on construction stage.

Traffic that previously used the Lake Washington Boulevard ramp to access Eastbound SR 520 would use the Montlake Interchange.

- - Westbound traffic re-route when Lake Washington Boulevard ramps are closed
— Access from Westbound SR 520
- - Eastbound traffic re-route when Lake Washington Boulevard ramps are closed
— Lake Washington Boulevard Access to Eastbound SR 520

Source: King County (2005) GIS Data (Streams and Streets), King County (2007) GIS Data (Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 10-4. **Lake Washington Boulevard Access During Construction**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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24th Avenue East Bridge

The 24th Avenue East bridge across SR 520, north of Lake Washington Boulevard, would be closed to all traffic for approximately 1 year while the bridge is demolished and reconstructed. The 24th Avenue East bridge provides access to MOHAI, East Montlake Park, and McCurdy Park. The MOHAI facility would be moved prior to demolition of the bridge. A potential alternative access to parking at East Montlake Park could be provided. When the new bridge is completed in conjunction with the new westbound off-ramp, the lanes and intersections on 24th Avenue East between Lake Washington Boulevard and the westbound off-ramp would be in temporary configurations until the project is completed. This strategy would improve traffic operations on Montlake Boulevard East by providing an additional route for traffic from the westbound SR 520 off-ramp. Drivers exiting from westbound SR 520 will be able to turn left on 24th Avenue East to access Lake Washington Boulevard or East Montlake Place East and travel south, without going through the Montlake interchange.

Montlake Boulevard East

Several roadway capacity improvements would be made to the intersections and ramps along Montlake Boulevard to accommodate the additional traffic due to the Lake Washington Boulevard ramp closures and to maintain traffic flow while construction activities occupy the existing right-of-way. These improvements would minimize substantial delays that otherwise would occur on Montlake Boulevard at the SR 520 interchange. The following changes are proposed along Montlake Boulevard:

- Two left-turn lanes and two right-turn lanes from the westbound SR 520 off-ramp to Montlake Boulevard would be constructed. A traffic signal would be added at this intersection to allow left turns.
- One additional lane would be added on southbound Montlake Boulevard between the westbound SR 520 off-ramp and East Roanoke Street. This would accommodate the increased traffic from the westbound off-ramp to southbound Montlake Boulevard during construction.
- Two northbound left-turn lanes to the SR 520 eastbound on-ramp and two southbound left-turn lanes to Lake Washington Boulevard would be provided on Montlake Boulevard.

- An additional general-purpose lane would be constructed on the SR 520 eastbound on-ramp from Montlake Boulevard.
- An additional westbound lane would be constructed on Lake Washington Boulevard at the intersection with Montlake Boulevard.

SR 520

Four lanes on SR 520 (two eastbound and two westbound) would remain open during peak periods and for most of the construction period. All ramp connections on SR 520 at the I-5 interchange and at Montlake Boulevard would also remain open during these times. The only substantial change of access affecting SR 520 would be the Lake Washington Boulevard ramp closures described above. The locations where ramps connect to the freeway would be modified several times as construction progresses. The location of the freeway lanes would also be shifted several times. These changes in lane configurations would allow traffic flow to be maintained as work sites are moved to new locations.

Intermittent lane closures are expected on SR 520 and its ramps throughout the project duration. Traffic would continue to pass through the area, but could be required to merge into one lane to go around the closed portion of roadway. Lane closures would be short term and limited to nights and weekends when roadway volumes are typically lower than during peak travel periods. The closure hours and dates would be restricted based on special events and coordinated with closures on other freeways.

Limited full closures are expected for major construction activities that would require work on the full width of the roadway. When full closure of SR 520 is required, the SR 520, I-5 to Medina project would use the closure plan that WSDOT developed for the annual maintenance and inspection for the Evergreen Point Bridge. This plan closes SR 520 from Montlake Boulevard on the west side of Lake Washington to 92nd Avenue on the east side of the lake. The designated detour route during closure of SR 520 is the I-90 Bridge. These closures would occur on weekends, as they do for bridge maintenance and inspection.

Traffic Volumes during Construction

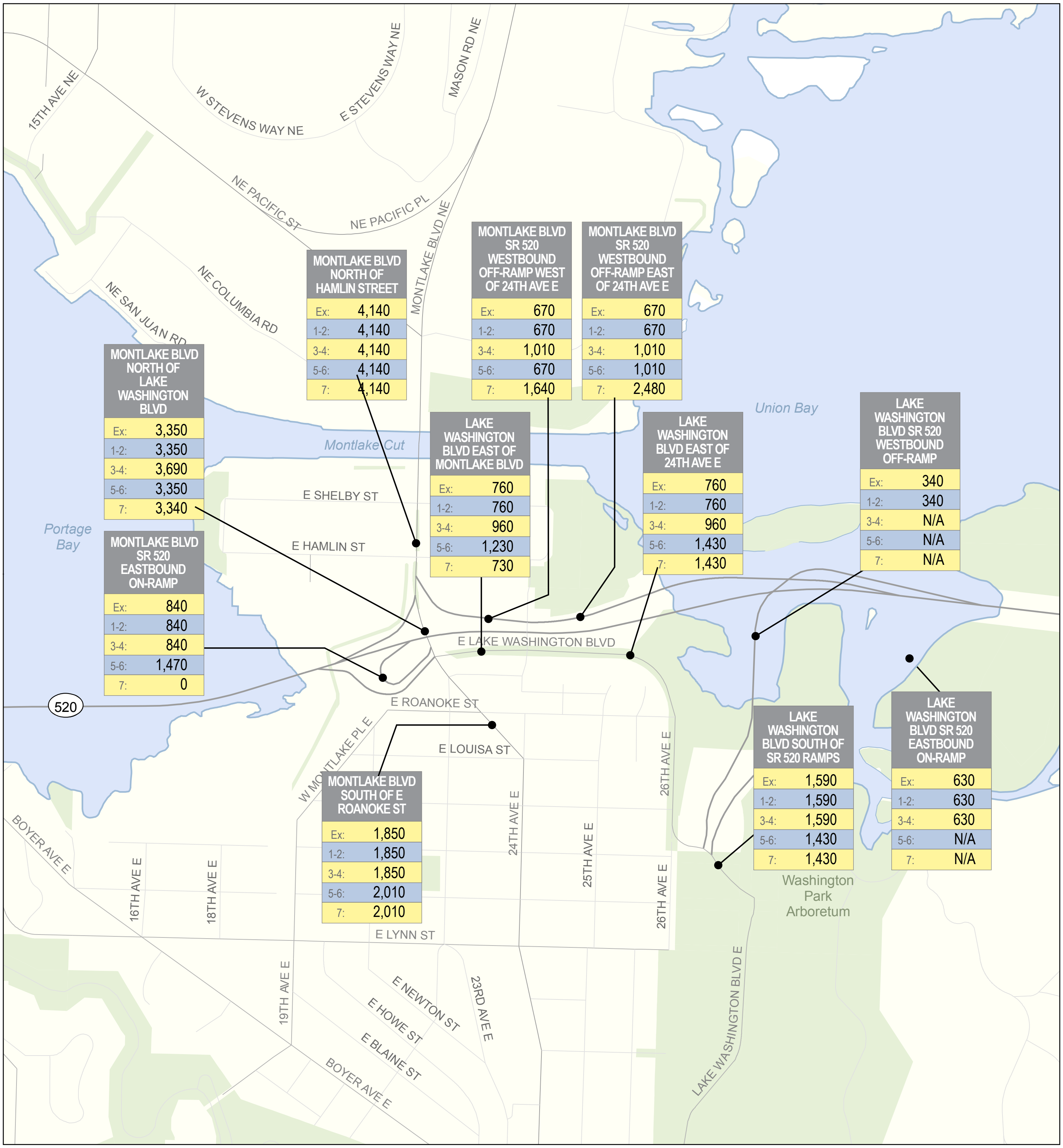
Because of the temporary roadway changes that would be needed, traffic patterns would change periodically as the stages of construction progress, particularly on local streets in the Montlake interchange area.

Other locations in the project vicinity would not be substantially affected. The major stages of construction would last for approximately 1 to 2 years each, which would result in major project elements being completed in designated areas. After each stage, construction activities would move to new areas. The configurations of some roadways, ramps, and intersections would be adjusted before each stage to allow space for workers and equipment. These adjustments would result in increases of traffic volumes on some roadway segments and decreases on others. The estimated traffic volumes during construction at locations throughout the Montlake interchange area are shown in Exhibits 10-5 and 10-6. The results are grouped by the approximate years of construction that would have similar traffic volume patterns.

Local Arterial Effects during Construction

While traffic volumes would vary at several locations, traffic operations on local streets are expected to remain similar to existing conditions during most of the construction period. The temporary improvements along Montlake Boulevard would accommodate traffic volume changes and prevent substantial increases in congestion. Drivers could expect the same level of congestion that currently occurs during the morning and afternoon peak hours. However, some additional travel delays are expected at three intersections during specific periods of construction. Under the Preferred Alternative, the transportation construction effects would be experienced primarily at the Montlake Boulevard/SR 520 interchange, but could result in delays that extend to NE Pacific Street and Montlake Boulevard NE, north of NE Pacific Street. These effects would be due to temporary increases in traffic volumes and right-of-way constraints where construction is taking place.

WSDOT evaluated the local street traffic conditions that would result from the expected changes in volumes and roadway configurations during construction. The results of the traffic operations analysis for affected intersections are shown in Exhibit 10-7 in terms of level of service. Similar to the traffic volumes indicated in Exhibit 10-6, the results are grouped by years of construction when traffic operations are expected to be consistent. The analysis results for years 5 and 6 are reported separately, although the volume estimates are the same for those years. The difference in traffic operations is due to roadway changes that would be needed for reconstruction of the Montlake Boulevard bridge over SR 520. As with all major projects, the conditions associated with construction could change.



MONTLAKE BLVD NORTH OF HAMLIN STREET	
Ex:	4,140
1-2:	4,140
3-4:	4,140
5-6:	4,140
7:	4,140

MONTLAKE BLVD SR 520 WESTBOUND OFF-RAMP WEST OF 24TH AVE E	
Ex:	670
1-2:	670
3-4:	1,010
5-6:	670
7:	1,640

MONTLAKE BLVD SR 520 WESTBOUND OFF-RAMP EAST OF 24TH AVE E	
Ex:	670
1-2:	670
3-4:	1,010
5-6:	1,010
7:	2,480

MONTLAKE BLVD NORTH OF LAKE WASHINGTON BLVD	
Ex:	3,350
1-2:	3,350
3-4:	3,690
5-6:	3,350
7:	3,340

LAKE WASHINGTON BLVD EAST OF MONTLAKE BLVD	
Ex:	760
1-2:	760
3-4:	960
5-6:	1,230
7:	730

LAKE WASHINGTON BLVD EAST OF 24TH AVE E	
Ex:	760
1-2:	760
3-4:	960
5-6:	1,430
7:	1,430

LAKE WASHINGTON BLVD SR 520 WESTBOUND OFF-RAMP	
Ex:	340
1-2:	340
3-4:	N/A
5-6:	N/A
7:	N/A

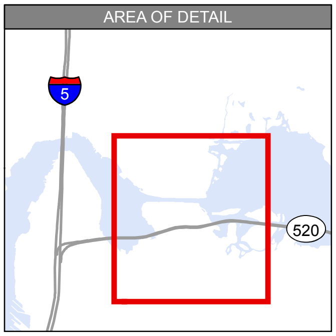
MONTLAKE BLVD SR 520 EASTBOUND ON-RAMP	
Ex:	840
1-2:	840
3-4:	840
5-6:	1,470
7:	0

MONTLAKE BLVD SOUTH OF E ROANOKE ST	
Ex:	1,850
1-2:	1,850
3-4:	1,850
5-6:	2,010
7:	2,010

LAKE WASHINGTON BLVD SOUTH OF SR 520 RAMPS	
Ex:	1,590
1-2:	1,590
3-4:	1,590
5-6:	1,430
7:	1,430

LAKE WASHINGTON BLVD SR 520 EASTBOUND ON-RAMP	
Ex:	630
1-2:	630
3-4:	630
5-6:	N/A
7:	N/A

AREA OF DETAIL



	LOCATION	
Existing	Ex:	Volume
Year of Construction	1-2:	Volume
	3-4:	Volume
	5-6:	Volume
	7:	Volume

Volumes are totals for both directions

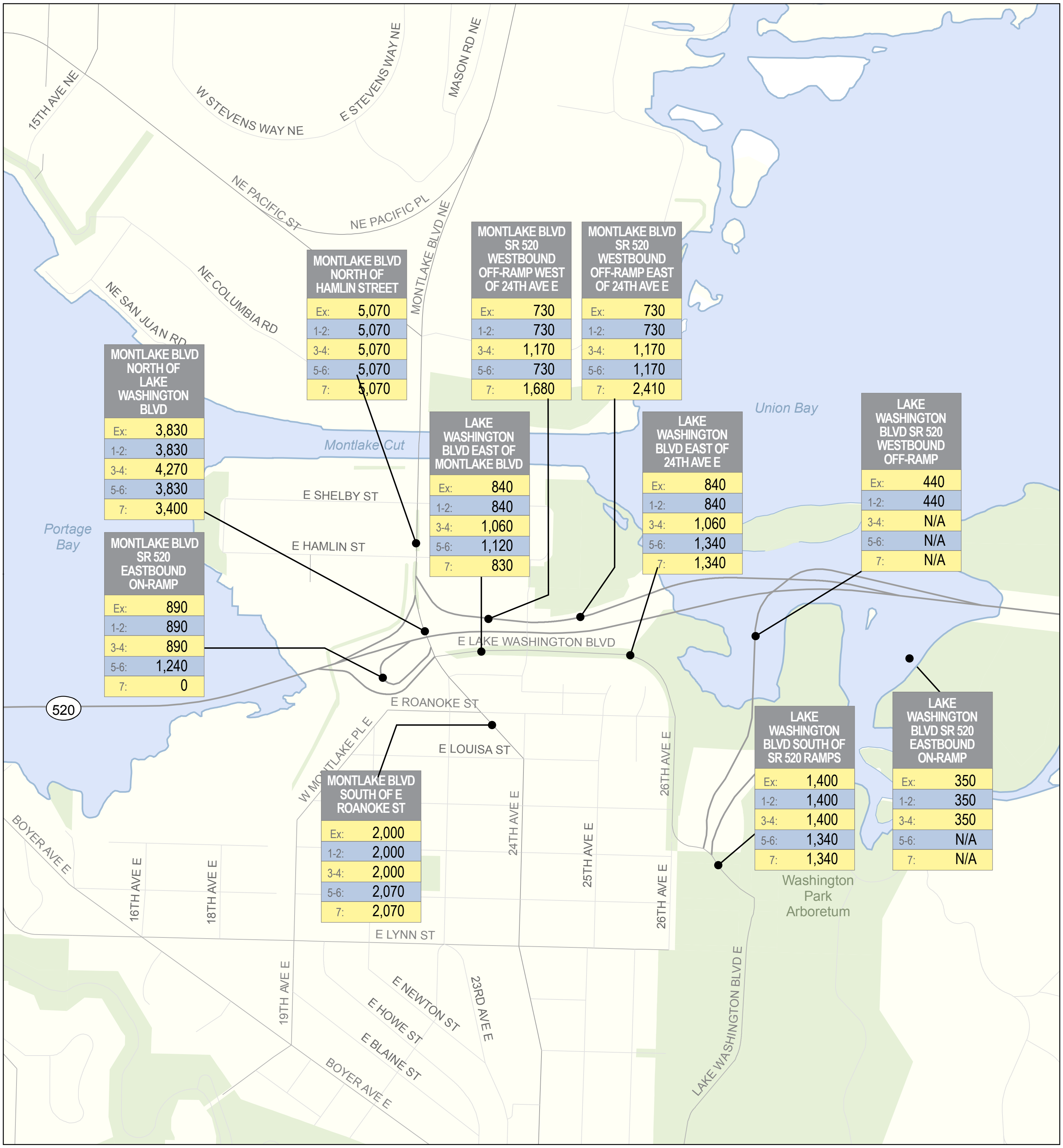
N

0 500 1,000 Feet

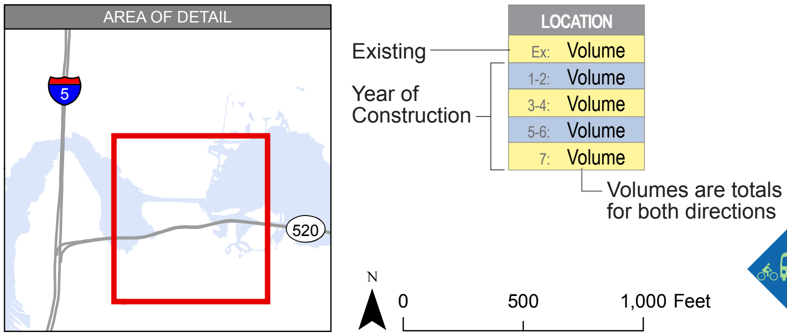
Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 10-5. **SR 520/Montlake Boulevard Interchange Area – AM Peak Hour Vehicle Volumes During Construction**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project



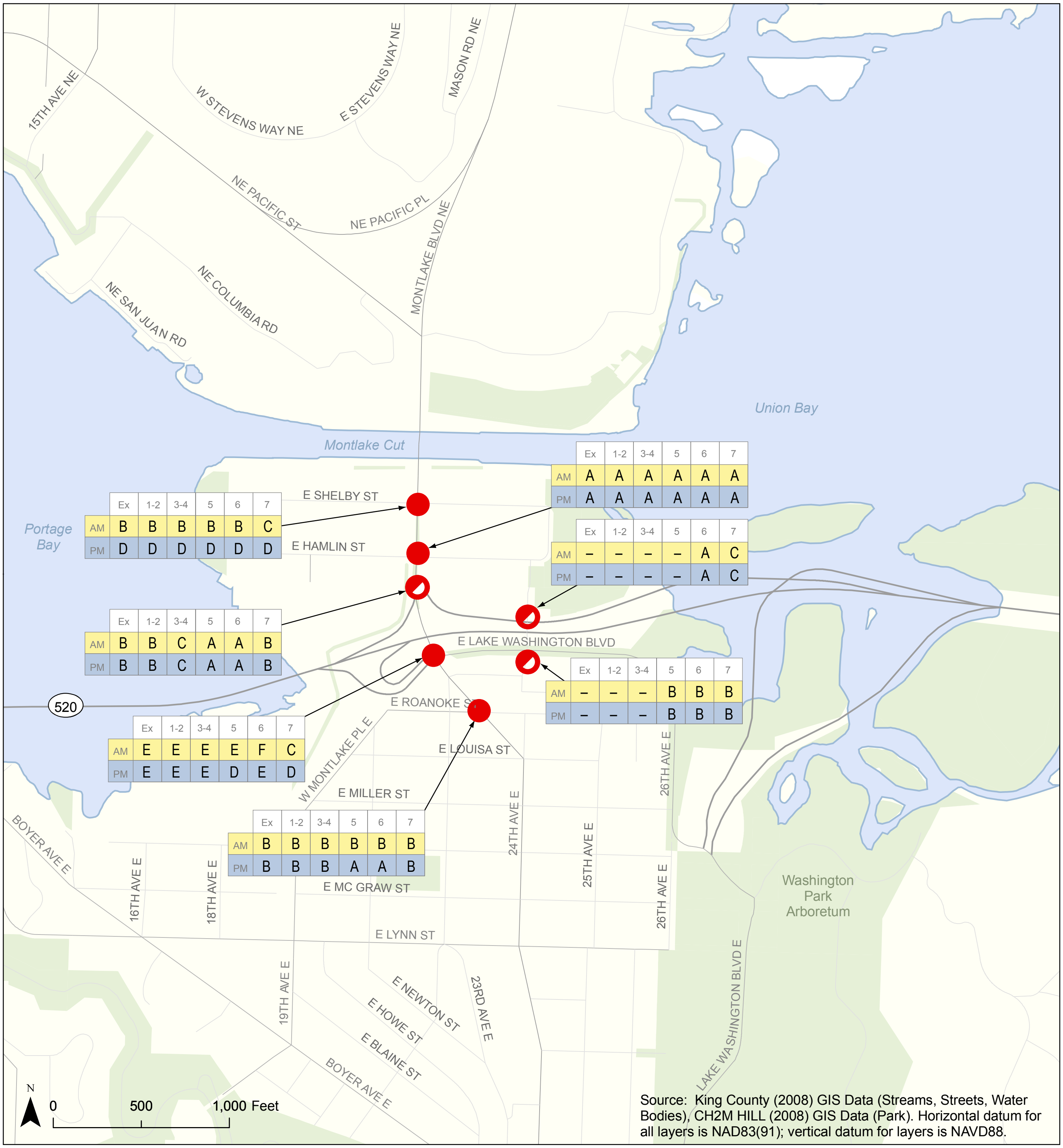
	Ex:	1-2:	3-4:	5-6:	7:
MONTLAKE BLVD NORTH OF LAKE WASHINGTON BLVD	3,830	3,830	4,270	3,830	3,400
MONTLAKE BLVD SR 520 EASTBOUND ON-RAMP	890	890	890	1,240	0
MONTLAKE BLVD NORTH OF HAMLIN STREET	5,070	5,070	5,070	5,070	5,070
MONTLAKE BLVD SR 520 WESTBOUND OFF-RAMP WEST OF 24TH AVE E	730	730	1,170	730	1,680
MONTLAKE BLVD SR 520 WESTBOUND OFF-RAMP EAST OF 24TH AVE E	730	730	1,170	1,170	2,410
LAKE WASHINGTON BLVD EAST OF MONTLAKE BLVD	840	840	1,060	1,120	830
LAKE WASHINGTON BLVD EAST OF 24TH AVE E	840	840	1,060	1,340	1,340
LAKE WASHINGTON BLVD SR 520 WESTBOUND OFF-RAMP	440	440	N/A	N/A	N/A
MONTLAKE BLVD SOUTH OF E ROANOKE ST	2,000	2,000	2,000	2,070	2,070
LAKE WASHINGTON BLVD SOUTH OF SR 520 RAMPS	1,400	1,400	1,400	1,340	1,340
LAKE WASHINGTON BLVD SR 520 EASTBOUND ON-RAMP	350	350	350	N/A	N/A



Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 10-6. **SR 520/Montlake Boulevard Interchange Area – PM Peak Hour Vehicle Volumes During Construction**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project



	Ex	1-2	3-4	5	6	7
AM	B	B	B	B	B	C
PM	D	D	D	D	D	D

	Ex	1-2	3-4	5	6	7
AM	A	A	A	A	A	A
PM	A	A	A	A	A	A

	Ex	1-2	3-4	5	6	7
AM	–	–	–	–	A	C
PM	–	–	–	–	A	C

	Ex	1-2	3-4	5	6	7
AM	B	B	C	A	A	B
PM	B	B	C	A	A	B

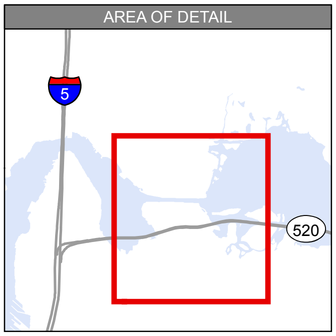
	Ex	1-2	3-4	5	6	7
AM	–	–	–	B	B	B
PM	–	–	–	B	B	B

	Ex	1-2	3-4	5	6	7
AM	E	E	E	E	F	C
PM	E	E	E	D	E	D

	Ex	1-2	3-4	5	6	7
AM	B	B	B	B	B	B
PM	B	B	B	A	A	B

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

AREA OF DETAIL



Existing

Year of Construction

		Ex	1-2	3-4	5	6	7
AM Peak Hour	AM	B	B	B	B	B	C
PM Peak Hour	PM	D	D	D	D	D	D

LEVEL OF SERVICE

A-C	No/Little Congestion
D	Moderate Congestion
E	Heavy Congestion
F	Severe Congestion/Over Capacity

○ Unsignalized Intersection

● Signalized Intersection

◐ Signalized Intersection with Project

Exhibit 10-7. **SR 520/Montlake Boulevard Interchange Area – AM and PM Peak Hour LOS During Construction**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

\\simba\proj\Parametrix\180171\GRAPHICS\x_FEIS_Westside\TRAN\FEIS_DR_TRAN_Ex10-07_SR520_MontlakeBlvdInterchange_AM_PM_LOS_29mar11.ai

This could result in a different timing of effects, but the magnitude and duration of effects at specific locations should not change substantially. The following sections discuss traffic operations at several locations in more detail.

The construction activities affecting local street operations are planned to begin in the third year of construction, so traffic operations during the first 2 years of construction would be the same as existing conditions. The results indicated in Exhibit 10-7 show that most intersections would function similarly to existing conditions throughout construction, and better in some cases due to the temporary roadway improvements that would be built. Delay would increase at three locations during a portion of the construction timeline:

- SR 520 westbound ramps/Montlake Boulevard East, during years 3 and 4 in the AM and PM peak hours
- Lake Washington Boulevard/eastbound SR 520 ramps/Montlake Boulevard East, during year 6 in the AM peak hour
- East Shelby Street/Montlake Boulevard East, during year 7 in the AM peak hour

Prior to year 3 of construction, the westbound Lake Washington Boulevard off-ramp would be closed and traffic would be diverted to the westbound Montlake Boulevard off-ramp. Traffic volumes through the intersection of the westbound off-ramp and Montlake Boulevard would increase by about 340 vehicles per hour in the AM peak period and 440 vehicles per hour in the PM peak period. Delay would increase at the westbound ramp intersection and traffic operations would change from LOS B to LOS C during the AM and PM peak hours. This change is due to the addition of westbound left turns at the intersection. At all other locations, traffic operations would be very similar to existing conditions. These conditions would continue through years 3 and 4 of construction.

Prior to year 5 of construction, the eastbound Lake Washington Boulevard on-ramp would be closed and traffic would begin using the eastbound SR 520 on-ramp at Montlake Boulevard. Traffic volumes entering the eastbound on-ramp at Montlake Boulevard would increase by about 630 vehicles per hour in the AM peak period and 350 vehicles per hour in the PM peak period. Traffic operations during year 5 in the Montlake area would remain similar to existing conditions, although some intersections would improve due to the temporary capacity improvements on Montlake Boulevard. By year 5, construction of the

24th Avenue East bridge would be completed, and would provide an alternative route for some drivers who use the westbound SR 520 off-ramp. This would improve traffic operations on Montlake Boulevard at the westbound off-ramp intersection. It would also prevent increased congestion at the eastbound on-ramp and Lake Washington Boulevard intersection that would otherwise occur due to additional traffic from Lake Washington Boulevard.

During year 6 of construction, the Montlake Boulevard bridge over SR 520 would be demolished and reconstructed. While this work takes place on the existing Montlake Boulevard right-of-way, traffic would be shifted east onto a portion of the new Montlake lid. Because of the area occupied by construction, temporary capacity improvements on Montlake Boulevard would be limited. The traffic destined for the eastbound on-ramp from northbound Montlake Place East and from Lake Washington Boulevard would require through traffic on Montlake Boulevard to stop for a longer time than they currently do, resulting in an overall increase in delay at this intersection during year 6. Traffic operations would degrade from LOS E to LOS F at the eastbound on-ramp and Lake Washington Boulevard intersection. Traffic operations at other locations would be similar to existing conditions.

By year 7, construction of the Montlake Boulevard bridge over SR 520 would be complete and reconstruction of the eastbound SR 520 on-ramp at Montlake Boulevard would begin. The existing loop ramp would be closed and traffic destined for eastbound SR 520 would use the temporary on-ramp along the future alignment of the HOV direct access ramp. This configuration would result in an increased volume of southbound left turns and northbound right turns at the Montlake interchange. However, the interchange would be near its final configuration, which would provide sufficient roadway capacity to maintain traffic operations similar to or better than existing conditions at all locations.

Freeway Effects during Construction

Traffic operations and congestion on SR 520 would remain similar to existing conditions during construction. Closure of the Lake Washington Boulevard ramps is not expected to have a substantial effect on SR 520 operations; ramp closures would mostly affect local street operations. Traffic volumes would increase on the SR 520 eastbound on-ramp and westbound off-ramp at Montlake Boulevard. Congestion associated with the Lake Washington Boulevard ramps would no longer be present. The congested locations would change periodically as the configurations of Montlake Boulevard ramps are adjusted.

When the Lake Washington Boulevard westbound off-ramp is closed, traffic that previously used it would begin using a realigned westbound off-ramp to Montlake Boulevard. Traffic operations on westbound SR 520 would remain similar to existing conditions during years 3 and 4 after the ramp is closed. The congestion and queuing that occur under existing conditions would remain during construction of the project. Eastbound freeway operations would be similar to existing conditions during years 3 and 4.

When the Lake Washington Boulevard eastbound on-ramp is closed, prior to year 5, traffic that previously used it would begin using the SR 520 eastbound on-ramp at Montlake Boulevard. The level of service during the AM peak hour would be similar to existing conditions at the ramp, but is expected to degrade slightly from LOS D to E on the eastbound main line east of the Montlake on-ramp due to the increased volumes concentrated into one merge point. Levels of service during the evening peak hour are projected to remain unchanged even with a modest increase in traffic on the eastbound on-ramp and the downstream mainline section at Montlake Boulevard. SR 520 traffic operations at the westbound off-ramp would improve in year 5 during the morning and evening peak hours due to the exit option and drop-lane configuration proposed during this phase of construction.

In year 6 of construction, westbound SR 520 would return to traffic conditions similar to existing conditions during both peak hours. Eastbound operations would remain unchanged from year 5.

In year 7, the loop ramp to eastbound SR 520 at Montlake Boulevard would be closed for reconstruction. All local traffic destined for eastbound SR 520 will use the temporary on-ramp along the alignment of the HOV direct access ramp on the newly finished portion of the Montlake lid. The merge location for the eastbound on-ramp would be much farther east than in other stages of construction. Traffic operations would be improved compared to years 5 and 6. However, LOS E is still projected for this area during the AM peak hour in year 7, which is still below the LOS D of existing conditions. Elsewhere, eastbound operations would remain similar to existing conditions for both peak hours. Westbound traffic conditions should remain unchanged during year 7.

What are the anticipated effects of construction trucks?

Local jurisdictions can limit the use of nonarterial streets for truck traffic; therefore, efforts were made to identify designated arterial streets for potential use as haul routes. Final haul routes will be identified by the contractor(s) in cooperation with local jurisdictions, and all necessary permits would be obtained as required by law. Construction trucks would use these routes to access work sites and construction staging areas. The construction staging areas would be used for a variety of activities, including access to construction sites, location of construction office and storage trailers, parking for contractors' employees and agents, and storage of equipment needed for construction activities. Potential construction haul routes and staging areas are shown in Exhibit 10-8. Refer to the Construction Techniques and Activities Discipline Report Addendum and Errata (WSDOT 2011b) for more information about construction staging areas and potential haul routes.

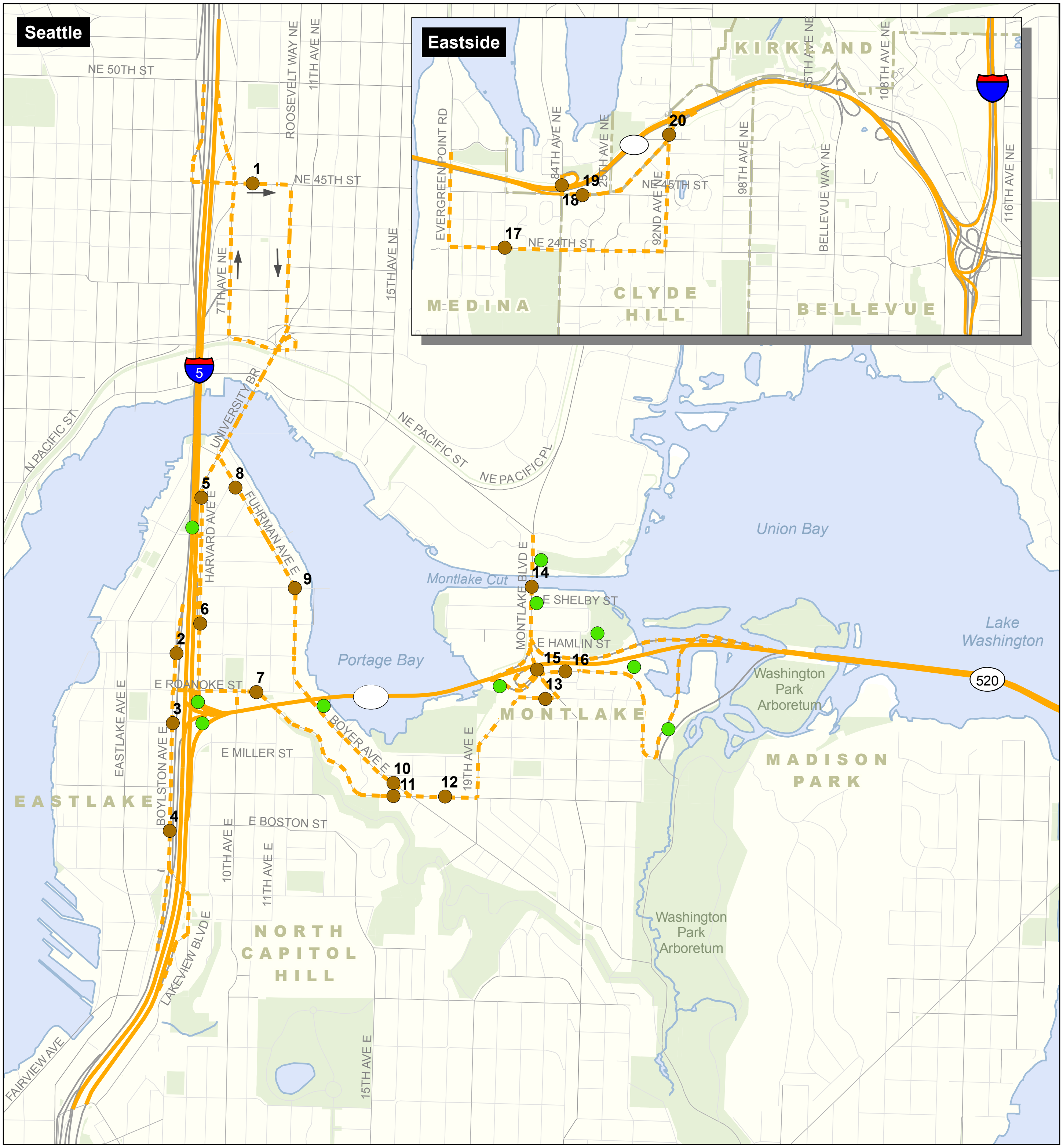
Did you know?

Seattle classifies arterials that accommodate significant freight movements through the city and to and from freight traffic generators as **major truck streets.**

Where possible, the work sites would include direct access from SR 520 and the ramps, which would minimize the amount of truck traffic on local streets. However, construction truck traffic would be necessary on City of Seattle streets in the project vicinity. Haul routes would require approval of WSDOT and those on local streets would require review and approval by the City of Seattle.

The use of barges is also planned to support many activities at the construction sites. This would reduce the amount of truck traffic required on roadways. However, for this analysis it was assumed that trucks would be used for all hauling activities.

WSDOT updated the truck estimates based on preliminary construction plans for the Preferred Alternative, and summarized them by specific roadway locations in the project vicinity. The study locations for construction truck estimates are shown in Exhibit 10-8. The effects of construction trucks on local streets and freeways are described in terms of average, or typical, daily construction truck volumes and peak construction truck volumes. The results are compared to the existing average daily traffic volumes and truck volumes.



● Potential Staging Area

● Haul Study Location

— Haul Route-Project Duration

- - Haul Route-Limited Duration

Source: King County (2005) GIS Data (Streams and Streets), King County (2007) GIS Data (Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

N 0 500 1,000 2,000 Feet

Exhibit 10-8. **Potential Haul Routes**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

The estimates for average daily trucks represent the typical volume of construction trucks that could be expected at each location when the haul route is in use. The actual daily volumes would vary from the average over the project duration as construction activities progress. A variation of approximately 25 percent from the average could typically be expected.

Peak construction refers to construction activities such as concrete placement that require more frequent arrivals of trucks than the average daily estimates indicate. These activities are infrequent, requiring much work and preparation on the site between occurrences. This is high-production work that requires substantial effort and above-average construction truck activity; therefore, this work is summarized separately from the typical daily results. The effects of peak construction are described for local streets and freeways in the following sections.

Construction Trucks on Local Streets

Many trucks required for construction must use local streets in addition to freeways to access work sites. Most construction trucks on local streets in Seattle would use Montlake Boulevard to access SR 520. Some trucks would also access local streets from I-5 at NE 45th Street or Boylston Avenue and Harvard Avenue via East Roanoke Street.

Some local streets on the Eastside would be used on a limited basis during construction of the Evergreen Point Bridge and Eastside transition area. Most trucks would directly access the project site from SR 520 through temporary construction entrances. During approximately the last 18 months of construction, the direct access from the site to eastbound SR 520 would be unavailable due to other construction activities east of the site. The SR 520, Medina to SR 202 project would need to close the access to complete construction of the roadway in that area. Trucks would still enter the work site directly from SR 520, but would need to leave the site along local streets to return to SR 520. Most trucks would arrive loaded and leave the site unloaded.

Exhibit 10-9 shows the estimated project effects of construction trucks on local streets compared to the for the existing heavy vehicles, which include trucks and buses. Traffic studies typically describe truck volumes as a percentage of the total vehicle volumes. Exhibit 10-9 also shows the percentages of trucks generated by the project compared to the percentages for the existing conditions at each location.

Exhibit 10-9. **Daily Construction Trucks on Local Streets**

		Existing Weekday			Project Average (Typical Day)		Project Peak Activities (Infrequent)	
Map Location	**Study Street**	**Total Vehicle Volume**	**Daily Trucks and Buses**	**Trucks Percentage of Total Vehicles**	**Daily Trucks**	**Trucks Percentage of Total Vehicles**	**Daily Trucks**	**Trucks Percentage of Total Vehicles**
1	NE 45th Street	36,700	1,430	3.9	15	< 0.1	220	0.6
2	Boylston Avenue East	13,360	250	1.9	25	0.2	240	1.8
3	Boylston Avenue East	10,330	240	2.3	7	0.1	60	0.6
4	Boylston Avenue East	13,700	340	2.5	25	0.2	240	1.8
5	Harvard Avenue East	8,000	310	3.9	6	0.1	110	1.4
6	Harvard Avenue East	17,640	690	3.9	15	0.1	70	0.4
7	East Roanoke Street	7,050	160	2.3	30	0.4	170	2.4
8	Fuhrman Avenue East	7,240	170	2.3	20	0.3	230	3.2
9	Boyer Avenue East	5,940	130	2.2	20	0.4	230	3.9
10	Boyer Avenue East	6,180	140	2.3	15	0.2	210	3.4
11	Delmar Drive East	4,910	100[a]	2.0	20	0.4	160	3.3
12	East Lynn Street	5,270	110[a]	2.1	15	0.3	120	2.3
13	East Roanoke Street	4,630	140	3.0	20	0.4	290	6.3
14	Montlake Boulevard East	57,350	1,410	2.5	10	< 0.1	100	0.2
15	Montlake Boulevard East	33,180	920	2.8	25	0.1	280	0.8
16	Lake Washington Boulevard	7,230	90	1.2	30	0.4	290	4.0
17	NE 24th Street	3,500	70	2.0	20	0.5	100	2.9
18	84th Avenue NE	7,790	220	2.8	2	< 0.1	10	0.1
19	NE 28th Street	4,390	60	1.4	5	0.1	20	0.5
20	92nd Avenue NE	5,000	90	1.8	20	0.4	100	2.0

This comparison shows how the project trucks would relate to the overall traffic conditions in the project vicinity. The volume of trucks on typical urban arterial streets is in the range of 2 to 3 percent of total vehicles, which is reflected in the data for most locations in the project vicinity. During typical construction days, the project would add trucks amounting to less than 1 percent of total traffic at any location.

On days when peak construction activities occur, the volume of project trucks added to local streets would be similar to the existing volumes of trucks and buses at most locations. The additional trucks would range from 2 to 4 percent of existing vehicle volumes. One location, East Roanoke Street at Montlake Boulevard East, is expected to have greater than 4 percent added trucks because of its proximity to work bridges on the south side of Portage Bay Bridge. Additional trucks at that location are estimated to be about 6 percent of existing vehicle volumes. Of the remaining locations, those near the high end of the 2 to 4 percent range would be Lake Washington Boulevard East in Montlake, and Boyer Avenue East near Portage Bay. The added trucks on Montlake Boulevard East during peak construction would be just under 1 percent at the interchange and less than 0.5 percent in the Shelby-Hamlin area. At the Eastside locations, additional trucks during peak construction would be less than 3 percent of existing vehicle volumes.

Construction Trucks on Freeways

Most construction trucks would use freeways to reach the project site. The existing total vehicle volumes, including trucks and buses on freeways, are much greater than on arterial streets; therefore, the additional project trucks would not have a substantial effect. Most construction trucks would travel during off-peak traffic conditions because road congestion would delay arrivals and reduce construction productivity.

The estimated volumes of construction trucks are shown in Exhibit 10-10, together with the existing total vehicles and existing trucks and buses. The volume of construction trucks is shown for both the average and peak construction activities. Both estimates are substantially less than the existing daily volumes of trucks and buses.

Exhibit 10-10. **Daily Construction Trucks on Freeways**

	Existing Weekday			Preferred Alternative Construction			
	Total Vehicle Volume	Daily Trucks and Buses	Trucks Percentage of Total Vehicles	Project Average Daily Trucks	Average Truck Percentage of Total Vehicles	Project Peak Daily Trucks	Peak Trucks Percentage of Total Vehicles
SR 520, Portage Bay	104,100	4,100	3.9	60	0.1	350	0.3
SR 520, Lake Washington	115,000	4,400	3.9	60	0.1	350	0.3
SR 520, Medina	115,000	4,400	3.9	110	0.1	590	0.5
SR 520, 108th Avenue NE	113,300	4,400	3.9	120	0.1	590	0.5
I-5, North Seattle	216,600	21,700	10.0	50	< 0.1	340	0.2
I-5, Downtown Seattle	247,800	24,800	10.0	50	< 0.1	340	0.1
I-405, Kirkland	193,300	7,700	4.0	50	< 0.1	240	0.1
I-405, Bellevue	206,200	8,300	4.0	50	< 0.1	240	0.1

Most of the construction trucks using freeways would reach the project site from the west via I-5, particularly for activities on the west side of Lake Washington. For the floating bridge and Eastside transition area, most trucks would arrive from the east. Of the total project trucks, approximately 75 to 85 percent would travel on SR 520 to reach the work sites. About 65 percent would travel on I-5 and 30 percent would use the I-405 corridor. The existing volumes of trucks and buses amount to about 4 percent of total daily vehicles on SR 520 and I-405, and about 10 percent of total daily vehicles on I-5. On average construction days, the trucks added to freeways due to project activities would be negligible at all locations. During peak construction days, the estimated additional trucks would amount to 0.5 percent, or less, of total daily vehicles. The additional trucks would not affect freeway traffic operations in comparison to existing conditions. Haul routes and truck traffic resulting from project construction are not expected to affect I-90.

How would construction affect transit operations?

Construction would affect bus stops and operations on local streets in the study area, and could affect transit stations and associated bus operations along SR 520. Much like general traffic operations, most transit effects would be on the local streets rather than the freeway. The presence of construction activities, temporary roadway modifications, and increased traffic volumes would affect existing transit facilities and how riders use them. Transit travel times through the Montlake area could also be affected. The most substantial change during construction would be the closure of the Montlake Freeway Transit Station. The following sections describe the anticipated changes to transit facilities and the estimated travel time variations during construction.

Montlake Freeway Transit Station

The Montlake Freeway Transit Station on SR 520 would be permanently closed after the new Montlake lid stops are operational. The effects during construction of removing the Montlake Freeway Transit Station would be the same as those described in Chapter 8. The station would remain open during construction, but would be closed for short periods to accommodate construction activities.

During periods of closure, riders who travel from the east side of Lake Washington and currently use the station for access to Montlake or the University District would not be able to use all of the westbound SR 520 bus routes. Instead, they would need to board a bus on one of the University District routes. Riders who do not already use a University District route would need to transfer to buses at one of the SR 520 freeway transit stations on the east side of Lake Washington. Similarly, riders who travel from Montlake or the University District to the Eastside would need to use one of the University District routes on SR 520 and might need to transfer at one of the freeway transit stations. Those who transfer to and from local routes on Montlake Boulevard could do so near East Shelby Street on Montlake Boulevard, or on NE Pacific Street by the UW Medical Center.

During closures, riders who use the Montlake Freeway Transit Station for travel to and from downtown Seattle would not be able to use the SR 520 routes. Instead, they would use local bus routes through the University District and Eastlake or through Capitol Hill. Starting late in year 5 of construction, they would also be able to use light rail as described in Chapter 8.

During closures of the Montlake Freeway Transit Station, the Eastside freeway transit stations at Evergreen Point Road and 92nd Avenue NE would be essential transfer points for riders who currently transfer at Montlake. Both of the transit stations currently serve substantial transfer functions. Sufficient capacity for the additional transfer activity must be available at these locations. WSDOT will coordinate the construction activities along SR 520 to provide the needed capacity throughout construction of the SR 520, I-5 to Medina project. Earlier construction plans, as described in the SDEIS, assumed that the Evergreen Point Freeway Transit Station would be closed for a period of time during construction. Based on current plans, this station would not be closed during construction.

Montlake Boulevard at SR 520

The bus stops on Montlake Boulevard at SR 520 would need to be relocated during construction. The current northbound bus stop at the Montlake Boulevard/SR 520 westbound ramp termini serving northbound routes would be combined with the existing bus stop at Montlake Boulevard/Shelby Street. The southbound stop on Montlake Boulevard at the eastbound off-ramp could be relocated north to the intersection with East Shelby Street until construction is complete. These changes would occur by the beginning of year 3.

Construction of the Preferred Alternative would affect trolley bus operations along Montlake Boulevard. Building the Montlake lid over SR 520 would require significant travel lane shifts and changes in channelization, especially during year 6. This temporary realignment may require construction of temporary trolley wire, including providing new switches and poles along the route or other changes to the transit facilities.

10th Avenue East

The bus stop on southbound 10th Avenue East at East Roanoke Street is located on the existing bridge over SR 520. The stop would remain near its current location during construction, but it would be moved to a nearby temporary location when the bridge is demolished. This move would not substantially affect access to transit or transit operations.

Construction of the Preferred Alternative would affect trolley bus operations on 10th Avenue East. Traffic on this street would be shifted to a temporary bridge during demolition and reconstruction of the 10th Avenue East bridge over SR 520. As with Montlake Boulevard, realignment of the overhead wires or other transit facility improvements would be required to maintain operation of the routes served by trolley buses.

Transit Travel Times

In response to comments received on the SDEIS, WSDOT evaluated the changes to midday transit travel times along Montlake Boulevard that could occur during construction. Many of the daily bus riders travel during this time and, unlike the peak periods, the Montlake Bridge openings can stop traffic during the midday periods. The estimated changes in travel times are shown by year of construction in Exhibit 10-11 for local and SR 520 bus routes that operate on Montlake Boulevard. The results indicate the expected change in minutes from the existing average travel time through the Montlake interchange area, accounting for bridge openings. The temporary road capacity improvements on Montlake Boulevard were included in the analysis, resulting in travel times similar to existing conditions for most time periods and routes.

During years 1 and 2, most construction activity would be away from the Montlake interchange and travel times would not be affected. Prior to year 3, capacity improvements at the Montlake interchange would be built to accommodate traffic from the westbound Lake Washington Boulevard exit ramp. This would allow travel times to remain similar to existing conditions with more traffic on Montlake Boulevard during years 3 and 4, after the ramp is closed. Northbound travel times for local routes could increase slightly due to the addition of a traffic signal at the westbound ramp intersection prior to year 3 of construction.

The reduction of travel times in year 5 is due to reduced traffic on Montlake Boulevard following completion of the bridge over SR 520 on 24th Avenue East. In combination with the capacity improvements on Montlake Boulevard, completed in previous stages, the bridge will improve traffic circulation at the Montlake interchange.

Exhibit 10-11. **Average Off-Peak Transit and HOV Travel Times with Bridge Opening (minutes)**[a]

		Travel Time Change from Existing				
Route	**Existing**	**Years 1-2**	**Years 3-4**	**Year 5**	**Year 6**	**Year 7**
Southbound Montlake Boulevard NE to Eastbound SR 520 (NE Pacific Street to Foster Island)	12.9	0	0	-1	+4	+1
Southbound Montlake Boulevard NE Local Routes (NE Pacific Street to south of East Roanoke Street)	11.8	0	0	-3	0	-5
Southbound Montlake Boulevard NE to Westbound SR 520 (NE Pacific Street to Portage Bay)	12.0	0	0	-1	+2	-4
Westbound SR 520 to Northbound NE Pacific Street (Foster Island to NE Pacific Street)	5.4	0	0	-1	0	-2
Westbound SR 520 to Northbound Montlake Boulevard NE (Foster Island to Montlake Boulevard NE)	5.4	0	0	-1	0	-1
Northbound Montlake Boulevard NE Local Routes (south of East Roanoke Street to NE Pacific Street)	7.5	0	+1	-1	0	+4

[a] Estimates represent the average of all HOV and transit vehicles from 3:00 p.m. to 4:30 p.m. (off-peak),with a Montlake bascule bridge opening between 3:25 p.m. and 3:30 p.m.

The southbound travel times for SR 520 routes are projected to increase in year 6 when the existing Montlake Boulevard bridge over SR 520 is reconstructed. Because of right-of-way constraints during construction activities, the potential capacity improvements on Montlake Boulevard would be limited. Also during this period, traffic volumes on the eastbound SR 520 loop ramp would continue to be higher due to the closure of the eastbound Lake Washington Boulevard ramp in year 5.

During year 7 of construction, the eastbound SR 520 loop ramp at Montlake Boulevard would be reconstructed. All traffic destined for eastbound SR 520 would use a temporary on-ramp along the alignment of the future HOV direct access ramp. This configuration would result in a high volume of traffic traveling southbound and turning left at the intersection of the westbound off-ramp/eastbound on-ramp on Montlake Boulevard. Northbound roadway capacity on Montlake Boulevard would be affected by stops required to allow the southbound left turns, resulting in increased northbound travel times. Because southbound buses to eastbound SR 520 would need to stop at a signal rather than using the loop ramp, these routes could also incur a small increase in delay during year 7. Other routes would have shorter travel times due to completed roadway improvements.

What are the anticipated construction effects on bicyclists and pedestrians?

Construction of the Preferred Alternative would have some effects on bicycle and pedestrian access within the project corridor. In addition to general construction activities that would affect bicycle and pedestrian access, some local bicycle and pedestrian routes would be closed during construction. However, safe access meeting ADA requirements will be provided throughout construction.

Montlake Area

Under the Preferred Alternative, the Montlake Boulevard bridge over SR 520 is one of four north-south connections for pedestrians and bicyclists crossing SR 520 in the Montlake neighborhood that also include the Bill Dawson Trail, 24th Avenue East bridge, and the Arboretum Waterfront Trail. The Bill Dawson Trail runs under SR 520 along the west side of Montlake Boulevard and connects the Montlake Playfield (south of SR 520 on Portage Bay) to Montlake Boulevard north of SR 520. The 24th Avenue East bridge connects Lake Washington Boulevard to East Montlake Park. The Arboretum Waterfront Trail connects East Montlake Park to the Arboretum through Foster Island.

The 24th Avenue East bridge and the Bill Dawson Trail would be closed to pedestrian and bicycle access during the majority of construction. Montlake Boulevard would remain open to pedestrians and bicycles during construction.

Starting with construction in year 2, the 24th Avenue East bridge would be demolished to build the abutments for the proposed 24th Avenue East crossing and portions of the Montlake lid that would be constructed during years 3 and 4. Although the bridge would be open to two lanes of southbound traffic in year 5, no connection to 24th Avenue north of the westbound off-ramp would be provided until year 6. The Bill Dawson Trail is proposed as a temporary construction access road and would be closed to pedestrians and bicycles for the majority of construction. Bicycles and pedestrians would need to use Montlake Boulevard to cross SR 520 during construction.

The tunnel under Montlake Boulevard connecting the Bill Dawson Trail to the regional trail will be built during years 3 to 4 and will be open for use during year 5.

There is an on-street bicycle route on 24th Avenue East between East Shelby Street and East Lake Washington Boulevard. The 24th Avenue East bridge will be demolished during year 2 and replaced as part of the Montlake lid. Pedestrians would need to use Montlake Boulevard to cross SR 520 during construction years 2 through 4.

Major construction activities are proposed for years 2 through 6 along Montlake Boulevard near SR 520 for the Preferred Alternative. Construction methods may restrict bicycle and pedestrian access to one side of Montlake Boulevard over SR 520 during construction. Restrictions would be in place during the entire construction period to prevent the closure of bicycle and pedestrian access on both sides of Montlake Boulevard over SR 520. When traffic is detoured from the Lake Washington Boulevard ramps to the Montlake ramps, bicyclists riding in the street may face more conflicts with vehicles due to the higher volume of traffic and trucks, particularly along Montlake Boulevard compared to other routes. The project would increase the frequency of trucks on roadways; however, the exposure throughout the day would not be substantially greater than existing conditions.

Cyclists who board buses to cross the Evergreen Point Bridge would have to travel to NE Pacific Street to board an SR 520 route. The number of available bike racks on cross-lake buses would be reduced because there would be fewer routes from which to choose. When the Montlake Freeway Transit Station is closed after year 4, the highly used bicycle lockers at that location would also be closed due to the widening of Montlake Boulevard and construction of the new westbound off-ramp and direct access ramps. WSDOT will relocate the bicycle lockers nearby and is currently coordinating with Metro to identify a suitable location.

A major realignment of Montlake Boulevard east onto a portion of the new Montlake lid is proposed during year 6 of construction to build the portion of the lid under Montlake Boulevard. During this stage, the pedestrian crossings will be realigned along this section of Montlake Boulevard. Temporary crossing islands may be created between right-turn and through lanes by skewed geometry; however, because they are temporary, the crossing islands would likely not be protected by raised curbs.

Lane widths may be substandard during this stage due to space constraints, making it difficult for cyclists to share the road with vehicles. Marked and signal-protected pedestrian crossings will improve the 24th Avenue East intersections with Lake Washington Boulevard during year 6, and the westbound off-ramp and direct access ramps in year 7.

Delmar Drive Bridge

During year 2, a portion of the lid west of Delmar Drive East will be built to carry Delmar Drive traffic while the existing Delmar Drive crossing is demolished and reconstructed in years 3 and 4. During year 5, Delmar Drive East will be restored to its current alignment on a new structure equipped with nonmotorized facilities that meet current design standards. As a result, Delmar Drive East would remain open to bicycles and pedestrians throughout construction.

However, cyclists and pedestrians may choose to use alternative routes during construction. Potential detour routes include Boyer Avenue East on the east side of Delmar Drive East and 11th Avenue East to 10th Avenue East on the west side of Delmar Drive. Both routes are feasible for bicycle and pedestrian traffic; however, 11th Avenue East is particularly steep. Depending upon the route traveled, the Boyer Avenue East detour could require longer out-of-direction travel.

Foster Island and the Arboretum

During construction of the west approach, the portion of the Arboretum Waterfront Trail that currently travels under the existing west approach bridge would be closed. Access to the Arboretum Waterfront Trail from East Montlake Park would not be affected. However, the parking lot at the trailhead near East Montlake Park will be reconstructed and parking may not be available for up to 6 months. Parking and temporary access would otherwise be available throughout the construction period.

How would construction affect parking?

Construction would affect parking at several locations in the study area. The estimated effects during construction of the Preferred Alternative are shown in Exhibit 10-12 and described below.

Exhibit 10-12. **Parking Effects During Construction**

Location	Existing Capacity	Spaces Closed During Construction
Bagley Viewpoint	10	10
MOHAI and East Montlake Park	150	124
Husky Stadium Lot E11	429	10
NOAA Northwest Fisheries Science Center[a]	132	50
WSDOT Public Lot	24	12
24th Avenue East	5	5
Lake Washington Boulevard	35	35

[a] Parking supply includes 38 spaces located on WSDOT right-of-way under the existing Portage Bay Bridge.

Bagley Viewpoint

The lot at Bagley Viewpoint (Delmar Drive East and East Roanoke Street) is located in Bagley Park, just east of the Delmar Drive overpass and north of the existing SR 520 structure. The lot currently has 10 parking stalls, of which (on average) only 1 is used. The Preferred Alternative would completely eliminate this lot during construction.

Museum of History and Industry and East Montlake Park

MOHAI is located near McCurdy Park and East Montlake Park, just east of 24th Avenue East. The MOHAI parking lot, which has 150 parking stalls, would be eliminated during construction of the Preferred Alternative. MOHAI would move to a different location prior to the start of construction. Access to East Montlake Park and the Arboretum would be maintained during construction. Once construction is complete, a trailhead parking lot containing approximately 26 parking spaces would be located just north of the stormwater facility.

24th Avenue East On-Street Parking

There are five on-street parking spaces located just west of MOHAI on the west side of 24th Avenue East, south of East Hamlin Street. Construction activities would temporarily block the five spaces at this location.

NOAA Northwest Fisheries Science Center

NOAA has a parking lot with 132 marked spaces on the south side of its Northwest Fisheries Science Center building, south of East Hamlin Street and west of Montlake Boulevard East. Ninety-four of the parking spaces are located within the NOAA property and the remaining 38 are located under the Evergreen Point Bridge structure.

The current design for the Preferred Alternative would permanently remove all 38 parking spaces located under the existing bridge. Approximately 15 of the NOAA parking spaces north of the bridge would be temporarily unavailable during construction of the Portage Bay Bridge. As a result, approximately 50 spaces would be unavailable during construction. Alternative parking would be needed for approximately 40 vehicles during construction. It is possible that some of the 38 lost parking spaces under the bridge could be replaced after construction is complete.

Husky Stadium Lot E11

The construction effects on parking at the U W would not be substantial. During the last year of construction, up to 10 parking spaces could be affected in Husky Stadium lot E11 due to construction on Montlake Boulevard, south of NE Pacific Street.

WSDOT Public Lot (Lake Washington Boulevard)

This parking lot contains at least 24 spaces and is located just east of Lake Washington Boulevard East at East Miller Street. The lot provides access to a trail with connections to the Arboretum. Approximately half of these spaces could be temporarily closed during construction to provide an access point for construction traffic.

Lake Washington Boulevard On-Street Parking

There are approximately 35 on-street parking spaces along Lake Washington Boulevard, east of East Montlake Boulevard. The spaces would be unavailable while the Montlake lid and the 24th Avenue East bridge are under construction.

Construction Employee Parking Considerations

The contractor may provide parking within or near the staging areas or could pursue an option such as operating a shuttle to a remote parking lot. If construction workers do not have designated parking areas, or if the construction parking supply is inadequate, workers would likely seek available long-term parking in the surrounding areas.

It is expected that construction workers would first pursue on-street spaces and then pay lots. However, the use of any on-street parking spaces by construction workers would likely need to be coordinated and approved by the City of Seattle. The City would discourage the use of on-street parking spaces by construction workers. On-street parking spaces are free weekday evenings after 6 p.m. and on Sundays. More specific details regarding construction worker parking would be developed at a later phase of the project design after preferred design options have been selected.

Chapter 11—Cumulative Transportation Effects

What is in this chapter?

This chapter summarizes the cumulative transportation effects of project alternatives in combination with other improvements to regional transportation facilities that were not included in the direct effects analyses described in Chapters 5 through 10. Because the analysis year for direct effects was 2030, the results included effects of projects that were planned and programmed to be completed by that time. The cumulative effects analysis also includes transportation projects that are planned to be completed by 2030, but were not programmed or funded at the time of the direct effects analysis. This includes evaluation of a reasonably foreseeable future tolling scenario for the year 2030. The cumulative effects scenario provides an estimate of travel demand throughout the region—taking into account all other reasonably foreseeable transportation improvement projects that may be constructed during the same time frame as the SR 520, I-5 to Medina project.

Several conclusions can be drawn by comparing projected travel demand and travel patterns from the project alternatives with those from the cumulative effects scenario. This chapter summarizes those conclusions.

The following terms are used throughout this chapter and defined as follows:

- **Cumulative Effects Scenario:** This scenario is used for traffic analysis and assumes future implementation of an extended regional package of transportation capacity improvements in addition to the SR 520, I-5 to Medina project.

- **Preferred Alternative:** The Preferred Alternative, also referred to as the Build Alternative, includes the following elements:

  – A 6-lane SR 520 corridor from I-5 in Seattle to Evergreen Point Road in Medina that includes two general-purpose and one transit/HOV lane in each direction

  - Reversible transit/HOV ramp to the I-5 express lanes; headed from the Eastside to downtown Seattle in the morning and from downtown Seattle to the Eastside in the evening
  - A 6-lane Portage Bay Bridge with a westbound peak-period managed shoulder
  - Transit/HOV direct access ramps to and from the Eastside at the SR 520/Montlake Boulevard interchange
  - Removal of the Lake Washington Boulevard ramps to and from SR 520
  - A new bascule bridge across the Montlake Cut that provides additional capacity for transit/HOV, bicycles, and pedestrians

Elements of the Preferred Alternative include the transportation network assumptions described in other chapters of this report, but do not include the additional regional package of capacity improvements assumed in the cumulative effects scenario.

The following sections describe the regional transportation improvements included in the cumulative effects scenarios, as well as how those scenarios were modeled. The results of the analysis are presented primarily in terms of screenline and cross-lake travel demand for both daily and afternoon peak periods. Screenline results include the following major regional corridors: I-5, I-405, I-90, SR 522, and SR 520.

This evaluation of cross-lake travel specifically compares travel demand and mode choice between SR 520 and I-90. The No Build and Preferred Alternatives were evaluated against the cumulative effects scenario for both the screenline and cross-lake travel demand assessments.

What was included in the regional package for the cumulative effects scenario?

WSDOT decided that the transportation system modeled for the year 2030 cumulative effects scenario should include regional transportation facility improvements that are not included in the direct effects analysis of the No Build and Preferred Alternatives. This model includes transportation projects that are planned to be completed by 2030, but were not programmed or funded at the time of the direct effects analysis. For the 2030 cumulative effects scenario, regional pricing strategies were also assumed to be in place in the I-90, I-405, and SR 99 corridors, in addition to the SR 520 toll that is included in the Preferred Alternative.

Highway Network

Exhibit 11-1 identifies additional highway projects included in the cumulative effects scenario. These projects are currently not funded, but could be completed by 2030. Of these projects, several I-405 projects are part of the I-405 Master Plan but are not funded by the 2003 Nickel, 2005 Transportation Partnership Account, or the American Recovery and Reinvestment Act. The projects referenced in Exhibit 11-1 were documented in PSRC's *Transportation 2040* (adopted May 20, 2010) and/or the I-405 Master Plan.

Exhibit 11-1. **Unfunded Highway Projects Included in the Final EIS Cumulative Effects Scenario**

Project	Notes
I-405–Southbound (SB) Braided Ramps: Construct SB braided ramps between SR 520 and NE 8th Street, including ramp connections to NE 10th Street	I-405 Master Plan, *Transportation 2040*; estimated completion by 2030
SR 520–124th Avenue NE Interchange: Construct additional ramps to and from the east on SR 520	I-405 Master Plan, *Transportation 2040*; unfunded. Being pursued by the City of Bellevue as part of the Bel-Red area transformation
I-405 at North 8th Street: Construct an HOV interchange on I-405 at North 8th Street in north Renton	*Transportation 2040*
I-405 at I-90: Add northbound (NB) I-405 to eastbound (EB) I-90 and EB I-90 to SB I-405 braided ramps and westbound (WB) I-90 and NB I-405 freeway-to-freeway HOV/high-occupancy toll (HOT) connection	*Transportation 2040*, estimated completion by 2030
I-405 at NE 6th Street Extension: Construct east half of interchange to provide HOV/HOT access	*Transportation 2040*
I-405 at SR 520: Add direct HOV connections in the NW, SE, and SW quadrants of the I-405/ SR 520 interchange. Includes modifying ramps at 124th Avenue NE	*Transportation 2040*, unfunded
I-405 at SR 522 Interchange: Reconfigure and rebuild the SR 522 Interchange. The existing SR 522 WB to I-405 SB ramp will remain; will include HOV direct connection in center	*Transportation 2040*

Exhibit 11-1. **Unfunded Highway Projects Included in the Final EIS Cumulative Effects Scenario**

Project	Notes
I-405: SR 169 to NE 6th Street express toll lanes (ETLs): Convert the existing HOV lanes and add a new lane in each direction to provide a 2-lane express toll system.	I-405 Master Plan, *Transportation 2040;* partially funded. Initial stage(s) of this project are expected to be open to traffic by 2030
I-405: I-5 to SR 167 ETLs: Convert existing lanes into a 1-lane express toll system between I-5 and SR 167	I-405 Master Plan, *Transportation 2040*
I-405: SR 167 to SR 169 ETLs: Construct freeway-to-freeway HOT lane ramps for the NB to NB and SB to SB movements. Convert existing lanes on I-405 to provide a 2-lane express toll system between SR 167 and SR 169	I-405 Master Plan, *Transportation 2040*
I-5 at Airport/Industrial Way: Implement HOV direct access to E3 busway	*Transportation 2040*, estimated completion by 2025
I-5: Construct NB peak-period transit-lane shoulder (Olive Way – SR 520)	*Transportation 2040*, estimated completion by 2025

Local Street Network

Exhibit 11-2 identifies local street projects included in the cumulative effects scenario. These projects are currently not funded, but could be complete by 2030.

Exhibit 11-2. **Unfunded Local Street Projects Included in the Final EIS Cumulative Effects Scenario**

Project	Location	Notes
Mercer Corridor Improvements: Phase II – Dexter Avenue to Elliott Way West	Seattle	Not fully funded.
South Lander Street Grade Separation (1st Avenue South – 4th Avenue South)	Seattle	This project is not coded in the Final EIS Cumulative Effects model because the project will not increase capacity. *Transportation 2040*, funded by 2040.
118th Avenue NE Road Extension – north of NE 116th (new) to NE 118th Street	Kirkland	This project is not coded in the Final EIS Cumulative Effects model because the supporting road network is not available. Funding status unclear.
NE 132nd Street Road Improvements – 100th Avenue to 132nd Avenue	Kirkland	25 to 30% increase in capacity.

Exhibit 11-2. **Unfunded Local Street Projects Included in the Final EIS Cumulative Effects Scenario**

Project	Location	Notes
119th Avenue NE Road Extension: NE 128th Street to NE 130th Street	Kirkland	This project is not coded in the Final EIS Cumulative Effects model because the supporting road network is not available.
NE 130th Street Road Extension: Totem Lake Boulevard to 120th Avenue NE	Kirkland	This project is not coded in the Final EIS Cumulative Effects model because the supporting road network is not available.
120th Avenue NE Road Extension: NE 116th Street north to Burlington Northern Santa Fe Railroad crossing	Kirkland	This project is not coded in the Final EIS Cumulative Effects model because the supporting road network is not available.
124th Avenue NE Road Improvement, NE 85th Street to NE 116th Street (widen to 3 lanes)	Kirkland	
132nd Avenue NE Road Improvement, NE 85th Street to Slater Avenue NE (widen to 3 lanes)	Kirkland	
NE 120th Street (west section) from 124th Avenue NE to Burlington Northern Santa Fe Railroad Crossing (construct 2 to 3 lanes as needed)	Kirkland	This project is not coded in the Final EIS Cumulative Effects model because the supporting road network is not available.
NE 4th Street Extension: 116th Avenue NE to 120th Avenue NE (construct new 3- to 5-lane roadway)	Bellevue	Increase in capacity not provided.
120th Avenue NE Corridor Widening to 5 Lanes: NE 4th Street to Northup Way	Bellevue	Only the portion of this project between NE 4th Street and NE 12th Street is coded in the Final EIS Cumulative Effects model; no increase in roadway capacity in the remaining sections. *Transportation 2040*, funded by 2040.
Bellevue Way HOV Lanes and Transit Priority (South Bellevue Park-and-Ride to I-90)	Bellevue	*Transportation 2040*, funded by 2040.
Bel-Red Regional Connectivity: Extend NE 16th Street (NE 124th Street to NE 136th Place) and widen 136th Place NE (NE 16th Street and NE 20th Street)	Bellevue	The portion of this project between 124th Avenue and 132nd Avenue is coded in the Final EIS Cumulative Effects model. Outside of these parameters, part of the supporting road network is not available and the remaining road network will not increase capacity. *Transportation 2040*, unfunded.

Exhibit 11-2. **Unfunded Local Street Projects Included in the Final EIS Cumulative Effects Scenario**

Project	Location	Notes
Bel-Red Regional Connectivity: Increased connectivity between downtown Bellevue/Overlake growth center and the new Bel-Red transit-oriented development node. Widening, non-motor improvements (120th Avenue NE, 124th Avenue NE, NE 4th Street)	Bellevue	*Transportation 2040*, funded by 2040.
Coal Creek Parkway Widening to 6 Lanes at I-405 Intersection	Bellevue	*Transportation 2040*, unfunded.
East Marginal Way Grade Separation (South Idaho Street to Spokane Street)	Port of Seattle	This project is not coded in the Final EIS Cumulative Effects model because the project will not increase capacity. *Transportation 2040*, funded by 2040.
North Argo Truck Roadway (Duwamish Avenue South to Colorado Avenue South)	Port of Seattle	This project is not coded in the Final EIS Cumulative Effects model because the supporting road network is not available. *Transportation 2040*, unfunded.
Coal Creek Parkway: Add HOV lane and transit priority (Forest Drive to I-405)	WSDOT	*Transportation 2040*, funded by 2040.

Transit Network

No additional transit improvements beyond those identified for the year 2030 No Build and Build alternatives are included in the cumulative effects scenario. All projects included in the Sound Transit 2 plan are currently funded and are now included in the year 2030 No Build and Build alternatives.

Tolling and Pricing

Exhibit 11-3 identifies the regional tolling and roadway pricing concept included in the cumulative effects scenario. These tolling and pricing assumptions are similar to PSRC's mid-range constrained tolling strategy—an early phase (year 2025) tolling implementation concept for *Transportation 2040*. PSRC's concept includes 1- and 2-lane HOT lanes (i.e., I-405 and sections of I-5), with fully tolled selected facilities (i.e., SR 520, I-90, I-5 express lanes, and sections of SR 99).

Exhibit 11-3. **Tolling Components Currently Included in the Final EIS Cumulative Effects Scenario**

Roadway	Toll Description	Notes
SR 520 Cross-lake	Single point toll with same toll rate as Final EIS Preferred Alternative, 3+ HOV/transit free	Same assumption as Final EIS Build Alternative
I-90 Cross-lake	Single point toll on I-90 west bridge, with same toll rate as SR 520; 3+ HOV/transit free	Consideration of tolling I-90 is consistent with the intent of Engrossed Substitute House Bill (ESHB) 3096. No project is currently identified.
I-405 ETLs: 1- to 2-lane system the length of I-405 providing buffer-separated lanes with tolled use by general-purpose traffic and free 3+ HOV/transit use	ETL toll rate of $0.20 per mile (2010 dollars) during AM/PM peak periods; $0.05/mile for midday, evening, and night periods; 3+ HOV/transit free	Bellevue to Lynnwood section is currently funded but tolling was not included in base model because operation of new lanes has not been determined.
SR 167	Same as existing ETL, 3+ HOV/transit free	Same as Final EIS No Build and Build alternatives
SR 99 Bored Tunnel	Scenario “C” toll rates per SR 99 Final EIS, 3+ HOV/transit free	Potential funding source for SR 99 project

A tolling and pricing concept similar to PSRC’s mid-range constrained tolling strategy is used in the SR 520 Final EIS cumulative effects analysis. The SR 520 Final EIS cumulative effects tolling and pricing concept, shown in Exhibit 11-3, includes full facility tolls on SR 520, I-90, and SR 99. It also includes express toll lanes (ETLs) on I-405 and SR 167. Unlike PSRC’s mid-range constrained tolling strategy, the I-5 corridor is not assumed to be tolled for the SR 520 Final EIS cumulative effects analysis because there is no clear legislative intent to move forward with pricing strategies in this corridor at this time.

The tolling strategies evaluated in this cumulative effects section are not intended to replace the necessary full study of each corridor and their more specific planning and evaluation processes. This evaluation is only intended to provide a high-level planning assessment as to the potential effect a more regional-level toll strategy might have on the SR 520 corridor traffic and person volumes.

How was the travel modeling conducted?

WSDOT used the SR 520 travel demand model to analyze potential future cumulative effects throughout the region, and specifically their effect on cross-lake travel demand. The cumulative effects scenario was built upon the Preferred Alternative network. The SR 520 travel demand model was validated against actual travel data for this corridor. The cumulative effects scenario was then compared with the No Build Alternative and the Preferred Alternative for both daily and peak periods. The primary measures used to make the comparisons included vehicle trips and person trips.

The steps in developing the cumulative effects scenario model runs included the following:

1. The cumulative effects package of other regional projects was added to the project travel demand model with the Preferred Alternative and the model was run to obtain output for the scenario.

2. The output results from the transportation model run for the cumulative effects scenario were then compared to the results of the model runs for the Build Alternative.

To compare results from the model runs, six screenlines were developed at the following locations:

- Screenline 1: Midspan bridge (Evergreen Point Bridge and I-90 Bridge, and SR 522)
- Screenline 2: East of I-405 (between SR 520 and I-90)
- Screenline 3: North of SR 520 (between Lake Washington Boulevard NE and 148th Avenue NE)
- Screenline 4: Lake Washington Ship Canal (Fremont Bridge to Montlake Bridge, a combination of Seattle screenlines 5.12, 5.13, and 5.16)
- Screenline 5: South of I-90 (East Marginal Way to Rainier Avenue South, a combination of Seattle screenlines 9.12 and 9.13)
- Screenline 6: South of I-90 (118th Avenue SE, I-405, Factoria Boulevard SE, and 150th Avenue SE)

What are the cumulative effects findings?

WSDOT consolidated and summarized extensive data from the travel demand modeling. The results are presented in several formats to provide insight into the travel behavior of automobiles and transit riders under the No Build Alternative, Preferred Alternative, and the cumulative effects scenario. Specifically, screenlines were used to compare the differences in cross-lake and north-south travel between the different scenarios. The following discussion represents results from the screenline data and more specific cross-lake travel trends that were observed. The vehicle and person demand data reported in this chapter should not be directly compared to the results of operations analysis in other chapters. The cumulative effect results are output from the project travel demand model and are to be used for relative comparison of transportation scenarios at a regional level. For 2030 forecasts of vehicle and person demand, refer to Chapter 5—Freeway Volumes and Operations.

Regional Travel Patterns

Several exhibits were developed that depict the results of the cumulative effects modeling in comparison to the model results of the project alternatives. Both daily and afternoon peak period screenlines were developed for vehicle and person trips. Exhibits 11-4 and 11-5 present screenline daily results for vehicle and person trips, respectively. Exhibits 11-6 and 11-7 present afternoon peak period screenline results for vehicle and person trips, respectively.

The screenline exhibits show the different forecasted vehicle and person trips for the Preferred Alternative, the cumulative effects scenario, and the No Build Alternative. The No Build Alternative results from the travel demand model were used as a basis of comparison for the Preferred Alternative model run as well as the cumulative effects model run.

General observations are as follows:

- The addition of tolls on SR 99 and I-90, including the express toll lanes on I-405 provided in the cumulative effects scenario, combined with the increased roadway capacity on I-405 would result in increased vehicle and person trips on the Eastside (see screenlines 2, 3, and 6). This is particularly true for north-south trips, and is likely because the available capacity on I-405 and SR 167 would create a more attractive regional north-south route in comparison to I-5 and a tolled SR 99 facility.

- Cross-lake vehicle and person demand (see screenline 1) would be less in the cumulative effects scenario compared to the direct effects of the project alternatives. The presence of tolls on both SR 520 and

I-90 would reduce the demand for cross-lake trips. In addition, increased north-south capacity on Eastside facilities (e.g., I-405) would improve Eastside traffic circulation and likely shift some cross-lake demand to other routes.

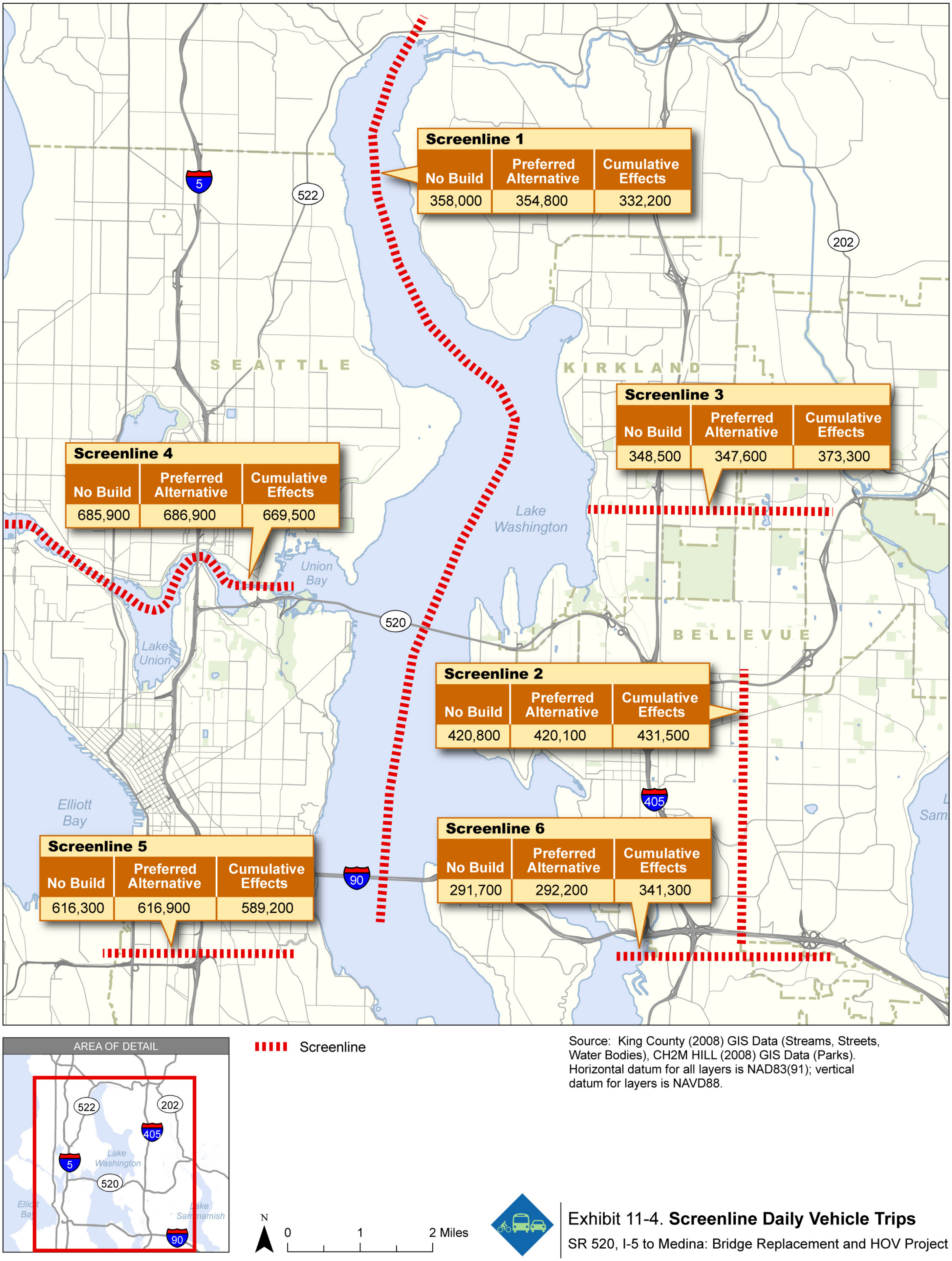
- Seattle screenlines (see screenlines 5 and 6) show relatively uniform decreases in north-south trips caused by the cumulative effects scenario. This would likely be due to the diversion of north-south trips through Seattle away from a tolled SR 99 corridor, as well as a diversion of trips between south King County and the Eastside away from the I-5/I-90 route.

Cross-Lake Travel Demand

The results of cross-lake travel demand on I-90, SR 520, and SR 522 for cumulative effects show similar trends in both vehicle and person trips among the Preferred Alternative, No Build Alternative, and the cumulative effects scenario in both the daily and afternoon peak periods. The cumulative effects scenario shows a slight decrease in daily cross-lake vehicle demand compared to the No Build Alternative and the Preferred Alternative (about 7 percent and 6 percent, respectively). These effects are shown in Exhibits 11-4 through 11-7.

This decrease in cross-lake vehicle trips can, in part, be attributed to several capacity improvements in the regional corridor on the Eastside that were included in the cumulative effects scenario. Increased capacity on Eastside roadways would allow some trips to shift from the cross-lake routes to other routes on the Eastside. The introduction of an I-90 Bridge toll in the cumulative effects scenario also contributes to the reduction in cross-lake trips. With the largest north-south capacity increases occurring on I-405 south of I-90, and the addition of an I-90 toll, I-90 would experience a large decrease in cross-lake vehicle travel demand. The vehicular demand to use SR 520 would remain substantial, with or without the added tolls and regional corridor improvements.

The same pattern is exhibited for daily person trips when comparing the cumulative effects scenario with the No Build and Preferred Alternatives. The cumulative effects scenario exhibits lower cross-lake person trips than either the No Build Alternative or Preferred Alternative, although the percentage difference (4 percent) is less than for vehicle trips.



Screenline 1

No Build	Preferred Alternative	Cumulative Effects
358,000	354,800	332,200

Screenline 2

No Build	Preferred Alternative	Cumulative Effects
420,800	420,100	431,500

Screenline 3

No Build	Preferred Alternative	Cumulative Effects
348,500	347,600	373,300

Screenline 4

No Build	Preferred Alternative	Cumulative Effects
685,900	686,900	669,500

Screenline 5

No Build	Preferred Alternative	Cumulative Effects
616,300	616,900	589,200

Screenline 6

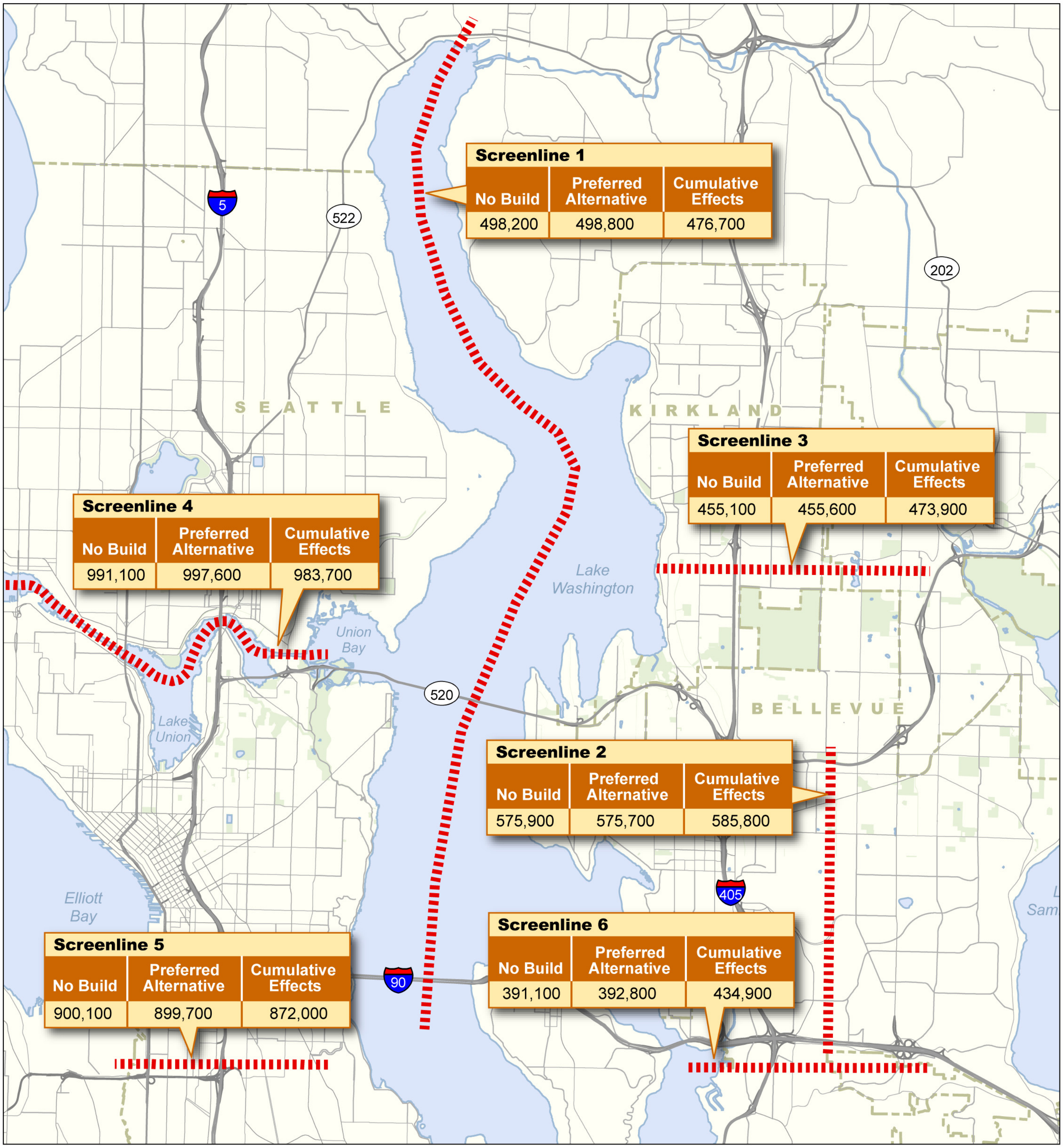
No Build	Preferred Alternative	Cumulative Effects
291,700	292,200	341,300

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 11-4. **Screenline Daily Vehicle Trips**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

\\simba\proj\Parametrix\180171\GRAPHICS\x_FEIS_Westside\TRAN\FEIS_DR_TRAN_Ex11-04_GR283_ScreenlineDailyVehTrips.ai



Screenline 1

No Build	Preferred Alternative	Cumulative Effects
498,200	498,800	476,700

Screenline 3

No Build	Preferred Alternative	Cumulative Effects
455,100	455,600	473,900

Screenline 4

No Build	Preferred Alternative	Cumulative Effects
991,100	997,600	983,700

Screenline 2

No Build	Preferred Alternative	Cumulative Effects
575,900	575,700	585,800

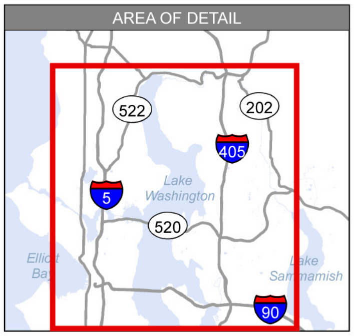
Screenline 5

No Build	Preferred Alternative	Cumulative Effects
900,100	899,700	872,000

Screenline 6

No Build	Preferred Alternative	Cumulative Effects
391,100	392,800	434,900

AREA OF DETAIL



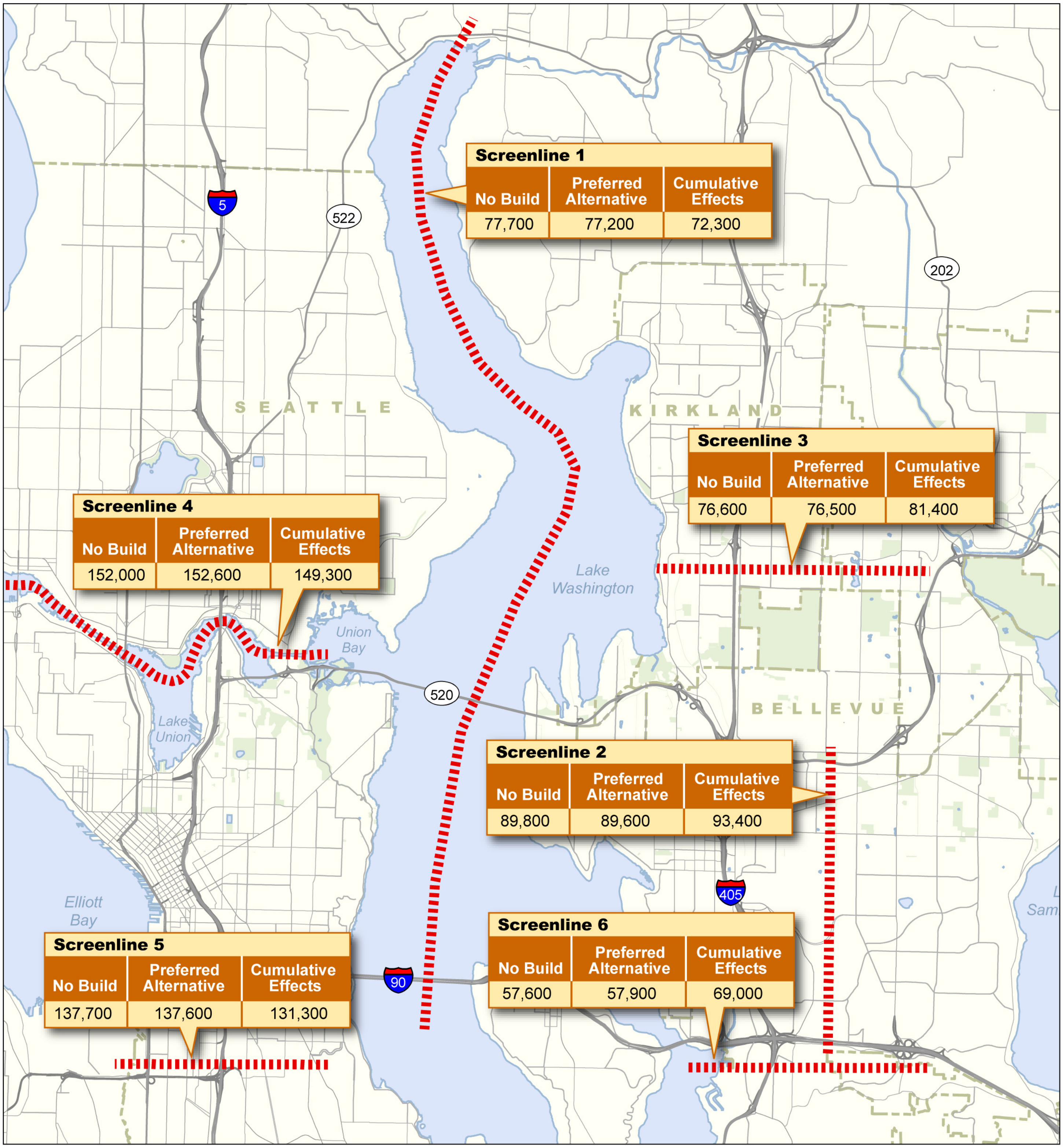
▮▮▮▮▮ Screenline

N 0 1 2 Miles

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 11-5. **Screenline Daily Person Trips**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project



Screenline 1

No Build	Preferred Alternative	Cumulative Effects
77,700	77,200	72,300

Screenline 3

No Build	Preferred Alternative	Cumulative Effects
76,600	76,500	81,400

Screenline 4

No Build	Preferred Alternative	Cumulative Effects
152,000	152,600	149,300

Screenline 2

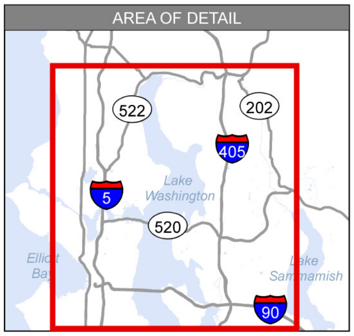
No Build	Preferred Alternative	Cumulative Effects
89,800	89,600	93,400

Screenline 6

No Build	Preferred Alternative	Cumulative Effects
57,600	57,900	69,000

Screenline 5

No Build	Preferred Alternative	Cumulative Effects
137,700	137,600	131,300



▮▮▮▮▮ Screenline

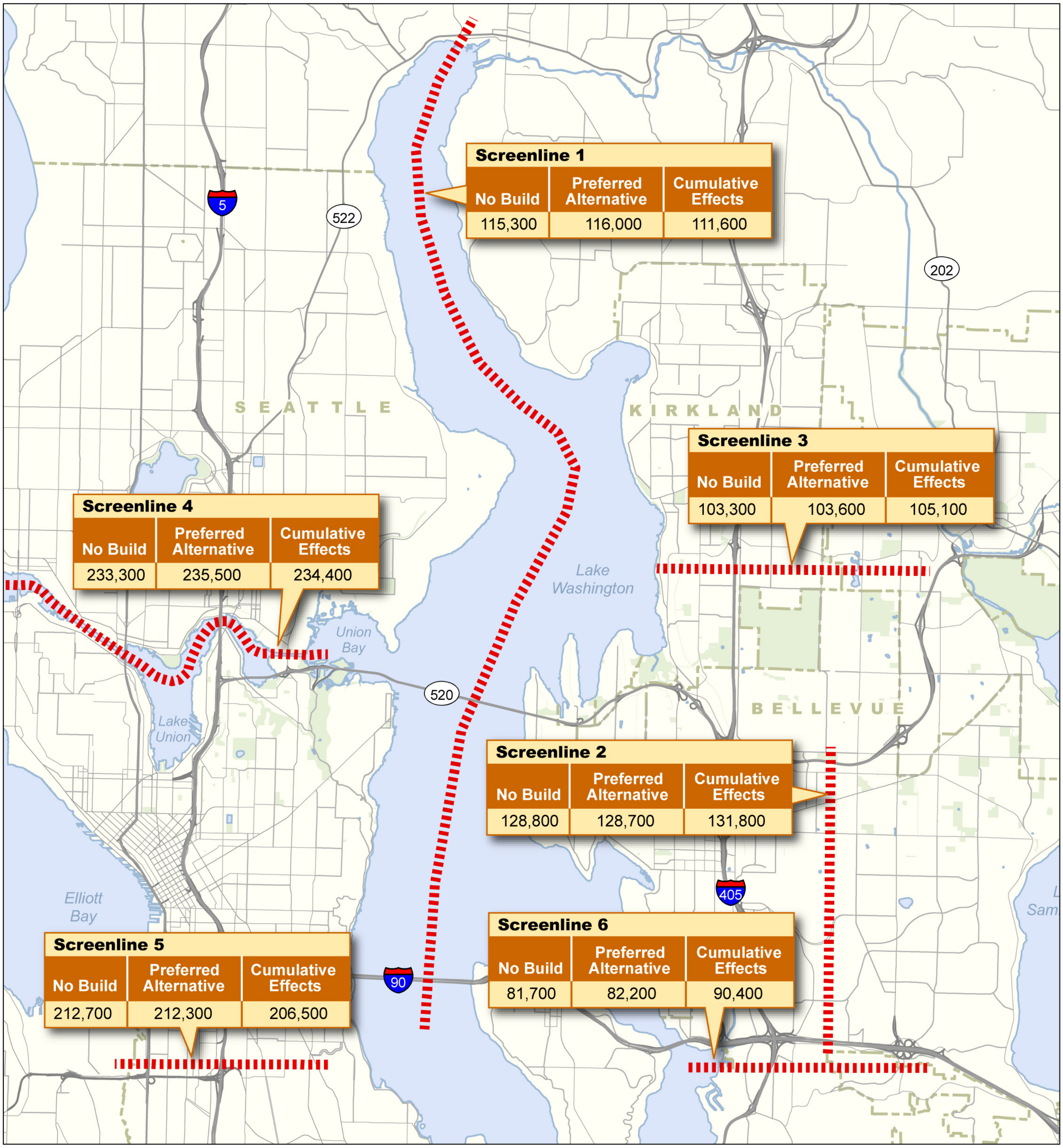
N

0 1 2 Miles

Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 11-6. **Screenline PM Peak Period Vehicle Trips**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project



Screenline 1

No Build	Preferred Alternative	Cumulative Effects
115,300	116,000	111,600

Screenline 2

No Build	Preferred Alternative	Cumulative Effects
128,800	128,700	131,800

Screenline 3

No Build	Preferred Alternative	Cumulative Effects
103,300	103,600	105,100

Screenline 4

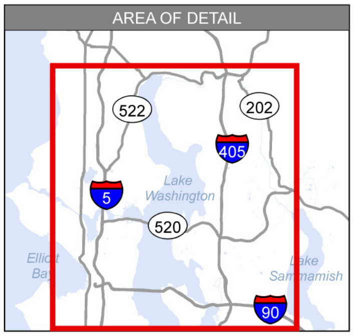
No Build	Preferred Alternative	Cumulative Effects
233,300	235,500	234,400

Screenline 5

No Build	Preferred Alternative	Cumulative Effects
212,700	212,300	206,500

Screenline 6

No Build	Preferred Alternative	Cumulative Effects
81,700	82,200	90,400



Source: King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAD88.

Exhibit 11-7. **Screenline PM Peak Period Person Trips**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

Another observation regarding cross-lake travel is a general increase in the ratio of person trips to vehicle trips. The combination of higher 3+ person HOV usage on SR 520 due to the exemption of tolls in the HOV lanes on the bridge, as well as the addition of 3+ HOV-exempt tolling on I-90 with light rail, increases the attractiveness of travel that do not involve single-occupant vehicles and the overall person-carrying efficiency of the two bridges.

The model results suggest that several specific capacity improvements, in combination with tolling on the Evergreen Point Bridge and I-90 Bridge, would encourage some cross-lake trips to remain on the Eastside. The incorporation of the 10- to 15-year Implementation Plan for I-405 assumes an increase in capacity on I-405 between I-5 in Tukwila and SR 522 in Bothell. Between now and 2030, additional capacity is also planned for SR 167 (from SE 180th Street to I-405) and SR 522 (bus lane). Both regional facilities tie into I-405 and would provide a viable alternative to the cross-lake bridges, given the additional capacity of these facilities and the requirement to pay a toll to cross either the Evergreen Point Bridge or I-90 Bridge.

North-South Travel Demand

The north-south travel demand screenlines for the cumulative effects scenario show similar trends in both vehicle and person trips during the daily and afternoon peak periods. Exhibits 11-4 through 11-7 show the increase in north-south trips on the Eastside south of I-90 (screenline 6).

The cumulative effects scenario shows daily trips on the Eastside south of I-90 increasing by 17 percent in vehicle trips, and by 11 percent for daily person trips compared to the No Build and Preferred Alternatives. This increase reflects the capacity improvements in the form of express toll lanes assumed along I-405 and SR 167.

I-5 would also be affected by the change in roadway capacity on the Eastside. In fact, given that I-405 would become more attractive with its additional capacity, travel demand on the I-5/ SR 99 corridor south of I-90 (see screenline 5) would decrease by approximately 4 percent on a daily basis.

The north-south screenline north of SR 520 and east of Lake Washington (screenline 3) shows an increase in daily vehicle trips by approximately 7 percent and person trips by approximately 4 percent with the cumulative effects scenario compared to the No Build and Preferred Alternatives. This increase suggests that more north-south trips would be made in the I-405 corridor due to the additional capacity provided by the year 2030 and the introduction of tolling on the SR 99 corridor.

East-west demand would increase slightly east of I-405 (screenline 2) in the cumulative effects scenario. The daily increase, compared to either the No Build Alternative or Preferred Alternative, would be about 3 percent for daily vehicle trips and 2 percent for daily person trips. Given the increased attractiveness of the I-405 corridor due to the increased capacity in the cumulative effects scenario and the fact that more trips would remain on the Eastside, an increase in trips along this stretch of SR 520 is reasonable.

What happens to cross-lake mode choice?

Exhibits 11-8 through 11-11 show the modeled results for year 2030 cross-lake daily and afternoon peak-period vehicle and person trips. With this information, travel demand was compared among HOVs, general-purpose vehicles, and transit across the Evergreen Point Bridge and I-90 Bridge. The following paragraphs discuss the key findings from that analysis.

In summary, the percentage of people on each corridor using HOV modes of travel increases or stays the same in the cumulative effects scenario when compared with the Preferred Alternative.

	% HOV		
Location	**No Build Alternative**	**Preferred Alternative**	**Cumulative Effects Scenario**
SR 522	12%	10%	11%
SR 520	12%	24%	24%
I-90	31%	26%	30%
Total	**22%**	**23%**	**25%**

When evaluating the choice of cross-lake travel mode for the Preferred Alternative and the cumulative effects scenario, it is necessary to isolate the effects on cross-lake vehicle demand to avoid erroneous conclusions. Capacity improvements in the SR 167/I-405 corridor contained in the cumulative effects scenario would cause a considerable number of trips that would be traveling along I-5 and I-90 to divert to the I-405 corridor. In addition, the introduction of tolls on both the SR 520 and I-90 corridors would likely deter some travelers from making cross-lake trips.

As shown in Exhibit 11-8, the cross-lake daily vehicular traffic would be about 6 to 7 percent less in the cumulative effects scenario than in the No Build and Preferred Alternatives. The primary decrease in vehicle trips would occur on I-90, where total daily vehicle trips are shown to decrease by approximately 28,000 (or 16 percent) compared to the No Build Alternative and 30,000 (or 17 percent) compared to the Preferred Alternative.

On SR 520, daily vehicle trips are expected to increase with the cumulative effects scenario by approximately 1,500 (or 1 percent) compared to the No Build Alternative and by 7,900 (or 7 percent) compared to the Preferred Alternative. These numbers suggest that the introduction of a toll on I-90 would result in a considerable decrease in vehicle trips on I-90 and a relatively small increase in trips on SR 520. Negligible changes in vehicle trips would occur on SR 522 among the No Build Alternative, Preferred Alternative, and cumulative effects scenario. A review of vehicle volumes during the afternoon peak period, shown in Exhibit 11-10, yields similar comparisons.

Some changes to cross-lake transit and HOV person trips are also associated with the cumulative effects scenario when compared with the No Build and Preferred Alternatives. Exhibits 11-9 and 11-11 show that total cross-lake transit ridership would remain similar (within 10 percent of total daily person trips) with the No Build Alternative, Preferred Alternative, and cumulative effects scenario. However, with the cumulative effects scenario, total daily cross-lake HOV person trips would increase by approximately 15 percent compared to the No Build Alternative and by about 6 percent compared to the Preferred Alternative.

On SR 520, the addition of an HOV lane and a toll on non-HOV vehicles associated with the Preferred Alternative would result in a substantial increase (approximately 20,000 trips or 125 percent) in daily HOV person trips compared to the No Build Alternative. The addition of an I-90 toll with the cumulative effects scenario would result in further increases in daily HOV person trips on SR 520 over the Preferred Alternative (approximately 2,400 trips or 7 percent).

For I-90, the changes to SR 520 associated with the Preferred Alternative would reduce the number of daily HOV person trips by approximately 10,000 (or 25 percent) when compared to the No Build Alternative. The introduction of an I-90 toll with the cumulative effects scenario would, in turn, result in approximately 1,700 trips (or 6 percent) increase in daily HOV person trips on I-90 over the Preferred Alternative because some general-purpose trips would likely shift to HOV usage to avoid a toll.

What are the conclusions of the cumulative effects evaluation?

Several conclusions are apparent in comparing the cumulative effects scenarios to the project alternatives. These are summarized below.

- Total traffic crossing the SR 520 corridor is forecasted to increase by 7 percent in the cumulative effects scenario compared to the Preferred Alternative. This is a 1 percent increase in total traffic compared to the No Build Alternative. All of the increase in volume compared to the No Build Alternative would occur in the HOV lanes. The HOV lane in the SR 520 corridor would have adequate capacity to accommodate this level of increase. This means that if the regional projects assumed in the cumulative effects scenario are implemented in conjunction with the SR 520, I-5 to Medina project, more person trips would likely be made across Lake Washington using SR 520; as a result, traffic conditions within the project corridor may fall somewhere between what has been estimated with the No Build and Preferred Alternatives in the Final EIS.

- Because the SR 520, I-5 to Medina project completes the HOV lane system between Redmond and Seattle, and assuming carpools and transit would not be required to pay a toll, a considerable increase in HOV demand would occur along SR 520 with the Preferred Alternative compared to the No Build Alternative. The combination of reduced travel time and cost avoidance is a powerful incentive for carpool and transit use. An additional, but smaller, increase in carpool demand is also projected in the cumulative effects scenario compared to the Preferred Alternative with the introduction of a toll on I-90.

- Total net peak and daily cross-lake vehicle travel with the cumulative effects scenario would be lower when compared to the No Build and Preferred Alternatives. However, the number of peak and daily cross-lake HOV vehicle trips is expected to increase while the number of cross-lake general-purpose trips would decrease.

- Cross-lake vehicle trips would decrease at a higher rate than person trips. This means that more people would be moved by fewer vehicles with the cumulative effects scenario than with the No Build and Preferred Alternatives.

- Total cross-lake HOV travel would increase with the cumulative effects scenario compared to the No Build and Preferred Alternatives. This is due to the increasing shift to HOV travel that would result from the implementation of tolls on both SR 520 and I-90.
- Internal traffic circulation on the Eastside would improve. Also, more trips would likely remain on the Eastside due to the introduction of tolls on SR 99 and I-90 and capacity improvements along regional corridors such as I-405 and SR 167. Therefore, the volume across the cross-lake screenline is expected to decrease, while volumes across screenlines on the Eastside are projected to increase with the cumulative effects scenario.

Exhibit 11-8. **2030 Cross-Lake Average Weekday Vehicle Trip Volumes**

	Average Weekday Vehicle Volumes		
Roadway Facility	**Total Non-HOV[a]**	**HOV (3+)**	**Total**
2030 No Build Alternative			
SR 522 (West of 61st Avenue NE)	52,550	1,760	54,310
SR 520 (Evergreen Point Bridge)—General-Purpose Lanes	123,040	4,530	127,570
SR 520 (Evergreen Point Bridge)—HOV Lanes	—	—	—
I-90 (West Bridge)—General-Purpose Lanes	164,750	2,090	166,840
I-90 (West Bridge)—HOV Lanes	—	9,320	9,320
I-90 Light Rail	—	—	—
Total Cross-Lake	340,340	17,700	358,040
2030 Preferred Alternative[b]			
SR 522 (West of 61st Avenue NE)	53,970	1,520	55,490
SR 520 (Evergreen Point Bridge)—General-Purpose Lanes	111,640	—	111,640
SR 520 (Evergreen Point Bridge)—HOV Lanes	—	9,470	9,470
I-90 (West Bridge)—General-Purpose Lanes	170,150	1,760	171,910
I-90 (West Bridge)—HOV Lanes	—	6,320	6,320
I-90 Light Rail	—	—	—
Total Cross-Lake	335,760	19,070	354,830
2030 Cumulative Effects[b]			
SR 522 (West of 61st Avenue NE)	53,430	1,590	55,020
SR 520 (Evergreen Point Bridge)—General-Purpose Lanes	118,960	—	118,960
SR 520 (Evergreen Point Bridge)—HOV Lanes	—	10,080	10,080
I-90 (West Bridge)—General-Purpose Lanes	139,620	300	139,920
I-90 (West Bridge)—HOV Lanes	—	8,200	8,200
I-90 Light Rail	—	—	—
Total Cross-Lake	312,010	20,170	332,180

[a] Includes non-HOV and commercial vehicles.

[b] Toll model run was executed for mode choice and route diversion effects using trip distribution results from the 2030 Preferred Alternative toll-free model run.

Notes: Model results are bi-directional and for comparison purposes.
The model was validated for the SR 520 corridor. Other regional facilities included in the model were validated as part of the regional modeling process.

Exhibit 11-9. **2030 Cross-Lake Average Weekday Person Trip Volumes**

	Average Weekday Person Trip Volumes				
Roadway Facility	**Non-HOV**	**HOV (3+)**	**Commercial**	**Transit**	**Total**
2030 No Build Alternative					
SR 522 (West of 61st Avenue NE)	56,490	6,200	3,290	1,840	67,820
SR 520 (Evergreen Point Bridge)—General-Purpose Lanes	123,750	16,020	15,340	3,670	158,780
SR 520 (Evergreen Point Bridge)—HOV Lanes	—	—	—	—	—
I-90 (West Bridge)—General-Purpose Lanes	164,780	7,360	23,070	—	195,210
I-90 (West Bridge)—HOV Lanes	—	33,030	—	1,990	35,020
I-90 Light Rail	—	—	—	41,390	41,390
Total Cross-Lake	345,020	62,610	41,700	48,890	498,220
2030 Preferred Alternative[a]					
SR 522 (West of 61st Avenue NE)	58,410	5,340	2,910	1,590	68,250
SR 520 (Evergreen Point Bridge)—General-Purpose Lanes	111,690	—	15,450	—	127,140
SR 520 (Evergreen Point Bridge)—HOV Lanes	—	33,690	—	7,050	40,740
I-90 (West Bridge)—General-Purpose Lanes	172,300	6,190	21,570	—	200,060
I-90 (West Bridge)—HOV Lanes	—	22,270	—	1,990	24,260
I-90 Light Rail	—	—	—	38,360	38,360
Total Cross-Lake	342,400	67,490	39,930	48,990	498,810
2030 Cumulative Effects[a]					
SR 522 (West of 61st Avenue NE)	58,090	5,560	2,600	1,570	67,820
SR 520 (Evergreen Point Bridge)—General-Purpose Lanes	121,870	—	13,740	—	135,610
SR 520 (Evergreen Point Bridge)—HOV Lanes	—	36,090	—	7,270	43,360
I-90 (West Bridge)—General-Purpose Lanes	142,790	1,060	18,040	—	161,890
I-90 (West Bridge)—HOV Lanes	—	29,140	—	1,750	30,890
I-90 Light Rail	—	—	—	37,100	37,100
Total Cross-Lake	322,750	71,850	34,380	47,690	476,670

[a] Toll model run was executed for mode choice and route diversion effects using trip distribution results from the 2030 Preferred Alternative toll-free model run.

Notes: Model results are bi-directional and for comparison purposes.

The model was validated for the SR 520 corridor. Other regional facilities included in the model were validated as part of the regional modeling process.

Exhibit 11-10. **2030 Cross-Lake Afternoon Peak Period Vehicle Trip Volumes (General-Purpose and HOV)**

	Afternoon Peak Period Vehicle Volumes		
Roadway Facility	**Total Non-HOV[a]**	**HOV (3+)**	**Total**
2030 No Build Alternative			
SR 522 (West of 61st Avenue NE)	11,500	290	11,790
SR 520 (Evergreen Point Bridge)—General-Purpose Lanes	25,950	620	26,570
SR 520 (Evergreen Point Bridge)—HOV Lanes	—	—	—
I-90 (West Bridge)—General-Purpose Lanes	36,230	230	36,460
I-90 (West Bridge)—HOV Lanes	—	2,900	2,900
I-90 Light Rail	—	—	—
Total Cross-Lake	73,680	4,040	77,720
2030 Preferred Alternative[b]			
SR 522 (West of 61st Avenue NE)	11,700	240	11,940
SR 520 (Evergreen Point Bridge)—General-Purpose Lanes	24,150	—	24,150
SR 520 (Evergreen Point Bridge)—HOV Lanes	—	2,400	2,400
I-90 (West Bridge)—General-Purpose Lanes	36,870	160	37,030
I-90 (West Bridge)—HOV Lanes	—	1,710	1,710
I-90 Light Rail	—	—	—
Total Cross-Lake	72,720	4,510	77,230
2030 Cumulative Effects[b]			
SR 522 (West of 61st Avenue NE)	11,530	250	11,780
SR 520 (Evergreen Point Bridge)—General-Purpose Lanes	24,780	—	24,780
SR 520 (Evergreen Point Bridge)—HOV Lanes	—	2,710	2,710
I-90 (West Bridge)—General-Purpose Lanes	30,960	—	30,960
I-90 (West Bridge)—HOV Lanes	—	2,050	2,050
I-90 Light Rail	—	—	—
Total Cross-Lake	67,270	5,010	72,280

[a] Includes non-HOV and commercial vehicles.

[b] Toll model run was executed for mode choice and route diversion effects using trip distribution results from the 2030 Preferred Alternative toll-free model run.

Notes: Afternoon peak period represents 3 hours.

Model results are bi-directional and for comparison purposes.

Exhibit 11-11. Cross-Lake Afternoon Peak Period Person Trip Volumes (General-Purpose and HOV)

	Afternoon Peak Period Person Trip Volumes				
Roadway Facility	**Non-HOV**	**HOV (3+)**	**Commercial**	**Transit**	**Total**
2030 No Build Alternative					
SR 522 (West of 61st Avenue NE)	12,340	1,020	810	630	14,800
SR 520 (Evergreen Point Bridge)—General-Purpose Lanes	26,270	2,220	3,260	1,130	32,880
SR 520 (Evergreen Point Bridge)—HOV Lanes	—	—	—	—	—
I-90 (West Bridge)—General-Purpose Lanes	36,030	830	5,440	—	42,300
I-90 (West Bridge)—HOV Lanes	—	10,370	—	990	11,360
I-90 Light Rail	—	—	—	13,940	13,940
Total Cross-Lake	74,640	14,440	9,510	16,690	115,280
2030 Preferred Alternative[a]					
SR 522 (West of 61st Avenue NE)	12,690	830	680	530	14,730
SR 520 (Evergreen Point Bridge)—General-Purpose Lanes	23,950	—	3,760	—	27,710
SR 520 (Evergreen Point Bridge)—HOV Lanes	—	8,650	—	2,350	11,000
I-90 (West Bridge)—General-Purpose Lanes	37,470	570	4,710	—	42,750
I-90 (West Bridge)—HOV Lanes	—	6,050	—	990	7,040
I-90 Light Rail	—	—	—	12,770	12,770
Total Cross-Lake	74,110	16,100	9,150	16,640	116,000
2030 Cumulative Effects[a]					
SR 522 (West of 61st Avenue NE)	12,620	880	570	530	14,600
SR 520 (Evergreen Point Bridge)—General-Purpose Lanes	25,590	—	2,870	—	28,460
SR 520 (Evergreen Point Bridge)—HOV Lanes	—	9,840	—	2,470	12,310
I-90 (West Bridge)—General-Purpose Lanes	31,390	—	4,410	—	35,800
I-90 (West Bridge)—HOV Lanes	—	7,380	—	870	8,250
I-90 Light Rail	—	—	—	12,170	12,170
Total Cross-Lake	69,600	18,100	7,850	16,040	111,590

[a] Toll model run was executed for mode choice and route diversion effects using trip distribution results from the 2030 Preferred Alternative toll-free model run.

Notes: Afternoon peak period represents 3 hours.

Model results are bi-directional and for comparison purposes.

Chapter 12—Traffic and Parking Improvement Guidelines

What is in this chapter?

This chapter describes jurisdiction guidelines for traffic and parking improvements and summarizes the traffic improvement measures and design modifications for the SR 520, I-5 to Medina project. WSDOT will coordinate with local jurisdictions to determine if traffic and parking improvements are required for the project and how they should be implemented. Agreements with jurisdictions may supersede jurisdiction-specific guidelines for project-related improvements.

How have agency policies guided development of the Final EIS Preferred Alternative?

A Draft EIS and addendum were completed in August 2006 for the SR 520, I-5 to Medina project. The Draft EIS addendum included design options for a Montlake area interchange between I-5 and the western shore of Lake Washington. The public response to the proposed design options was not favorable, forcing the state to reconsider the configuration of the Montlake area interchange option near Montlake Boulevard and SR 520.

The Washington State Legislature passed ESSB 6099 during the 2007 legislative session. ESSB 6099 directed the Office of Financial Management to hire a mediation group to facilitate an agreement on the interchange configuration on the west approach of SR 520. The goal of mediation was to select an interchange option for the 6-Lane Alternative configuration that would be analyzed further in the SDEIS.

In January 2010, WSDOT published the SDEIS that evaluated the three design options developed in the mediation process for the Montlake interchange area. In April 2010, WSDOT announced a Preferred Alternative for the floating bridge and Seattle interchanges.
The Preferred Alternative was developed based on public and agency comment received on the SDEIS. The Preferred Alternative includes:

- Four general-purpose lanes and two new lanes dedicated to transit and carpools
- An urban interchange at Montlake Boulevard, with an extended lid to maximize open space and pedestrian/bicycle connections
- A new bascule bridge and dedicated transit/carpool lanes across the Montlake Cut
- A path for bicyclists and pedestrians across the lake on the north side of the floating bridge
- Investments to treat stormwater and reduce traffic noise

Around the same time, the Washington State Legislature passed ESSB 6392 during the 2010 legislative session to convene a workgroup to refine specific elements of the Preferred Alternative. The workgroup consisted of WSDOT, City of Seattle, King County, UW, Sound Transit, and other designees. The workgroup was supported by two technical groups: the Technical Coordination Team and the Montlake Triangle Charrette. These groups of technical experts from local governments and agencies discussed transit connections and design refinements in great detail (WSDOT 2010g). The Technical Coordination Team provided technical review, analyzed specific topics, and developed preliminary recommendations for workgroup consideration. The Montlake Triangle Charrette recommended design options to begin developing the Montlake Triangle into a multimodal transit hub—a key element identified in the 2008 SR 520 High Capacity Transit Plan (WSDOT 2008c).

The recommendations made during the ESSB 6392 process are consistent with the environmental documentation and any refinements that affect the project footprint were addressed in the Final EIS. As the project design advances and moves into construction, WSDOT and the City of Seattle will continue to work with the communities and the public to implement the ESSB 6392 Workgroup recommendations.

How were project guidelines for traffic and parking improvements developed?

WSDOT design standards and Seattle concurrency thresholds for local traffic operations and parking policies were reviewed to establish project standards and thresholds for traffic and parking improvements. These standards and thresholds are described below.

WSDOT Standards

WSDOT design guidelines for traffic operations, which are based on LOS grades, are discussed in this section. WSDOT has acknowledged that meeting design standards for year 2030 in an urban environment may be difficult. However, the design standards should be used as first level guidance for alternative development with the acknowledgement that the final design decisions could be based on agreements between WSDOT and local jurisdictions.

Highway Main Line

SR 520 is a designated Highway of Statewide Significance (HSS). WSDOT uses an LOS standard of D as the minimum operational standard for an HSS corridor. Under this standard, LOS D or better is the preferred operating condition for highways in urban areas.

Arterial Intersections at Ramp Terminals

WSDOT recommends that traffic operation improvements be considered if an existing ramp terminal intersection operates at LOS E or worse and is negatively affected by the project (compared to the No Build Alternative).

New intersections, such as the intersection at the terminus of the westbound off-ramp at 24th Avenue East, are typically designed to operate at LOS D for the horizon year. WSDOT would consider additional improvements if queue spillback from an on- or off-ramp were to exceed the available storage and affect freeway operations.

WSDOT can also develop agreements with local jurisdictions that modify the above recommendations for new and existing intersections. In the case of the Preferred Alternative, this was accomplished through the ESSB 6392 Workgroup process.

Level-of-Service Standards for Regionally Significant Highways

Montlake Boulevard is an urban arterial connecting the Montlake/Madison Park/Capitol Hill neighborhoods to the University District/Sandpoint/Laurelhurst neighborhoods. Montlake Boulevard (also known as SR 513) is designated as a Non-Highway of Statewide Significance (Non-HSS) by WSDOT and a Regionally Significant State Highway (RSSH) by PSRC.

Based on its classification as an RSSH, Montlake Boulevard has an LOS threshold of LOS E, which calls for improvements to reduce traffic congestion when the afternoon peak hour falls below LOS E.

Coordination with Local Jurisdictions

Design standards and concurrency thresholds from local jurisdictions were also considered as the project effects were evaluated. WSDOT coordinates with local jurisdictions to determine what types of traffic improvement measures should be included in the project and how the measures will be implemented.

Some jurisdictions require that local development projects conform to the jurisdiction’s concurrency and maximum operational thresholds. Local development projects include housing, condominium, apartment, and business development that generate varying levels of traffic into the local street network.

The SR 520, I-5 to Medina project is not considered a local development project because it would not include any new facilities that *generate* vehicle trips within city limits. Therefore, the criteria used for identifying local street traffic improvement measures for project effects along the corridor do not directly correlate to specific jurisdictions’ concurrency thresholds.

City of Seattle Concurrency Guidelines

Seattle’s *Comprehensive Plan: Toward a Sustainable Seattle* (City of Seattle 2005) divides the city into more than 20 subareas for which average screenline traffic operations are measured. To determine whether a project meets or exceeds Seattle’s concurrency thresholds, a project’s V/C ratios across screenlines would be calculated.

Each of the screenlines identified for the SR 520, I-5 to Medina project has a V/C ratio threshold of 1.2. The V/C ratio of 1.2 indicates that the traffic demand crossing the screenline may be no more than 20 percent greater than the capacity; this ratio is calculated for both morning and afternoon peak hours.

Comprehensive Plan Policy T67 states, "When the calculated LOS for a screenline approaches the LOS standard for that screenline, first pursue strategies to reduce vehicular travel demand across the screenline before increasing the operating capacity across the screenline."

What are SR 520 Program guidelines for traffic and parking improvements?

The SR 520 Program guidelines for traffic operations indicate that the project should result in operations similar to or better than the No Build Alternative within the study area. Therefore, the project will not require improvements to traffic operations that are unrelated to direct project effects.

Local

Exhibit 12-1 presents the project's guidelines for determining if traffic improvement measures are necessary at a local level. These guidelines were developed as a part of the transportation methodology report for the project.

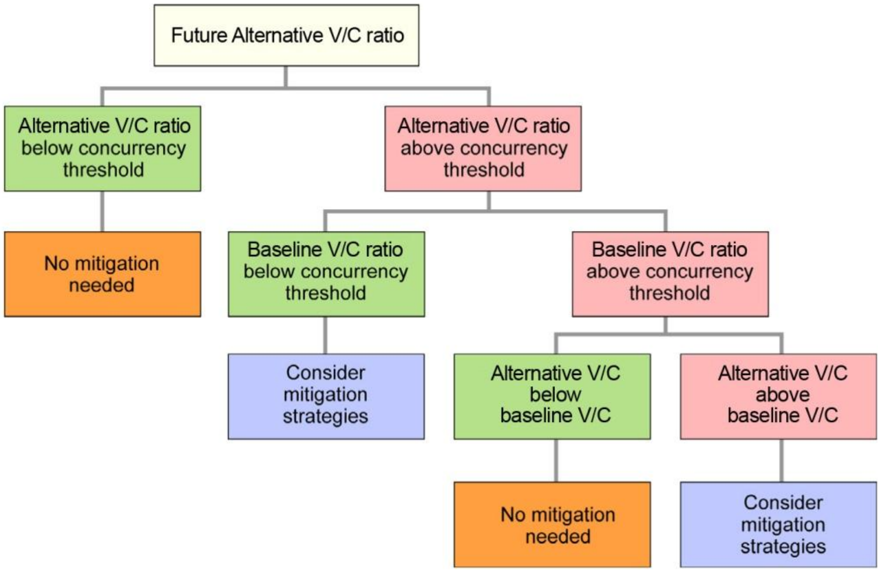


Exhibit 12-1. **Guidelines for Considering Local Traffic Operation Improvements**

Based on City of Seattle criteria, the V/C ratios across a screenline or within a subarea must be below a designated threshold. Because the analysis for the SR 520, I-5 to Medina project focused on groups of individual intersections, the screenline level of information was not prepared.

WSDOT adapted the City's criteria for use on the project by determining the average of the maximum lane group V/C ratio of each intersection. This resulted in an interchange area maximum V/C ratio. V/C ratios were obtained from analysis provided in the *Highway Capacity Manual* report of the Synchro analysis tool (Transportation Research Board 2000).

The interchange area maximum values were then compared to the City's screenline V/C thresholds. This method results in a more conservative analysis than the City's methodology because it emphasizes the worst approach of each intersection within the interchange area. Exhibit 12-2 shows the results of that comparison.

The No Build and Preferred Alternative have similar maximum v/c ratios and are below the City's adopted threshold of 1.2.

Exhibit 12-2**. Montlake Boulevard/Lake Washington Boulevard Interchange Area Maximum V/C Ratios**

	Year 2030	
Peak Hour	**No Build Alternative**	**Preferred Alternative**
AM	0.76	0.77
PM	0.93	0.92

Parking

Local jurisdiction parking policies focus on managing congestion by encouraging commuters to choose alternative modes of travel other than single-occupant vehicles. However, the importance of providing enough parking to sustain economic vitality in commercial areas is acknowledged. The guidelines for improving parking availability in conjunction with a project are not as clearly defined as those for improving traffic operations.

The parking policies allow local jurisdictions to provide input on the type of parking improvements that may be warranted when existing parking is affected by a project. Negative effects on the undesignated use of public right-of-way for parking would not be considered a cause for new parking improvements.

The remainder of this chapter identifies areas affected by the SR 520, I-5 to Medina project and describes proposed improvements to traffic and parking conditions. WSDOT will discuss these proposed improvements with the City of Seattle prior to design and incorporation into the project.

What has the project done to avoid or minimize negative effects?

Continued growth over the past two decades has resulted in worsening traffic levels and congestion on the SR 520 corridor. With the No Build Alternative, traffic levels and congestion on the SR 520 corridor would continue to degrade. One of the purposes of the project's Preferred Alternative is to address the negative effects of the No Build Alternative by building new transportation facilities that improve mobility for people and goods on the SR 520 corridor. By design, the Preferred Alternative improves mobility and safety and decreases congestion in the corridor; thus, it avoids negative transportation effects.

After the announcement of the Preferred Alternative in April 2010 as part of ESSB 6392 and the general design refinement process, the 6392 Technical Coordination Team proposed design modifications for the Preferred Alternative that would further improve the mobility benefits. Design modifications included the number of lanes needed for on- and off-ramps, and intersection configurations and stop control adjacent to the corridor. Following are some examples of design modifications incorporated into the Preferred Alternative that minimize negative effects on transportation.

- Provides access to Montlake lid transit stops for SR 520 buses during off-peak hours
- Removes the Lake Washington Boulevard ramps, reducing traffic volumes traveling through the Arboretum compared to the No Build Alternative
- Provides a wider (18-foot) pedestrian path along the new bascule bridge across the Montlake Cut
- Relocates transit stops on Montlake Boulevard to minimize walk distance to new bus connections on the Montlake lid
- Provides an alternative route for pedestrians and bicyclists on the new path under SR 520, allowing for separation between nonmotorized modes and vehicular traffic on 24th Avenue East

What project design refinements could further minimize negative effects?

WSDOT reviewed the operational results for the various signalized intersection networks presented in Chapters 5 and 6 to determine if additional traffic improvement measures were warranted. The effects of the Preferred Alternative on nonmotorized facilities (Chapter 7) and parking (Chapter 9) were also reviewed. The results of these reviews are reported below for traffic operations, nonmotorized facilities, and parking.

Traffic Operations

The Montlake Boulevard interchange area V/C ratios are under the City of Seattle threshold of 1.2.

In addition to reviewing project effects for the overall interchange area, WSDOT reviewed individual intersection operations to identify where additional design changes could be considered based on its LOS guidelines.

In the AM peak hour, traffic operations at the eastbound ramps intersection with Montlake Boulevard East/East Lake Washington Boulevard/SR 520 are slightly worse with the Preferred Alternative (LOS F, 10 percent over capacity) compared to the No Build Alternative (LOS E, 5 percent over capacity). The operations at this intersection may be included in further discussions with the City of Seattle such as coordinating with the City to develop the City’s traffic management plan for this area. Because the comparison does not include the congestion effects from the SR 520 corridor, the Preferred Alternative would likely operate better than the No Build Alternative due to the substantial improvements to the SR 520 corridor.

Nonmotorized Facilities

The Preferred Alternative would result in the loss of 54 bicycle locker spaces and 53 bicycle rack spaces near the existing Montlake Freeway Transit Station. WSDOT, Metro, and Sound Transit will continue to work together to determine the best way to replace these bicycle parking facilities.

Parking

Exhibit 12-3 identifies the parking that exists today and capacity lost with the project. Parking may not be replaced in kind at Bagley Viewpoint and the NOAA facility due to a shortage of space available for replacement. Coordination and discussion among WSDOT, the City of Seattle, and affected land owners are required to determine the actual parking measures that may be implemented as part of the project. For instance, WSDOT is coordinating with the City of Seattle to further develop design details for the lids, which could include replacement parking for the loss of 10 parking spaces at Bagley Viewpoint.

Exhibit 12-3. **Existing Parking and Capacity Changes with the Project**

Location	Existing Capacity	Preferred Alternative Parking Supply	Capacity Reduction	Comments
Bagley Viewpoint (Delmar Drive East and East Roanoke Street)	10	0	10	Potential replacement parking to be provided on 10th and Delmar lid
NOAA Northwest Fisheries Science Center (2725 Montlake Boulevard East)	132[a]	94	38	38 spaces removed from WSDOT property
MOHAI (2700 24th Avenue East)	150	26	124	MOHAI to be relocated; 26 spaces retained for East Montlake Park

[a] Parking supply includes 38 spaces located on WSDOT right-of-way under the existing Portage Bay Bridge.

How can the project minimize negative effects during construction?

Similar to any large construction project, some level of traffic congestion is expected in the study area as a result of construction activities. The project construction plans will include staging techniques and temporary improvements to reduce the potential construction effects on traffic. These plans include specific restrictions on construction methods, prescribed work times for construction to avoid peak travel periods, and temporary roadway improvements. Details about construction methods and transportation effects are in the Construction Techniques and Activities Discipline Report Addendum and Errata (WSDOT 2011b) and in Chapter 10 of this report.

These methods serve to manage the timing of construction activities and alleviate capacity constraints through the construction area. In addition to these physical methods, the strategies described in this section may be used to manage the flow of traffic and minimize the traffic demand during construction.

Safety

The FHWA published the Work Zone Safety and Mobility Rule on September 9, 2004, in the Federal Register (69 FR 54562). In accordance with this rule, the project would develop a temporary traffic control plan. This plan would address traffic safety and control throughout the work zone.

Traffic Management Plan

The contractor selected to construct the project will be required to prepare a Traffic Management Plan (TMP) to be approved by WSDOT, in coordination with the City of Seattle, to ensure that construction effects on local streets, property owners, and businesses are minimized. The TMP will include, as a minimum, the following measures:

- Details on required street and lane closures (duration and timing)
- Proposed detours and signing plans (for vehicles, pedestrians, freight, and bicycles)
- Measures to minimize impacts on transit operations and access to/from transit facilities (in coordination with transit service providers)
- Traffic enforcement measures, including deployment of police officers
- Coordination with emergency service providers
- Measures to minimize traffic and parking impacts from construction employees
- Measures to minimize effects of truck traffic for equipment and material delivery
- Measures to minimize disruption of access to businesses and properties
- Measures to minimize conflicts between construction activities and traffic during events (this may or may not include stopping construction activities during certain hours)
- Public outreach communication plan

Work Zone Management Techniques

Other options for construction traffic management include developing and implementing various work zone management strategies. These strategies may include using Intelligent Transportation Systems (ITS), traveler information, real-time work zone monitoring, traffic incident management, and enforcement techniques.

Traveler Information Systems

Traveler information systems are designed to inform the public of construction activities and transportation system operating conditions. They allow drivers to avoid traffic problems, save time, and reduce frustration. Examples include, but are not limited to, dynamic and variable message signs, highway advisory radio, e-mail alerts, and project Web sites that provide real-time information on traffic conditions around construction and outlying areas. The traveler information system already in place will be used for this project, which includes all the above-mentioned examples, except for a project-specific Web site with real-time information.

Incident Management Systems

WSDOT’s current incident response program will continue to be used for this project. Incident management systems are planned and coordinated strategies to detect, respond to, and remove traffic incidents to restore traffic capacity as safely and quickly as possible.

The process of restoring traffic capacity involves a number of public and private sector partners, including law enforcement, fire and rescue, emergency medical services, transportation, public safety communications, emergency management, towing and recovery services, hazardous material contractors, and traffic information media. Incident management systems can help reduce impacts during construction for the following types of incidents:

- Incident clearance time: 38 to 66 percent
- Emergency vehicle response time: 20 to 30 percent
- Primary crashes: 35 to 40 percent
- Secondary crashes: 30 to 50 percent

Active Traffic Management

Active traffic management technology dynamically controls traffic based on the prevailing conditions. Using integrated systems and a coordinated response, both recurrent and non-recurrent congestion can be managed to improve roadway safety and traffic flows. Potential tools used as part of an active traffic management system include:

- **Overhead signs**—to display variable speed limit and real-time traffic information over each lane
- **Variable speed limit**—to dynamically and automatically reduce speed limits approaching areas of congestion, collisions, or special events
- **Queue warning**—to warn motorists of downstream queues (or backups) and direct through traffic to alternative lanes
- **Travel time signs**—to display estimated travel time and other condition reports as well as communicate travel and traffic conditions; WSDOT currently uses variable message signs to post travel time information

Construction Worker Shuttle Service

Construction worker shuttle service moves workers from outlying temporary or permanent parking facilities into the work zones, thereby reducing the number of vehicles arriving and leaving the work zone areas.

Special Events

Several strategies would be used to help mitigate construction activities during special events, such as those at the UW:

- Tailor special event traffic management plans to consider project construction congestion, including transit priority and special event shuttle services
- Increase shuttle services so access is provided to and from events
- Provide event discounts with the use of transit shuttles
- Implement additional event date/time-specific parking restrictions
- Add police officer traffic control as needed
- Provide a Web site and other outreach regarding construction and travel options to special events that are accessible and understandable
- Restrict construction activities during major events

Transportation Demand Management

Transportation demand management (TDM) includes a variety of strategies that provide alternatives to driving in single-occupant vehicles, particularly during peak traffic periods. TDM programs include outreach to increase public awareness about travel options and services, including incentives that help people choose a new travel option. They even provide new travel options such as vanpools to encourage a shift away from travel in single-occupant vehicles. TDM is implemented in a regional context through a variety of ongoing state and local jurisdiction TDM programs.

Purpose of TDM During Construction

The SR 520, I-5 to Medina project will be built over a period of approximately 7 years; as with any major project, construction activities will affect the normal travel patterns of road users within the project vicinity. TDM may be used, in addition to other techniques, to minimize these effects by reducing the number of vehicle trips through the study area.

TDM and Transit

The goal of TDM is to increase the efficiency of travel on roadways by moving more people in fewer vehicles. Transit is typically a primary consideration for any comprehensive TDM program because it is a reliable mode of moving many people in fewer vehicles. This is particularly true in urban areas with well-established transit systems in place. The people-moving capacity of transit is necessary for many TDM strategies to be successful. WSDOT is engaged in coordination with Metro and Sound Transit to develop construction management plans that maintain the reliability of transit as an alternative to driving. WSDOT will continue this coordination throughout construction.

Implementing TDM During Construction

A trip reduction plan is one part of the overall plan for managing traffic during construction. WSDOT is developing a plan focused on keeping people moving through congested areas during construction. As part of the construction traffic management plan, WSDOT will evaluate a set of temporary TDM and transit enhancements to provide additional travel options to people who travel through the study area.

TDM is not a physical part of the roadway or a requirement of the construction methods like many of the other measures that are used to minimize construction effects. Instead, it seeks to improve the efficiency with which people use the roadway. In order for demand management to be effective on a specific project, it must be implemented in a manner that reaches out to the primary users of the affected roadway facility. Because SR 520 is classified as an RSSH, many of the users originate in communities well beyond the project limits and travel to destinations both within and beyond the project vicinity.

Many jurisdictions where SR 520 users live and work have existing TDM programs. Bellevue, Kirkland, Redmond, and Seattle have established programs that provide travel options to commuters. King County also provides these services through its own efforts in addition to operating a popular vanpool program. WSDOT supports local jurisdictions through its investment in a variety of strategies and through the Commute Trip Reduction (CTR) program.

WSDOT will focus on supporting existing programs rather than implementing an entirely new program during the construction period. Therefore, a significant aspect of the project TDM strategy will involve communication and cooperation with local experts who are already implementing successful programs. WSDOT will coordinate with jurisdictions affected by SR 520 to offer services to travelers through programs they already use. This approach will encourage continuity in the services provided to users. When construction is complete, it will allow a streamlined transition of project-related TDM services back to the ongoing programs managed by the local jurisdictions.

The project will include a communications plan to ensure that both the implementers and users of TDM programs receive the information they need about construction activities on the project. Prior to construction, project personnel will work with WSDOT staff to find out who needs to be engaged in the process.

Conditions often change during construction of complex projects, and it will be necessary to communicate changes quickly and accurately to those who are affected. The TDM strategy will include a feedback process to constantly monitor its effectiveness. The feedback will be used to identify improvement opportunities and under-performing elements so that adjustments can be made to ensure that the project meets its goals.

WSDOT is working to develop a general strategy for trip reduction during construction and will further refine the strategy prior to construction. The strategy will include a range of potential trip reduction options based on the estimated construction effects on traffic for the Preferred Alternative. The strategy will be coordinated with other traffic management techniques tailored for construction areas such as temporary roadway improvements and prescribed construction methods. Trip reduction will be used to maximize traveler options in areas where temporary capacity improvements are not possible.

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