

Chapter 5: Project Operation and Permanent Effects

This chapter focuses on the permanent effects that the 6-Lane Alternative options would have on traffic, communities, and ecosystems compared to the No Build Alternative. It explains how the transportation system would operate with and without the project and how the options would differ. It also describes the permanent effects, both positive and adverse, that the project would have on the built and natural environment.

5.1 Transportation

How were traffic and transportation evaluated for this project?

The first step in analyzing traffic is to determine how much traffic is predicted to grow in the region. This is done using a travel demand model, which estimates where in the region population and employment will grow, and then predicts how the resulting travel demand will be distributed over the regional transportation system. Future traffic volumes both with and without the project were predicted based on the Puget Sound Regional Council four-county travel demand model, which forecasts demand in King, Pierce, Snohomish, and Kitsap counties. This model is based upon adopted regional and local land use plans and growth targets.

The model's transportation network represents the 2030 No Build Alternative conditions, including planned and programmed roadway and transit improvements. (As discussed in Chapter 1, it was assumed that the No Build Alternative would not be tolled.) The percent growth in traffic demand between now and 2030 was then applied to existing traffic count data to forecast detailed traffic volumes at the streets and intersections within the study area

After forecasting travel demand for the year 2030 No Build Alternative, modifications to the transportation network for each of the 6-Lane Alternative options were coded into the travel demand model. The model

How does tolling affect transportation demand?

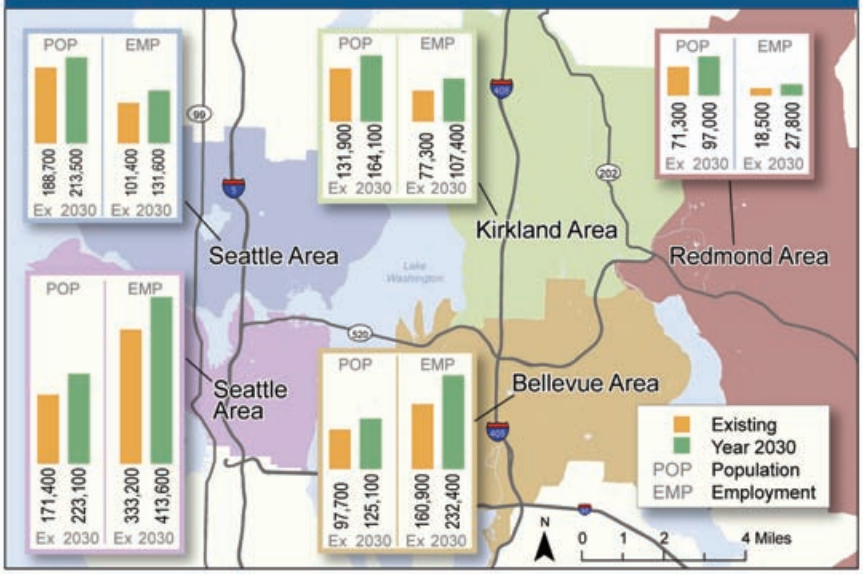
Prior to analysis for the SDEIS, the project demand model was updated to represent the most current transportation network, tolling assumptions, land use, and transit data. For the transportation analysis included in this report, HOVs (3+ carpools and buses) were assumed to be exempt from tolling. Tolling and the completion of the HOV lane would reduce daily vehicle volumes across SR 520 by up to 4,700 vehicles (or 3 percent) compared to the No Build Alternative. This is because some people would choose to take other modes of travel (such as transit, carpools, vanpools, and bike), change time of travel, or select a different route. Chapter 1 includes more information on project tolling assumptions.

was then used to determine how the interchange improvements for each 6-Lane Alternative Option would affect traffic demand compared to the No Build Alternative. It was assumed that HOVs (3+ carpools and buses) would be exempt from the toll.

How is travel demand predicted to grow in the SR 520 corridor?

Between today and the year 2030, the region will grow by 1.1 million people, add over 850,000 new jobs, and need to accommodate close to 50 percent more traffic (PSRC 2007). Projected population and employment growth for selected Seattle and Eastside areas are shown in Exhibit 5.1-1. 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 the lake.

Exhibit 5.1-1. **Forecasted Growth in Population and Employment between 2006 and 2030**



What transit service and facilities are planned for the project area?

The transit network and operating plan assumptions for the 2030 No Build Alternative are consistent with those identified for other corridor projects in the region and include:

- King County Metro Transit Now and RapidRide programs
- Sound Transit's light rail service between Sea-Tac and Northgate
- Seattle streetcar service between South Lake Union and the Seattle waterfront

High-Capacity Transit

The SR 520 High-Capacity Transit Plan—developed by King County Metro, Sound Transit, the University of Washington, and WSDOT—identified a vision for bus rapid transit in the SR 520 corridor. It also developed options for a Montlake Multimodal Center and identified transit service needs without the Montlake Freeway Transit Station.

The plan's commitment to rapid transit bus lines in the SR 520 corridor is contingent on replacing the Evergreen Point Bridge, adding HOV lanes, and constructing critical transit facilities, including the Evergreen Point Freeway Transit Station and transit/HOV direct-access facilities.

King County Metro's *Transit Now*

Transit service in the SR 520 corridor is projected to grow through Metro's *Transit Now* investments and other service expansion opportunities. *Transit Now* will add service to two core routes, route 271 and route 255, across the Evergreen Point Bridge, primarily in the midday and on weekends. *Transit Now* investments will also create an Eastside *RapidRide* route along the NE 8th Street corridor, improving transit service between downtown Bellevue and the Crossroads area.

Transit Now Initiative

The *Transit Now* initiative, approved by King County voters in the general election on November 7, 2006, will expand Metro transit service by 15 to 20 percent over the next 10 years. Intended to help Metro keep pace with regional growth, the initiative is funded by a 1/10 of 1 percent sales tax increase.

RapidRide is a bus rapid transit service that will provide frequent, fast, and reliable bus service in certain major arterial corridors. At full implementation, *RapidRide* will feature:

- Frequent, all-day service
- Transit stations at high-ridership and high-transfer locations with real-time bus arrival signs and enhanced shelters
- High-capacity, low-emission hybrid buses with low floors designed for fast boarding and rider comfort.

Sound Transit Light Rail and Express Bus Routes

For the No Build and 6-Lane Alternative transportation analyses, it was assumed that light rail service would be in place between Sea-Tac Airport, downtown Seattle, the University of Washington, and Northgate by 2030. These projects were approved by voters as a part of Sound Move and environmental documentation was completed and approved. The transportation analysis also assumed the improvements to Express Bus service identified in Sound Transit's 2008 Service Implementation Plan.

A 14-mile segment of light rail between downtown Seattle and the Tukwila International Boulevard Station opened in July 2009, and an extension to Sea-Tac Airport was completed in December 2009. Sound Transit also initiated construction of the University Link, or U-Link, segment of light rail between downtown Seattle and the University of Washington Station near Husky Stadium in 2009. U-Link and the University of Washington station are expected to open in 2016.

The University of Washington Station will provide access to the campus and UW Medical Center, nearby sports venues, and surrounding neighborhoods. A potential grade-separated pedestrian bridge connecting the Burke-Gilman Trail, the Montlake Triangle, and the light rail station could provide direct access to the upper campus for transit riders and minimize conflicts between pedestrians and bicyclists using the trail. Sound Transit is also evaluating additional crossings.

The No Build and 6-Lane Alternative transportation analyses did not include transit improvements identified in the ST2 Plan. When the update to the transportation analysis for the SDEIS began in 2006, the ST2 Plan had yet to be approved by voters and was unfunded. However, the ST2 Plan was approved by voters in November 2008. At that point, ST2 Plan components were incorporated in the cumulative effects transportation analysis, which is discussed in Chapter 7.

Sound Transit's ST2 Plan

In 2008, voters approved funding for the ST2 plan, which will extend the initial rail service provided by the original Sound Move plan. The ST2 Plan includes the East Link project, an extension of light rail from downtown Seattle across I-90 to downtown Bellevue by 2020 and east to the Overlake Transit Center by 2021. ST2 also includes an extension of light rail from the University of Washington station to Northgate by 2020 (North Link). Light rail will be extended to Lynnwood and south from Sea-Tac Airport to the Redondo/Star Lake area of Federal Way by 2023.

How was the Montlake Triangle considered?

The City of Seattle, King County Metro, Sound Transit, UW, and WSDOT are considering several options to improve circulation at the intersection of Montlake Boulevard NE and NE Pacific Street. WSDOT is coordinating

with these agencies to ensure that the SR 520 project options are compatible with other improvements at this location.

The SR 520, I-5 to Medina: Bridge Replacement and HOV Project assumes that the Sound Transit University Link light rail station, improved Montlake Boulevard crosswalk, and a new pedestrian connection from the University Link light rail station to the main campus would be constructed separately. The University Link light rail station and associated features are part of the University Link project. The station is scheduled to open in 2016.

UW is also planning a project to improve the Rainier Vista, parts of which could be integrated with the SR 520, I-5 to Medina: Bridge Replacement and HOV Project. The Rainier Vista project would include improvements on NE Pacific Place, the Montlake Triangle, 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 Triangle.

Under Option A, there would be no change in pedestrian connections compared to No Build conditions. For Options K or L, the proposed lidded intersection at Montlake Boulevard/NE Pacific Street would provide pedestrian connection between the University Link light rail station and campus.

How many people and vehicles would SR 520 carry in 2030?

Traffic demand was measured in two ways: average daily traffic (ADT) and traffic during the peak period, which corresponds to morning and evening commute times. Traffic throughput (see box at right) was measured only during the peak period because this is when the primary differences between demand and throughput occur; daily throughput would equal daily demand. WSDOT measured demand separately for vehicles and for people. This helped determine how many people are expected to use transit and carpools.

Daily Demand

While daily ***vehicle*** traffic demand is expected to grow considerably between now and 2030, the vehicle demand for the 6-Lane Alternative is not expected to be much different than for the No Build Alternative. This is, in part, because during the off-peak periods, when traffic flows best, travelers may opt to avoid SR 520 tolls and use SR 522 or I-90. Also, the addition of the toll, improved HOV reliability, and reduced travel times would increase the incentive to carpool or take the bus. As a result, the 6-Lane Alternative would actually result in a small net decrease in daily vehicle traffic demand on SR 520 and a minor increase on SR 522 and I-90 compared to the No Build Alternative (Table 5.1-1).

Demand and Throughput

Travel demand is a term used to refer to the number of people or vehicles that want to use a given roadway during a particular time period. Throughput refers to the number of people or vehicles that the roadway can actually carry during that period—a number influenced by the road's physical features (such as the number of lanes) and the level of traffic congestion. When transportation planners say that demand exceeds throughput, it's simply a technical way of saying that a roadway has more traffic than it can handle.

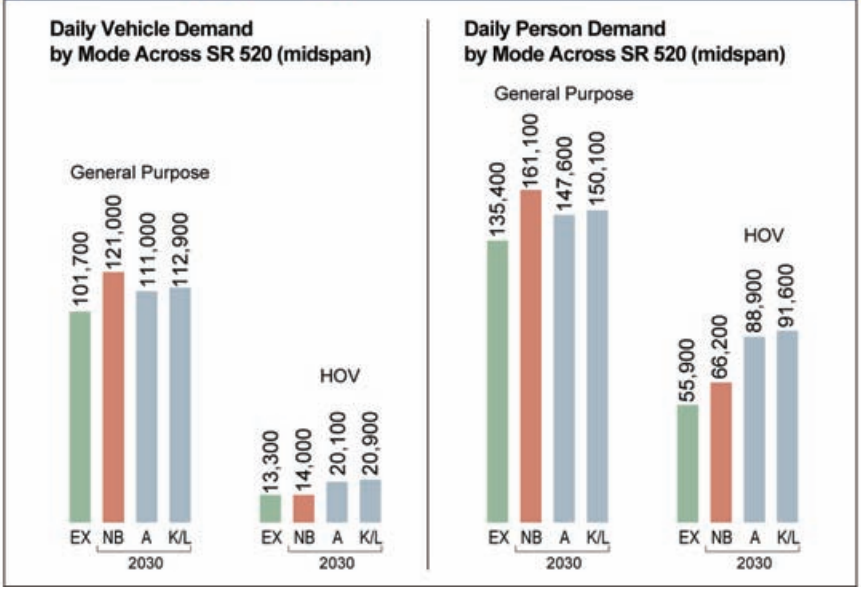
Table 5.1-1 Daily Vehicle Demand

	SR 522	SR 520	I-90
Existing	49,000	115,000	149,000
2030 No Build	63,100	135,000	199,100
2030 Option A	65,100	131,000	201,800
2030 Option K or L	64,000	133,800	200,100

Note: Adding the suboptions to Options A, K, and L would result in no substantial change in the daily vehicle demand listed in this table.

However, daily ***person*** demand on SR 520 is expected to increase more with the 6-Lane Alternative options than with No Build. This is because the toll on SR 520, along with improved HOV reliability and travel times, would encourage greater use of transit and carpooling. In 2030 the 6-Lane Alternative would carry up to 6 percent more people per day than the No Build Alternative in about the same number of vehicles. Changes in daily person demand between now and 2030 are summarized in Exhibit 5.1-2. All options result in improved person mobility in fewer vehicles. This is the result of completing the HOV lane system and tolling the bridge.

Exhibit 5.1-2. **Daily Vehicle and Person Demand by Mode Across the SR 520 Bridge (mid-span)**



Peak Period Demand and Throughput

Unlike the ***daily*** vehicle demand volumes, the ***peak period*** vehicle demand volumes with all the 6-Lane Alternative options would increase more than the No Build Alternative. This is because during the peak periods the other

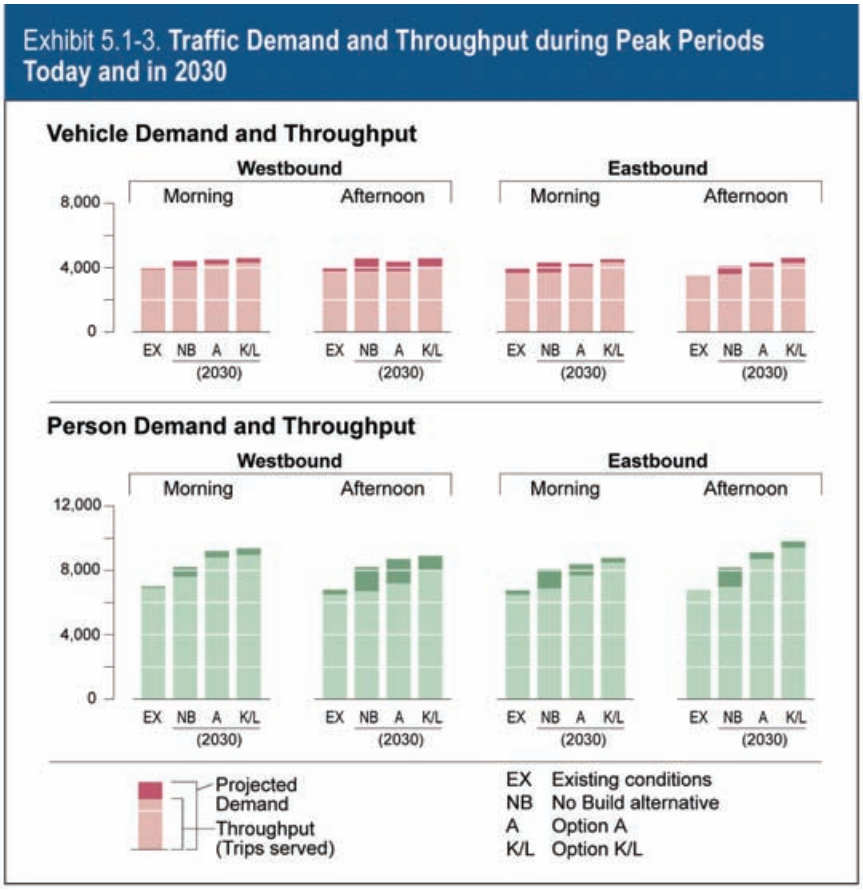
How do general-purpose and HOV lanes differ?

HOV lanes typically accommodate fewer vehicles and more people than general-purpose lanes, making them more efficient. How many people an HOV lane accommodates will vary from corridor to corridor, depending on the level of bus service and ridership, the minimum carpool occupancy requirement, and the incentive for using bus or carpool. Travel time benefits for buses and carpools, along with no payment of toll to cross the SR 520 bridge, are good examples of incentives. An HOV lane typically accommodates up to 1,500 vehicles per hour compared to 2,200 vehicles per hour for general-purpose lanes, but those vehicles can accommodate many more riders. If the two general-purpose lanes are full, they would accommodate about 5,800 people; the single HOV lane could operate at just over 75% of its capacity and still accommodate the same number of people as both general-purpose lanes combined. Thus, the HOV lanes may look "empty" compared to the general-purpose lanes, even while accommodating as many or more people than the two adjacent lanes.

two primary cross-lake routes (SR 522 and I-90) also would be congested, and drivers would just as likely choose SR 520—even with tolls—especially if it is the most direct route.

When there is more demand to use a roadway than it has capacity, we say that demand exceeds throughput. Exhibit 5.1-3 shows that demand would be greater than throughput for the No Build Alternative and 6-Lane Alternative options in 2030, as is true now. However, the 6-Lane Alternative options would serve more trips (i.e., have greater throughput) than No Build.

Exhibit 5.1-3. Traffic Demand and Throughput during Peak Periods Today and in 2030



Under the 6-Lane Alternative options, the addition of HOV lanes would allow more people and vehicles to use SR 520. The new lanes, combined with the toll, would provide an incentive to use transit and HOV. Nevertheless, because of congestion within the general transportation system, demand would continue to exceed throughput on SR 520. Although SR 520 could not accommodate all of this demand, the 6-Lane Alternative options would serve more vehicle and person trips than the No Build.

HOVs

When we use the term HOV in 2030, we are always referring to 3+ person carpools and transit. A 2-person carpool is considered general-purpose traffic and accounted for as such within the traffic model.

How would the project affect freeway operations and travel times during peak periods?

The term "freeway traffic operations" refers to how freely traffic is flowing and is discussed here in terms of congestion and travel times. (The project's effect on local streets and intersections is discussed in the following section.) Without the project, congestion and travel times during the morning and evening commute would continue to worsen over existing conditions. No Build Alternative average travel times between I-5 and SR 202 are expected to be 20 minutes (westbound) and 22 minutes (eastbound) during the morning commute and 49 minutes (westbound) and 22 minutes (eastbound) during the afternoon peak period. With the project, congestion and travel times for both general-purpose and HOV trips would be reduced, particularly during the westbound afternoon and eastbound morning peak periods. The greatest travel time savings, however, would occur for HOV trips, especially during the peak hour of the eastbound peak period when traffic is at its worst.

KEY POINT

Freeway Operations and Travel Times

Overall freeway operations and travel times on SR 520 would be similar for all 6-Lane Alternative options. Freeway congestion and travel times for both general purpose and HOV trips would be improved compared to the No Build Alternative.

Peak Period versus Peak Hour

When we refer to **peak period** in this analysis, we are referring to a 3-hour peak period.

When we refer to **peak hour** in this analysis, we are referring to the "worst" hour within the peak period.

Morning Commute

Westbound

In 2030 without the project, morning congestion would continue on westbound SR 520 east of I-405 because the SR 520 off-ramp to southbound I-405 would be over capacity. SR 520 west of I-405 would also continue to be congested approaching the Evergreen Point Bridge from the Eastside because of the termination of the HOV lane near 84th Avenue NE in Medina (Exhibit 5.1-4). Congestion would last several hours. No Build Alternative average travel times between SR 202 and I-5 would be 20 minutes for general-purpose traffic and 16 minutes for HOV traffic, compared to 19 minutes and 16 minutes, respectively, today.

With the project, congestion on westbound SR 520 east of I-405 would increase slightly due to the slight increase in traffic volumes during the morning commute. However, congestion west of I-405 approaching the Evergreen Point Bridge would be less because the HOV lanes would be extended to I-5, eliminating the westbound merge at the bridge. Overall, average travel time compared to the No Build Alternative would improve by 1 minute in the general-purpose lane and 2 minutes in the HOV lane (Exhibit 5.1-5).

Effects of Suboptions

- Adding the suboptions to Options A, K and L would not change the westbound areas of congestion and travel times as described above for the morning commute.

Exhibit 5.1-4. Westbound Areas of Congestion During the Morning Commute Peak Period

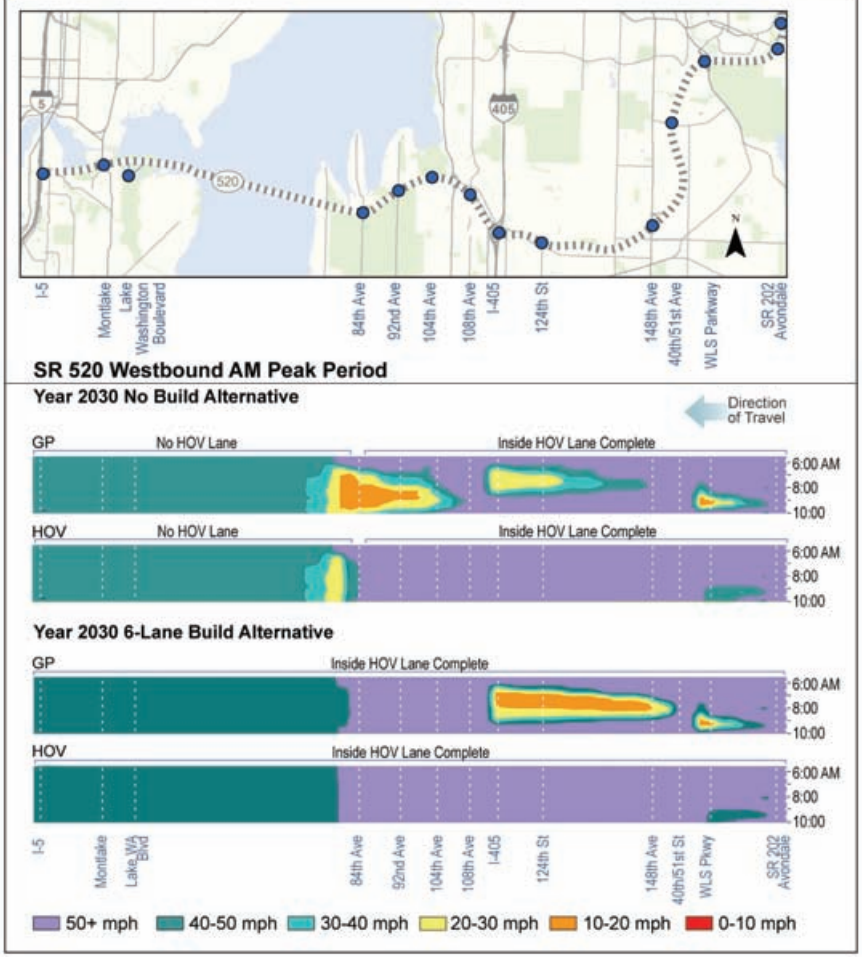
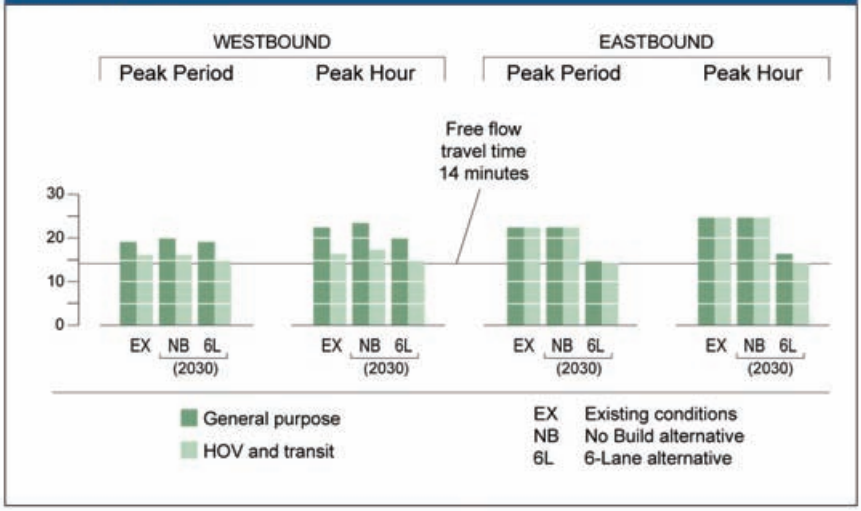


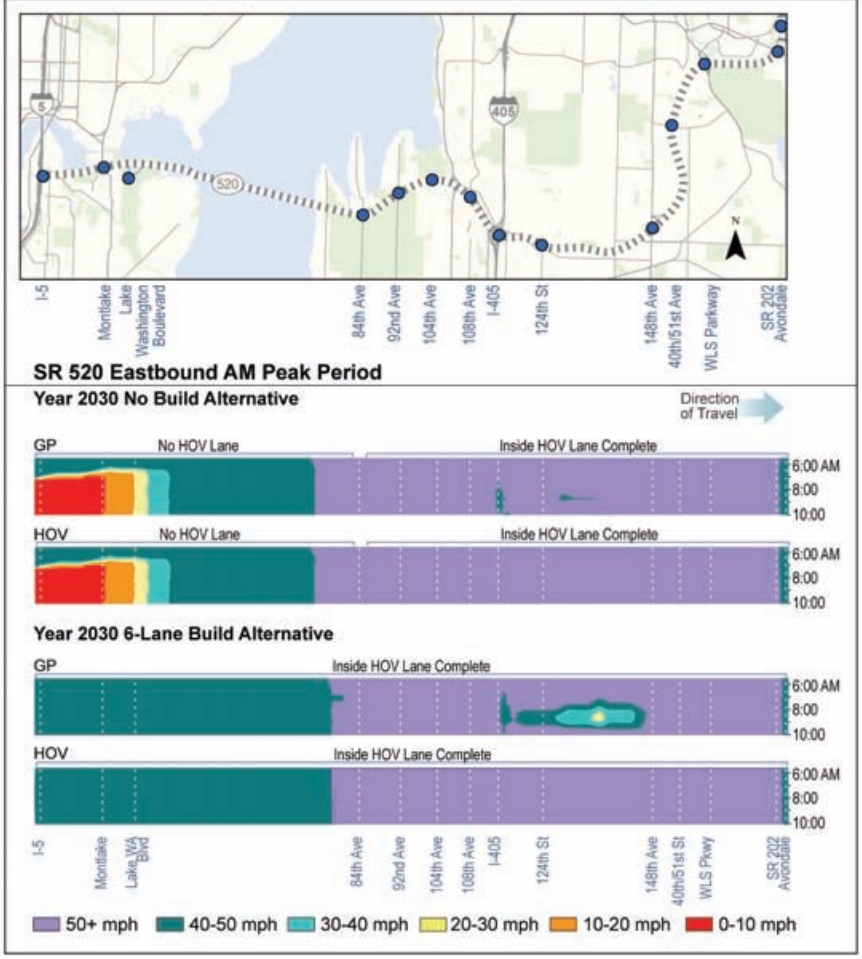
Exhibit 5.1-5. Average Travel Times (in minutes), I-5 to SR 202 during the Morning Commute



Eastbound

In 2030 without the project, SR 520 eastbound would continue to be congested between I-5 and the west transition span of the floating bridge (near the Arboretum) (Exhibit 5.1-6). Congestion would occur at this location because of the short acceleration lane for traffic merging from the Lake Washington Boulevard on-ramp, the mainline grade change approaching the western transition span, substandard shoulder widths, and visual distractions associated with the lake. Congestion would last for about 3 hours and would limit the amount of traffic that could cross the bridge. Both general-purpose and HOV travel times would average 22 minutes between I-5 and SR 202 (Exhibit 5.1-5).

Exhibit 5.1-6. **Eastbound Areas of Congestion During the Morning Commute Peak Period**



With the project, congestion in this area would be substantially reduced because high-occupancy vehicles would be using the new HOV lane. The additional capacity would improve operations and travel time for both HOV and general-purpose traffic. On average, travel times between I-5 and SR 202 would improve by 7 to 8 minutes for general-purpose and HOV

trips. The travel time benefits would be greater during the peak hour with a 9- to 11-minute improvement for general-purpose and HOV trips, respectively.

Effects of Suboptions

- Adding the suboptions to Options A, K, and L would not change the eastbound areas of congestion and travel times described above for the morning commute.

Afternoon Commute

Westbound

Under current afternoon commute conditions, SR 520 is congested in the project area between the Montlake Boulevard on-ramp merge point and I-5 due to the short acceleration lane. Montlake on-ramp drivers do not have the space to accelerate to freeway speeds, and drivers on the SR 520 main line must slow down to accommodate entering vehicles. Westbound drivers changing lanes to access the I-5 off-ramps and congestion spilling back from I-5 also contribute to congestion in this area (Exhibit 5.1-7). Today, moderate congestion lasts approximately 2 to 3 hours in this area daily. By 2030 during the afternoon commute, congestion across the Portage Bay Bridge would last approximately 3 to 4 hours. Under the No Build Alternative, average westbound travel times between SR 202 and I-5 would be 49 minutes for general-purpose traffic and 20 minutes for HOV traffic. This is because of a combination of SR 520 congestion east of I-405 approaching the SR 520/I-405 interchange and east of I-5 approaching the SR 520/I-5 interchange. The HOV travel time would be much faster than general- purpose travel times because HOVs can bypass congestion east of the floating bridge (Exhibit 5.1-8).

What do these travel times assume about the Eastside portion of SR 520?

All travel times shown in this chapter, including No Build, assume that the SR 520, Medina to SR 202: Eastside Transit and HOV Improvement Project is completed. This project would complete the SR 520 HOV system east of Lake Washington and build new inside transit stops. It would reduce congestion and travel times on SR 520 on the Eastside, improving baseline conditions for the SR 520, I-5 to Medina project.

With the 6-Lane Alternative interchange options, congestion across the Portage Bay Bridge would continue but the duration would be shorter (2 hours or less) because of improvements in SR 520 freeway design. With all 6-Lane Alternative options, both general-purpose and HOV average travel times westbound across the corridor would improve by 5 to 8 minutes. Option A would add more capacity across the Portage Bay Bridge with a westbound auxiliary lane between Montlake and I-5. However, Option A would also reduce freeway ramp capacity by removing the Lake Washington Boulevard ramps, thus increasing traffic volumes across the Portage Bay Bridge as drivers shift to the Roanoke and NE 45th Street interchanges.

Options K and L would provide increased freeway ramp capacity in the Montlake area, but would not include the westbound auxiliary lane across the Portage Bay Bridge. With the increased capacity at the new interchange, traffic volumes would increase in the Montlake interchange area and decrease on the Portage Bay Bridge compared to Option A.

Exhibit 5.1-7. **Westbound Areas of Congestion During the Evening Commute Peak Period**

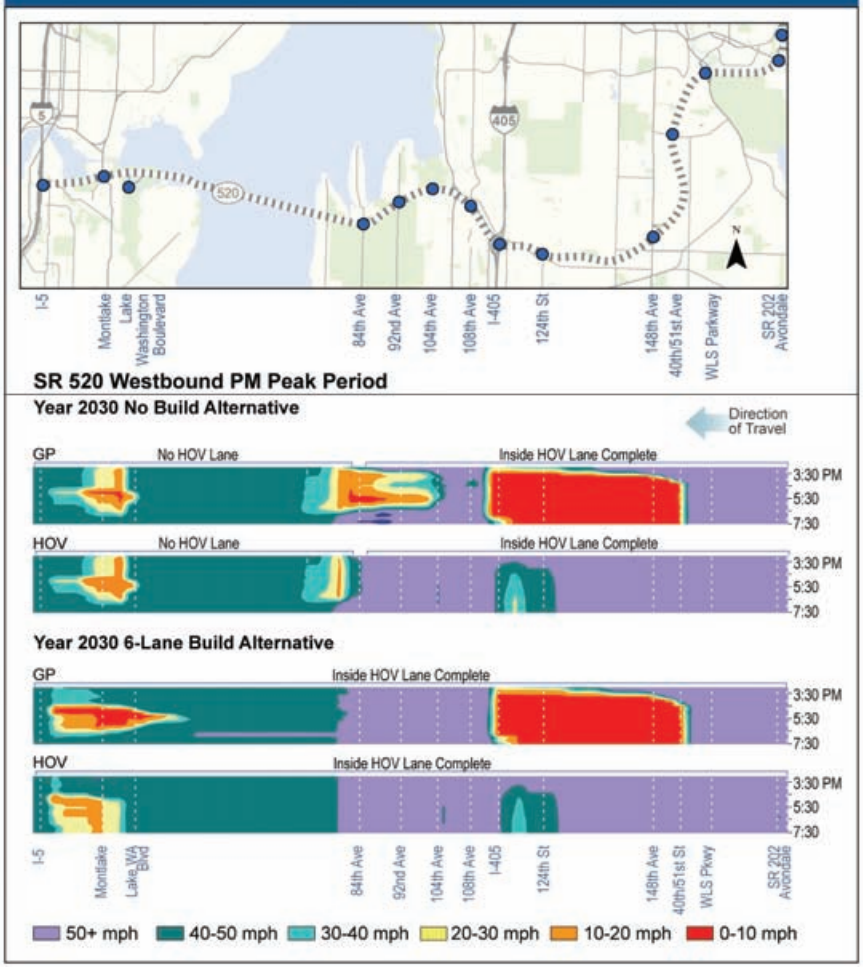
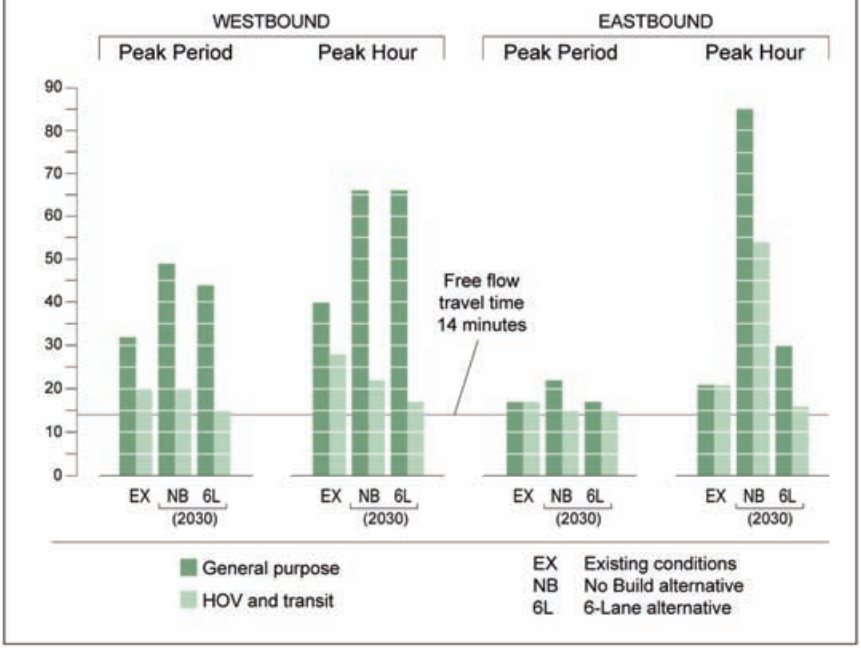


Exhibit 5.1-8. **Average Travel Times (in minutes), I-5 to SR 202 during the Evening Commute**



Effects of Suboptions

Option A Suboptions

- Adding the Lake Washington Boulevard ramps would result in lower traffic volumes on Portage Bay Bridge, lower than Option A and similar to the No Build Alternative. Congestion from I-5 would still spill back onto Portage Bay Bridge and the local street system, but the extent of the congestion would be less than in Option A. Westbound afternoon travel times would be better than both the No Build Alternative and Option A.
- With the added ramps, the Lake Washington Boulevard eastbound on-ramp merges would also improve as compared to the No Build, allowing the ramp meters to serve more traffic. This effect would substantially reduce congestion that spills back onto Lake Washington Boulevard compared to the No Build Alternative. Adding the eastbound HOV direct-access ramp and the constant-slope profile to Option A would not change the congestion and travel times described above.

Option K Suboption

- Adding the suboptions to Option K would not change the westbound areas of congestion and travel times described above.

Option L Suboptions

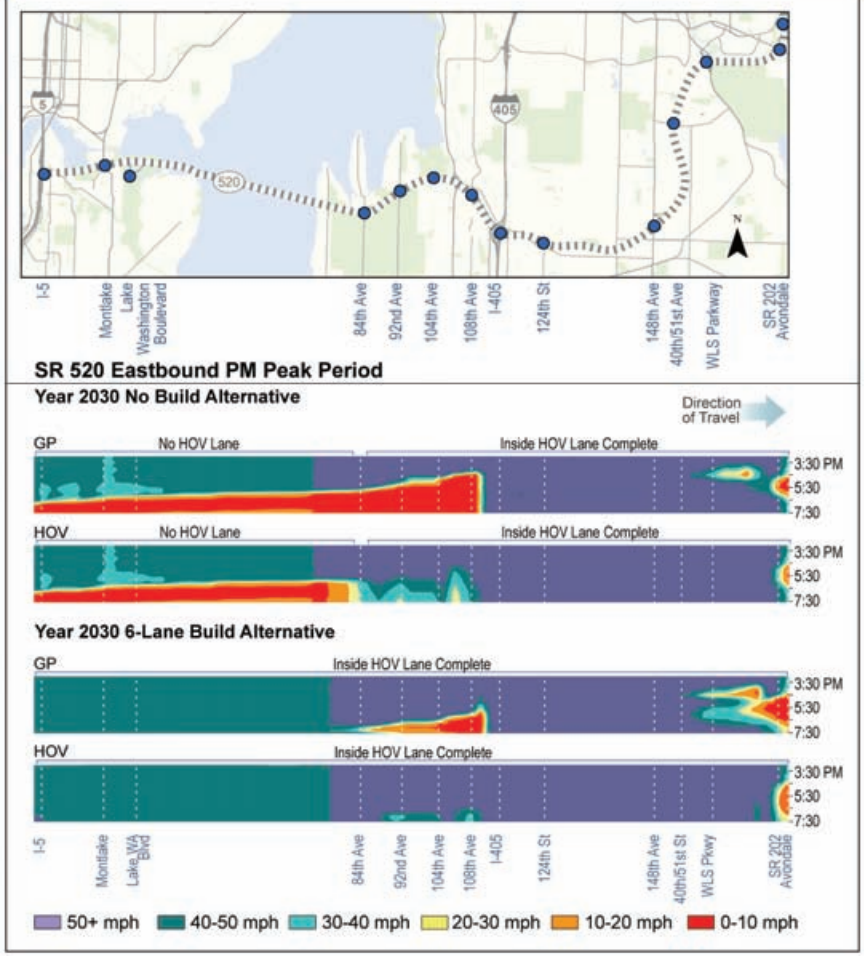
- Adding the suboptions to Option L would not change the westbound areas of congestion and travel times described above.

Eastbound

By 2030, congestion on I-405 will have a substantial effect on the eastbound SR 520 afternoon commute. Traffic on I-405 through downtown Bellevue will back up onto the SR 520 ramps, limiting the amount of traffic that can exit from SR 520. Congestion lasting up to 2 hours will extend from I-405 as far back as I-5 (Exhibit 5.1-9). Under the No Build Alternative, average afternoon general-purpose travel times would increase by 5 minutes. However, during the peak hour of the afternoon commute, general-purpose travel times could increase by 1 hour for a total travel time of 85 minutes between I-5 and SR 202. General-purpose congestion would extend as far back as I-5, blocking eastbound HOVs from reaching the HOV lane starting near 84th Avenue NE (assumed as a part of the No Build Alternative). As a result, under the No Build Alternative, eastbound HOV travel times would increase by approximately 30 minutes for a total travel time of 54 minutes between I-5 and SR 202.

With the 6-Lane Alternative, traffic on I-405 would still back up onto SR 520. However, with the extension of the HOV lane to I-5, HOVs would be able to access the eastbound HOV lane, making HOV travel times 40 minutes faster with the project during the peak hour of the afternoon

Exhibit 5.1-9. **Eastbound Areas of Congestion During the Evening Commute Peak Period**



commute. This improvement in HOV operations along with roadway design improvements would result in substantial improvements in general-purpose traffic operations and travel times during the afternoon peak hour. With the 6-Lane Alternative, p.m. peak general-purpose travel times would improve between 37 and 55 minutes compared to the No Build. Current and year 2030 travel times are summarized in Exhibit 5.1-8.

Effects of Suboptions

- Adding the suboptions to Option A, K, or L would not changes the eastbound areas of congestion and travel times described above.

How would the project affect traffic on local streets and at intersections?

To gauge project effects on local traffic, WSDOT identified 39 key intersections near SR 520 in the study area and modeled their operations without and with the project. Without the project, 5 of the 39 study intersections would operate poorly (level of service [LOS] E or F) during

Traffic Levels of Service

Level of service rates the quality of traffic operations on a given transportation facility. The LOS rating scale uses the letters A through F. The letter grades are based on the levels of delay that drivers experience at an intersection, with the letter A representing the shortest delays (10 seconds) and the letter F representing the longest delays (80 seconds or more at signalized intersections).

For this SDEIS, level of service results are presented in the following terms:

- Low to moderate congestion (LOS A through D)
- Congested (LOS E)
- Severely congested (LOS F)

The results of the LOS analysis are presented in the Transportation Discipline Report (Attachment 7).

the morning commute period and 12 intersections during the afternoon commute period (Exhibit 5.1-10). With the project, local traffic volumes would be most affected in the Montlake Boulevard Interchange area. The effects in this area would then result in slight changes to local traffic volumes in the East Roanoke and NE 45th Street interchange areas. With the project, 5 of the 39 study intersections would operate poorly during the morning commute period and 10 intersections during the afternoon commute period (Exhibit 5.1-10).

Changes to local traffic patterns were concentrated in the Montlake area and the Roanoke and NE 45th Street interchange areas. The discussion below focuses on those intersections most affected for the No Build Alternative and each design option. The Transportation Discipline Report (Attachment 7) provides more detail on specific traffic volume changes on streets in the entire project area.

Option A

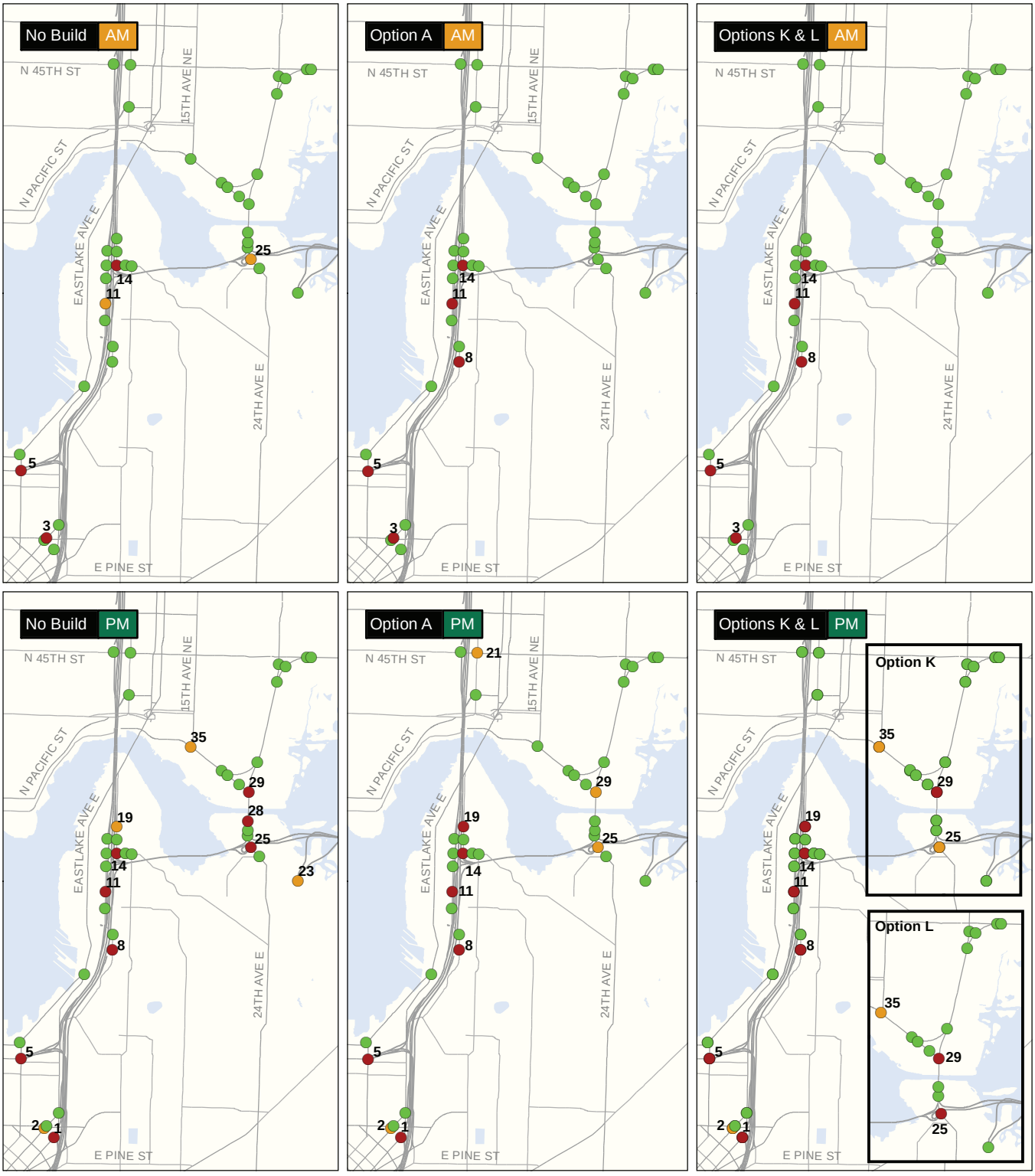
Option A would remove the Lake Washington Boulevard ramps that exist today, provide direct transit access from the westbound SR 520 HOV lane, and add a second Montlake bridge. Because Option A would remove the Lake Washington Boulevard ramps, traffic volumes would decrease through the Arboretum and increase at the Montlake Boulevard interchange compared to the No Build Alternative (Exhibits 5.1-11 and 5.1-12). Option A adds capacity across the Montlake Cut with the second bascule bridge, and on the SR 520 eastbound on-ramp with the addition of a second general-purpose lane. As a result, local and SR 520 vehicles and buses would benefit over the No Build Alternative by reduced congestion and delay on both directions of Montlake Boulevard between East Roanoke Street and NE Pacific Street.

Local traffic operations along Montlake Boulevard NE and NE Pacific Street would improve with Option A compared to the No Build Alternative. Option A traffic patterns would improve operations at four intersections in the Montlake area and degrade operations at one intersection in the NE 45th Street interchange area and two intersections at the Roanoke/Harvard interchange.

Option A Suboptions

- Adding the Lake Washington Boulevard ramps to Option A would result in less congestion in the SR 520/Montlake Boulevard interchange area as compared to Option A. This is because drivers destined for areas south of SR 520 would use the Lake Washington Boulevard westbound off-ramp to exit the freeway rather than using the Montlake Boulevard exit. As a result, traffic volumes at the Lake Washington Boulevard ramps would be similar to the No Build Alternative.

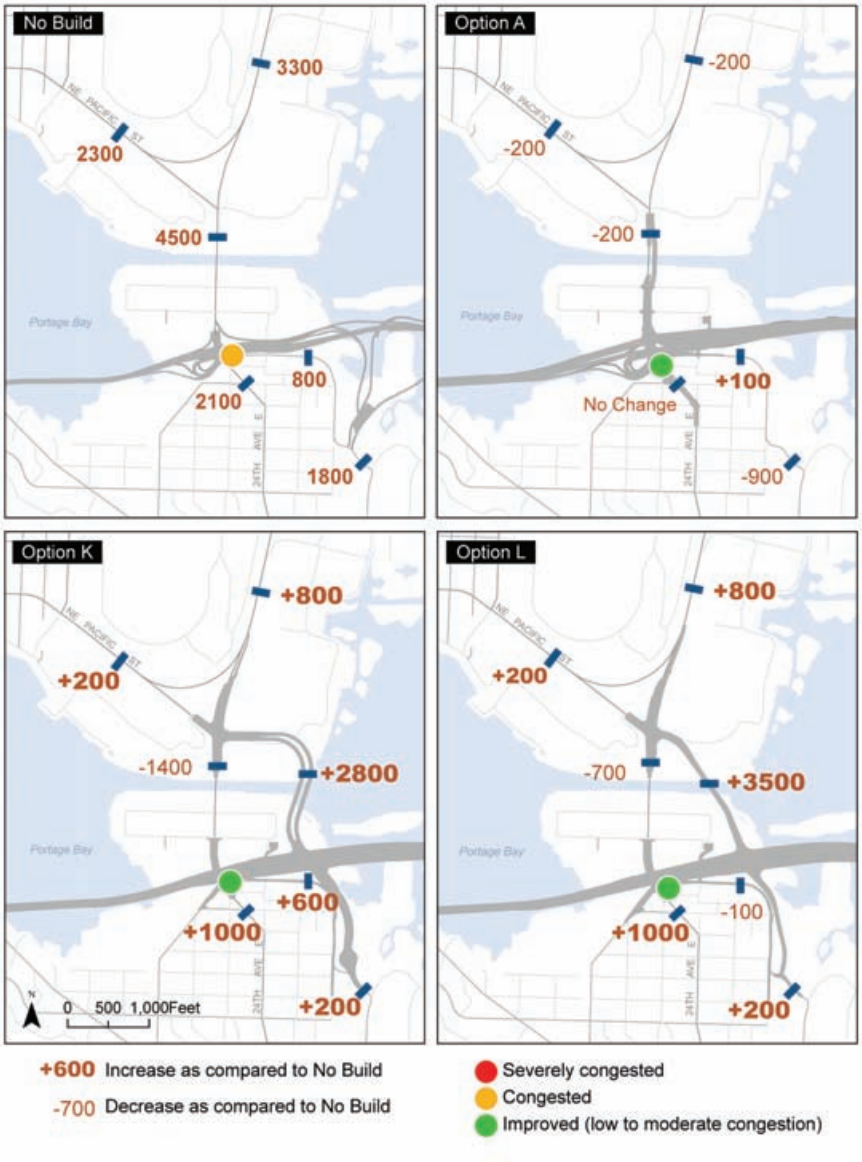
Exhibit 5.1-10. Traffic Congestion at Seattle Project Area Intersections 2030 AM and PM Peak Hours



Intersection Locations:

1 Yale Ave/Howell St/I-5 SB On-Ramp
2 Yale Ave/Stewart St
3 Denny Way/Stewart St
5 Mercer St/I-5 Ramps
8 Lakeview Blvd/I-5 NB Off-Ramp
11 Boylston Ave/E Lynn St
14 E Roanoke St/Harvard Ave/SR 520 WB Off-Ramp
19 Harvard Ave/I-5 NB On-Ramp
21 NE 45th St./7th Ave NE
22 NE 45th St/5th Ave NE
23 SR 520 Arboretum Ramps
25 Montlake Blvd/SR 520 EB Ramps/Lake Washington Blvd
28 Montlake Blvd/E Shelby St
29 Montlake Blvd/NE Pacific St
35 NE 45th St/University Village Driveway

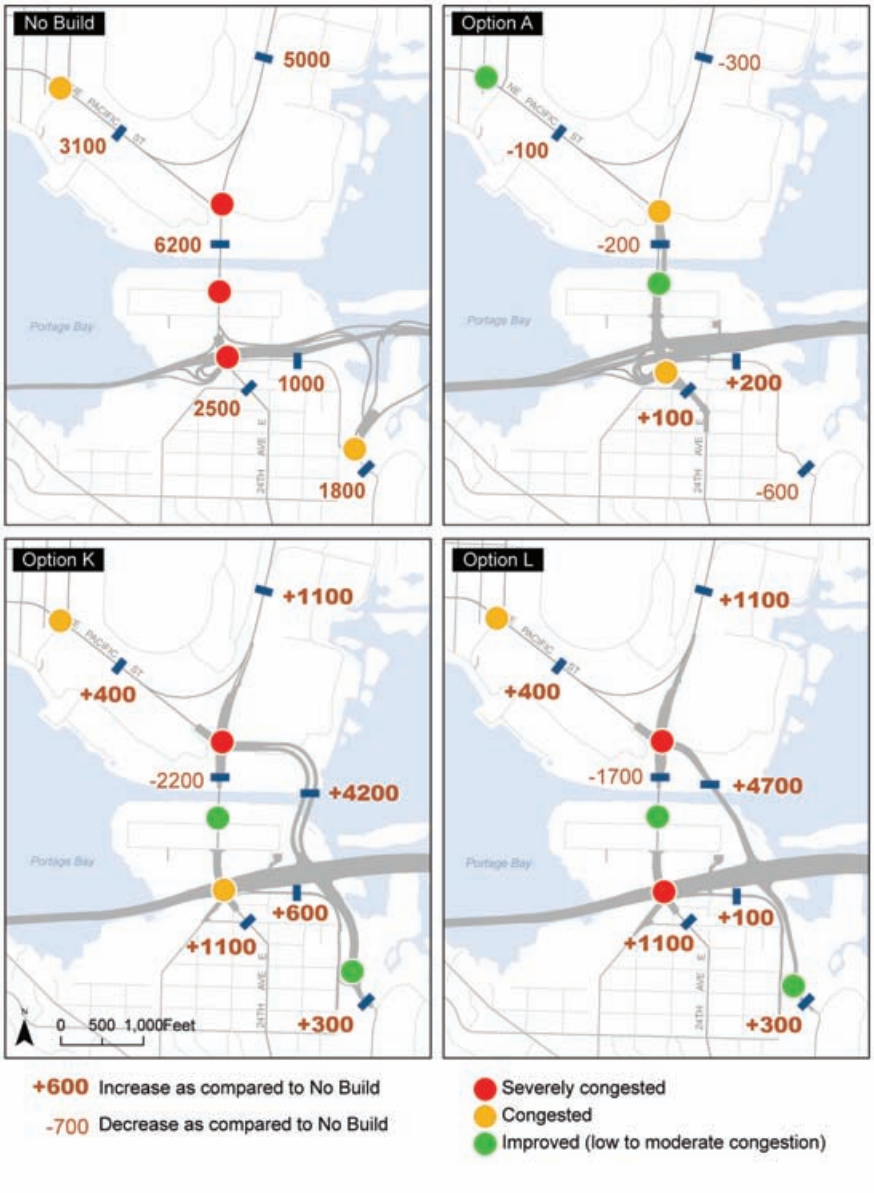
Exhibit 5.1-11. **Traffic Volume Changes During the AM Peak Period**



- The ramps would also improve intersection operations in the SR 520/Montlake Boulevard interchange area compared to the No Build Alternative during the afternoon peak hour. During the morning peak hour, all intersections within the SR 520/Montlake Boulevard interchange area would operate at LOS D or better, similar to Option A and the No Build Alternative. During the afternoon peak hour, traffic operations would improve at the same intersections as Option A.
- Option A with Lake Washington Boulevard ramps would differ from Option A for drivers using the Montlake westbound off-ramp. With the access the Lake Washington Boulevard ramps would provide to Montlake Boulevard, the Montlake westbound off-ramp would be restricted to right turns only onto Montlake Boulevard. Drivers

destined for areas south of SR 520 would need to use the Lake Washington Boulevard westbound off-ramp to travel southbound on Montlake Boulevard rather than using the U-turn movement as they do today.

Exhibit 5.1-12. **Traffic Volume Changes During the PM Peak Period**



- Adding the eastbound HOV direct-access ramp and the constant-slope profile to Option A would not change the effects described above.

Option K

Option K would include a new lowered SPUI that combines the functions of the existing SR 520/Montlake Boulevard and Lake Washington Boulevard ramps to the east. Traffic volumes in the Montlake Boulevard

interchange area are forecasted to increase under Option K compared to the No Build Alternative (Exhibits 5.1-11 and 5.1-12). This is because drivers would take advantage of the capacity associated with the new interchange and crossing of the Montlake Cut. By shifting SR 520 traffic to the SPUI, drivers would choose to take advantage of the capacity made available on Montlake Boulevard.

Some local streets would experience a greater increase in traffic volumes than others. The greatest increase would occur on Montlake Boulevard north of NE Pacific Street and across the Montlake Cut because of the new tunnel connection between the SPUI and the NE Pacific Street/Montlake Boulevard intersection. Traffic volumes across the Montlake Bridge itself would be less than under the No Build Alternative or Option A, but overall traffic volumes across the Montlake Cut (including the tunnel) would be more. Traffic would also increase south of SR 520 on Montlake Boulevard and through the Arboretum because Option K would provide access to the new SPUI via a new frontage road and traffic turnaround from the Montlake Boulevard/Lake Washington Boulevard NE intersection.

Option K would not degrade operations at any intersections during the morning peak hour and at only one intersection (Montlake Boulevard/ NE Pacific Street) during the afternoon peak hour. Although the Montlake Boulevard/NE Pacific Street intersection would operate at LOS F with the No Build Alternative, the conditions would become worse under Option K because there would be more vehicles traveling northbound through the intersection.

Compared with No Build, Option K traffic patterns would degrade operations at three intersections at the Roanoke/Harvard interchange area.

Option K Suboption

- Adding the eastbound off-ramp to Montlake Boulevard to Option K would improve traffic conditions at the SR 520/SPUI traffic turnaround. This is because the added eastbound right-only off-ramp to Montlake Boulevard would allow drivers to head directly south on Montlake Boulevard without having to use the new interchange and traffic turnaround. This would reduce traffic volumes and improve maneuverability and travel speed on the traffic turnaround roadway.
- Traffic operations at the Montlake Boulevard/Lake Washington Boulevard/SR 520 eastbound off-ramp would improve compared to Option K. Under Option K with the added ramp, it would improve to LOS C during the afternoon peak hour, compared to LOS E without the added ramp.

Option L

Traffic forecasts, travel patterns, and operations are the same for Options K and L, except that Option L would not include the traffic

turnaround in the Arboretum. Therefore, vehicles would not be able to access the new interchange from Lake Washington Boulevard southbound. Instead, drivers would go north on Montlake Boulevard to the Montlake Boulevard/NE Pacific Street intersection and turn right to access the new bridge connection to the new interchange. As a result, Montlake Boulevard traffic volumes would not decrease as much as with Option K. However, they would still be substantially less than under the No Build Alternative between Lake Washington Boulevard and NE Pacific Street in the morning and afternoon peak hours.

Option L Suboptions

- Adding a third northbound lane on Montlake Boulevard north of the Montlake Cut would improve traffic operations, but the intersection would still operate at LOS F during the p.m. peak hours. Traffic volumes would be the same as with Options K and L.
- Adding the potential left-turn access from Lake Washington Boulevard onto the SPUI south ramp would allow drivers south of the cut on Montlake Boulevard to access the SR 520/SPUI via Lake Washington Boulevard. This results in a shift of traffic away from the Montlake Bridge to Lake Washington Boulevard. These changes would worsen operations at the SR 520 ramps/Lake Washington Boulevard intersection from LOS C to D in the morning peak hour and from LOS E to F in the afternoon peak hour (compared to the No Build Alternative). Operations at this intersection would also be worse than with Option L. At the SR 520/SPUI intersection, operations would degrade from LOS D to E in the morning peak hour (compared to Option L) because of the increase in volumes from south of the SPUI.

How would the project affect transit facilities and service?

All options would affect transit service by adding new facilities and removing others. All 6-Lane Alternative options would:

- Add HOV lanes in both directions across the SR 520 bridge to I-5
- Add an HOV direct connection to the I-5 express lanes that would operate westbound-to-southbound in the morning and northbound-to-eastbound in the afternoon
- Add HOV bypass lanes on all interchange on-ramps
- Remove the Montlake Freeway Transit Station

In addition to the HOV facilities listed above, Option A would include a westbound transit-only off-ramp to northbound Montlake Boulevard. Options K and L would include 3+carpools and transit direct-access ramps at the new interchange east of Montlake Boulevard.

Transit Demand

With the No Build Alternative, daily transit person-trips would increase by approximately 8,150 people, or 51 percent, between now and the year 2030. Similar percent increases would occur during both commute periods. This increase in ridership is attributed to:

- The growing population and employment expected along the corridor over the next 20 years, and
- Changes in choice of travel mode in response to improved transit service and connectivity, increased congestion, climate change concerns, and other societal factors.

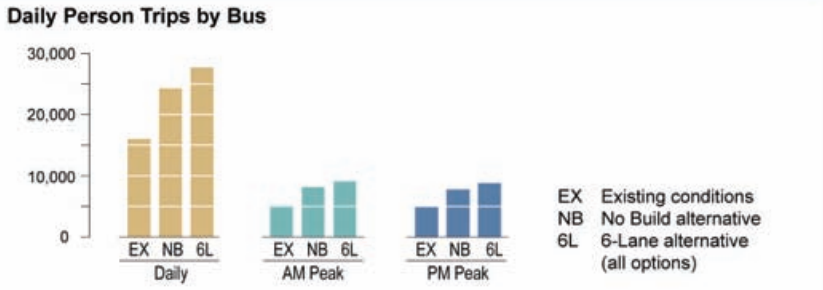
The 6-Lane Alternative options would increase transit person-trip demand by approximately 3,450 per day, or 14 percent over the No Build Alternative. This increase reflects the effect of tolling on mode choice, the benefit of completing the HOV lanes in both directions across the bridge, the reversible connection to the I-5 express lanes, and other corridor improvements. There are similar percent increases during both morning and afternoon commute periods. Exhibit 5.1-13 summarizes the current and forecasted daily and peak-period person-trips by bus.

KEY POINT

Transit

All options would substantially increase the demand for transit service, allowing SR 520 to carry more people with greater efficiency. The options would allow transit vehicles to move faster and more reliably than the No Build Alternative.

Exhibit 5.1-13. **Daily Person Trips by Bus**



Bus ridership is not expected to vary among the design options. This is because the roadway changes are localized at the Montlake area and therefore do not substantially affect total transit travel times on the SR 520 corridor. Additionally, future transit service levels would be similar for all of the options. Without substantial differences in corridor transit travel times or transit service, transit demand is expected to be similar.

Transit Travel Times on the SR 520 Corridor

With the 6-Lane Alternative, the HOV improvements to the SR 520 corridor would improve transit reliability and travel times and, therefore, connections between transit service and other travel modes.

HOV travel times between I-5 and SR 202 would improve by up to 5 minutes for westbound HOV traffic in both morning and afternoon peak

periods. Eastbound HOV travel times would improve by nearly 40 minutes during the afternoon peak period compared to the No Build Alternative. Completing the eastbound HOV lanes would allow transit to reliably bypass congestion associated with I-405 that is forecast to extend back onto SR 520 eastbound by the year 2030.

The capacity added across the Montlake Cut with all options would improve local traffic operations and, therefore, travel times and reliability for SR 520 buses compared to the No Build Alternative.

Option A

Option A would add a transit-only direct access ramp between SR 520 westbound and Montlake Boulevard northbound. As a result of this and the other improvements provided by Option A, local and SR 520 buses would benefit over the No Build Alternative by reduced congestion and delay on both directions of Montlake Boulevard NE. The HOV priority treatments on NE Pacific Street eastbound and Montlake Boulevard NE southbound would be retained with this option and would continue to benefit transit by allowing buses to bypass traffic queues associated with off-peak openings of the Montlake Bridge.

Option A Suboptions

- Adding the Lake Washington Boulevard ramps to Option A would result in less congestion in the SR 520/Montlake Boulevard interchange area. As a result, transit travel times would be better than both the No Build Alternative and Option A.
- Adding the eastbound transit direct-access ramp to Option A would allow buses to avoid signal delay at the SR 520 eastbound on-ramp/Montlake Boulevard intersection. With this ramp, eastbound buses would also enter directly into an inside HOV lane, reducing delay associated with lane changes across the general-purpose lanes that would occur in Option A.
- Adding the constant-slope profile to Option A would not change the effects described above.

Option K

With Option K, the HOV direct-access ramps at the new interchange would allow buses to bypass general-purpose traffic congestion on SR 520 ramps and main line. Transit operations for SR 520 buses would benefit from the new tunnel between SR 520 and the Montlake Boulevard/NE Pacific Street intersection. SR 520 buses would be able to bypass the Montlake Bridge and its associated off-peak openings.

However, for northbound local buses, delay would worsen because of increased congestion at the Montlake Boulevard/NE Pacific Street intersection. Through traffic would back up and block the northbound left turn lanes, delaying local buses.

The existing HOV bypass lane and transit signal priority on NE Pacific Street would be removed due to right-of-way constraints. A dedicated right-turn-only lane would be retained and local buses continuing to Montlake Boulevard southbound would use this lane. However, during the peak period eastbound traffic operations on NE Pacific Street approaching Montlake Boulevard would improve over No Build conditions. Bus travel times would be affected by Montlake Bridge openings during the off-peak, as eastbound buses would no longer be able to bypass congestion on NE Pacific Street.

Once on Montlake Boulevard southbound, local traffic operations would improve substantially, especially at the Montlake Boulevard/ Lake Washington Boulevard intersection. This would improve travel times for local buses.

Option K Suboption

- Adding the suboption to Option K would result in no measurable difference in the effects on transit operations described above.

Option L

Option L effects on transit travel times would be similar to Option K. However, with Option L, SR 520 buses would continue to be delayed by off-peak bridge openings because the new roadway between the new interchange and the Montlake Boulevard/NE Pacific Street intersection would include a bascule bridge.

Option L Suboptions

- Adding the suboptions to Option L would result in no measurable difference in the effects on transit operations described above.

Montlake Freeway Transit Station

All options would remove the Montlake Freeway Transit Station. Without the transit station, bus service between the Eastside and downtown Seattle would continue on SR 520 without stopping, and University District bus routes would continue to operate with direct service as they do today. Without the Montlake Freeway Transit Station, access to SR 520 bus service in the Montlake interchange area would be reduced, and transit riders that currently use the Montlake Freeway Transit Station would be required to use bus service that operates directly between the Eastside and the University District and light rail between downtown Seattle and the Montlake Triangle.

Transit Connections for Westbound Riders

Riders who currently walk, bus, or bike to the Montlake Freeway Transit Station to board a westbound bus to downtown Seattle could use the same method to access light rail, which is estimated to run every 5 to 15 minutes, at the Montlake Triangle (Sound Transit 2006). It is approximately a half

mile between the Montlake Freeway Transit Station and the Montlake Triangle, which is distance and time that would be saved for riders coming from the north and added for riders coming from the south.

Riders who currently get off at the Montlake Freeway Transit Station to walk, bus, or bike to surrounding destinations would now have to catch a University District route on the Eastside. Riders could transfer to University District buses at either the 92nd Avenue NE or Evergreen Point Freeway Transit Station, if required. Future frequencies between the University District and the Evergreen Point Freeway Transit Station, as evaluated for the SDEIS, would be about 4 minutes during the morning peak period and about 20 minutes during the afternoon peak period. These estimated frequencies do not include new ST route 542 between Redmond and the University District, which would increase overall service frequency in the corridor.

Under Option A, westbound transit riders that want to transfer to southbound local bus service on Montlake Boulevard could do so by exiting the bus at the end of the transit-only direct-access ramp and walking to the bus stop located at the SR 520 eastbound on-ramp. The distance to this stop would be shorter than it is today and under the No Build Alternative.

Under Option K or L, SR 520 buses would be rerouted to the new 3+carpool and bus direct-access ramps as part of the new SPUI. Buses would use the new tunnel (Option K) or bridge (Option L) to connect to the University District. The first westbound and last eastbound Seattle bus stop for University District-Eastside service would be the NE Pacific Street stops near the Montlake Triangle and UW Medical Center.

Sound Transit Route 542

Estimated transit frequencies do not include additional weekday peak service on new state route 542 between Redmond and the University District. This route was funded through a combination of ST2 and the Urban Partnership Agreement. Service is planned to start as early as September 2010. Peak-period service would be from about 6:00 a.m. to 10:00 a.m. and 2:00 pm to 7:00 p.m. 2010 bus service is planned to be every 15 minutes (Sound Transit 2008).

Effects of Suboptions

- Adding the suboptions to Option A, K, or L would result in no measurable differences in effects on westbound transit riders from those described above.

Transit Connections for Eastbound Riders

Eastbound riders who currently walk, bus, or bike to the Montlake Freeway Transit Station to catch a bus to the Eastside would now have to board a University District-Eastside direct route. Without the option to use bus routes that serve the Montlake Freeway Transit Station, riders would have fewer bus routes for travel across Lake Washington. With Option A, riders could board an eastbound bus at the traffic island located at the entrance to the eastbound SR 520 on-ramp or at the Montlake Triangle, and, if required, transfer at Evergreen Point Freeway Transit Station.

With Options K and L, riders could board an eastbound SR 520 bus at the Montlake Triangle. This could add approximately 1 to 3 minutes of travel time for riders originating from areas south of the Montlake Cut by car or bus, or approximately 7 to 10 minutes for those who walk. Some passengers

could transfer at the Evergreen Point Freeway Transit Station to connect to routes to their final destinations.

Riders who start their trip in downtown Seattle and use eastbound buses to get off at the Montlake Freeway Transit Station to access Montlake and the University District areas could use light rail service to the University of Washington Station.

Effects of Suboptions

- Adding the eastbound direct-access ramp to Option A would result in the removal of the HOV lane on the SR 520 eastbound loop ramp and the bus stop located at the top of the ramp. SR 520 buses would be rerouted to the new direct-access ramp. Transit riders would connect to SR 520 eastbound bus service at the NE Pacific Street bus stops near Montlake Triangle. This would mean some additional travel time for riders from the south.
- Adding the Lake Washington Boulevard ramps and the constant-slope profile to Option A would result in no additional transit effects.
- Adding the suboptions to Option K or L would result in no measurable differences to the transit connections that are described above.

University District Service

University District-Eastside bus routes would continue to operate with direct service as they do today. On weekdays, transit riders using the Evergreen Point Freeway Transit Station would have direct all-day service to the University District on Sound Transit route 540 and peak period service on King County Metro routes 167, 243, 272, 277, and 555/556. Additional weekday service could be provided by Sound Transit's new Redmond-University District route (route 542).

With relocation of the HOV lanes and freeway transit stations to the inside median of SR 520, King County Metro routes 261 and 271 would no longer be accessible from the Evergreen Point Freeway Transit Station. These routes use the SR 520/ 84th Avenue NE interchange, which, with the project, would prevent them from being able to access and serve riders using the new median transit station at Evergreen Point. On weekends, no University District bus service would be accessible from the new transit station with the current transit service and routes.

University Link Station

All options are designed to be compatible with the planned University Link station at Husky Stadium (Exhibit 5.1-14). Coordination among WSDOT, King County Metro, Sound Transit, and the University of Washington regarding the project effects on transit will continue through the selection and design of a preferred alternative. WSDOT—along with Sound Transit,

King County Metro, and the University of Washington—has also developed a separate High Capacity Transit Plan to determine the effects of different transit service structures, including bus rapid transit, on the SR 520 corridor. The Final High-Capacity Transit Plan (WSDOT 2008c) provides more information about this work.

Exhibit 5.1-14. **Rendering of Sound Transit's University of Washington Station Entrance with Pedestrian Bridge, (opening in 2016)**

In the future, bus stop activity is expected to increase in the Montlake Triangle area, as some transfer activity would relocate there with the opening of U-Link's University of Washington station and the closure of the Montlake Freeway Transit Station. For riders transferring between SR 520 buses and light rail, pedestrian walk times between the NE Pacific Street bus stops and the light rail station entrance would be less than 5 minutes.

Effect of Suboptions

- Adding the suboptions to Option A, K, or L would result in no measurable changes to the effects on the University Link Station as they are described above.

Bus Stops

In the future, bus routing and stops in the Montlake Triangle area would remain largely unchanged from what they are today, with buses traveling northbound and southbound on Montlake Boulevard NE, and then westbound and eastbound on NE Pacific Street.

Some of the bus stops and facilities in the Montlake Triangle and overpass area would be different than the No Build. The next sections discuss the changes in bus stops and facilities (and therefore transit connections) that are specific to each 6-Lane Alternative option.

Option A

Under Option A, the southbound bus stop on the Montlake overcrossing would be reconstructed near where it is today at the entrance to the SR 520 eastbound on-ramp. This would allow transfers between local and eastbound SR 520 routes to continue.

For westbound SR 520 bus riders wanting to transfer to southbound local bus service, riders would exit at the bus stop that would be located at the end of the transit-only direct-access ramp and walk to the bus stop located at the SR 520 eastbound on-ramp. The distance between these stops would be shorter than what it is today and under the No Build Alternative.

Transit transfer patterns at the northbound bus stop on the Montlake overcrossing are expected to change in the future when U-Link service begins. Riders that currently use this stop to transfer between downtown Seattle SR 520 buses and local buses might replace their downtown SR 520 bus with light rail. These riders would then transfer to local bus service at the Montlake Triangle. Continued coordination with the transit agencies will determine bus stop locations once a preferred alternative is selected.

Option A Suboptions

- Adding the eastbound HOV direct-access ramp would remove the HOV lane on the SR 520 eastbound loop ramp, and the bus stop located at the top of the ramp would serve southbound local buses only. Passenger access on eastbound SR 520 buses would occur at the Montlake Triangle. It is expected that many of these boardings and alightings would relocate to the NE Pacific Street stop with riders originating in Rainier Valley, Capitol Hill, and downtown Seattle switching to light rail.
- Adding the Lake Washington Boulevard ramps and the constant-slope profile to Option A would result in no additional effects.

Option K or L

With Option K or L, bus stops on the Montlake overcrossing would be provided to maintain access to the local routes using Montlake Boulevard

NE. All transfers to SR 520 bus routes would occur at the Montlake Triangle.

Option K or L Suboptions

- Adding the suboptions to Option K or L would result in no additional changes to bus stops and effects would not differ from those described above.

Bikes and Transit

Some bus riders who use the Montlake Freeway Transit Station are bike riders. With the project, bicycle commuters would have the option of riding across the SR 520 bridge, which is likely to reduce their total commute travel time. Often, bike riders are delayed because of full bike racks, sometimes waiting up to 30 to 40 minutes for a bus with bike rack space (King County Metro 2002). The project would make their trip more reliable because they would not have to wait for bike rack space.

Effect of Suboptions

- Adding the suboptions to Option A, K, or L would result in no change to bikes and transit, and effects would not differ from those described above.

How would the project affect nonmotorized transportation?

All of the design options would meet the project goals of providing 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, help to 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.

KEY POINT

Bicycle/Pedestrian Path

All options would add a regional bicycle/pedestrian path along SR 520, which would provide an additional route across the lake for bicyclists and

The following project features apply to all design options:

- The bicycle/pedestrian path across the SR 520 bridge is the most substantial nonmotorized improvement included in the project. Bicyclists and pedestrians will have the ability to travel directly on the bridge, an option they do not have today.
- The I-5/SR 520 interchange lid provides indirect yet safer bicycle/pedestrian connections through the Roanoke interchange area than the No Build Alternative.
- On the 10th Avenue and Delmar Drive East lid, intersection connections are improved to provide enhanced safety for bicyclists and pedestrians. The lid surface offers a more aesthetic connection between

neighborhoods adjacent to SR 520 and includes a pathway from east to west between 10th Avenue and Delmar Drive.

While all of the design options meet the basic project goals, they contain slight differences in their effects on nonmotorized transportation in the Montlake interchange area. These differences are associated with the variations in design features along Montlake Boulevard. As described below, the ease of nonmotorized travel from place to place will be most improved to the east and southwest through Option A. Options K and L provide more improvements to the north, east, and west. Exhibit 5.1-15 illustrates these changes.

Montlake Boulevard and 24th Avenue East Lid

The Montlake and 24th Avenue East lid would allow people to connect to the SR 520 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. Option A offers the most direct access on paths from the SR 520 bridge to Lake Washington Boulevard, the Arboretum, and the Bill Dawson Trail. Options K and L would require users to cross streets to access the same facilities.

With Option L, the elevation differences at the SPUI limit the area of the lid, which may require users to travel along streets instead of using pathways on the lid to reach their destinations.

Montlake Boulevard and NE Pacific Street Intersection

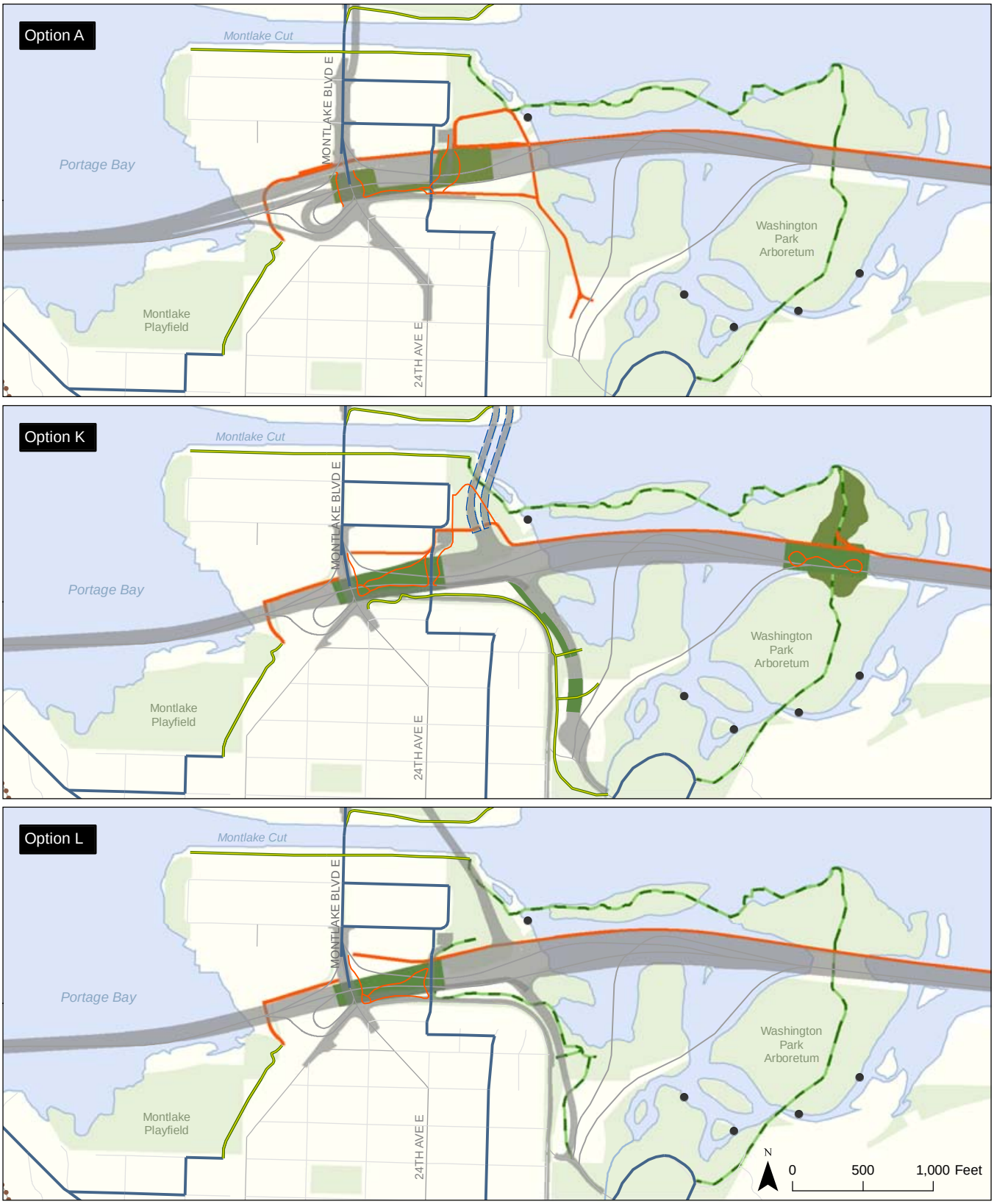
Option A would allow bicyclists and pedestrians to connect to other modes of transportation via the Montlake Multimodal Center and University Link light rail station instead of the existing Montlake freeway transit station. A roadside bicycle/pedestrian path would be provided along the new Montlake Cut Bridge. Compared to the No Build Alternative, bicyclists will experience fewer conflicts with traffic by using the roadside path.

With Options K and L, the NE Pacific Street lid would provide more nonmotorized connections between local bus services, regional bus services, including SR 520 routes to the Eastside and the University Link light rail station. Bicyclists traveling south of NE Pacific Street on Montlake Boulevard would still be required to use the street, but they would experience fewer conflicts with vehicles as a result of reduced traffic.

Lake Washington Boulevard

Option A would reduce vehicular traffic in the Arboretum (up to 900 vph compared to No Build), resulting in improved conditions for bicycle and pedestrian travel.

Exhibit 5.1-15. Future Trail Connectivity



Option K would provide small lids across the new frontage road for bicyclists and pedestrians to connect from Lake Washington Boulevard to the Arboretum pathways.

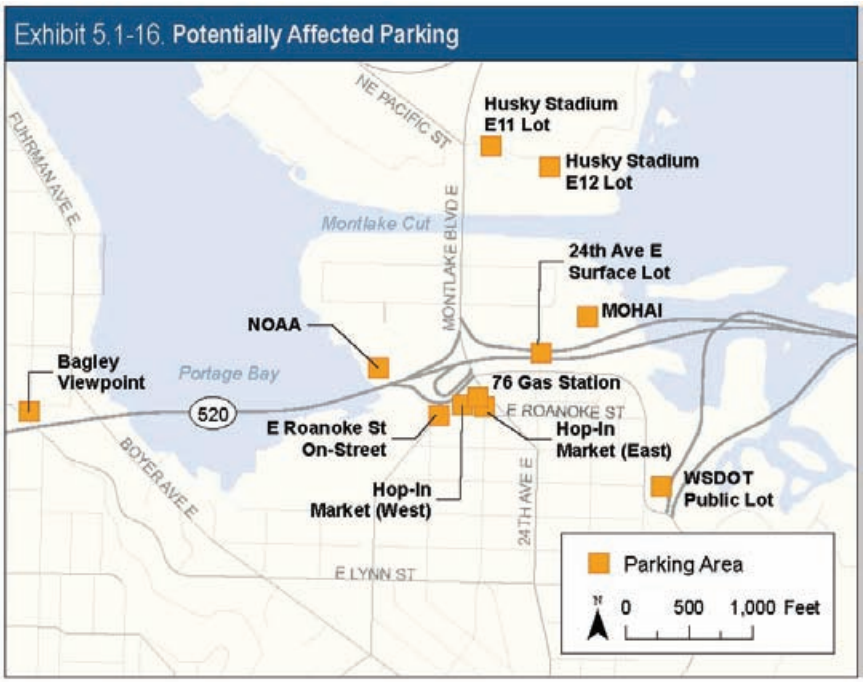
Effects of Suboptions

- Adding the Lake Washington Boulevard ramps to Option A would result in traffic volumes higher than Option A but similar to the No Build. Volumes would increase by 100 vehicles per hour during the morning peak hour and would be unchanged during the afternoon peak hour. Adding the eastbound HOV direct-access ramp or the constant-slope profile to Option A would result in no additional changes to nonmotorized transportation.
- Adding the suboptions to Options K or L would result in no measurable difference to the nonmotorized transportation effects described above.

How would the project affect parking?

With the exception of the parking lot at Bagley Viewpoint near I-5, all of the parking lots that the project would affect are in the Montlake area. Exhibit 5.1-16 shows the location of affected parking. Table 5.1-2 lists the existing parking supply, average number of spaces in use, estimated utilization rate, and the number of spaces each design option is expected to affect. Option L would have the greatest overall effect on parking due to construction of the northern SPUI ramps across the Montlake Cut that would pass through the Husky Stadium south parking lot.

Exhibit 5.1-16. **Potentially Affected Parking**



For many of the affected parking spaces, the facility that requires them would also be removed; therefore, replacement of the lost spaces would not be necessary. This includes MOHAI, which would have the most affected parking spaces and would be removed under all options. However, some facilities would continue operating and, therefore, would still require parking. These locations include the Husky Stadium lots, the Hop-In Market for Option A, and the WSDOT Public Lot for Option K. The implications of these parking losses are discussed in Section 5.2, Land Use.

Table 5.1-2. Potentially Affected Parking Areas

Location	Existing Parking Supply	Utilization Rate	Spaces Affected by Build Alternative		
			Opt. A	Opt. K	Opt. L
Lot at Bagley Viewpoint	10	10% [a]	10[d]	10[d]	10[d]
NOAA NW Fisheries Science Center	148	78% [a]	12[d]	0	0
East Roanoke Street (On-Street)	6	100% [b]	0	6	6
76 Gas Station	5	80% [a]	5	0	0
Hop-In Market (West)	17	53% [a]	9	0	0
Hop-In Market (East)	10	40% [a]	10	0	0
24th Avenue East (on-street)	5	20% [a]	0	1	0
MOHAI	150	39% [a]	150[d]	150[d]	150[d]
Husky Stadium E11 Lot	429	100% [c]	0	20	114
Husky Stadium E12 Lot	746	100% [c]	0	0	57
WSDOT Public Lot	24	100% [b]	0	24	0

[a] Utilization rate obtained by hourly field surveys in 2004.
[b] Utilization rate estimated from multiple aerial photographs.
[c] Utilization rate provided by the University of Washington; updated to reflect post-Sound Transit build condition.
[d] Includes removal of the facility that requires the parking spaces; therefore, there would be no net loss at these locations.
Note: Adding the suboptions to Options A, K, or L would not change the parking conditions listed in this table.

Effect of Suboptions

- Adding the suboptions to Option A, K, or L would result in no measurable change to the parking effects described above.

What could be done to avoid or minimize negative effects?

Design Refinements

As design options A, K, and L were developed and evaluated, WSDOT identified locations where increased traffic volumes resulting from the

project might affect local traffic operations. In these locations, WSDOT identified potential design refinements, such as increasing the number of lanes on freeway ramps, adding turn lanes, or signalizing intersections, that would help to reduce local congestion. Many of these refinements have been incorporated into Options A, K, and L.

Beyond the measures that have already been integrated into the design options, several local intersections could be signalized to improve traffic flow. These improvements would be consistent with WSDOT design standards. The intersections are:

- Lakeview Boulevard East/I-5 northbound on-ramp
- Harvard Avenue East/I-5 northbound on-ramp
- Boylston Avenue East/East Lynn Street

WSDOT will continue to work with the Seattle Department of Transportation to determine the effectiveness of these improvements in reducing project effects.

Transit

WSDOT has worked continuously with King County Metro and Sound Transit throughput project development to identify project effects. Once a preferred alternative is selected, more detailed transit planning and intersection design will be performed in coordination with the transit agencies to determine whether existing bus stops would need to be replaced, relocated, or removed.

Parking

Parking in some areas could not be replaced in-kind due to a shortage of space available for replacement. WSDOT will coordinate with the University of Washington Medical Center, King County Metro, and Sound Transit to develop a mitigation strategy to contend with the loss of parking. Coordination and discussion between 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. Coordination will continue after the selection of a preferred alternative.

5.2 Land Use and Economic Activity

Washington State's Growth Management Act integrates transportation and land use planning in order to encourage economic and community development around designated urban centers and transportation corridors. SR 520 is one of the two primary east-west traffic corridors between Seattle and the Eastside. This section evaluates potential effects of the 6-Lane Alternative and Options A, K, and L on land uses adjacent to the corridor, describes the project's consistency with transportation and land use

Design Standards

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 in the Transportation Discipline Report (Attachment 7).

planning goals, and includes a discussion of how proposed corridor improvements may influence future economic activity. Information in this section is based on the Land Use, Economics, and Relocations Discipline Report (Attachment 7).

How would the project affect land use?

WSDOT would acquire land adjacent to the existing corridor for new permanent right-of-way in order to accommodate the alignment and interchange improvements associated with the 6-Lane Alternative. Table 5.2-1 summarizes the number of acres that would be converted to right-of-way and the number of structures affected by each 6-lane Alternative option. Exhibits 5.2-1 through 5.2-6 show right-of-way acquisitions by geographic area from I-5 to Medina. Land use along the corridor is a mix of residential and park use, interspersed with civic, quasi-public, and commercial uses. Buildings, businesses, and other uses that are on affected properties would be removed or relocated.

Table 5.2-1. 6-Lane Alternative Land Use Effects – by Design Option

Option	Acres Converted to Right-of-Way	Residential Structures Removed	Non-Residential Structures Removed
Option A	11.1 acres	5	11
Option K	15.7 acres	3	2
Option L	11.9 acres [a]	3	1

[a] Adding northbound capacity on Montlake Boulevard to Option L would result in an additional 1.4 acres of right-of-way acquisition along Montlake Boulevard north of the Montlake Cut.

Note: Two parcels on the Eastside totaling 1.2 acres with two residences have been purchased as part of WSDOT's early acquisition of right-of-way. The two residences are currently vacant. See Exhibit 5.2-6.

Options A and L would convert a similar total acreage of property into right-of-way (11.1 and 11.9 acres, respectively). Option K would convert the largest total acreage to right-of-way (15.7 acres). This is due to construction of the tunnel across the Montlake Cut and the need for additional right-of-way in McCurdy and East Montlake Parks south of the cut (see Table 5.2-2, which breaks down the right-of-way requirements by area). Option K would also convert additional acreage associated with the land bridge on Foster Island. All options would convert the same amount of property to right-of-way on the Eastside.

Table 5.2-3 identifies the acres by existing land use types that would be converted to transportation land use. Park lands are subject to special protection under federal law; right-of-way effects on parks are discussed further in Section 5.4.

KEY POINT

Right-of-way Requirements

All design options would remove the MOHAI building, a single-family residence south of the Portage Bay bridge, and two vacant single-family residences in Medina.

Option A would require the least amount of new right-of-way (11.1 acres). The Montlake 76 gas station and 9 of the 11 buildings on the south campus of NOAA's Northwest Fisheries Science Center would also be removed, along with two additional single-family residences.

Option K would require the most new right-of-way (15.7 acres). The University of Washington's Waterfront Activities Center would also be relocated for a multiple-year period.

Option L would require 11.9 acres of new right-of-way.

Exhibit 5.2-1. **Right-of-way Acquisitions in the I-5 Area**

Exhibit 5.2-2. **Right-of-way Acquisitions in the Portage Bay Area**

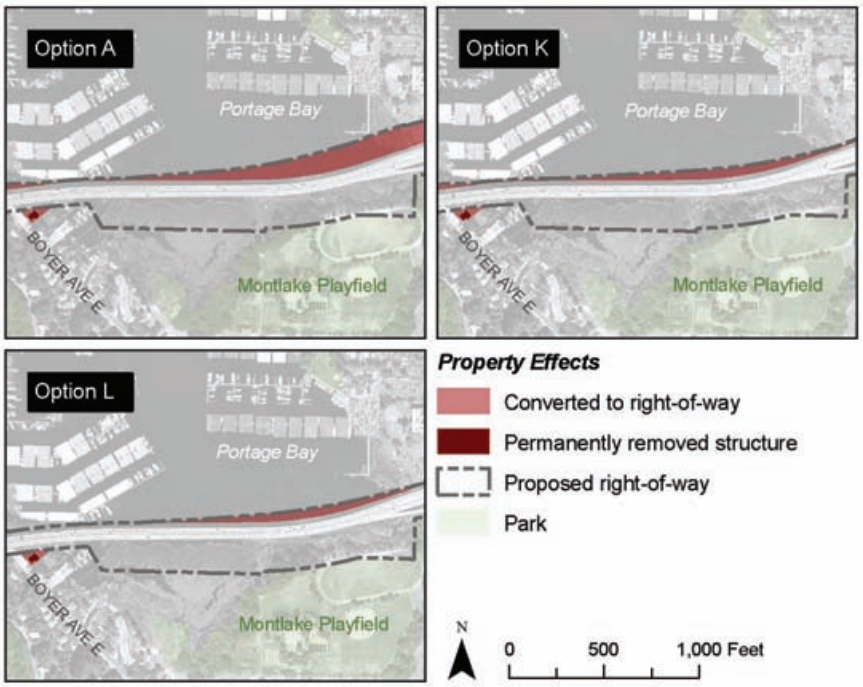


Table 5.2-2. Right-of-way Requirements by Geographic Area

Area	Option A (acres)	Option K (acres)	Option L (acres)
I-5 Area	0.1	0.1	0.1
Portage Bay Area	2.2	1.75	0.85
Montlake Area	6.68	11.35	9.08[a]
West Approach Area	0.89	1.35	0.64
Evergreen Point Bridge and East Approach Area	1.2	1.2	1.2
Total	11.1	15.7	11.9 [a]

[a] Adding northbound capacity on Montlake Boulevard to Option L would result in an additional 1.4 acres of right-of-way acquisition along Montlake Boulevard north of the Montlake Cut.

Note: These areas correlate with Exhibits 5.2-1 through 5.2-6.

Table 5.2-3. Right-of-way Requirements by Land Use Type

Area	Option A (acres)	Option K (acres)	Option L (acres)
Park/open space/civic/quasi-public	9.3	14.4	10.6[a]
Single-family residential	1.6	1.3	1.3
Commercial	0.2	0.0	0.0
Total	11.1	15.7	11.9[a]

[a] Adding northbound capacity on Montlake Boulevard to Option L would result in an additional 1.4 acres of right-of-way acquisition along Montlake Boulevard north of the Montlake Cut.

Exhibit 5.2-3. Right-of-way Acquisitions in the Montlake Area

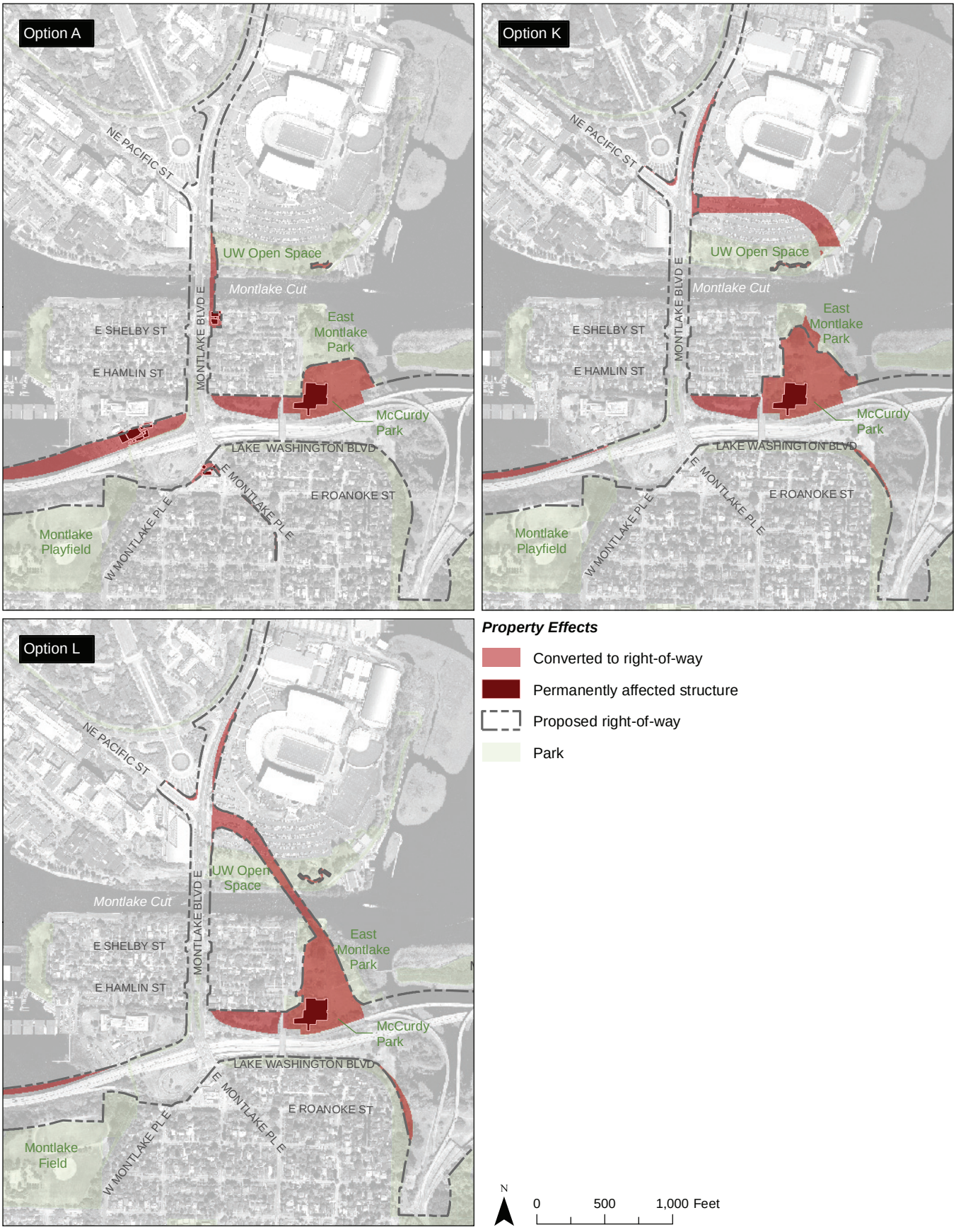
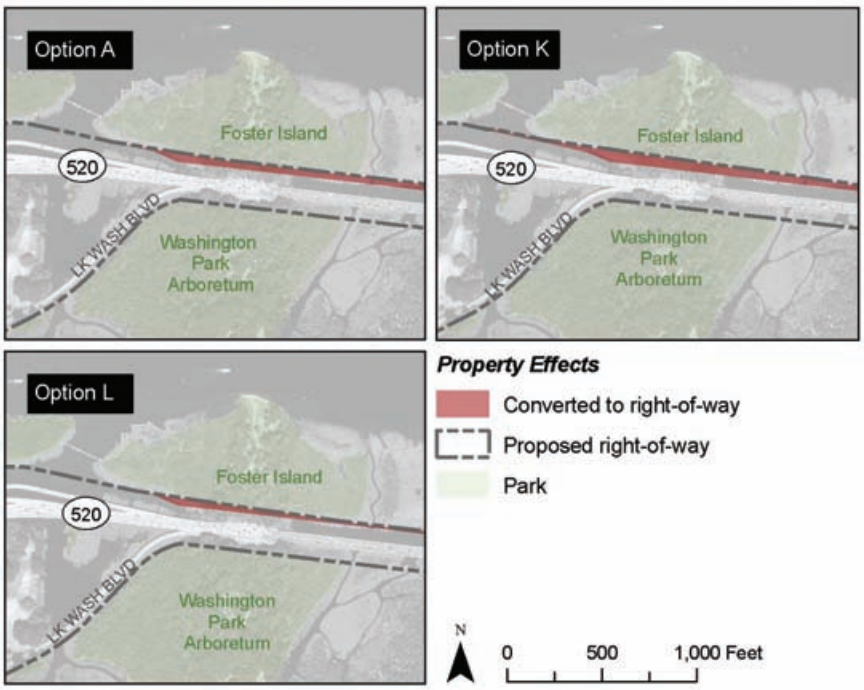


Exhibit 5.2-4. **Right-of-way Acquisitions in the West Approach Area**



Overall, these changes in land use represent small percentages of these types of land uses within the city of Seattle and are spread along the entire length of the corridor between I-5 and Lake Washington. No substantial change to the overall urbanized land use pattern in Seattle would occur. Effects on park areas would be mitigated consistent with federal, state, and local regulations (see Attachment 6, Supplemental Draft Section 4(f) Evaluation).

Structure Removal or Relocation

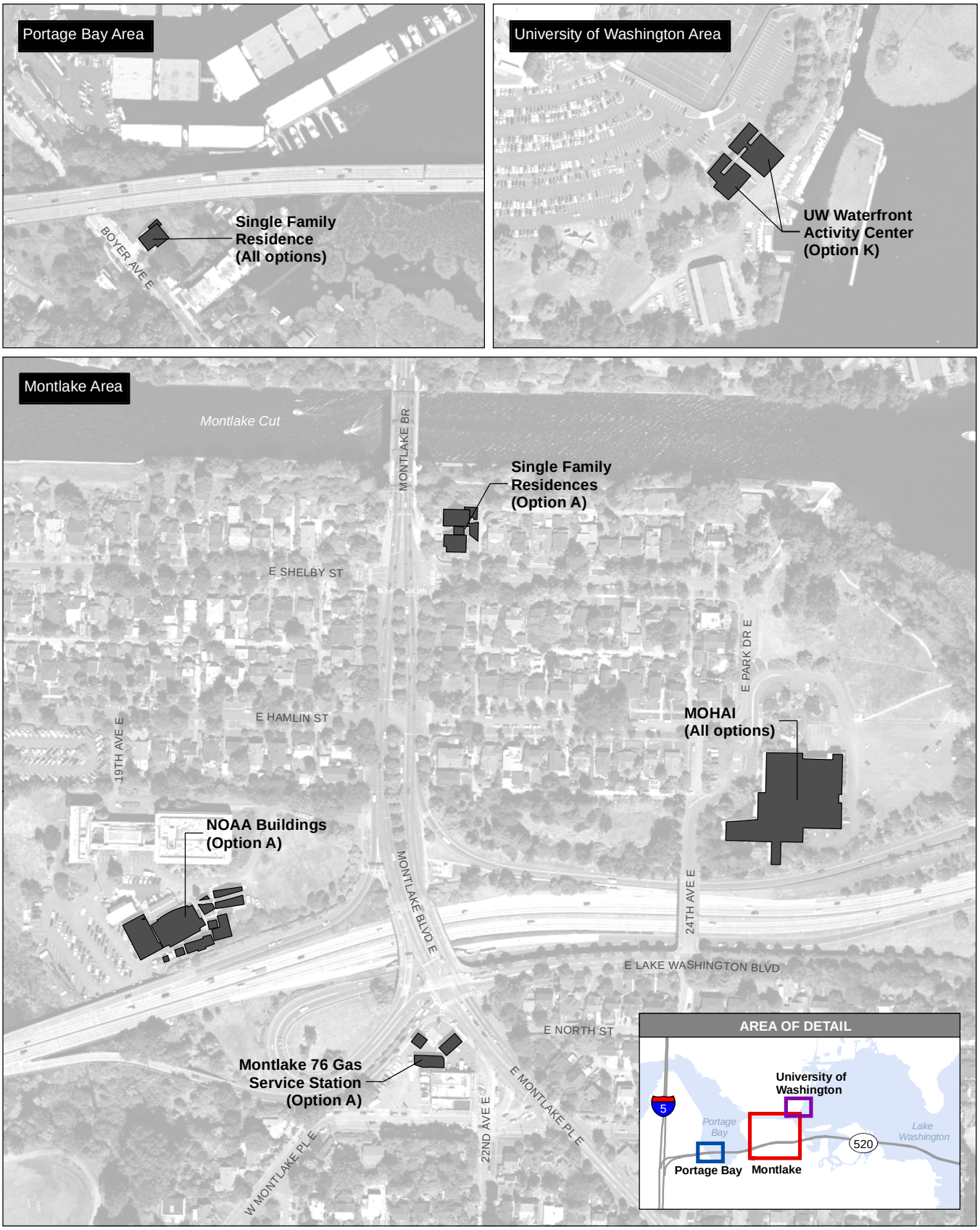
All options would permanently remove a residence south of the Portage Bay Bridge and the MOHAI building. Structures that would be permanently removed or relocated under Options A, K, and L are described below. Long-term relocations (that is, for multiple years) of docks or moorage slips are also identified.

- **Portage Bay residence.** One single-family residence would be removed in the Roanoke/Portage Bay neighborhood. This residence is located just south of the Portage Bay Bridge (Exhibit 5.2-2). The removal of this residence would occur to accommodate the construction work bridge south of the existing Portage Bay Bridge, which would be in place for several years. This is assumed to be a permanent effect.
- **MOHAI building.** The MOHAI building would be removed for a permanent stormwater treatment wetland that would treat runoff from

How would WSDOT work with property owners whose land is acquired for right-of-way?

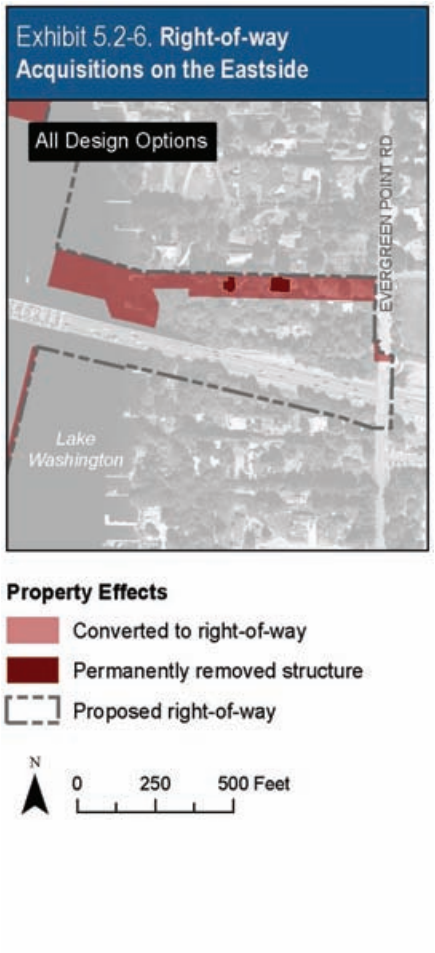
Property acquisition and relocations would occur in accordance with the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Property owners would receive compensation for their properties at fair market value, and relocation resources would be available to all displaced residents and business owners without discrimination and WSDOT would work closely with all displaced residents and businesses to find suitable properties to accommodate their needs.

Exhibit 5.2-5 Affected Structures



the west approach and Montlake interchange. MOHAI has indicated plans to relocate to a new site.

- **Moorage slips at Queen City Yacht Club and Bayshore Condominiums**. Several moorage slips on the south side of the Queen City Yacht Club and associated with the Bayshore Condominiums south of Portage Bay Bridge would be relocated during construction of the bridge, which would occur over a 6-year period. Depending on final design, it is anticipated that these moorage slips could be restored at their current location after the Portage Bay Bridge is completed.
- **Medina residences and shoreline docks**. Exhibit 5.2-6 shows the two affected parcels in Medina. They are located west of Evergreen Point Road. WSDOT has already acquired the two properties and plans to remove the two houses (currently vacant) that occupy them. One of the two parcels has a dock that would be permanently removed. Two docks are located north of and adjacent to the Evergreen Point Bridge on the Medina shoreline. The southernmost dock was purchased by WSDOT as part of right-of-way acquisition that has already occurred and may be removed. The northern dock would not be able to be used during the 2.5-year construction period of the east approach.



Option A

As identified above in Table 5.2-1, Option A would require the least amount of right-of-way, but would also remove the most structures. In addition to the structure removals common to all options described above, two single-family residences would be removed in the Montlake neighborhood to construct the new bascule bridge. Improvements to the Montlake interchange would remove the Montlake 76 gas station at the Montlake Boulevard and Lake Washington Boulevard intersection. Option A also includes a westbound auxiliary lane on the Portage Bay Bridge. The additional width associated with this lane would remove 9 of the 11 buildings on the south campus of NOAA's Northwest Fisheries Science Center. Structures that would be permanently removed or relocated under Option A are described below.

- **Montlake Residences.** Two single-family residences in the Montlake neighborhood would be removed to accommodate the second bascule bridge on Montlake Boulevard East across the Montlake Cut (see Exhibit 5.2-3). These residences are located on the east side of Montlake Boulevard East, immediately south of the Montlake Cut.
- **Montlake Business.** The Montlake 76 service station located at the Montlake Boulevard East/Lake Washington Boulevard intersection, just south of the SR 520 on- and off-ramps, would be removed to allow for improvements to the existing Montlake interchange.
- **NOAA Northwest Fisheries Science Center**. Eleven buildings make up the south campus of the NOAA facility, which is used for fisheries-

related research and experiments. Nine of these buildings would need to be removed to accommodate the westbound on-ramp and the auxiliary lane across the Portage Bay Bridge. The two northernmost buildings on the south campus would not be removed. The north campus, which consists of offices, laboratories, a library, and a 150-seat auditorium, would not be affected. WSDOT is working with NOAA to identify how research activities on the south campus would be affected by removal of these buildings and how their functions could be relocated elsewhere.

Option A Suboptions

- Adding the Lake Washington Boulevard ramps and eastbound HOV direct-access ramp to Option A would result in no measurable differences to the effects described above. This is because the added ramps would be located within and adjacent to the main line of SR 520. The added Lake Washington Boulevard on- and off-ramps for Option A would be located considerably farther west than they are currently. They would not cut through the Arboretum as the current ramps do, resulting in a positive change for the Arboretum. The majority of the length of the on- and off-ramps would run along the north and south sides of the main line, introducing little additional effect to the Arboretum. No additional structures would be removed and no additional long-term relocations would be required as a result of the suboptions. No additional right-of-way would be required under these suboptions.

Option K

Although Option K would require the most right-of-way, it would only affect one additional structure other than the two structures and dock/moorage slips affected under all options. Under Option K, the University of Washington's Waterfront Activities Center (WAC) would be relocated for a multiple-year period.

Option K Suboption

- Adding the eastbound off-ramp to Montlake Boulevard to Option K would result in no measurable differences to the land use impacts described above. The added ramp would be located within the existing right-of-way of the current Montlake Boulevard interchange. No additional structures would be removed, no additional long-term relocations would be required, and no additional right-of-way would be required as a result of the suboption.

Option L

Option L would not affect any structures beyond those identified as common to all options.

Option L Suboptions

- Adding northbound capacity on Montlake Boulevard to Option L would result in an additional 1.4 acres of right-of-way acquisition as compared to Option L. This effect would be from widening of the roadway and the relocation of a stormwater facility. There would be no other measurable differences to the impacts described under Option L.
- Adding left-turn access from Lake Washington Boulevard onto the SPUI south ramp to Option L would result in no measurable differences to the land use effects described above because it would require no additional right-of-way.

How would the project affect economic activity?

Investment in transportation infrastructure can be beneficial to businesses and consumers because of improved accessibility (the ease with which specific locations or activities can be reached). Factors that influence accessibility include travel times, safety, and the transportation choices available to users. Transportation investments that result in improved mobility can also contribute to economic development through inflow of labor and businesses from other regions, and increased efficiency for existing labor and capital resources (Transportation Research Board 2001).

KEY POINT

Local and Regional Economy

Businesses that rely on the efficient movement of goods and services (such as business supply companies, service providers, and freight operators) would benefit from all options.

Tolling of SR 520 is assumed under all 6-Lane Alternative options as a source of revenue to finance the project (see Chapter 1). Tolling scenarios included in the SR 520 Finance Plan (WSDOT 2008b) and evaluated in the transportation model assumed variable tolling (different toll rates are charged depending on the time of day and whether the trip is during peak or off-peak traffic hours). For example, a trip during peak traffic hours would be more expensive than at other times of day. Results from the transportation model indicate that the new lanes, combined with the toll, would provide an incentive to use transit and HOV. As discussed in Section 5.1, Transportation, congestion and travel times for both general-purpose and HOV trips would be reduced, particularly during the westbound afternoon and eastbound morning peak periods. Businesses that rely on the efficient movement of goods and services (such as business supply companies, service providers, and freight operators) would benefit from this improved mobility.

As described earlier, WSDOT would acquire additional right-of-way to construct the 6-Lane Alternative. As a result, taxable property would be removed from the local jurisdictions' tax bases, which would decrease property tax revenues. However, the project would result in only a minor decrease to Seattle's tax base because a considerable amount of the land that would be required is already publicly owned and not subject to property tax. Table 5.2-4 shows the initial property tax decrease for the 6-Lane Alternative design options. The total assessed value of the property acquired for right-of-way under all options would be between $8 million

and $10 million. Of this additional right-of-way acquired, approximately $1.8 million would be taxable. Using the 2008 tax levy rate for the City's portion of the taxable right-of-way, it is estimated that the loss of property tax revenue for the City of Seattle would be under $5,000. This represents less than 0.01 percent of the City's 2008 budgeted property tax revenues.

Table 5.2-4. Estimated Annual Property Tax Effects within Seattle

6-Lane Alternative	Estimated Assessed Value of Right-of-Way	Estimated Taxable Value of Right-of-Way	Initial Property Tax Decrease[a]	Budgeted 2008 Property Tax Revenues (percent)
Option A	$8,500,000	$1,800,000	$4,940	Less than 0.01
Option K	$8,100,000	$1,700,000	$4,850	Less than 0.01
Option L[b]	$10,000,000	$1,700,000	$4,960	Less than 0.01

[a] The total initial property tax effect would include partial encroachments. The tax effect of the partial encroachments was calculated by multiplying the actual 2008 property tax collected for the parcel by an estimate of the percentage of the parcel that would be taken for the 6-Lane Alternative.
[b] Adding northbound capacity on Montlake Boulevard to Option L would require an additional 1.4 acres of right-of-way; however, this area is currently in public ownership and its acquisition as right-of-way would not result in measurable changes to tax effects.
Note: adding the suboptions to Options A or K would not change the estimated tax effects listed in this table.
Source: King County Assessor (2009).

WSDOT has purchased two parcels in the city of Medina for replacement of the Evergreen Point Bridge. The City of Medina's loss of annual property tax revenue would be approximately $920. The losses of property tax revenue in Seattle and Medina would not represent a substantial effect on the cities' overall tax revenues.

Parking Removal

As discussed in section 5.1, Transportation, some permanent loss of parking may occur as a result of the project. Most of the parking displacements are not expected to result in adverse economic effects on the local economy because the lots are either rarely used or the amount of lost parking would be less than the amount of remaining spaces after the lot maximizes its average number of spaces in use. Those losses that could affect the businesses are discussed below.

Option A would affect parking at the Hop-In Market, which would make it difficult for patrons to frequent the store, especially during the noon hour. During other hours of operation, potential customers could be deterred from shopping at the market because parking spaces could be difficult to find.

Options K and L would affect parking at Husky Stadium lots E-11 and E-12. Option K would permanently acquire 20 stalls and Option L would permanently acquire 171 parking stalls. The Husky Stadium lots are almost

fully used and might require visitors and employees at the UW Medical Center to find alternative parking around the stadium.

Effect of Suboptions

- Adding the suboptions to Option A, K, or L would result in no measurable difference in the economic activity effects described above.

Would the project be consistent with regional and local land use plans and policies?

The elements of the 6-Lane Alternative, including new HOV lanes and a regional bicycle and pedestrian path, are consistent with the PSRC's *Vision 2040* and *Destination 2030* plans as well as King County's Countywide Planning Policies. These documents emphasize the need to provide transportation system continuity and the use of alternative transportation modes, and improve linkages between urban centers. As noted in Chapter 4, Destination 2030 and the PSRC regional travel demand model assume a 6-lane SR 520 by 2030 to support planned population and employment growth in the region.

The 6-Lane Alternative would also be consistent with policies of the Seattle Comprehensive Plan related to completing and promoting use of a regional HOV system, limiting freeway capacity expansions to those accommodating "non-single-occupancy vehicle users," protecting the Seattle neighborhoods from noise and traffic congestion, and improving transit connections.

The 6-Lane Alternative would be consistent with policies in the City of Medina Comprehensive Plan related to enhancing pedestrian and bicycle access and minimizing the effects of the regional transportation system on adjacent residential uses in the city.

Options K and L of the 6-Lane Alternative would cross the Montlake Cut and connect to the Pacific Street intersection through the Husky Stadium parking lot located in the southeast portion of the University of Washington campus. The change in land use from parking to transportation right-of-way would be inconsistent with the goals for this area identified in the *University of Washington Master Plan – Seattle Campus* (University of Washington 2003). Options K and L also conflict with the area designated in the plan as a potential development site near the WAC. WSDOT will work with the University of Washington to develop site-specific mitigation measures once a design for the 6-Lane Alternative is selected and the specific locations of project elements are determined.

The *Washington Park Arboretum Master Plan* (City of Seattle 2001) calls for the continued use of the Arboretum for education, conservation, and recreation and visitor services. One of its policies calls for the unused R.H. Thomson Expressway ramps to be converted to a multiuse path to MOHAI. All options would remove these ramps and would relocate MOHAI and, thus,

be inconsistent with this policy. Another policy in the master plan calls for retaining the WSDOT parking lot on Lake Washington Boulevard west of the SR 520 ramps. Option K would remove this parking lot, and thus would be inconsistent with this policy. The 6-Lane Alternative would be consistent with all other policies of the *Washington Park Arboretum Master Plan*.

Shoreline regulations apply to improvements located within 200 feet of shorelines, including water bodies such as lakes and associated wetlands. As such, the Portage Bay, west approach, and Evergreen Point bridges, as well as the new Montlake Cut bridge or tunnel crossings, would all be located within the shoreline environment.

Within Seattle, bridges are currently permitted as a special use under the CN, CR, and CM shoreline designations and as a conditional use under the CP designation. Bridges and streets are permitted outright in areas designated UR. Specific elements of the 6-Lane Alternative (for example, fill, construction work bridge, and tunnel) within 200 feet of shorelines are not consistent with current shoreline regulations.

The City of Seattle is in the process of updating its shoreline master program. Since the updated SMP language has not yet been developed and adopted, it is not possible to assess the consistency of the 6-Lane Alternative options with the new regulations. However, it is possible to generally use the current SMP as guidance on the relative degree of consistency among the three design options. Based on this approach, Option A would be more consistent with the SMP than Option K and L because the latter two options would have greater effects on the shoreline area and public recreation opportunities in the Arboretum.

When a design for the 6-Lane Alternative is selected and the specific locations of project elements are determined, WSDOT will work with Ecology and the cities of Seattle and Medina to ensure the 6-Lane Alternative could obtain all required shoreline master program permits and approvals. Construction of the 6-Lane Alternative would also use best management practices and other site-specific mitigation measures to protect shoreline areas.

The No Build Alternative would not support local land use plans as well as the 6-Lane Alternative because the portion of SR 520 in the project area would remain a nonstandard roadway that does not allow bicycle or pedestrian travel and offers few advantages for transit. The No Build Alternative would not be consistent with the Seattle Comprehensive Plan's policies about completing the regional HOV system, avoiding noise and traffic congestion in neighborhoods, and improving transit connections.

Effect of Suboptions

- Adding the suboptions to Option A, K or L, would result in no measurable differences to consistency with the regional and local land use plans and policies described above.

How will WSDOT work with property owners whose land is acquired for right-of-way?

WSDOT would conduct property acquisition and relocations in accordance with the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Property owners would receive compensation for their properties at fair market value, and relocation resources would be available to all displaced residents and business owners without discrimination and WSDOT would work closely with all displaced residents and businesses to find suitable properties to accommodate their needs. As noted above, some park properties would be subject to special mitigation requirements; these are discussed in Section 5.4.

5.3 Social Elements

Highways and transit lines connect people with their homes and daily destinations, while local streets and paths provide circulation for commuters, bicyclists, and pedestrians within their neighborhoods. Modifying or building new transportation infrastructure can improve these connections, but can also change the character of communities. Consideration of low-income and minority populations is particularly important to ensure that these communities are not disproportionately affected by adverse effects on human health or the environment. This section evaluates the project's potential benefits to and effects on neighborhoods and populations. The information in it is based on the Social Elements Discipline Report (Attachment 7).

How would the project affect neighborhoods?

Community Cohesion

All of the 6-Lane Alternative options would result in several long-term benefits that would improve community cohesion for the neighborhoods in the study area. They all include landscaped lids with pedestrian and bicycle pathways over I-5 at East Roanoke Street, 10th Avenue East and Delmar Drive East, and in the vicinity of Montlake Boulevard East. The lids would benefit community cohesion by reconnecting neighborhoods originally bisected by SR 520 and I-5, providing linkages between adjacent and nearby parks, improving views toward the highway from nearby residences, and providing safe passage across I-5 and SR 520 at these locations. Option K

KEY POINT

All 6-Lane Alternative options include lids that would benefit community cohesion by reconnecting neighborhoods originally bisected by SR 520 and I-5, providing linkages between adjacent and nearby parks, improving views toward the highway from nearby residences, and providing safe passage across I-5 and SR 520.

includes three additional smaller lids: one across Foster Island, one across the south SPUI ramps near the Arboretum (partial), and one at the NE Pacific Street and Montlake Boulevard NE intersection. Option L also includes a lid at the NE Pacific Street and Montlake Boulevard NE interchange. These lids are described in detail in Chapter 2, Description of Alternatives. Exhibit 5.3-1 shows the conceptual lid configurations at the Montlake interchange for Options A, K, and L.

Exhibit 5.3-1. **Potential Lids in Montlake Boulevard Area**

All options also include a regional bicycle/pedestrian path that would extend from the Montlake interchange area across the Evergreen Point Bridge and connect to the regional path on the Eastside. This regional trail would function both as a travel option across the lake and as a link to local trails through the Arboretum and bike routes in the Montlake neighborhood that connect to the University District and Roanoke/ Portage Bay neighborhoods. The trail would improve connectivity between neighborhoods, their business districts, and community resources.

Overall, travel times for transit, carpools, and vanpools along SR 520 would decrease, and access between the urban centers east and west of Lake Washington would improve. Transit service in neighborhoods would benefit under Options A, K, or L by the completion of the HOV system, which would result in more reliable transit connections. Section 5.1 includes more specific information on changes in transit operations that would occur from closure of the Montlake Freeway Transit Station.

All options include removal of the R.H. Thomson Expressway ramps in the Washington Park Arboretum, which would improve the visual experience of park users by removing these large concrete structures. Noise and traffic may also decrease through the Washington Park Arboretum, depending on the selected noise reduction approach (see Section 5.7). All options would acquire some land from the Arboretum, East Montlake Park, and McCurdy Park. These parks are primarily used for passive recreation activities such as walking, kayaking, canoeing, and bird watching. For more information on how the project would affect recreation, see Section 5.4 of this chapter.

Widening the highway would bring some homes closer to the project footprint, which would create negative effects related to visual quality and aesthetics and potentially noise, depending on the type of noise mitigation approved by adjacent neighborhoods.

All options would displace MOHAI, which is a resource that serves the region's population and Seattle tourists. However, the museum has plans to relocate its facilities from its current location in the Montlake neighborhood. Because MOHAI is somewhat isolated and access is limited (primarily via 24th Avenue East), relocation to an area with more accessibility and visibility could also benefit this valuable community resource.

Relocations associated with the project (see Section 5.2, Land Use) would be relatively few and would not be expected to cause an adverse effect on community cohesion. Buildings that would be displaced are not concentrated in one particular area.

Community Demographics

The project would have no effect on housing or population characteristics of the project neighborhoods. The options would not displace affordable housing or community facilities. Acquisition of new right-of-way for SR 520 would not affect the ability of the city and neighborhoods to plan for changes in density that may occur as the region grows.

Effect of Suboptions

- Adding the suboptions to Option A, K, or L would result in no measurable differences to the neighborhood effects described above.

SR 520 Health Impact Assessment

As described in Chapter 1, the legislation that established the SR 520 mediation group also called for King County Public Health and the Puget Sound Clean Air Agency to prepare a health impact assessment (HIA) for the project. An HIA is a tool to help decision-makers recognize the health consequences of the decisions they make and provide a healthier living environment. It focuses on the potential effects of a decision on the health of the population and the distribution of those effects within the population.

The SR 520 HIA (September 2008) recommends elements for creating healthy communities in the SR 520 corridor, including landscaped lids and green spaces, transit improvements, pedestrian and bicycling amenities, design improvements, and noise reduction strategies. Because the health impact differences among the options are difficult to estimate until the specific designs are developed, the SR 520 HIA focused on a broad view of the project's design features, including the options' common elements.

Landscaped lids across SR 520 would provide multiple health benefits by allowing people to connect in easily accessible and safe areas. Green space can enhance people's ability to cope with and recover from stress. The HIA describes how the green space on the lids can bring diverse groups together and how people in neighborhoods with green space are more likely to enjoy stronger social ties than those who live in areas surrounded by concrete.

A regional bicycle/pedestrian path linking to local trails and neighborhood routes would likely lead to an increase in pedestrian and bicycle activity, which would promote healthier neighborhoods.

How did we evaluate potential effects on low-income or minority populations?

Effects on low-income and minority populations are considered as part of the environmental justice analysis. WSDOT conducted its environmental justice evaluation by analyzing census data, conducting geographic information system (GIS) mapping to compare the poverty and minority status of those who would and would not be affected by the project, and reviewing project discipline reports to identify the types of effects by census block group. In addition, findings were verified with the National Center for Education Statistics (NCES) demographic data on students enrolled in schools in the study area for the 2006-2007 school year. The analysis also relied on outcomes from public involvement, particularly outreach, that was directed at low-income and minority populations living in neighborhoods that could be affected by the project.

An extensive research effort was also conducted that included a random-sample telephone survey, focus groups, and a transit intercept survey. This survey was conducted to understand how tolling might affect low-income and minority populations. Outreach efforts and outcomes are documented in detail in the Environmental Justice Discipline Report, Attachment 7.

These methods were used to determine what types of effects could affect low-income and minority populations and whether low-income or minority populations would experience "disproportionately high and adverse effects" from the project. Examples of adverse effects on these populations could include displaced residents, increased pollution, or loss of services at a substantially higher level than the rest of the population. FHWA (Order 6640.23) requires that WSDOT apply two criteria to determine whether low-income or minority populations would experience "disproportionately high and adverse effects."

- Low-income or minority populations would predominantly bear the effect; or
- Low-income or minority populations would suffer the effect, and the effect would be considerably more severe or greater in magnitude than the adverse effect suffered by the general population.

Two study areas were evaluated for project effects: 1) an area of census block groups within an approximately half-mile radius of the construction limits, and 2) the Evergreen Point Bridge "travelshed," which is the geographic area where bridge traffic originates. Exhibit 4.3-2 shows the distribution of low-income and minority populations within the first study area. As described in Section 4.3, just over 5 percent of the population within the 1/2-mile study area overall has household incomes at or below the federal poverty level. Concentrations of low-income residents along the SR 520 corridor are less than 10 percent except in the area around the I-5 interchange, which has a concentration of between 10 and 20 percent. The

What is environmental justice and why do we evaluate it?

The concept of "environmental justice" acknowledges that the quality of our environment affects the quality of our lives and that minority and low-income populations should not suffer disproportionately high and adverse effects from federal projects. Executive Order 12898 directs each federal agency to make environmental justice part of its mission. The U.S. Department of Transportation (USDOT) Order 5610.2, directs federal agencies to:

Explicitly consider human health and environmental effects related to transportation projects that may have a disproportionately high and adverse effect on low-income or minority populations; and

Implement procedures to provide "meaningful opportunities for public involvement" by members of those populations during project planning and development.

University District has the highest concentration of minority populations (between 40 and 50 percent). Less than 1 percent of residents in the project study area are limited-English-proficient.

WSDOT determined the SR 520 travelshed limits (Exhibit 5.3-2) by placing video cameras at SR 520 on- and off-ramps and on the main line during the morning and evening peak periods, as well as midday and weekends. The Washington State Department of Licensing provided WSDOT with the addresses associated with the registered owners of each videotaped vehicle (no other identifying information—such as the vehicle owner's name—was released to WSDOT).

For the analysis, the Evergreen Point Bridge travelshed study area map was overlaid with U.S. Census data. The data suggest that bridge users are not disproportionately originating from census block groups with higher concentrations of low-income, minority, or limited-English-proficient (LEP) residents. The Environmental Justice Discipline Report (Attachment 7) contains additional detail and discussion on the results of the analysis.

According to the FHWA implementing order, when determining whether a particular program, policy, or activity will have disproportionately high and adverse effects on minority and low-income populations, FHWA must take into account mitigation measures and enhancements and potential offsetting benefits to the affected minority or low-income populations. Other factors that may be taken into account include design, comparative effects, and the relevant number of similar existing transportation system elements in non-minority and non-low-income areas.

Potential Effects of Tolling on Low-Income and Minority Populations

From 2000 to the present, WSDOT has conducted outreach activities to provide the public and low-income and minority populations with information about the SR 520, I-5 to Medina: Bridge Replacement and HOV Project and engage them in identifying its potential adverse and beneficial effects. Outreach activities are described in more detail in Chapter 1.

WSDOT determined that the effects of the tolls do not meet the first FHWA criterion for a "disproportionately high and adverse effect" (as stated above). Low-income, minority, or LEP populations would not predominantly bear the effects of a toll because it would be charged to all bridge users, and all bridge users would either need to purchase transponders or be billed for the toll plus a surcharge. Although some national and regional studies suggest that low-income populations use transit at a higher rate than the general population, results from the transit intercept survey on the SR 520 corridor suggest that low-income users do

Exhibit 5.3-2. Travelshed Study Area

Limited-English-Proficient Populations

Title VI of the Civil Rights Act of 1964 requires WSDOT to examine the effects of projects on populations with limited English proficiency in order to avoid discrimination based on national origin.

KEY POINT

Low-income populations would experience disproportionately high and adverse effects as a result of tolling. The most affected low-income populations would be those that are car-dependent and populations living in areas with limited transit service.

not use transit service on SR 520 at a higher rate than the general population (Environmental Justice Discipline Report, Attachment 7). However, the effects of the tolls do meet the second FHWA criterion for a "disproportionately high and adverse effect." A toll on SR 520 would be more of a hardship for low-income users because it would consume a greater proportion of their income than it would for the general population. Many survey respondents indicated that they would use non-tolled routes as an alternative to paying a toll. Other survey results indicate that many low-income SR 520 users do not believe that transit service, as it exists today, would be a viable alternative to paying a toll because it is too infrequent or too far from where they live or work. The burden of purchasing a transponder and setting up a prepaid account would also be appreciably more severe for low-income bridge users because they are more likely to be without a credit or debit card and would need to prepay their accounts with cash. Low-income populations are also less likely to have the initial deposit that might be required to prepay an account. LEP bridge users may have difficulty understanding how to use the system.

For these reasons, the environmental justice analysis concluded that low-income populations would experience disproportionately high and adverse effects as a result of tolling. Tolls on SR 520 would be appreciably more severe for low-income users because they would have to spend a greater proportion of their income on tolls than the general population. The cost of the tolls would present a burden to low-income populations and social service agencies that serve those populations. The low-income populations most affected would be those that are car-dependent and populations living in areas with limited transit service. Mitigation measures are described at the end of this chapter.

How would other aspects of the project affect low-income and minority populations?

Community cohesion would improve with the project in place, because the lids would reconnect the neighborhoods bisected by SR 520 in the 1960s. This would benefit all residents, including low-income and minority residents along the corridor. The addition of bicycle and pedestrian paths would also contribute to improved community cohesion by enhancing pedestrian and bike travel within and between neighborhoods in the project area. In general, the project study areas would be quieter than they are today.

The number of relocations of single-family residences would range between one and three, depending on the option, and relocation assistance would be provided. (WSDOT has already provided relocation assistance for the two residences in Medina acquired for the project.) At the time of publication, no low-income, minority, or LEP households would be relocated.

Potential project effects on Foster Island are of concern to Native American tribes. As a traditional burial area, Foster Island retains significance to people of Lakes Duwamish descent. The Muckleshoot Indian Tribe, Snoqualmie Tribe, Suquamish Tribe, and Confederated Tribes and Bands of the Yakama Nation have indicated interest in Foster Island because many tribal members are descended from families who lived in the project area. WSDOT is currently conducting oral history interviews with tribes that have Lakes Duwamish descendants to provide additional information on the cultural significance of the island. If archaeological sites were discovered during construction, tribes would be consulted to determine the appropriate mitigation measures (see Section 5.6, Cultural Resources). However, based on the information available at this time, no disproportionately high and adverse effects on tribal members are anticipated in relation to cultural resources.

Project effects on tribal fishing are also of concern to the Muckleshoot Indian Tribe, which has treaty fishing rights in Lake Washington and its tributaries. Where new bridges are elevated over water bodies, the resulting shading could affect fish in tribal fishing areas, especially in shallow habitats near the shore. The new bridges will have a substantially wider footprint than the existing Evergreen Point Bridge, reducing access to "usual and accustomed" tribal fishing areas for the Muckleshoot Tribe. The wider bridge deck, supplemental stabilization pontoons, and anchor cables will span from 450 to 600 feet wider than the existing Evergreen Point Bridge. In addition, the alignment of the new bridge will shift north. Although all of Lake Washington is considered a "usual and accustomed" fishing ground for the Muckleshoot Tribe, most tribal fishing takes place north of the Evergreen Point Bridge (see Section 5.11, Ecosystems, for additional information). Effects on tribal fishing during construction are discussed in Section 6.3.

Effects of Suboptions

- Adding the suboptions to Option A, K or L would result in no measurable differences in the social effects described above because effects on neighborhoods, recreational resources, transit mobility, noise, and fisheries that could affect low-income, minority, or LEP populations would not vary measurably.

How would the project affect public services and utilities?

KEY POINT

The project would enhance the provision of public services like police, fire, and emergency medical by reducing traffic congestion.

Many utilities would need to be protected or relocated during construction, but no permanent effects would result.

The 6-Lane Alternative and options would result in improved response and travel times for public service providers along the SR 520 corridor. These benefits would be due to new HOV lanes and full shoulders, which would allow public service vehicles to bypass traffic and reach incidents faster. The shift in mode from single-occupant vehicle to transit, vanpool, and carpool

would reduce congestion in the corridor. There would be no changes in service areas for any of the providers. There would be no operational effects on utilities or utility providers.

Effects of Suboptions

- Adding the suboptions to Option A, K, or L would result in no measurable differences in the public services effects described above.

What has been done to avoid or minimize negative effects?

All options include features intended to minimize negative effects on neighborhoods, including a continuous HOV lane, wider shoulders, landscaped lids, a regional bicycle/pedestrian path, and stormwater treatment. In addition, design of the roadway reflects community goals for a narrow footprint and a low profile so as not to encroach on residential or park property more than necessary and to prevent views from being obscured.

WSDOT will continue to coordinate closely with the Muckleshoot Tribe to understand the extent to which the wider bridges would affect access to their usual and accustomed fishing areas and work with the tribe to develop a plan for mitigating adverse effects on access.

Options A and L include longer bridge spans with fewer columns in the west approach area than the No Build Alternative. This would reduce the number of in-water structures that could be used by predators of juvenile salmonids, and would reduce impediments to access by tribal fishing boats. In addition, under all design options the roadway runoff would be treated before it discharges into the water. This would improve water quality in Lake Washington as a whole, benefiting fish species harvested by tribal fisheries.

What could be done to mitigate for negative effects that cannot be avoided or minimized?

Mitigation measures are listed as a range of potential measures only. The Final EIS will contain WSDOT commitments for mitigation appropriate to the project effects under environmental justice.

The SR 520 Variable Tolling Project, described in Chapter 1, has proposed measures to mitigate the burden that electronic tolling would place on low-income and LEP drivers. Measures that are being considered are listed below:

- Establish a permanent transit-accessible customer service center at both ends of the replacement bridge. Drivers would be able to purchase transponders and establish prepaid accounts with cash at these centers.

- Establish transponder retail outlets at convenient locations, such as grocery stores, convenience stores, or pharmacies throughout the travelshed.
- Conduct outreach in multiple languages to provide information about how to purchase a transponder, establish an account, and use the system.
- Provide social service agency employees with information about tolling and options to avoid it. This would help social service workers share accurate information with low-income and LEP clients.
- Allow low-income drivers to establish and replenish their prepaid accounts with their electronic benefit transfer (EBT) cards. EBT cards function like debit cards and allow recipients who receive federal benefits to pay for products and services, such as groceries and health care.

Even with mitigation measures, some low-income populations, especially car-dependent populations or populations living in areas without adequate transit service, would experience a disproportionately high and adverse effect as a result of tolling.

According to USDOT 5610.2 and FHWA Order 6640.23, a USDOT or FHWA program that has disproportionately high and adverse effects on low-income or minority populations may be carried out only if:

- A substantial need for the program, policy, or activity exists, based on the overall public interest; and
- Alternatives that would have less adverse effects on protected populations have either:

adverse social, economic, environmental, or human health effects that are more severe; or would involve increased costs of an extraordinary magnitude.

As described in Chapter 1, the aging floating bridge is vulnerable to catastrophic failure. Furthermore, forecasted demand for transportation along the already congested SR 520 corridor is expected to increase because of expected population and job growth. Given these factors, there is a substantial need for this project, based on the overall public interest.

In addition, the potential catastrophic failure of the floating bridge would have substantially more severe effects on all populations, including car-dependent low-income populations and low-income residents of communities that are not well-served by transit.

Unmitigated increases in congestion along the corridor would create much more severe mobility challenges and air quality and noise concerns for all populations, including low-income and minority populations.

5.4 Recreation

As described in Chapter 4, park and recreation facilities of local, regional, and national significance are located within the project area. This section discloses potential effects on those resources.

Some of the park and recreation resources in the project area are protected by federal regulation. The Supplemental Draft Section 4(f) Evaluation (Attachment 6) evaluates the use of park and recreation resources in accordance with Section 4(f) of the Department of Transportation Act (49 USC 303). It also assesses the conversion effects and replacement requirements for park properties that have been improved with funds from the Land and Water Conservation Fund Act (LWCFA) and Aquatic Lands Enhancement Account (ALEA) grant programs. The mitigation section of the Section 4(f) Evaluation notes specific avoidance and mitigation requirements related to these laws.

Section 4(f)

Some of the park and recreation resources in the project vicinity are protected by federal regulations. Section 4(f) of the Department of Transportation Act of 1966 (23 United States Code [USC] 138 and 49 USC 303) prohibits FHWA from approving a project or program that uses land from a significant park, recreation area, wildlife or waterfowl refuge, or historic site unless the following criteria are met: 1) there is no feasible or prudent alternative to the use of the land, and 2) the project includes all possible planning to minimize harm to the property. See the Section 4(f) Evaluation for more details.

How would the project affect parks and recreational resources?

All 6-Lane Alternative options would improve bicycle and pedestrian connections across the SR 520 corridor and the Montlake Cut by retaining and improving existing trails. The proposed regional bicycle/pedestrian path across SR 520 would provide a new connection between the City of Seattle's bicycle and pedestrian system and the Points Loop Trail in Medina.

Green open spaces, landscaping, and pathways planned for the lids at I-5, 10th and Delmar, and in the Montlake area would provide new areas for passive recreation. Trails across these lids would further improve connectivity for bicyclists and pedestrians.

Where widening of the roadway would bring the project footprint closer to the parks, there could be negative effects related to visual quality and aesthetics as a result of the loss of vegetation and the change in views.

Loss of parkland would also occur with the acquisition of all or a portion of four to five recreational properties (depending on the option). Estimated permanent acquisition of park and recreational resources under the different options is shown in Table 5.4-1. As shown, Option K would acquire more park land than Options A and L. Specific effects on each project area resource are discussed below; effects of adding the suboptions to Options A, K, and L are discussed only under the resource in which each suboption is located. See Section 4.4 for a description of the characteristics and uses of each resource.

KEY POINTS

The proposed regional bicycle/pedestrian path across SR 520 would provide a new connection between the City of Seattle's bicycle and pedestrian system and the Points Loop Trail in Medina.

The landscaped lids at I-5, 10th and Delmar, and in the Montlake area would provide new areas for passive recreation. Trails across these lids would further improve connectivity for bicyclists and pedestrians.

KEY POINT

The 6-Lane Alternative options would affect parkland by acquiring all or a portion of four to five recreational properties (depending on the option). There could also be negative effects related to visual quality and aesthetics where widening of the roadway would bring the project footprint closer to parks. Option A would acquire 5.55 acres of park land, Option K would acquire 7.55 acres of park land, and Option L would acquire 7.05 acres of park land.

Table 5.4-1. Permanent Park Acquisition (acres)

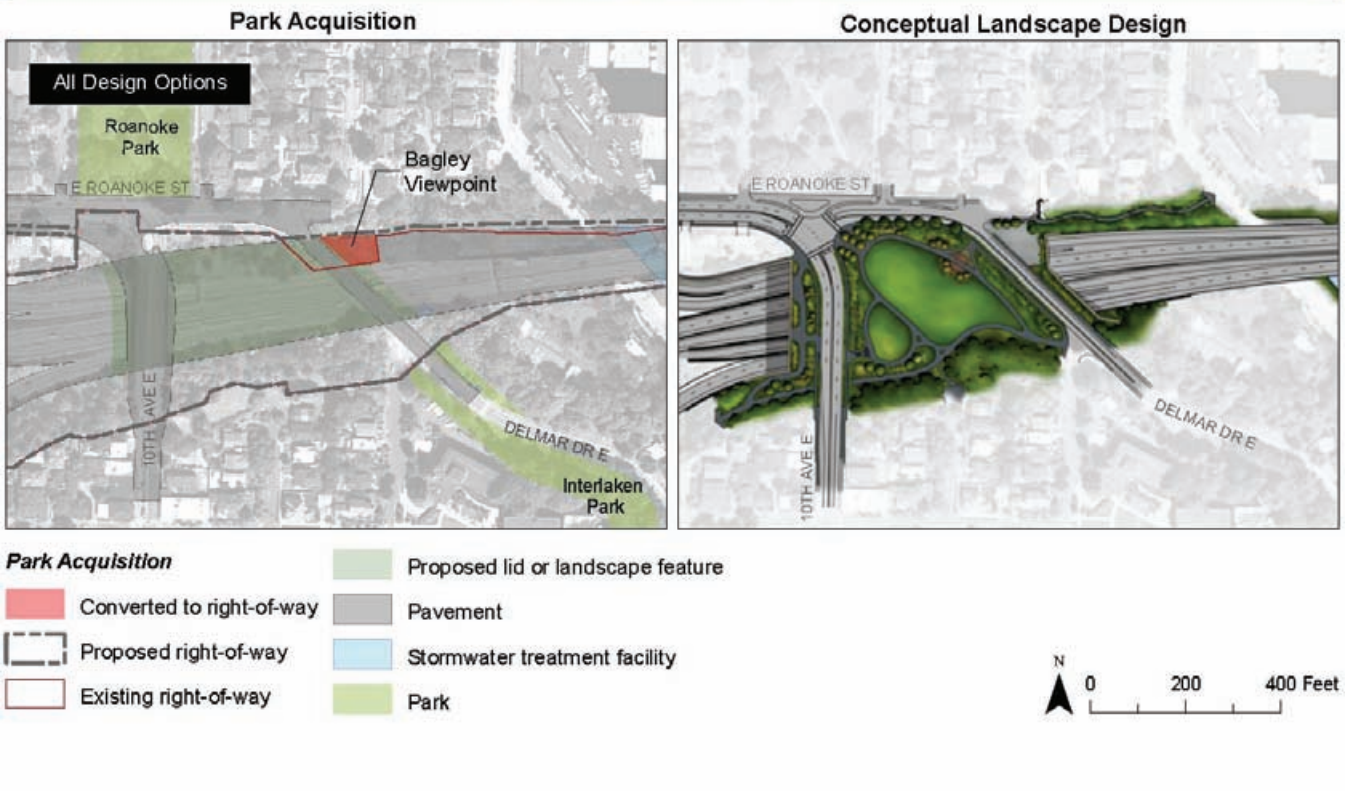
Resource	Existing Size	Option A	Option K	Option L
Bagley Viewpoint	0.15	0.15	0.15	0.15
East Montlake Park	7.1	2.8	4.5	4.3
McCurdy Park	1.5	1.5	1.5	1.5
Washington Park Arboretum	193	0.9	1.4	0.6
University of Washington Open Space	3	0.2	0.1	0.5
Total Acquisition		5.55	7.55	7.05

Note: Adding the suboptions to Options A, K, and L would not change the park acquisitions listed in this table.

Bagley Viewpoint

All of the options would result in the complete acquisition of Bagley Viewpoint (Exhibit 5.4-1). WSDOT proposes to replace the function of the viewpoint on the new 10th and Delmar lid.

Exhibit 5.4-1. Permanent Park Acquisition at Bagley Viewpoint (all design options)



Roanoke Park

Although no property would be acquired from Roanoke Park, the 10th Avenue East and Delmar Drive East lid would improve the park's setting and the experience of park users by reducing freeway noise and creating a more continuous stretch of open space south of the park. The lid would create new open space and grassy areas for residents in the surrounding area. The 10th Avenue East and Delmar Drive East lid would include pathways to improve connectivity and to provide access across SR 520, improving safety for pedestrians and bicyclists.

East Montlake and McCurdy Parks

All options would convert a sizable portion of East Montlake Park and all of McCurdy Park from recreational use to transportation use (Exhibit 5.4-2). All options would remove the MOHAI building. Options K and L would require more right-of-way than Option A because the SPUIs would occupy this area.

Option A

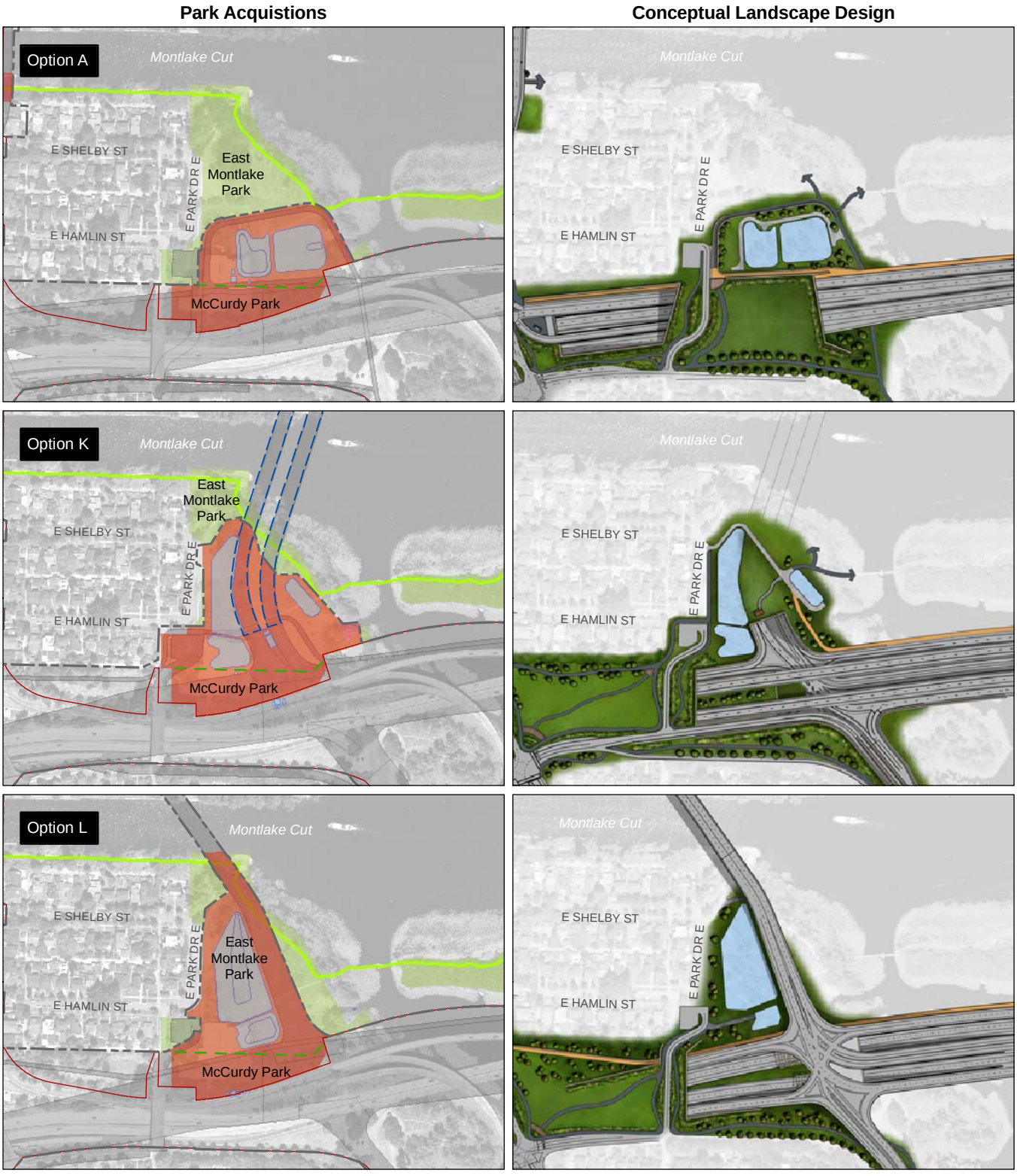
With Option A, 4.3 acres (50 percent) of the total park area would be converted to transportation use. The remainder of the park, primarily along the Arboretum Waterfront Trail, the north end of Montlake Park, and the connection to the Ship Canal Waterside Trail, would be returned to park use. The restored park areas are adjacent to Lake Washington and the Montlake Cut where the majority of passive use features are located. The MOHAI and associated parking lots include most of the area changed from park use to transportation use. The non-motorized boat launch, access to the Ship Canal Waterside Trail, and the Arboretum Waterfront Trail would retain their current condition and setting.

Option K

Six acres (69 percent) of the total park area would be converted to transportation use with Option K. The remainder of the park, primarily along the Arboretum Waterfront Trail, the north end of Montlake Park, and the connection to the Ship Canal Waterside Trail, would be restored to park use.

The restored portion of the park would be located near the new SPUI. The additional traffic adjacent to the park and reduced acreage, from a combined 8.6 acres to 2.6 acres (31 percent of original size), would change the function of the park from passive open space to an urban park setting with additional manicured landscapes to limit the effects of the transportation facility. Additional features required for tunnel operation include an exhaust tower with ventilation fans and pumping stations placed along the tunnel alignment. These features would be aboveground and would generate additional noise and visual elements associated with the

Exhibit 5.4-2. Permanent Park Acquisition at East Montlake and McCurdy Parks



tunnel operation. Bicycle and pedestrian features would be added to provide non-motorized connections to the Washington Park Arboretum and the Evergreen Point Bridge bicycle/pedestrian path. The non-motorized boat launch, access to the Ship Canal Waterside Trail, and the Arboretum Waterfront Trail would be restored in close proximity to the SPUI interchange, which would change the user experience.

Option L

With Option L, 5.8 acres (67 percent) of the total park area would be converted to transportation use. The remainder of the park, primarily along the Arboretum Waterfront Trail, the north end of Montlake Park, and the connection to the Ship Canal Waterside Trail, would be restored to park use.

The restored portion of the park would be located near a new SR 520 interchange. The interchange would provide access to SR 520 and cross over the Montlake Cut to the Pacific Street intersection. The additional traffic and reduced acreage, from a combined 8.6 acres to 2.8 acres (33 percent of original size), would change the function of the park from passive open space to an urban park setting with additional manicured landscapes and bicycle features under a large bridge structure. The non-motorized boat launch, access to the Ship Canal Waterside Trail, and the Arboretum Waterfront Trail would be restored in close proximity to the Pacific Street interchange and the new bascule bridge, and the user experience would change.

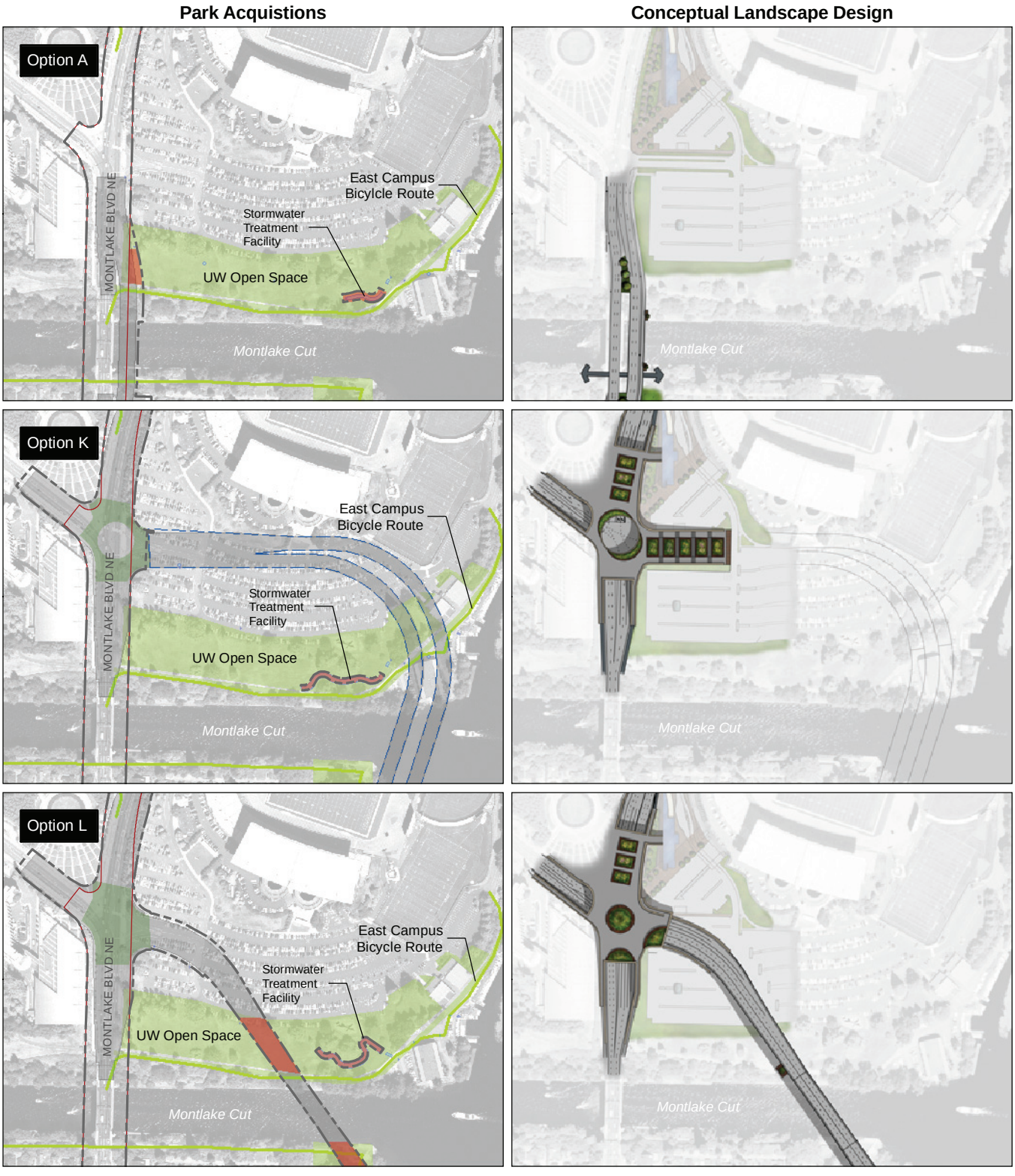
University of Washington Recreational Facilities

Option A would acquire 0.2 acre and Option L would acquire 0.5 acre of land from the University of Washington open space (Table 5.4-1). Options K and L could affect the users of the open space because of new project elements. Option L would have the greatest effect because it would place the north end of the bascule bridge over the open space, making it visible and potentially audible to users of the Waterfront Activities Center, the climbing rock, and other areas.

A number of improvements to non-motorized facilities would benefit people attending or working at the University of Washington and would enhance access for recreational activities at all campus facilities, including UW and civic events. Options K and L include a full or partial lid at the NE Pacific Street and Montlake Boulevard NE interchange, which would provide grade-separated crossings for pedestrians and bicyclists at this busy intersection and improve access to the Burke-Gilman Trail.

Exhibit 5.4-3 shows the land acquisition from the University of Washington Open Space under each option and the lid concepts at NE Pacific Street.

Exhibit 5.4-3. Permanent Park Acquisition in UW Open Space



Washington Park Arboretum

All options would convert land in the Washington Park Arboretum at Foster Island from recreation use to transportation use. For all options, the acquisition would be north of the existing freeway, as shown in Exhibit 5.4-4.

As shown in Table 5.4-1, Option K would require the largest amount of right-of-way (1.4 acres) for construction of the lid and related fill. Conversions of the Washington Park Arboretum adjacent to the existing SR 520 would include filling of wetlands and removal of trees. Because the options differ considerably in their effects, they are discussed separately below.

KEY POINT

All options would remove the existing Lake Washington Boulevard ramps. Although these ramps are on WSDOT property, they are visible from the Arboretum, and their removal would improve views and reduce traffic noise. The existing unused R.H. Thomson Expressway ramps would also be removed, which would further open views and remove some columns that currently impede canoe access.

Option A

Option A would bridge over Foster Island. The wider footprint of the new roadway would require acquisition of 0.9 acre of land north of the existing right-of-way, of which 0.2 acre is forested and the remainder is vegetated with grass and shrubs.

The highway main line would provide approximately 15 to 18 feet of clearance above the crossing of the Arboretum Waterfront Trail on Foster Island. The Arboretum Waterfront Trail currently crosses under SR 520 in a low and narrow (8 feet high by 12 feet wide) pedestrian underpass that many trail users find unpleasant and uncomfortable. The new SR 520 structure would allow the trail to pass between columns of an elevated structure, improving the user experience by opening views at ground level while still maintaining a relatively low profile.

Arboretum Waterfront Trail under SR 520 on Foster Island

Although the land underneath the footprint of the highway would be within the WSDOT right-of-way, it would be available for recreational use after construction, except for the area necessary for the columns to support the highway structure. Under current conditions, canoes can access the Arboretum area south of SR 520 by travelling underneath the existing freeway structure and ramps. With Option A, canoe passage would still occur but the experience would be altered as a result of the higher profile, wider bridge structure and wider spaced columns. The wider spacing of the new columns to support the elevated structure on the proposed bridge would contribute to positive visual change.

Option A – Arboretum Area

Because the highway main line would be approximately 10 feet higher than the existing roadway, the structure would become a more dominant and noticeable feature and would affect the visual environment for trail users. However, traffic volumes on Lake Washington Boulevard would drop, creating safer and quieter conditions for park and trail users.

Exhibit 5.4-4. Permanent Acquisition in Washington Park Arboretum

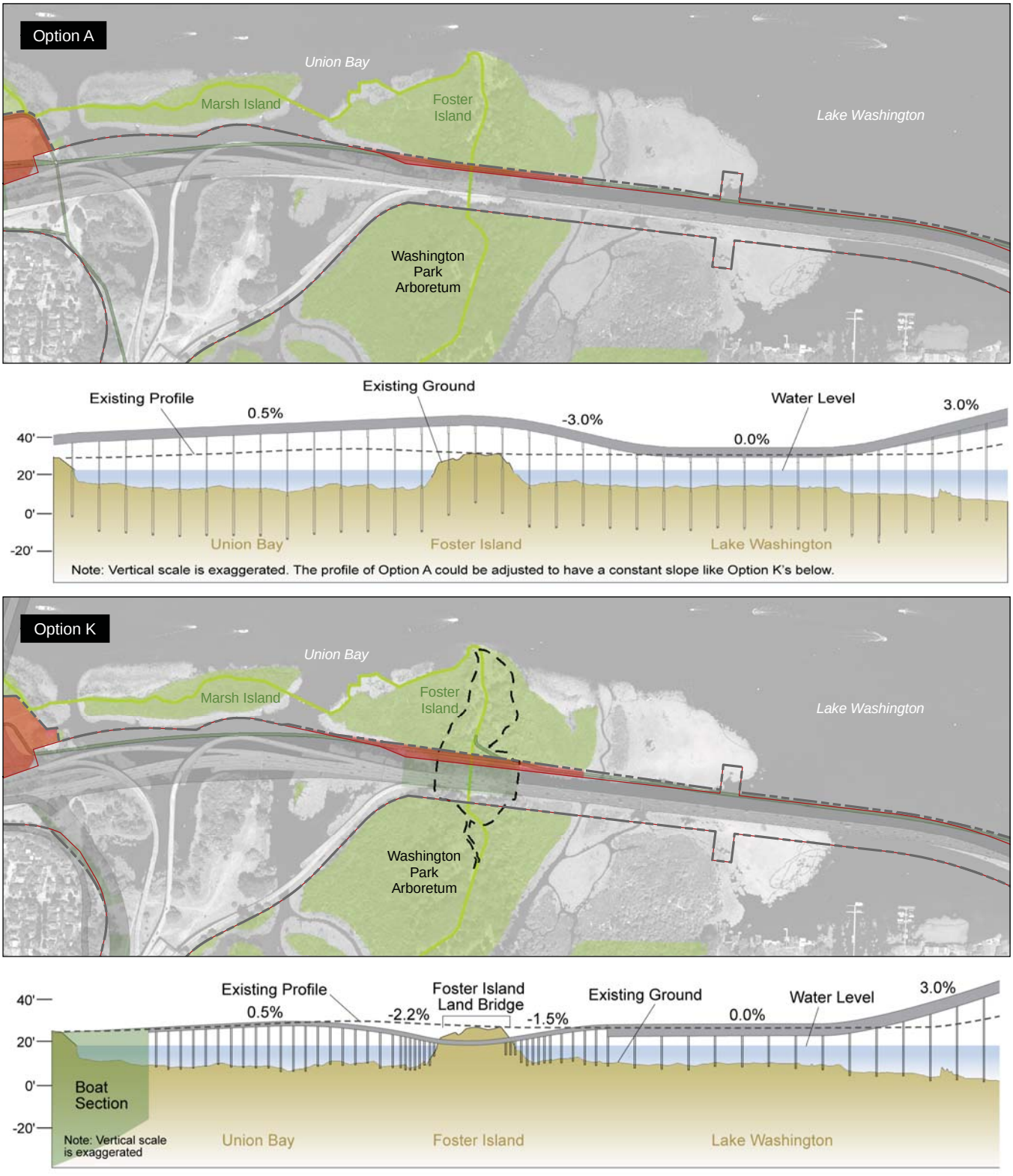
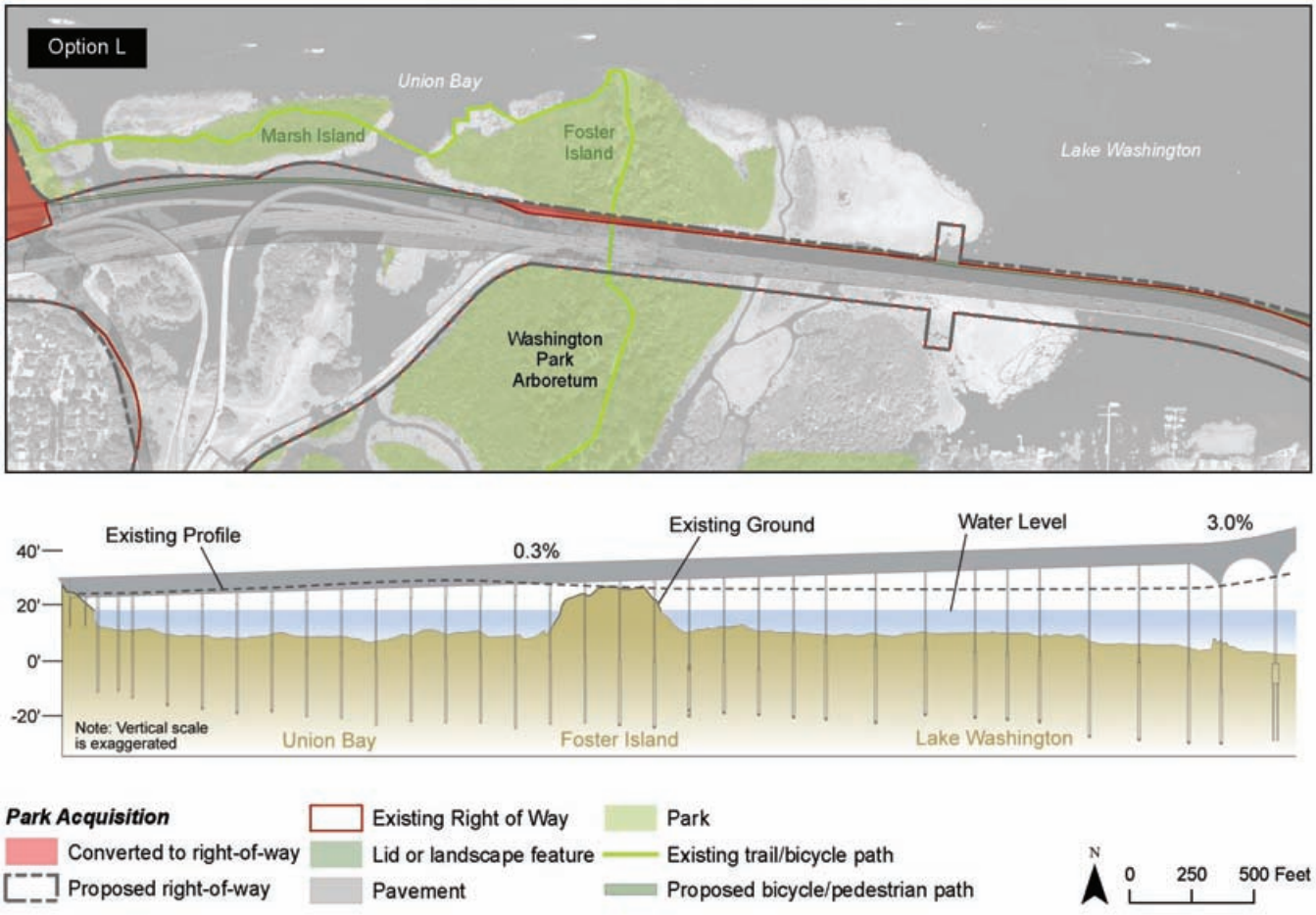


Exhibit 5.4-4. **Permanent Acquisition in Washington Park Arboretum**



Option A Suboptions

- The Lake Washington Boulevard ramps would be located within and adjacent to the main line of SR 520 and considerably farther west than they are currently. They would not cut through the Arboretum as the current ramps do, but would run along the north and south sides of the main line, introducing little additional effect to the Arboretum. However, traffic through the Arboretum would be higher than for Option A without the ramps.
- Adding the eastbound HOV direct-access ramp to Option A would not require any additional right-of-way in the Arboretum.
- Changing the profile in the west approach to a constant-slope profile would not require any additional right-of-way. The structure would be slightly lower across Foster Island than for Option A.

Option K

Option K would cross Foster Island beneath a "land bridge." The roadway would be at or slightly below the existing grade, but would be lidded by a large berm that would provide pedestrian access over the highway. This

Option K Arboretum Area

option would require acquisition of 1.4 acres of land on Foster Island, of which 0.4 acre is forested. Although the land bridge would be within the WSDOT right-of-way, it would be available for recreational use after construction. The Arboretum Waterfront Trail would be reconstructed to pass over the land bridge and would also connect to the regional bicycle/pedestrian trail.

The top of the land bridge would be landscaped, which would provide a much more pleasant crossing of SR 520 than the current narrow underpass. Fill would be placed north of the land bridge to create a gentle slope from the bridge to the north end of Foster Island. This hill would provide enhanced views of the water for trail users, but would change the character of this portion of the Arboretum Waterfront Trail from a wetland viewing opportunity to a more landscaped upland setting. Despite the landscaping, portions of the concrete structure supporting the land bridge would be visible as tall vertical walls, particularly from the north (see Section 5.5, Visual Quality, for more information).

Under Option K, canoes could still access areas south of SR 520 by going under a wider bridge than today. However, nearshore access under SR 520 would be obstructed because the roadway in these areas would be below the high water mark near Montlake and at Foster Island for approximately 200 feet. In addition, the columns would be much more closely spaced than today in this area, so recreational navigation would have more obstructions. East of Foster Island, nearshore access would also be obstructed under SR 520 for several hundred feet, although today's recreation navigation is very limited in this area because of the lily pads and milfoil.

Option L

Option L would cross over Foster Island on a bridge. It would require acquisition of 0.6 acre of land on the island, of which 0.4 acre is forested. Option L would require acquisition of less land than Options A or K (see Table 5.4-1). The highway main line would provide approximately 10 to 12 feet of clearance above the crossing of the Arboretum Waterfront Trail on Foster Island, which is higher than the current clearance of 8 feet. Canoe access within the Arboretum area would be similar to Option A.

Option L Arboretum Area

Because the highway main line would be higher than the existing roadway, the highway would become a more dominant and noticeable feature within the park, and would affect the visual environment for trail users on Marsh Island. The wider spacing of the new columns on the proposed bridge would be a positive visual change, opening views of Lake Washington.

What has been done to avoid or minimize negative effects?

During project planning, extensive work has been done to minimize the SR 520 footprint through parks and to ensure that all possible measures have been taken to avoid park acquisition. As part of the Section 4(f) analysis, WSDOT evaluated various potential alternatives for the project that would avoid effects on parks; none of these were found to be feasible and prudent. The Draft Section 4(f)/6(f) Evaluation contains more information on avoidance alternatives and measures to minimize harm to Section 4(f) resources.

Although lids are not considered as replacement property for mitigation of park effects, the lids included in all options would have beneficial effects in connecting existing parks. In addition, the lids would provide additional passive open space for community use.

Section 6(f)

Section 6(f) of the Land and Water Conservation Fund Act (LWCFA) protects outdoor recreation property that was acquired or developed with LWCFA grant assistance. Section 6(f) prohibits the conversion of property acquired or developed with these grants to non-recreational purpose without the approval of the National Park Service. If a project results in converting Section 6(f) properties to another use, replacement land must be provided in accordance with Section 6(f) requirements and with the agreement of the agencies with jurisdiction over the 6(f) resources.

What would be done to mitigate for adverse effects that cannot be avoided or minimized?

Section 6(f) of the Land Use and Water Conservation Fund Act (LWCFA) requires that replacement property be acquired for recreational lands purchased with grants from the fund. Replacement property will also be needed for recreational land that was redeveloped with grants from the Aquatic Lands Enhancement Account (ALEA). This includes all acquisitions within the Arboretum and a portion of East Montlake Park. The required amount of replacement recreational land is estimated at between approximately 6 and 9 acres, depending on the design option. WSDOT is working with the City of Seattle Department of Parks and Recreation, the University of Washington, the Recreation and Conservation Office, the National Park Service, and the Federal Highway Administration to identify suitable replacement property, as discussed in the Supplemental Draft Section 4(f) Evaluation. In addition, the City of Seattle will need to demonstrate compliance with Ordinance 118477.

In addition to replacement, mitigation may also include enhancement of existing parks and recreational properties in a manner consistent with applicable planning documents, and the City of Seattle will need to demonstrate compliance with Ordinance 118477 (see sidebar at right). The remainder of this section provides more detailed mitigation measures related to specific properties.

Seattle Ordinance 118477

Seattle parklands are further protected under Seattle Ordinance 118477, enacted in February 1997. This ordinance specifies that all lands and facilities held now or in the future by the City of Seattle for parks and recreational purposes, whether designated as park, boulevard, or open space, must be preserved for such use, or replacement land must be provided as mitigation.

Bagley Viewpoint

A new viewpoint would be designed and constructed on the 10th and Delmar lid to recreate the panoramic views of Portage Bay and the Cascade Mountains that were available when Bagley Viewpoint was first built.

East Montlake Park and McCurdy Park

If MOHAI has not moved to another site before construction, WSDOT would assist MOHAI in relocating to suitable replacement facilities. WSDOT would also compensate the Seattle Parks and Recreation Department and the Washington State Department of Natural Resources (which owns a portion of the park land in accordance with applicable WSDOT policies and regulations for right-of-way acquisition.

WSDOT would coordinate with the City of Seattle and the University of Washington to investigate opportunities to restore and enhance the shoreline wetlands and/or protect the wetland buffer area so as to improve the ecological value of the remaining portion of the park.

Washington Park Arboretum

WSDOT is working with the City of Seattle, the University of Washington, the National Park Service, and the Recreation and Conservation Office to identify appropriate replacement land for park property permanently acquired.

WSDOT, the City of Seattle, the University of Washington, and other appropriate regulatory agencies will evaluate the potential for shoreline and wetland restoration on both sides of SR 520 on Foster Island, consistent with the Washington Park Arboretum Master Plan. WSDOT may also explore the possibility of developing other components of the Arboretum Master Plan for areas of the park affected by the project.

University of Washington Recreational Facilities

WSDOT would work with the University to replace lost functions of property acquired from the University of Washington Open Space.

5.5 Visual Quality

Highways and bridges affect the visual character of the surrounding landscapes. Changes in transportation facilities are of keen interest to local residents and jurisdictions. This section describes and evaluates the potential effects of the project on existing visual resources and their context. It is based on the Visual Quality and Aesthetics Discipline Report (Attachment 7).

How would the project affect visual quality?

All options would result in wider bridges and roadways that would be shifted in some areas and raised or lowered in other areas. The views most affected would be in the vicinity of the Portage Bay Bridge, the Montlake area, and the wetlands in Washington Park Arboretum.

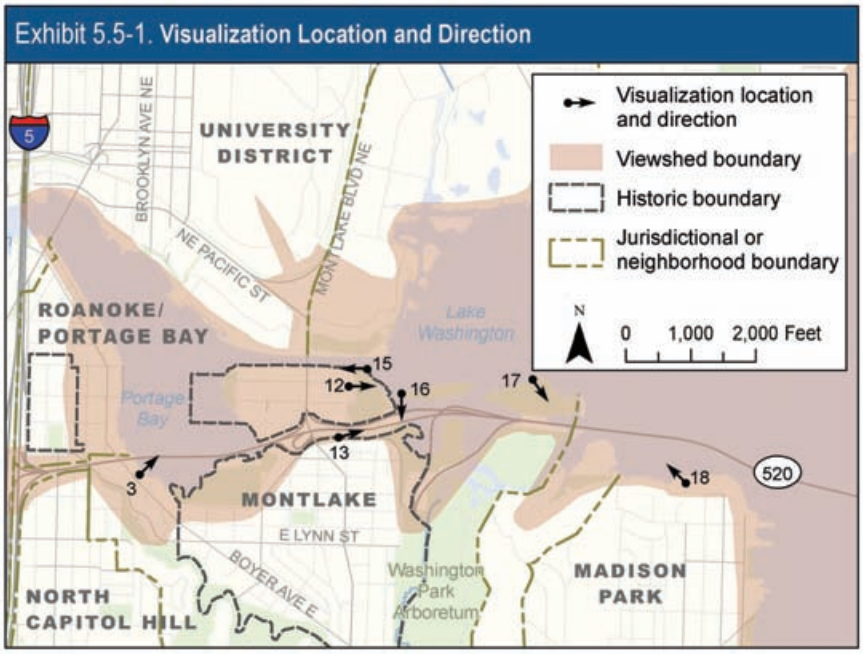
DEFINITION

Visual quality is discussed and rated according to the following terms:

- Vividness is the degree of drama, memorability, or distinctiveness of the landscape components. For example, a view across Lake Washington can have high vividness because it is a memorable sight.
- Intactness is a measure of the visual integrity of the natural and human-built landscape and its freedom from encroaching elements. This factor can be present in well-kept urban and rural landscapes, as well as in natural settings. High intactness means that the landscape is not broken up by features that are out of place. An unbroken expanse of native vegetation would have high intactness.
- Unity is the degree of visual coherence and compositional harmony of the landscape considered as a whole. High unity frequently attests to the careful design and placement of individual components and their relationship in the landscape.

As part of the analysis, the project team selected views and corresponding viewpoints and took photographs for visualizations from these viewpoints. Exhibit 5.5-1 shows the location of the visualizations presented in this section. (The Visual Quality Discipline Report includes more visualizations than presented here.) While the visualizations are limited in their field of view because the focal length of the camera is set to match the human eye field of view (without peripheral vision), the overall visual analysis considers the entire view. The visualizations provide an accurate representation of the scale of a structure in relation to other objects as seen from the viewpoint. Effects on each landscape unit (as described in Chapter 4) are presented below. Effects of adding the suboptions to Options A, K, and L are discussed under the landscape unit in which each suboption is located.

Exhibit 5.5-1. Visualization Location and Direction



Roanoke Landscape Unit

Under all options, the overall character and quality of this landscape unit would improve as a result of the presence of the I-5 and 10th Avenue East and Delmar Drive East lids (Table 5.5-1). The visual character of the neighborhoods and commercial area would not change, but the area would be less dominated by the roadway. The 10th Avenue East/Delmar Drive East lid would provide a continuous landscape between neighborhoods.

I-5 Area Lid and Interchange Concept

Table 5.5-1. Visual Quality Effects in Roanoke Landscape Unit

	Vividness	Intactness	Unity
Existing	Moderate	Low	High – in neighborhoods Low – near I-5 and SR 520
All options	Moderate	Moderate	Moderate

The landscaped lid could also recreate a more substantial connection between Interlaken Park and Bagley Viewpoint.

A new Bagley Viewpoint would be different from the original park, but could be designed to take advantage of the extra space created by the lid for the panoramic vista of Lake Washington and the Cascade Mountains. The view is currently screened by tree canopy. The areas to the north and south of the lid surface would be planted to reestablish the tree buffer and street trees that were removed for construction.

Portage Bay Landscape Unit

Under all options, the overall character and quality of this landscape unit would not change as a result of the Portage Bay Bridge, but views in the vicinity of the new bridge would be more open (Table 5.5-2).

Table 5.5-2. Visual Quality Effects in Portage Bay Landscape Unit

	Vividness	Intactness	Unity
Existing	High	Moderate	High
All options	High	Moderate to high	High

The greater column spacing (from 100 feet on center currently to as much as 250 feet apart) would open up views under the bridge, especially looking northward from the south side of the bridge (Exhibit 5.5-2).

The east end of the new bridge would be farther north, which could have a positive effect for Montlake Playfield views. A wider west end of the bridge would affect views from the homes next to the bridge on the north side, making the bridge more dominant in eastward views. This would not change visual quality because the bridge is already the dominant structure in the southern half of their views. The areas under the west end of the bridge would be re-landscaped to open up views into those landscapes and along Boyer Avenue.

Option A may include noise walls, depending on the preferences of adjacent communities. If noise walls are built, they would make the roadway appear more massive when seen from outside of the roadway and would block lateral views for commuters on the bridge. This would have a negative effect on views experienced while driving across the Portage Bay Bridge.

Montlake Landscape Unit

All options would result in changes to the visual character and quality in the Montlake area (Table 5.5-3). Options K and L would include additional structures in the McCurdy Park and East Montlake Park areas that would

be most visible to commuters and park users. Option K would include a SPUI and tunnel configuration that would require tall retaining walls at the tunnel entrance and columns to support the main line over the SPUI. Option L would include an elevated SPUI over the main line and a new bridge through East Montlake Park and over the Montlake Cut. (Exhibits 5.5-3 and 5.5-4).

Exhibit 5.5-2. **View of Portage Bay Bridge Columns (Visualization Location 3)**

Existing View
- 4-lane bridge
- Column spacing at 100 feet on center

Option A
- 6-lane bridge with westbound auxiliary lane
- Column spacing at 250 feet on center
- No noise walls
- Bridge design to be determined

Option K
- 6-lane bridge
- Column spacing at 250 feet on center
- No noise walls
- False arches

Option L
- 6-lane bridge
- Column spacing at 250 feet on center
- Noise walls
- False arches

Table 5.5-3. Visual Quality Effects in Montlake Landscape Unit

	Vividness	Intactness	Unity
Existing	High	Low	Low
Option A	High	Low to moderate	Low to moderate
Option K	Moderate to high	Low to moderate	Low
Option L	Moderate to high	Low	Low

Exhibit 5.5-3. **Looking Northeast from Lake Washington Boulevard at MOHAI and McCurdy Park Trees (Visualization Location 13)**

Existing View

- 4-lane roadway
- Unused R.H. Thomson Expressway ramps in distance
- Lake Washington Boulevard off-ramp

Option A

- Partial lid from Montlake Boulevard East to 24th Avenue East
- Landscaping not shown

Option K

- Full lid from Montlake Boulevard to beyond 24th Avenue East
- Vent tower for twin tunnels under Montlake Cut
- Depressed SPUI east of 24th Avenue East
- Landscaping not shown

Option L

- Full lid from Montlake Boulevard to 24th Avenue East
- Bridge over East Montlake Park
- Elevated SPUI east of 24th Avenue East
- HOV direct-access ramps

Option A

Under Option A, widening SR 520 to the north would remove mature roadside trees and shrubs that now provide a pleasant green edge along the roadway south of the neighborhoods. The removal of these trees would also change the view from several homes and for park users. In addition, the south retaining wall would be replaced by a high retaining wall below Lake Washington Boulevard to accommodate the deeper road bed.

In addition, Option A would change McCurdy Park, the MOHAI building and parking lot, and a portion of East Montlake Park into roadway and a stormwater treatment wetland that would result in high levels of change to the visual character of the landscape from the viewpoint of commuters and adjacent residents. However, the stormwater treatment wetland could be a positive change because replacing the large asphalt parking lot with a natural-appearing wetland would be more consistent with the appearance of the shoreline and wetlands of Union Bay and the Arboretum.

Exhibit 5.5-4. **Looking from East End of Shelby Street across East Montlake Park toward Marsh Island (Visualization Location 12)**

Existing View

- East Montlake Park with waterfront trail to Montlake Cut paths
- Union Bay and Cascade Mountains in background

Option A

- Stormwater treatment wetland pond

Option K

- Stormwater treatment wetland ponds
- Berm and entrance to twin tunnels under Montlake Cut
- Land bridge at Foster Island with emergency vehicle access

Option L

- Stormwater treatment wetland ponds
- Bridge over East Montlake Park to new bascule bridge

Changes along Montlake Boulevard would also occur. The removal of specimen trees along Montlake Boulevard in the UW open space to accommodate the new bascule bridge would diminish one of the positive features of this gateway.

Option A Suboptions

- The eastbound HOV direct-access ramp from Montlake Boulevard could be visible from distant viewpoints because of its height, and the ramp itself would add to the complexity of the overall structure.

Option K

For commuters on the main line, travel through the new lid would limit views of the surrounding area. On SR 520, the below-ground SPUI and tunnel configuration would also create the impression of a walled canyon for commuters. The tunnel entrance would require tall retaining walls, the main line would require columns for support, and there would be generally more road surface. These features would be visible to commuters and park users, with the highest level of visual effects on views from the Arboretum Trail at Marsh Island and the UW WAC. From these sensitive locations, the

structures would dominate views much more than the existing ramps and main line do because of the walls in the water for the SPUI ramps and because the tree buffers would be gone. People in residential areas would not be able to see the interchange area because of the lids and the depth of the excavation.

The tunnel would affect view quality at the Montlake Cut, even though the structure itself would not be visible, because the tunnel entrance would change the landform at the former MOHAI parking lot and would likely require ventilation towers and stormwater pump stations in East Montlake Park. The taller structures would be visible from some residences on both sides of the interchange.

Option K would also result in very high levels of change to visual character and quality in the southeast campus of the University of Washington. The lowered Montlake Boulevard NE/NE Pacific Street intersection and tunnel portal would be covered by a partial or full lid. From the commuters' viewpoint, this new configuration would create a complex, multi-layered channel that would block views of the UW. However, pedestrians, bicyclists, and light rail users could have an improved visual experience due to being separated from vehicular traffic and having unobstructed views. The project would not affect the view of Mt. Rainier from Rainier Vista on the UW campus.

Option K Suboption

- Adding the suboption to Option K would result in no measurable differences in the visual impacts described above. The added ramp would be located within the existing right-of-way of the current Montlake Boulevard interchange.

Option L

For commuters on the main line, travel through the new lid would limit views of the surrounding area. For other viewers, the SPUI over the main line and the new bridge through East Montlake Park would be a dramatic change; the retaining walls and columns would dominate commuters' views from the roadway. The walls and elevated interchange would also dramatically change the character and quality of views from the Arboretum Trail at Marsh Island and the WAC. From these sensitive locations, the structures would dominate views much more than the existing ramps and main line do, in part because the existing tree buffers would be gone and difficult to replace.

The new bascule bridge at the mouth of the Montlake Cut would dramatically change views from residences in the eastern part of the Shelby-Hamlin neighborhood and the WAC area (Exhibit 5.5-5). The bridge over East Montlake Park would cast shadows, block views, and diminish the natural openness of the shoreline. The new bascule bridge could be

noticeable from a number of viewpoints in the Montlake neighborhood, Foster Island, and Laurelhurst.

Exhibit 5.5-5. **Looking West from Northeast Corner of East Montlake Park toward Montlake Bridge (Visualization Location 15)**

Existing View

- Historic bascule drawbridge and Montlake Cut
- High volumes of boat traffic
- Mature vegetation lines both side of channel
- Viewing deck

Option A

- New bascule drawbridge parallel to existing Montlake Bridge

Option K

- Twin tunnels under Montlake Cut

Option L

- New bascule drawbridge over east mouth of Montlake Cut

Option L would also result in very high levels of change to visual character and quality in the southeast campus of the UW. The new bascule bridge would pass west of the Canoe House and part of the UW Open Space. The lowered Montlake Boulevard/NE Pacific Street intersection and bridge landfall would have a similar appearance to Option K.

KEY POINT

All three options would remove the R.H. Thomson Expressway ramps and the existing Lake Washington Boulevard ramp, opening up views, park space, and water. This would result in more natural-appearing land and waterscapes than now exist by providing unimpeded views to and from the roadway of the surrounding natural areas.

Option L Suboptions

- Adding northbound capacity on Montlake Boulevard to Option L would result in no measurable differences in the visual impacts described above. The added northbound lane on Montlake Boulevard

north of the Montlake Cut would not change the existing visual quality along the roadway.

West Approach Landscape Unit

Under all three options the west approach bridge through Union Bay and east to Lake Washington would be much wider than the existing bridges, which could change boaters' and park users' experience in this area. The west highrise would be shifted northward approximately 190 feet farther than the existing structure. Views would be changed from north Madison Park residences; views of the Laurelhurst hills could possibly be blocked, although more open water in Union Bay (Exhibit 5.5-7) would be revealed. Overall, however, visual quality would not change from its high level, except with Option K (Table 5.5-4). Option K would likely diminish views near or on Foster Island because the paved roads and land bridge structure would not be harmonious with the island's existing undeveloped woodlands (Exhibit 5.5-6).

Table 5.5-4. Visual Quality Effects in West Approach Landscape Unit

	Vividness	Intactness	Unity
Existing	High	High	High
Option A	High	High	High
Option K	High	Moderate	Moderate
Option L	High	High	High

Option A

The primary effect from Option A would be due to the noticeably greater width and somewhat noticeably greater height of the west approach. The new bridge structure would be higher than the existing west approach between the shoreline and Foster Island, which will make the bridge slightly more visible from distant viewpoints. For commuters and transit riders, the west approach would continue to provide panoramic and scenic views to Lake Washington, to the Cascades when traveling east, and to the Arboretum when traveling west. The new path under the bridge could be a more comfortable and pleasant experience than going through the tunnel as it does today because of the complete openness.

The Arboretum and Foster Island in general would not be affected by the presence of the new bridge. In the near term, visual quality along the bridge would be diminished until trees and shrubs are taller and filled in. In 10 to 20 years, vividness, intactness, and unity would be similar to or higher than their current high ratings. This would also be true for middle and distant views because structures would be seen from the side, minimizing the visual effect of the greater width (Exhibit 5.5-7).

Exhibit 5.5-6. **Looking South from Foster Island's North Shoreline toward SR 520 (Visualization Location 17)**

Existing View

- North Foster Island shoreline park
- Mature woods
- Passive recreation

Options A and L

- No change to north Foster Island

Option K

- Land bridge at Foster Island with pedestrian/bicycle pathway

Option A Suboptions

- Adding the Lake Washington Boulevard ramps to Option A would result in some changes to the effects described above. Although the ramps would be located within and adjacent to the main line of SR 520, the addition would remove some mature poplars and other specimen trees along the east side of Lake Washington Boulevard East. These trees now buffer the view of the roadway from several Montlake homes and the boulevard.
- Changing the profile of Option A to a constant-slope profile in the west approach would result in slight visual changes compared to the effects described above (see Exhibit 2-16, which shows the constant-slope profile under Option L).

Option K

The main effect on visual quality and character from Option K would result from the land bridge at Foster Island. The west approach through Union Bay would be approximately the same height as the existing SR 520 main line. Commuters would experience a much wider, relatively exposed

roadway for several years, until replanted shoreline vegetation matures on and around Foster Island.

Exhibit 5.5-7. **Looking South from Pedestrian Bridge between MOHAI and Marsh Island toward SR 520 (Visualization Location 16)**

Existing View

- Mainline at flat grade just above water
- Montlake Boulevard off-ramp
- Shoreline vegetation

Option A

- No ramps to Lake Washington Boulevard
- Wider column spacing
- Regional bike and pedestrian path

Option K

- Depressed SPUI east of 24th Avenue East
- Regional bike and pedestrian path
- Mainline at approximately the same level as existing

Option L

- Elevated SPUI east of 24th Avenue East
- Noise walls
- Regional bike and pedestrian path

Of the three options, Option K would result in the highest level of change to the visual quality and character of Foster Island. It would take considerable time for the newly planted landscape on both sides of SR 520 to naturalize as woodlands and reach sufficient height to screen and soften the presence of the concrete structure supporting the land bridge. The four corners of the land bridge would likely always be somewhat visible from parts of Lake Washington, Union Bay, and Husky Stadium because the marsh and wetland vegetation might not be tall enough to completely screen the walls. From the park users' perspective, the north portion of Foster Island would appear to be a somewhat more formalized recreation area than it is today. The south portion of Foster Island would retain most of its woodland character, and the new path over the lid would be more comfortable and pleasant than going through the current tunnel. However, access roads would be installed for vehicle access to the stormwater pump stations near the land bridge, and this would give the south island a more developed quality.

In the near term, visual quality would be degraded in the Foster Island area until trees and shrubs are taller and filled in. In 10 to 20 years, vividness, intactness, and unity would be similar to their current high ratings for people traveling on the bridge. On the whole, vividness, intactness, and unity of this landscape unit would not change from its high level, especially from distant viewpoints. Intactness and unity when seen from the viewpoints near or on Foster Island could be diminished to low or moderate because the paved roads and land bridge structure are not consistent or harmonious with the island's existing undeveloped woodlands. For middle and distant views, vividness, intactness, and unity of this landscape unit would not change appreciably from their current high levels because the structures would be seen from the side, minimizing the visual effect of the greater width (Exhibit 5.5-6 and 5.5-7).

Option L

Option L's effects on visual quality and character would be similar to those of Option A. There would be less change to the visual quality and character of Foster Island than with the other options because the west approach bridge through Union Bay would be more comparable in height to the existing bridge (Exhibit 5.5-7). A minimum of 10 feet of clearance would be provided for park maintenance vehicles and to avoid a confining experience for pedestrians.

Option L Suboptions

- Adding left-turn access from Lake Washington Boulevard onto the SPUI south ramp to Option L would result in no measurable differences to visual effects described above because it would not involve additional structures or right-of-way.

Lake Washington Landscape Unit

Changes to the scale and appearance of the west approach and floating bridge would be noticeable when seen from relatively distant shoreline neighborhoods such as Laurelhurst, but would not significantly change the quality or character of those views because the bridge is an existing, small element in the distance (Exhibit 5.5-8). For houses near the bridge in Medina, the northward shift would move the columns and roadway closer to houses on the north side and farther from houses on the south side of the east highrise. The overall visual character of those views is high and would not change because the bridge is already a large part of those views (see Table 5.5-5).

Sweeping views from the Evergreen Point Bridge of the Cascade and Olympic mountains and Mount Rainier, which currently exist only for commuters, would be available to users of the new bicycle/pedestrian path.

Exhibit 5.5-8. **Looking Northwest from Edgewater Apartments toward SR 520 West Approach and Husky Stadium (Visualization Location 18)**

Existing View
- 4-lane bridge
- Column spacing at 100 feet on center
- Husky Stadium
- Boat traffic

Option A
- 6-lane bridge
- Column spacing at 250 feet on center

Option K
- 6-lane bridge
- Column spacing at 250 feet on center

Option L
- 6-lane bridge
- Column spacing at 250 feet on center
- Noise walls

Table 5.5-5. Visual Quality Effects in Lake Washington Landscape Unit

	Vividness	Intactness	Unity
Existing	High	High	High
All options	High	High	High

The path would create a new opportunity for viewing those memorable landscapes because of the slower pace of pedestrians and cyclists. The bicycle/pedestrian path and vantage points would be a new element, but small relative to the scale of the bridge.

Views for boaters and kayakers on the lake would change moderately because the column-pontoon structure would raise the roadway, making the structure more noticeable from viewpoints close to the bridge. However, while the bridge structure would be wider and taller, the increased column spacing (from 30 feet apart to 90 feet apart) would open up views of the lake through the structure.

Although the bridge maintenance building and dock located directly underneath the new east approach would be noticeable to boaters on the lake, the building would not be visible from most locations because it would be in the bridge abutment, partially buried in the hillside, and screened with vegetation. Views from the lake of the road on the north side of the bridge leading to the facility, dock, and bicycle/pedestrian path passing under the east highrise would be screened by trees.

Eastside Transition Area Landscape Unit

As a result of the northward shift in alignment at Evergreen Point, a swath of mature trees and understory nearly 150 feet wide would be removed on the north side of SR 520. This would create a more dramatic view westward of Lake Washington and the Olympic Mountains. Roadway would also replace the grassy slope between Fairweather Park and the transit stop.

The portion of the view from shoreline residences that includes the existing bridge might be affected by the greater height of the approach and roadway; however, the bridge is already a major part of views here, and the overall level of change is expected to be low (Table 5.5-6).

Table 5.5-6. Visual Quality Effects in Eastside Landscape Unit

	Vividness	Intactness	Unity
Existing	High	Low	Low to moderate
All options	Moderate to high	Low	Low to moderate

Would the project create new sources of shadow, glare, or light?

Under all three options, the landscape units between Roanoke and Union Bay would have continuous illumination installed on all freeways and ramps, with light levels similar to existing levels. New lighting would use fixtures that shield sideways glare. Noise walls would not be tall enough to block direct illumination from 30- to 40-foot-high freeway light standards. It is possible that the loss of tall screening trees could create a situation where some residences receive more stray or direct illumination than they do now.

Over Portage Bay, the increased height of the bridge, high noise walls (under Option L and potentially Option A), and northward displacement of the roadway would create new shadow and shade effects for a few residents immediately north of the Portage Bay Bridge in the Roanoke Park area.

Based upon current lighting studies, the east approach would be illuminated to meet safety requirements for the transit ramps. The floating bridge

would not be illuminated except for navigation safety lights and lighting on the bike and pedestrian path on the bridge. The path would have low-wattage, down-cast lamps recessed into walls or barriers next to the travel way for user safety. No new sources of glare would be added because there would be no tall structures such as bridge arches, towers, toll booths, or bridge tender buildings. Shading on Lake Washington would increase relative to existing conditions because of the wider and higher roadway.

Overhead lighting, shade, and shadowing at the Evergreen Point Road lid would be similar to existing conditions; therefore, no new effects would be expected. However, because of the northward shift of the bridge and the accompanying loss of vegetation along the east approach, homes near the highway that did not experience spill-over lighting before the project could be exposed to stray light unless noise walls block it or until new screening vegetation grows tall enough.

At the bridge landfall in Medina, increased height and northward displacement of the roadway would change or increase shadow and shade effects for residents immediately north of the lid. Outside of the roadway, shade and shadowing could change because of the loss of vegetation in some locations. No new sources of glare would be expected, and the noise walls would block most of the light from the east approach roadway.

Effect of Suboptions

Option A Suboptions

- Adding the Lake Washington Boulevard ramps to Option A would require removal of the mature trees located along the east side of Lake Washington Boulevard. The added Lake Washington Boulevard ramps would not be expected to add light, glare, and shadow effects on the Arboretum because most of the length of the ramps would run along the north and south sides of the main line. They would not cut through the Arboretum as the current ramps do.
- Adding the HOV direct-access ramp to Option A would result in no measurable differences in the light, glare, and shadow effects described above because it would be located within the right-of-way of the existing Montlake Boulevard interchange.
- Changing the profile of the west approach to match Option L would result in some minor differences in shadow effects.

Option K Suboption

- Adding the suboption to Option K would result in no measurable differences to shadow, glare, and light effects described under the base options because the added ramp would be located within the existing right-of-way of the current Montlake Boulevard interchange.

Option L Suboptions

- Adding capacity to Montlake Boulevard north of the Montlake Cut would result in some minor differences in the location of lighting on this road segment, but would not add substantially to existing light and glare in this area.
- Adding left-turn access from Lake Washington Boulevard onto the SPUI south ramp would result in no measurable differences in the shadow, light, and glare effects described above because it would not involve additional structures or roadway area.

What has been done to avoid or minimize negative effects?

Community input during the early stages of the SR 520, I-5 to Medina project helped identify important visual quality and character features that were of concern. In 2006 the Design Advisory Group, a standing committee of citizens, worked with WSDOT to articulate an aesthetics vision statement and broad goals for maintaining visual quality. Mitigation options focused on addition of landscaped lids to reconnect neighborhoods and augment open space; the use of sensitively designed architectural elements and details, such as noise walls, active traffic management (ATM) signage, and maintenance facilities to be integrated with, complement, or otherwise enhance existing and/or new features; the application of "green over gray" wherever possible in the corridor; a sustainable, functional, and aesthetic landscape design; and increased spacing between bridge columns to open up views under bridge structures.

The design of noise walls must be carefully considered, given that they tend to create a confined, or hard-edged, visual character or reduce visual quality for motorists by cutting off views of visual resources. In addition, for viewers to the roadway these noise walls potentially block views and create an unpleasant concrete barrier. However, with a sensitive design that considers color palette, texture, top-of-wall treatment, and landscape, noise walls may in some cases serve as additional visual mitigation.

ATM signage could be integrated into planned structures, such as lids or gantries, rather than creating separate structures, thereby further cluttering the visual landscape.

Many of the stormwater facilities would be placed underground and out of sight, or if above-ground, would have natural-appearing landscaping, which would be consistent with the parks and open space where they are located. In the Shelby-Hamlin neighborhood, the addition of the stormwater treatment wetland, with appropriate design approaches by stormwater engineers and landscape architects, could be a positive visual change for the neighborhood because the large asphalt parking lot would be replaced by a

natural-appearing wetland landscape that is in harmony with the adjacent shoreline and bay.

The new bridge operations facility located under the east approach of the Evergreen Point Bridge would be inside the hillside abutment and screened with vegetation. While the addition of this new structure could have a potential negative visual effect for viewers on the lake, such as boaters and nearby neighbors, sensitive design of the maintenance structure will make the building look appropriate in terms of scale, integration, and style to the surroundings.

What would be done to mitigate negative effects that could not be avoided or minimized?

SR 520 Corridor

Under all the build options, the following are some of the possible mitigation measures that may be performed by WSDOT:

DEFINITION

Green Over Gray

An aesthetic and functional approach using vegetative screening to mitigate the visual impact of excessive structures, particularly in traffic corridors.

- Communicate regularly to the public during construction regarding road closures, detours, and other activities affecting traffic circulation. Use standard BMPs to reduce or eliminate construction effects on surrounding neighborhoods, such as use of construction screening, standardized work hours, and the use of low-impact construction methods, materials, and tools.
- Establish and follow design guidelines, developed in conjunction with the standards of both state and local jurisdictions, that include visual standards for the corridor. The guidelines and standards would present ways to ensure visual unity and consistency throughout the SR 520 corridor. These include defining the appearance and style of built elements, such as lighting, railings, sign bridges, structures, and walls. The guidelines would also address the use of public art in the corridor, including the process for selection and location of any art in cooperation with municipal and county jurisdictions and art organizations.
- Revegetate areas where natural habitat, vegetation, or neighborhood tree screens would be removed. These areas are under Portage Bay Bridge in Roanoke Park; through Montlake, in particular at the NOAA Northwest Fisheries Science Center and East Montlake Park and the Arboretum; and along the roadway in the Eastside study area. The *Roadside Classification Plan* (WSDOT 2007) requires that areas within the right-of-way and construction easements be revegetated to align with the goals for the designated roadside classification. Mature vegetation could generally be used to revegetate parks and re-establish tree screens in these areas in consultation with local jurisdictions and agencies. Revegetation plans should also provide for adequate irrigation and monitoring until trees and plants are well established.

- Follow the guidelines of the *Roadside Classification Plan* to blend the project into the adjacent land uses, while creating a unified experience for the roadway user. Refer also to the Seattle Department of Transportation's Streetscape Design Guidelines in the *Seattle Right-of-Way Improvement Manual* (City of Seattle 2009).
- Establish landscaping that would be compatible with the character of the existing vegetation, especially along Lake Washington Boulevard, Montlake Boulevard, and through the Washington Park Arboretum, East Montlake Park, Ship Canal Waterside Trail, Arboretum Waterfront Trail, Montlake Playfield, and Interlaken Park/Delmar Drive East.
- Construct noise walls that will visually screen the roadway from sensitive viewers, particularly in residential areas. The walls could be designed to ensure a unified visual appearance as viewed from within the roadway corridor. Noise walls that face communities could include a detailed texture to align with a slower viewing speed and ability to observe more detail.
- Establish guidelines to ensure the design of structures are aesthetically compatible with the surrounding land and waterscapes in scale and architectural style, and unified in appearance.
- Design lids to reconnect divided communities and provide a consistent and/or continuous visual connection across the SR 520 roadway. Landscape the lids to ensure a unified visual appearance appropriate to the surrounding landscape, including the use of appropriate plant materials, hardscape, and site furnishings that contribute to visual coherence and aesthetics. For example, on the north side of the Evergreen Point Road lid, a transitional seating wall and stairs might be included that would share elements and characteristics of the lid with Fairweather Park.
- Replace the Bagley Viewpoint Park either on the new lid or reconstructed bridge. WSDOT would work with the Seattle Parks Department to identify an appropriate site.

Specific mitigation measures are presented below. However, it will not be possible to delineate all mitigation options until engineering design is further advanced.

Context Sensitive Design/Solutions

WSDOT has a strong commitment to developing projects in accordance with the Context Sensitive Design/Solutions (CSD/CSS) philosophy. In order to design roadway facilities that fit within their unique contexts and meet the needs of the local communities, WSDOT developed a community involvement program to focus on SR 520 aesthetics.

The first step in this program was the formation of the Design Advisory Group (DAG) whose purpose was to explore and articulate an aesthetic vision for the new SR 520 facilities. The DAG is an important step in the on-going community information and outreach process that will continue through design and construction. The Corridor Aesthetics Handbook (CAH; WDOT 2006d) is the record of the ideas developed during the DAG workshops. The CAH can be found on WSDOT's website at http://www.wsdot.wa.gov/Projects/SR520Bridge/Library/technical.htm

Seattle Landscape Units

The MOHAI site and the remaining portions of McCurdy and East Montlake Parks would be redesigned in cooperation with the Seattle Parks Department. Grass and trees in the south Shelby-Hamlin area could be replaced with trees and screening vegetation to soften the appearance of the new noise wall. Mature and/or larger size trees, shrubs, vines, and groundcovers for replacement or enhancement would be selected as appropriate in consultation with Seattle Parks and Recreation. Plantings would be irrigated and monitored until established.

Treatment of the area between the new regional bicycle/pedestrian path and adjacent residences in the Shelby-Hamlin neighborhood would be appropriate to the location and consistent with corridor visual standards for unity. The treatment would likely be a fence or vegetation or a combination of both, depending on available space.

Foster Island would require extensive restoration for Option K, including shoreline and buffer restoration and roadside planting. This site is protected under Section 6(f) of the Land and Water Conservation Fund Act. As such, development of revegetation plans would require coordination with City of Seattle (Seattle Parks and Recreation Department), University of Washington, Department of Natural Resources, and the National Park Service. Plans should require mature and/or larger trees, shrubs, plants, and adequate irrigation and monitoring until vegetation is established. Union Bay would also require revegetation for the areas where the R.H. Thomson ramps used to stand.

Lake Washington Landscape Unit

The only location in the Lake Washington landscape unit that would have visual effects from the SR 520, I-5 to Medina project would be west of the Evergreen Point Road overpass. Screening vegetation that was removed for construction of the east approach connection to the Eastside highway would be replanted to screen views of SR 520.

Design guidelines would be established to ensure that the architectural style of the new structures presents a unified visual appearance.

Eastside Landscape Unit

Construction and operation effects from the SR 520, I-5 to Medina project in the Eastside landscape unit are minimal and would not need mitigation.

5.6 Cultural Resources

KEY POINTS

Cultural and Historic Resources

All options would affect the settings of a number of historic properties in both positive and negative ways. The positive effects would generally result from decreased noise in the vicinity of historic properties where noise walls are proposed, and from the introduction of increased green space and beneficial visual effects from landscaped lids. Negative effects would result either from the removal of land or buildings or from visual intrusion caused by more prominent roadway and bridge structures.

Environmental laws and review processes at the federal, state, and local level require that consideration be given to protecting significant historic, archaeological, and traditional cultural sites from damage or loss from the project. WSDOT works with agencies, tribes, and other interested parties, including the City of Seattle, King County, neighborhood associations, and historic preservation advocacy groups, to identify significant properties and develop protection strategies to assure that Washington's cultural heritage is protected.

Environmental laws such as the National Historic Preservation Act require that effects on significant cultural resources be considered during the public environmental review process. Section 106 of the National Historic Preservation Act (NHPA) requires that all federal agencies consider

significant cultural resources as part of all licensing, permitting, and funding decisions. As part of the Section 106 process, each agency must consult with the Department of Archaeology and Historic Preservation (DAHP) to assure that significant cultural resources are identified, and to obtain DAHP's formal opinion on each property's significance and the impact of the agency's proposed action upon the property.

Significant cultural resources protected by Section 106 are those that are listed in or eligible for listing in the National Register of Historic Places, known as historic properties. Where archaeological resources from prehistoric Native American use of the area may be present, or where a project may affect areas of continuing cultural importance, WSDOT and FHWA also consult with the potentially affected tribes to avoid or minimize adverse effects. This section discloses potential effects on the historic properties in the project area. Section 106 consultation is ongoing. All effects determinations are preliminary and are subject to change, pending DAHP concurrence.

How would the project affect historic properties during operation?

Each identified historic property in the APE was assessed for potential effects under the No Build Alternative and the 6-Lane Alternative and options using the criteria of effect and adverse effect from 36 CFR 800.5. The criteria of effect and adverse effect are used to determine whether the undertaking could change the characteristics that qualify a property for inclusion in the NRHP. If the characteristics are changed, for better or worse, it is considered an effect.

If the aspects of integrity are diminished to the point where the property can no longer convey its significance, it is considered an adverse effect. In accordance with 36 CFR Section 800.5(a)(1), an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time or be farther removed in distance, known as indirect effects, or be cumulative. Potential adverse effects on cultural resources include, but are not limited, to the following (36 CFR 800.5, Adverse Effect):

- Physical destruction of or damage to all or part of the property
- Alteration of a property (including restoration, rehabilitation, or repair that is not consistent with the Secretary of the Interior's standards for the treatment of historic properties)
- Removal of the property from its historic location

- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features

WSDOT reviewed the project alternatives to determine if they would affect historic properties by construction and/or operation of the project. Following standard NEPA guidance, analysis of effects entailed comparing existing conditions with those of both the No Build Alternative and the 6-Lane Alternative.

Several effects on historic properties were identified from the 6-Lane Alternative options. Based on available information, some of these effects may be considered adverse (all effects determinations are preliminary, pending DAHP concurrence), as follows:

- NOAA Northwest Fisheries Science Center – experiences an adverse effect under Option A
- Montlake Bridge – experiences an adverse effect under Option A
- 2111 East Shelby Street – experiences an adverse effect under Option A
- Montlake Historic District – experiences an adverse effect under Options A and L
- 2158 E. Shelby Street – experiences an adverse effect under Option L
- 2159 E. Shelby Street – experiences an adverse effect under Option L
- Foster Island – experiences an adverse effect under Option K

At this time, WSDOT, on behalf of FHWA, has not made a definitive Section 106 effects determination for the project. Once a preferred alternative has been selected and all effects can be fully evaluated, a determination of effect for the project will be made. As noted earlier, all effects determinations are preliminary, pending DAHP concurrence.

WSDOT has made every attempt to identify all foreseeable effects on historic properties and has disclosed them in the Cultural Resources Discipline Report, Attachment 7 for review and comment. This will help the public and decision-makers understand the range of potential effects for each option. Ongoing consultation with the state DAHP, affected Tribes, and other Section 106 consulting parties will also help WSDOT make a determination of effects after the preferred alternative is selected. If the project is determined to have an adverse effect on historic properties, Section 106 of the NHPA requires consultation to resolve the adverse effect, usually culminating in a Memorandum of Agreement (MOA).

I-5 Area

The landscaped lids in this area would affect the historic properties in this section of the APE. The I-5 lid would stretch across much of the front of the Seward School property, introducing a new green space between Eastlake and the Roanoke Park Historic District (Exhibit 5.6-1).

The lid at 10th and Delmar would have beneficial effects on the Roanoke Park Historic District, Fire Station #22, the Boyd House, and the Andrew Gunby House because it would provide a pedestrian passageway between the North Capitol Hill and Roanoke/Portage Bay neighborhoods (currently separated by SR 520), increase landscaped green space in the area, and reduce noise levels. The lid would serve to shield the historic properties from effects of the wider SR 520 roadway, both visual and audible. The lid's effects could be enhanced by design elements that reflect the district's historic character.

Portage Bay Area

Some historic properties in this area would experience increased visual intrusion from the wider footprint of the Portage Bay Bridge, especially with noise walls. Because the properties already experience visual intrusion from the existing bridge, this increase would not be so great as to constitute an adverse effect under Section 106 of the NHPA (see text box titled "Effects on Historic Properties under Section 106"). Other properties would experience an effect from more open views looking north under the bridge, due to the greater column spacing (from the existing 100 feet on-center to as much as 250 feet apart).

Option A could have an adverse effect on the NOAA Northwest Fisheries Science Center historic buildings (Exhibit 5.6-2). The North Campus buildings are eligible for the NRHP under Criterion A for their association with important research that is significant locally, regionally, and nationally. The oldest North Campus building, dating from 1931, is also eligible under Criterion C for its distinctive architecture that incorporates marine motifs to visually demonstrate its association with marine research, designed by a major architect, John Graham, Sr. Removing part of the land and nine buildings on the South Campus could make it difficult for the North Campus buildings to continue in their present function. This could potentially result in a change in the property's use, which contributes to its historic significance. The 1931 building was built to serve as the offices for the NOAA Northwest Fisheries Science Center and has fulfilled that purpose since construction. Changing the use would diminish the buildings' association with marine research and would result in an adverse effect.

Exhibit 5.6-1. **Effects on Historic Properties within the I-5 Area, All Options**

NRHP Eligibility of Surveyed Resources

- Contributing
- Listed
- Eligible

Property Effects

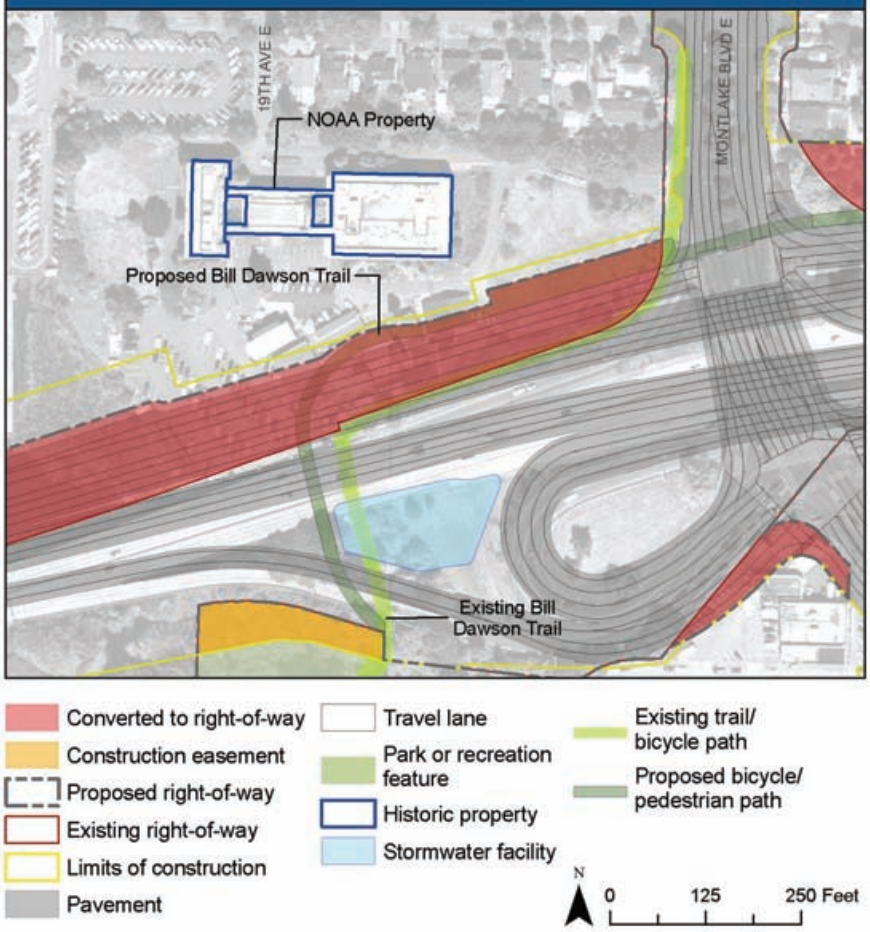
- Converted to right-of-way
- Construction easement
- Historic district boundary
- Area of potential effects
- Right-of-way
- Lid or Landscape Feature
- Pavement
- Parcel

Note: All resources are mapped and described in detail in the Cultural Resources Discipline Report. See Table 4.6-1 for a list of properties.

N

0 500 1,000 Feet

Exhibit 5.6-2. **Effects on NOAA - Northwest Fisheries Science Center, Option A**



Montlake Area

All options would affect the Montlake Historic District by lowering the SR 520 main line and adding a lid to Montlake Boulevard. The lid would be landscaped with a pedestrian passageway and green space. Lowering the roadway and adding the lid would reduce visual intrusion and noise from the roadway. In addition, the lid would partially reunite the two sides of the Montlake Historic District currently separated by SR 520 (Exhibits 5.6-3 and 5.6-4).

All options would also affect properties on the south side of East Hamlin Street. All of these properties are contributing elements to the Montlake Historic District, and three of them in the center of the block are also individually eligible. These properties would lose some of the landscaped buffer zone south of the alleyway behind their rear property lines. This land is the remainder of the Old Canal Reserve property. A buffer of between 45 and 98 feet would remain with Option A. Under Options K and L the north side of the new lid would connect to this property, resulting in a visual and audible change to historic properties located on the south side of

Effects on Historic Properties under Section 106

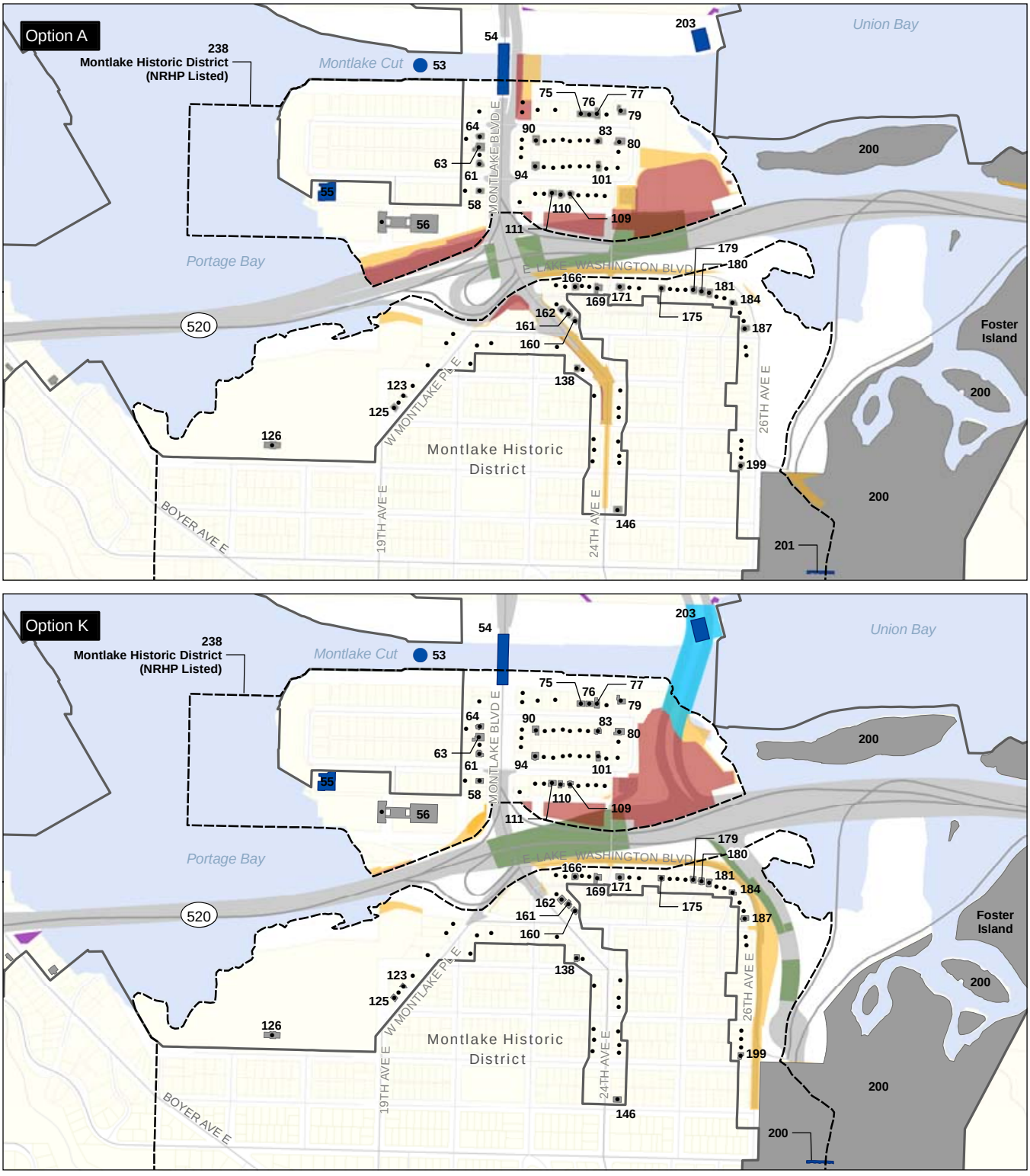
Section 106 of the NHPA says that an adverse effect occurs "when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association." State and local registers have similar definitions of what constitutes an adverse effect.

Coordination under Section 106

WSDOT formally initiated the Section 106 process for the SR 520 SR 520, I-5 to Medina project in April and May 2009, coordinating with the SHPO, Advisory Council on Historic Preservation (ACHP), affected Indian tribes, and other consulting parties. As lead federal agency, the FHWA conducts government-to-government consultations with the tribes. WSDOT has assisted FHWA with consultations since the beginning of this project, when it was known as the Trans-Lake Washington Study. The consultations will continue through project design and construction.

Northwest Fisheries Science Center, Montlake Historic District

Exhibit 5.6-3. Effects on Historic Properties within the Montlake Area, Option A and K



NRHP Eligibility of Surveyed Resources

- Contributing
- Listed
- Eligible

Property Effects

- Converted to right-of-way
- Construction easement
- Subterranean easement
- Construction easement (transitioned to subterranean easement)

Union Bay

- Historic district boundary
- Area of potential effects
- Right-of-way
- Lid or landscape feature
- Pavement
- Parcel

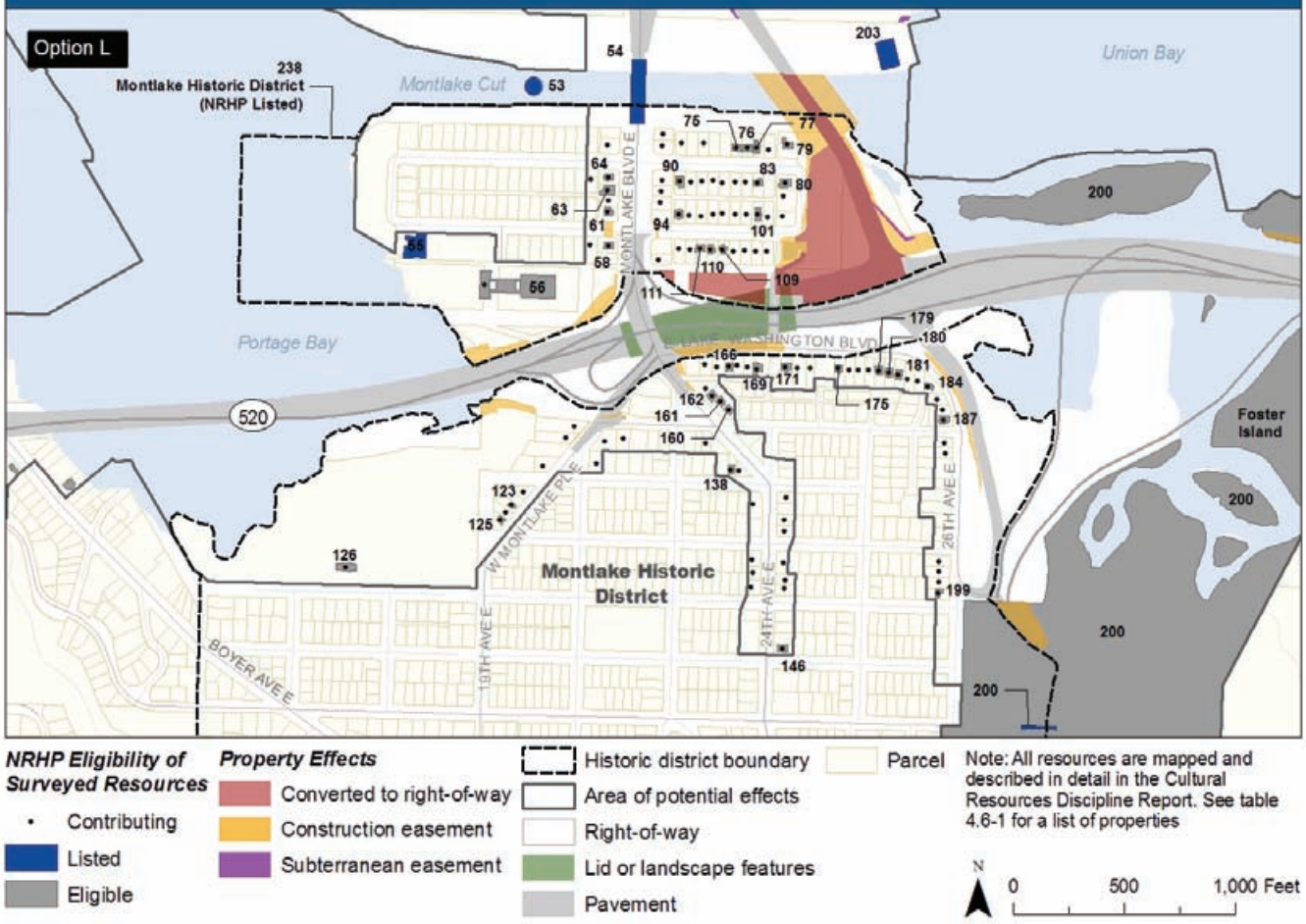
Note: All resources are mapped and described in detail in the Cultural Resources Discipline Report. See Table 4.6-1 for a list of properties.

N

0 250 500 1,000 Feet

East Hamlin Street. The visual effect and change in setting for these properties are expected to be minor.

Exhibit 5.6-4. Effects on Historic Properties within the Montlake Area, Option L



Option A

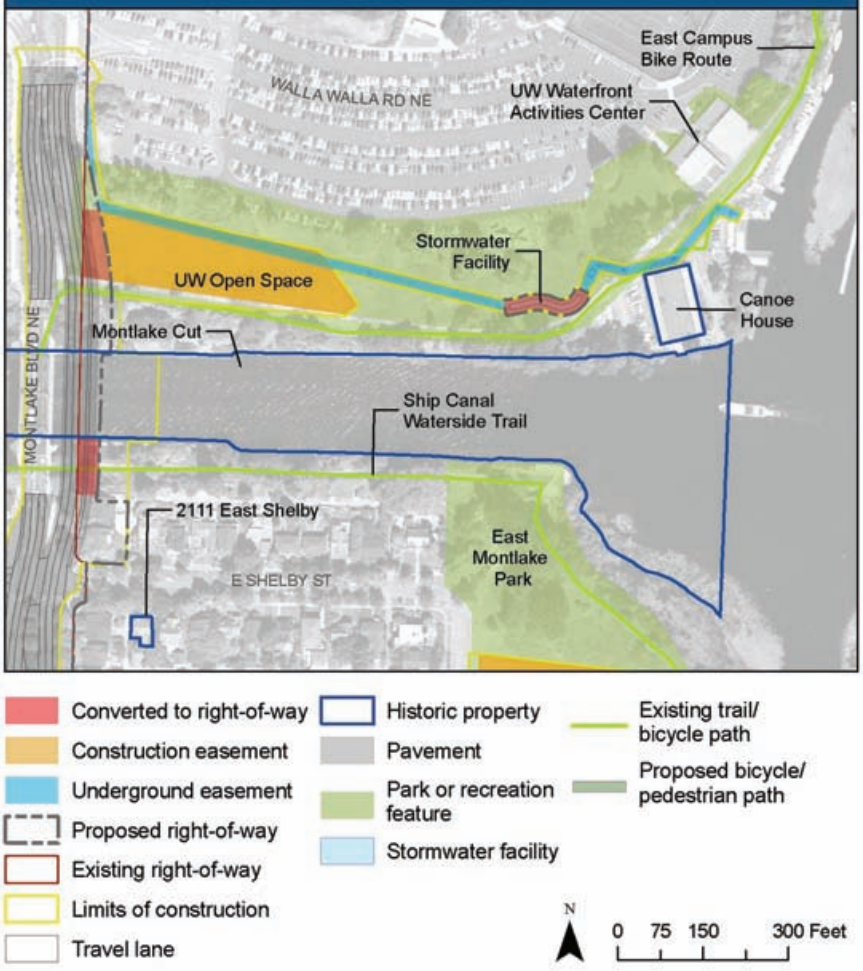
A new bascule bridge immediately adjacent to the historic Montlake Bridge would modify the setting and feeling of the historic bridge. The Montlake Bridge is listed in the NRHP under Criterion C for its design and engineering qualities. Context-sensitive design of the new bridge could minimize effects on the existing bridge (Exhibit 5.6-5). However, it is likely that the adjacent new bridge would still result in an adverse effect on the historic Montlake Bridge because its setting would be significantly altered. This effect would be mitigated through stipulations outlined in an MOA.

The loss of the two historic properties on Montlake Boulevard and the presence of the new bascule bridge would affect the setting of the Montlake Historic District, particularly of three adjacent contributing properties at 2111 East Shelby Street, 2112 East Shelby Street, and 2818 Montlake Boulevard NE. Both 2111 East Shelby Street and

2111 East Shelby Street

2818 Montlake Boulevard NE would become more exposed to open views of the existing Montlake Bridge and the new bridge. The changes to these properties would be a significant alteration to the integrity of their setting and feeling. The individually eligible property at 2111 East Shelby Street would experience an adverse effect from these changes. (See Exhibit 5.6-5 for the location of this property.)

Exhibit 5.6-5. **Effects on the Montlake Bridge and on 2111 East Shelby Street, Option A**



A new bridge would also have a visual effect on the NRHP-listed Canoe House, which now has a clear view of the historic Montlake Bridge. The historic bridge would be somewhat obstructed by new bridge.

Although the Montlake Bridge has become part of the historic viewshed of the Canoe House, the visual effect of a new bascule bridge would not be an adverse effect on the Canoe House, which is listed in the NRHP under Criterion C for its architectural significance.

The Montlake Cut, listed in the NRHP under Criterion C for its engineering significance, is a navigable waterway with an existing bascule bridge crossing. The addition of a new bascule bridge of similar size adjacent to the existing bridge would affect the setting and feeling of the cut. The greatest effect would be the partial blocking of the view of the historic bridge from the east end of the cut, but this effect to the integrity of the setting and feeling would not be adverse (see Exhibit 5.6-3).

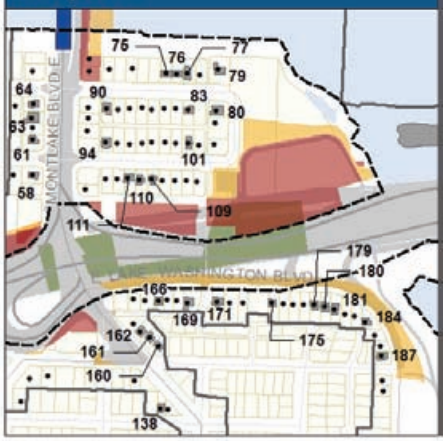
The wider roadway at East Montlake Place East and 24th Avenue East would affect the setting of four contributing elements in the Montlake

Historic District, including the individually eligible property at 2220 East Louisa Street. However, this alteration to the integrity of the setting would not be considered an adverse effect on the Montlake Historic District or to the individually eligible property at 2220 East Louisa Street. Although adding a lid provides benefits, all of the changes to the Montlake Historic District under Option A combine to affect the integrity of the district and result in an adverse effect.

Option A Suboptions

- Adding the eastbound HOV direct-access ramp to Option A would result in no additional effects on the Montlake Historic District because it would be located within the right-of-way of the existing interchange (Exhibit 5.6-6).
- Adding the Lake Washington Boulevard ramps to Option A would result in additional effects on the Montlake Historic District but not on the Arboretum. The ramps would be located considerably farther west than they are currently. They would not cut through the Arboretum as the current ramps do, resulting in a positive change for the Arboretum. Most of the length of the on- and off-ramps would run along the north and south sides of the main line, introducing little additional effect to the Arboretum. Because of their more westward location, however, these new ramps would have an increased visual effect on the Montlake Historic District, affecting contributing properties along Lake Washington Boulevard East and 26th Avenue East. In particular, the houses at 2429, 2433, and 2437 Lake Washington Boulevard East, all contributing elements, would experience visual effects and changes to their setting and feeling from the terminus of the new westbound off-ramp. The houses at 2445, 2449, 2455, and 2459 Lake Washington Boulevard East would experience similar effects from the new eastbound on-ramp. These are all contributing elements to the Montlake Historic District; 2445 and 2449 Lake Washington Boulevard East are also individually eligible. The houses along Lake Washington Boulevard East between Montlake Boulevard and 24th Avenue East would experience a change in setting from the increased width and added lane on Lake Washington Boulevard East in this area. These

Exhibit 5.6-6. **Effects on Lake Washington Boulevard, Option A Suboptions**



NRHP Eligibility of Surveyed Resources

- Contributing
- Listed
- Eligible

Property Effects

- Converted to right-of-way
- Construction easement
- Historic district boundary
- Area of potential effects
- Right-of-way
- Lid or landscape feature
- Pavement
- Parcel

Note: All resources are mapped and described in detail in the Cultural Resources Discipline Report. See Table 4.6-1 for a list of properties.

N

0 500 1,000 Feet

additional effects from the new ramps contribute to the adverse effect noted under Option A.

- Adding the constant-slope profile to Option A would result in no additional effects on the Montlake Historic District.

Option K

The depressed SPUI would likely not be visible from the residential areas of the Montlake Historic District because of the new lid and the depth of the interchange. The main line of SR 520 would be roughly the same height as the existing SR 520 where it is visible east of the lid, so this new road surface height would have no additional visual effect on the historic district.

The south tunnel portal would change the landform at the former MOHAI parking lot and may require ventilation towers and stormwater pump stations in East Montlake Park. The vent towers are estimated to be 50 feet high. These structures would be visible from the Montlake Cut, the Canoe House, and the surrounding area of the Montlake Historic District. The tunnel itself would be belowground and not visible from any historic properties.

The new ramps and traffic turnaround would be east of and completely separated from Lake Washington Boulevard East and 26th Avenue East, retaining Lake Washington Boulevard for local traffic only. Historic properties at the east end of Lake Washington Boulevard East and along 26th Avenue East would experience some visual effect from the new ramps and traffic turnaround, which would be located in a WSDOT right-of-way area that is currently natural landscape. The ramp would not be elevated and much of the southbound section would be covered by a landscape feature that resembles a partial lid. A second landscape feature that resembles a full lid would cover the entire ramp near the southern end, just before the turnaround.

These landscape features would greatly reduce the visual effect from the new ramp, which would be less intrusive than the existing ramps. The landscape features would also provide the benefit of allowing bicycle and pedestrian access to the Arboretum across the ramps. Lake Washington Boulevard would be altered and would no longer connect to the Arboretum. The Lake Washington Boulevard portion that currently connects to the Arboretum between East Roanoke Street and the Arboretum would be reconstructed on a new alignment with the traffic turnaround. This would affect this portion of historic Lake Washington Boulevard, severing the original path from the Arboretum, across the Old Canal Reserve land, and connecting to the University of Washington Campus, as planned by the 1908 Olmsted Park and Boulevard Plan. However, the effects of the new ramps and turnaround on the overall Montlake Historic District or on individually eligible properties along Lake

Washington Boulevard and 26th Avenue East would not be considered adverse.

Many of these changes would result in benefits to the historic district. Once the specific construction effects from the project are identified, they will be considered in combination with the known operational effects on the historic district as a whole, to determine if the sum of all the effects on the Montlake Historic District under Option K diminishes the aspects of integrity of the district to the point where the district can no longer convey its significance.

Option K Suboption

- Adding the eastbound off-ramp to Montlake Boulevard to Option K would have only a minimal additional effect on the historic district because the new ramp would replace the much larger on- and off-ramp structure that is currently in the same location. Removing the existing ramp structure would be beneficial to the historic district. The operation of the proposed eastbound off-ramp would have no adverse effect on the historic district.

Option L

The existing Montlake interchange would be replaced with an elevated SPUI located near the current location of MOHAI. This SPUI would be elevated 20 to 25 feet above the mainline SR 520 roadway, which would be approximately 3 feet higher in elevation than the existing 24th Avenue East bridge over SR 520. The SPUI would be only partially contained within noise walls, so it is likely that it would be visible from the residential areas of the Montlake Historic District. The SPUI could be a visual barrier to views north and northwest from historic properties on Lake Washington Boulevard East.

The new on- and off-ramps would be east of and completely separated from Lake Washington Boulevard East, retaining Lake Washington Boulevard for mostly local traffic. Historic properties at the east end of Lake Washington Boulevard East and along 26th Avenue East would experience a visual effect from the new ramps, which would be located in WSDOT right-of-way that is currently natural landscape. The ramps would be at the same height as or perhaps slightly higher than, the existing Lake Washington Boulevard East. The new ramps could block direct access into the area of the Arboretum beyond the ramps from the Montlake Historic District north of East Calhoun Street.

The new west approach structures would begin at the new elevated SPUI. The height of these structures between the SPUI and the floating portion of the bridge would vary and have a constant slope from the Montlake vicinity to the west highrise; the height would be similar to the existing height. The width of the structures would vary substantially in the area where ramps from the SPUI merge onto the structures. Because of the similarity of the

new structures to the existing structures, no effects on historic properties are anticipated.

The new bascule bridge near the east mouth of the Montlake Cut would affect the setting of the Montlake Cut, the Montlake Bridge, the Canoe House, and the northeast section of the Montlake Historic District. It would also be visible from historic properties along Lake Washington Boulevard East, and from the University of Washington Club and McMahon Hall. It would partially block the view of the historic Montlake Bridge from the east end of the cut and from the Canoe House. The two individually eligible properties at 2158 and 2159 East Shelby Streets would experience the most severe visual effects because the new bridge would be constructed immediately to the northeast of these properties. The new bridge would be a minimum of 131 feet from the northeast corner of the house at 2158 East Shelby. On the north side of the cut, the bridge would be a minimum of 323 feet from the southwest corner of the Canoe House. The new bridge and approaches would block views and would introduce shadows to these properties and nighttime glare from lighting of the bridge and headlights of nighttime traffic. The new bridge would degrade the integrity of the setting and feeling of this section of the Montlake Historic District, all the individually eligible properties at the east end of East Shelby Street, the Montlake Cut, the Montlake Bridge, and the Canoe House to varying degrees. The effects from the new bridge to the setting and feeling of the individually eligible houses at 2158 and 2159 East Shelby Street would be adverse (Exhibit 5.6-7).

2158 East Shelby Street, Montlake Historic District

2159 East Shelby Street, Mary Houlahan House, Montlake Historic District

The addition of the lid provides benefits to the historic district. However, once combined, the sum of all the effects on the Montlake Historic District under Option L could affect the integrity of the district to the point where it could no longer convey its significance and, therefore, Option L would result in an adverse effect on the historic district.

Exhibit 5.6-7. **Effects on 2158 and 2159 East Shelby Street, Option L**

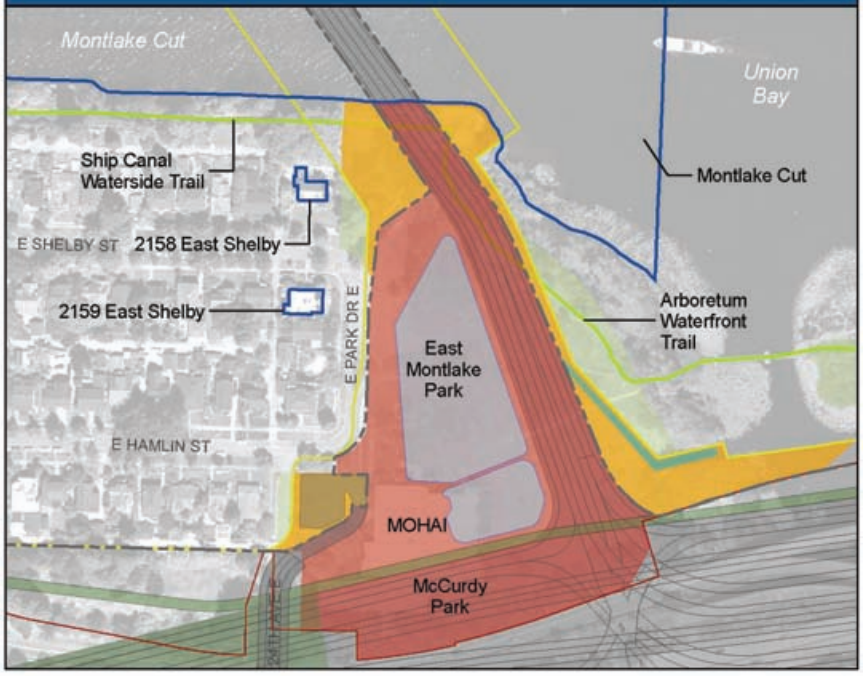
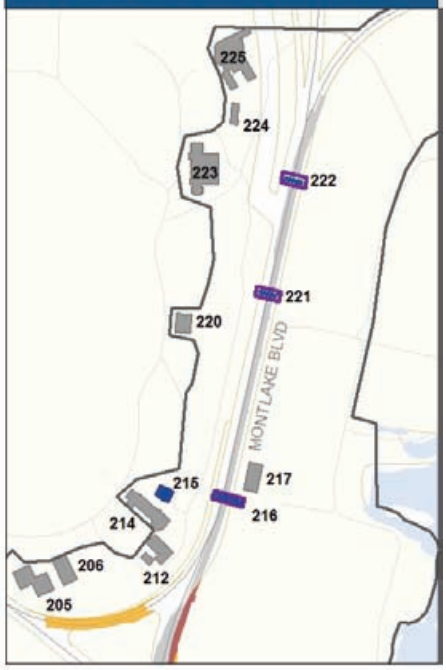


Exhibit 5.6-8. **Effects on Pedestrian Overcrossings, Option L Suboptions**



Option L Suboptions

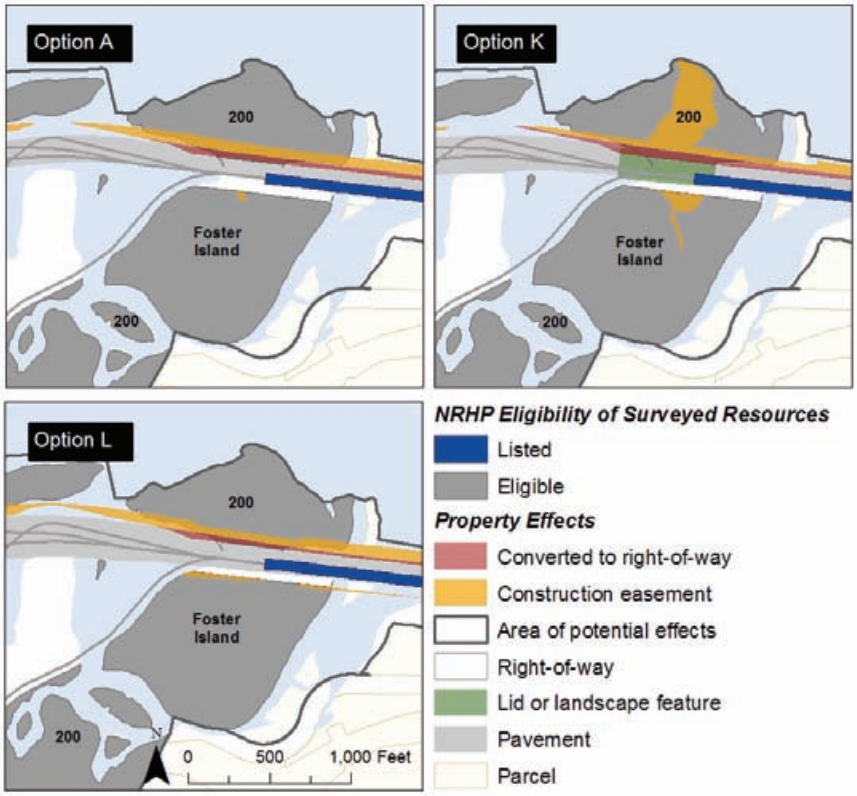
- Adding northbound capacity to Montlake Boulevard NE under Option L would necessitate removing the three existing pedestrian bridges over Montlake Boulevard NE (Exhibit 5.6-8). All three bridges are eligible for the NRHP. This would constitute an adverse effect on the properties. It would move the roadway closer to Graves Hall, also eligible for the NRHP, but this would not be adverse. The wider roadway with new pedestrian bridges would be visible from the University of Washington Club and McMahon Hall. However, the effect on the setting and feeling of these buildings would be minimal and would not be considered adverse. No additional effects on historic properties at the University of Washington are expected from the suboption to Option L.
- Adding left-turn access from Lake Washington Boulevard onto the SPUI south ramp to Option L would result in no measurable difference in the effects on historic properties described above because it would not require additional right-of-way.

West Approach Area

All options would remove the existing Lake Washington Boulevard and R.H. Thomson Expressway ramps in the Arboretum. This would affect the Arboretum, opening views for park users and improving the recreational experience on both the land and water.

All of the design options affect Foster Island to varying degrees, as described below (Exhibit 5.6-9). As discussed in Chapter 4, Foster Island meets at least some of the criteria of cultural significance relating to traditional cultural properties (TCPs). Therefore, although Foster Island has not been formally designated as a TCP, it is being treated as eligible for the NRHP on the basis of its cultural significance. It is known to have been used as a burial ground by Native American ancestors of families that are members of several identified affected Tribes.

Exhibit 5.6-9. **Effects on Foster Island, All Options**



Present-day Foster Island historically was two islands that were separated by about 250 feet of open water. These islands became a single one when the Montlake Cut opened in 1916, which dropped the lake about 9 feet from its natural high stand. The existing bridge alignment crosses the northern-most portion of the larger south island, and the replacement bridge alignment as proposed would cross the island mostly through what was the historic

topographic gap. Recognizing the cultural importance of this area, WSDOT may be able to refine the design to further reduce its footprint on the historic islands as more information becomes available about their boundaries. Doing so would avoid or greatly minimize an adverse effect to the Foster Island TCP, if it is determined to be such. Once the final alignment is determined, additional investigation will be done to determine the formal boundaries of the presumed TCP associated with Foster Island. Consultation among WSDOT, FHWA, the SHPO, and interested tribes would be necessary to mitigate any potential adverse effect on Foster Island.

Option A

In the Arboretum, the highway main line would be elevated, resulting in approximately 15 to 18 feet of clearance between the bottom of the bridge and the Arboretum Waterfront Trail on Foster Island. Because the highway main line would be higher than the existing roadway, the highway would become a more dominant and noticeable feature, causing a visual effect in this area of the Arboretum. However, this new SR 520 structure would have an effect by allowing the trail to pass between columns of an elevated structure, replacing the current low and narrow pedestrian underpass and opening views at ground level. The wider column spacing on the proposed bridge (to support the elevated structure) would also contribute to the positive visual change.

Option A would cross Foster Island with a pier-and-span bridge that would require acquisition of 0.9 acre of land on the island, expanding the right-of-way to the north of the existing alignment. According to coordination with tribal staff and ethnographic research done to date, the portion of Foster Island south of the existing SR 520 alignment, which includes the historic south island, has greater cultural significance than the northern portion. Locating the pier-and-span bridge north of the existing alignment in the area that was historically a channel between the north and south islands would use less of the significant land from the presumed TCP.

The Edgewater Condominiums would experience an effect because the west transition span would be shifted northward. The west approach would be a few feet higher but approximately 70 feet farther north than the existing structures, revealing more open water views in Union Bay from the Edgewater property.

Option A Suboptions

- Adding the Lake Washington Boulevard ramps to Option A would not result in a measurable change to the effects on historic properties in the west approach area described for the base options. The added ramps would be located considerably farther west than they are currently. They would not cut through the Arboretum as the current ramps do, resulting in a positive change for the Arboretum. Most of the length of

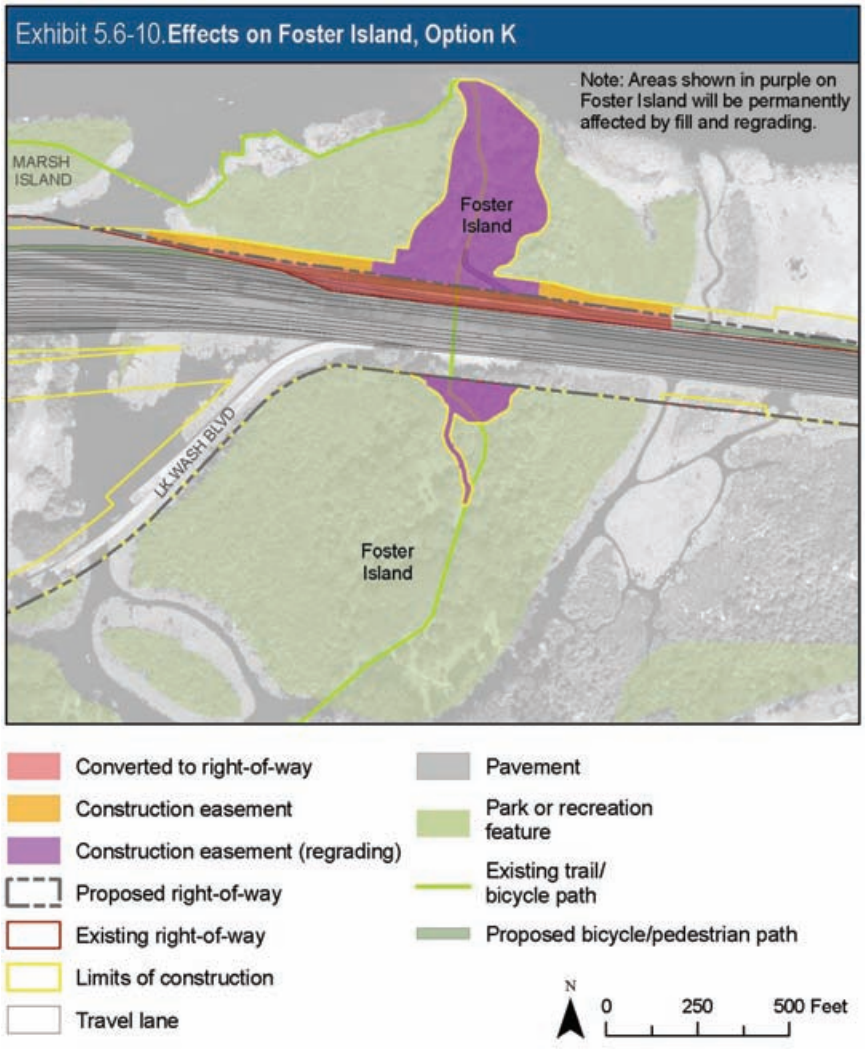
the on- and off-ramps would run along the north and south sides of the main line, introducing little additional effect to the Arboretum.

- Adding the eastbound HOV direct-access ramp to Option A would have no effect on historic properties.
- Changing the slope of the west approach area in Option A to a constant slope would have no effect on historic properties.

Option K

In the Arboretum, the Foster Island land bridge would require acquisition of 1.4 acres of land on Foster Island (Exhibit 5.6-10). Although the land bridge would be within the WSDOT right-of-way, it could be available for recreational use after construction. The Arboretum Waterfront Trail would be reconstructed to pass over the land bridge. The top of the land bridge would be landscaped, which would provide a positive effect for users, and fill would be placed north of the land bridge to create a gentle slope from the bridge to the north end of Foster Island. The character of the filled area would change somewhat from its present condition.

Exhibit 5.6-10. **Effects on Foster Island, Option K**



The right-of-way expansion for the land bridge on the Foster Island presumed TCP would occur north of the existing alignment. As stated previously, the portion of Foster Island south of the existing SR 520 alignment has greater cultural significance; therefore, locating the expansion north of the existing alignment in the area that was historically a channel between the north and south islands would use less of the significant land from the presumed TCP. However, because of the land bridge and associated grading to the north, the island would undergo a significant visual and topographic change, and the user experience would be very different from existing conditions. This high degree of change to the setting of the historic island could be determined to be an adverse effect on the presumed TCP.

The Edgewater Condominiums would experience an effect similar to that described for Option A.

Option L

In the Arboretum, Option L would cross over Foster Island with a bridge similar to Option A, requiring acquisition of 0.6 acre of land. The highway main line would be elevated, providing approximately 10 to 12 feet of clearance above the Arboretum Waterfront Trail on Foster Island. Because the main line would be higher than the existing roadway, the highway would become a more dominant and noticeable feature, although it would be lower than Option A in this area.

As stated previously, the southern half of the Foster Island presumed TCP has greater cultural significance than the northern portion. The permanent acquisition for Option L would occur on the north section of the island. Locating the pier-and-span bridge north of the existing alignment in the area that was historically a channel between the two portions of Foster Island would use less of the significant land from the presumed TCP.

The Edgewater Condominiums would experience an effect similar to that described for Option A.

Lake Washington Area

The 6-Lane Alternative would remove the existing Evergreen Point Bridge and construct a new Evergreen Point Bridge. This would necessitate the demolition and removal of the current structure, which has been determined eligible for the NRHP, resulting in an adverse effect.

Eastside Transition Area

No adverse effects are anticipated on the historic built environment in the Eastside transition area. Once completed, the floating span of the new bridge would be located approximately 160 feet north of its present location at the east end, and the east approach structure would be approximately

81 feet north, moving the bridge and approach farther away from the Helen Pierce House, which is eligible for the Washington Historic Register, and lessening the current effects, resulting in a positive change to the property (see Exhibit 5.6-11). Although the new floating portion would be slightly higher than the existing floating portion, this greater height would be a minimal visual change to the setting of historic properties.

What has been done to avoid or minimize adverse effects on cultural resources?

Specific minimization and avoidance methods that have been incorporated into the 6-Lane Alternative options are as follows:

- In the NRHP-eligible Montlake Historic District, the SR 520 roadway would be lowered up to 10 feet, which would minimize both visual and audible effects on the surrounding properties in the historic district.
- New and improved 14-foot-wide bicycle/pedestrian paths would be built, starting at Montlake Boulevard and continuing onto the Evergreen Point Bridge and over to the Eastside. These paths would help to reconnect the neighborhood and enhance pedestrian access in the Montlake Historic District, which was divided when SR 520 was built in the 1960s.
- New lids have been designed over I-5 at the East Roanoke Street crossing; over SR 520 at 10th Avenue East and Delmar Drive East, Montlake Boulevard/24th Avenue East, and potentially Foster Island; and over the intersection of Montlake Boulevard NE and NE Pacific Street under Options K and L. Landscape features similar to lids would go over the proposed turnaround ramp at Lake Washington Boulevard East under Option K. These lids would be landscaped and would have pedestrian crossings, providing a new green space in each area and reuniting the communities on either side. The landscaped lids would also help to minimize the visual and audible effects of SR 520, I-5, and the turnaround ramp to SR 520.Because of its geographic location relative to the existing alignment, the project cannot entirely avoid Foster Island. However, prior to the opening of the Montlake Cut in 1918, Foster Island was two islands separated by about 250 feet of open water. The replacement bridge would be built largely north of the existing bridge. It would cross the present-day Foster Island in a position mostly within the gap between the two historic islands. Project engineers may be able to further refine the bridge alignment to maximize this geographical avoidance.
- If a significant archaeological site was present on Foster Island, potential adverse effects could be avoided or greatly minimized by using sophisticated remote sensing techniques (such as GPR) to identify subsurface cultural features. If successful, such techniques could help WSDOT reduce the amount of excavation necessary in

Exhibit 5.6-11. Historic Properties within the Eastside Transition Area, All Options

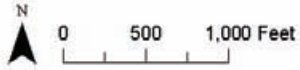
NRHP Eligibility of Surveyed Resources

- Listed
- Eligible

Property Effects

- Converted to right-of-way
- Construction easement
- Area of potential effects
- Right-of-way
- Pavement
- Parcel

Note: All resources are mapped and described in detail in the Cultural Resources Discipline Report. See Table 4.6-1 for a list of properties.



areas with known resources to avoid or minimize potential adverse effects on archaeological properties.

How could the project mitigate unavoidable adverse effects on cultural resources?

As noted previously, adverse effects on historic properties must be resolved through the Section 106 process and the preparation of an MOA. Ways to avoid, minimize, and mitigate adverse effects must be reached through consultation.

Some suggested mitigation measures that could be integrated into the stipulations of an MOA to address adverse effects in the Seattle study area include the following:

- Consultation between WSDOT, FHWA, the SHPO, and interested Tribes would be necessary to determine appropriate mitigation for any potential adverse effect on the Foster Island presumed TCP.
- Under Option A, the design of the new Montlake Bridge should be compatible with that of the existing historic Montlake Bridge. The new bridge should not replicate nor compete with the existing bridge, and the towers and light standards on the original bridge should remain the prominent visual features of the crossing. Safeguards would be put in place to ensure that the existing historic Montlake Bridge is protected and not physically affected in any way by constructing the new Montlake Bridge.
- The two residences on Montlake Boulevard NE that would be removed under Option A could be offered for removal from the site and relocation to other parcels rather than demolition. If they are demolished, they should be recorded to Historic American Building Survey/Historic American Engineering Record standards before demolition, and all architectural elements should be salvaged for re-use, such as historic doors, windows, brackets, and moldings. After these two houses are removed, solid fencing should be erected and vegetation planted to form a landscape screen and buffer between the construction on Montlake Boulevard and the adjacent house on East Shelby Street.
- Historic markers could be provided on Lake Washington Boulevard, in East Montlake Park, and elsewhere in the Montlake Historic District to convey the history of the neighborhood, the Montlake Bridge, and selected historic houses in the district. Providing a Web site on the history of the neighborhood along with the history of the Evergreen Point Bridge could be a mitigation measure for both the Montlake Historic District and the adjacent bridge. This would reach a much larger audience than physical historic markers alone.

- The clock tower, bell, cannon, and selected landscaping at MOHAI could be preserved and re-used, if they are not relocated with MOHAI.
- The Montlake neighborhood could be formally surveyed, documented, and nominated to the NRHP as a historic district by a professional who meets the Secretary of the Interior's Standards for architectural history.
- Lake Washington Boulevard and the Olmsted Parks system in Seattle could be formally surveyed, documented, and nominated to the NRHP as a historic property or district.
- The new pedestrian bridges across Montlake Boulevard NE under suboption L could be designed to be compatible with the surrounding University of Washington campus, and could incorporate historic markers with information on the history of the University of Washington campus and structures.

Evergreen Point Bridge

The Evergreen Point Bridge is a historic property that would be adversely affected by the project, which would remove and replace the bridge. Removal of the bridge could be mitigated by providing Level II Historic American Building Survey/Historic American Engineering Record documentation for the bridge, which would include photographs, measured drawings, and a written history component. Additional mitigation for the loss of the bridge could include funding of a bridge- or transportation-related community project, such as a survey of historic transportation elements in the area; funding of an educational display at a local museum on historic bridges of the Puget Sound region; or funding of an educational publication or development of a Web site featuring historic bridges and/or transportation facilities in the region. A web site on the history of the bridge in context with the neighborhoods and historic properties in its vicinity could also be a mitigation measure for both the bridge and the adjacent Montlake Historic District, providing web access to serve a much larger audience than physical historic markers.

5.7 Noise

The noise analysis followed the guidance of state and federal transportation agencies in order to identify the project's potential noise effects and mitigation. The guidelines and standards for analyzing and mitigating highway noise are established by the FHWA and state departments of transportation. The results of the analysis are summarized below. This information draws from the information included in the Noise Discipline Report (Attachment 7).

KEY POINTS

Noise

All options would have a lower number of residences where noise levels exceed the NAC than the No Build Alternative. This is because of the noise-reducing elements of the proposed design, which include lids, depressed roadway sections, and roadway realignments. Noise walls, if used, would further reduce the effects.

How would the project affect noise levels without mitigation?

Table 5.7-1 lists the number of locations in each neighborhood where noise levels would approach or exceed the FHWA Noise Abatement Criteria in 2030 without noise walls (see the Noise Discipline Report for detailed maps of noise receptor and modeling locations). Exhibits 5.7-1 and 5.7-2 show the noise modeling sites, notes which receivers would approach or exceed the NAC, and provides a symbol indicating whether an average person would notice an increase, decrease, or no change in traffic noise. Changes in traffic noise are typically noticeable at 3 dB. Noise levels at locations shown as having no noticeable change would remain within 2 dB of current levels. See Chapter 4 for an explanation of sound level terminology.

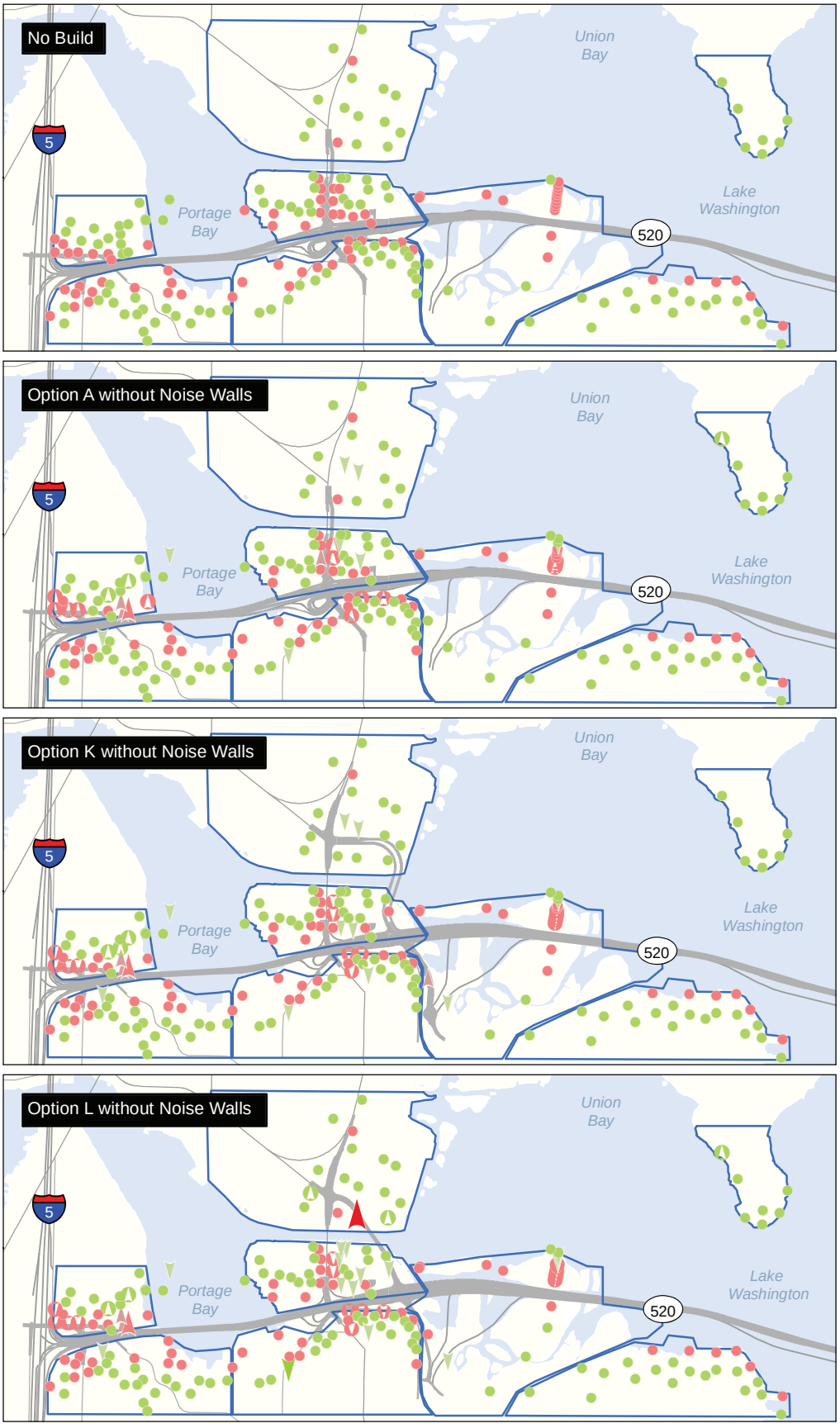
Table 5.7-1. Residences where Noise Levels Would Approach or Exceed the NAC in 2030 without Noise Walls

		2004	2030	2030 without Noise Walls		
	Total Residences	Existing	No Build	Option A	Option K	Option L
Project Corridor	862	288	327	249	256	235
Portage Bay/Roanoke	83	24	24	26	27	27
North Capitol Hill	219	99	109	89	89	83
Montlake North of SR 520	106	37	47	27	28	28
Montlake South of SR 520	142	63	70	57	52	45
University of Washington [a]	83	2	4	2	2	4
Washington Park Arboretum	54	22	27	16	27	22
Madison Park	99	16	16	10	10	5
Laurelhurst	15	0	0	0	0	0
Medina	61	26	30	21	21	21

[a] This metric is in residential equivalents.

Notes:
Noise levels were modeled at 211 receiver locations (representing 862 residences) for the No Build and Existing Conditions, at 208 receiver locations (representing 858 residences) for Options A and K, and 207 receiver locations (representing 855 residences) for Option L. The locations were chosen based on aerial mapping and onsite visits.
No measurable differences between predicted noise levels would be expected between 2004 and 2008 traffic data.
Adding the suboptions to Option A, K, or L would not change the noise effects listed in this table.

Exhibit 5.7-1. Noise Modeling Results for Receivers - Without Noise Walls - Seattle - (2030)



No Build Noise Levels

- Below the noise abatement criteria 49 - 65 (dB)
- Approach or exceed the noise abatement criteria 66 - 80 (dB)

Change - Noise levels are 49-65 (dB)

- -10 to -13 (dB)
- -7 to -9 (dB)
- -3 to -6 (dB)
- Noticeable increase
- No noticeable change

Change - Noise levels approach or exceed the NAC

- Noticeable decrease
- No noticeable change
- 3 to 6 (dB)
- 7 to 9 (dB)
- 10 to 13 (dB)
- Noise analysis areas
- Pavement

N

0 750 1,500 3,000 Feet

Overall, even without noise mitigation, the 6-Lane Alternative would have a lower number of residences where noise levels exceed the NAC than the No Build Alternative. This is because of the noise-reducing elements of the proposed design, which include lids, depressed roadway sections, and roadway realignments. Under Option A, the number of residences exceeding the NAC would decrease from 288 to 249. Under Options K and L, the number of residences exceeding the NAC would decrease from 388 to 256 and 235, respectively. The addition of lids and landscape features over the highway would be the primary reasons for the reduction in noise levels.

Effects of Suboptions

- Adding the suboptions to Option A, K, or L would result in no measurable differences in the noise impacts described above.

What policies apply to noise mitigation for WSDOT/FHWA projects?

Under FHWA regulations (23 CFR Part 772), noise abatement measures must be considered when highway noise levels approach or exceed the thresholds set in FHWA's noise abatement criteria, as they do along much of the SR 520 corridor and would continue to do under the No Build Alternative. (See section 4.7 for information on existing noise levels and the FHWA criteria.) Such measures must meet FHWA and WSDOT guidelines for feasibility and reasonableness, including a WSDOT requirement of making every reasonable effort to attain a 10-decibel or greater reduction in the first row of properties affected by project noise. WSDOT's practice is to work with the owners of these properties during detailed project design to determine the mitigation measures that will be used.

The mediation group recommended traffic noise reduction measures for each design option. Option A was defined as including noise walls and/or quieter rubberized asphalt pavement. Option K was defined as including only quieter rubberized asphalt pavement for noise reduction. Option L would include noise walls similar to those defined in the Draft EIS, which would extend along most of the corridor. Although these recommendations reflect the preferences of the mediation participants, they do not affect FHWA's and WSDOT's responsibility to identify and consider effective noise abatement measures under existing laws. For this reason, all of the design options were modeled both with and without noise walls.

What noise walls were modeled for the project area?

Noise wall heights are determined by a variety of factors. Design considerations include the general topography between the receivers and the roadway, and the relative height differences between the receiver, noise wall, and roadway. In general, noise walls are most effective if they are

Exhibit 5.7-2. Noise Modeling Results for Receivers - Without Sound Walls - Eastside - (2030)

Change - Noise levels are 49-65 (dB)

-10 to -13 (dB)

No noticeable change

Change - Noise levels approach or exceed the NAC

Noticeable decrease

No noticeable change and noise level above noise abatement criteria

3 to 6 (dB)

Noise analysis area

Pavement

N

0 500 1,000 2,000 Feet

placed as close as possible to either the noise source or the receiver locations and block the line of sight between the source and the receiver. If sensitive receivers are located above the roadway grade, the overall effectiveness of the noise wall can be considerably reduced unless the wall is placed at the same elevation as the receiver. Thus, walls in locations where the roadway is below the receivers are generally higher. Where the roadway is elevated above the receivers, a lower wall can effectively block noise.

In accordance with FHWA and WSDOT guidance, WSDOT performed a modeling evaluation of noise walls for all areas along the SR 520 corridor from I-5 to Medina where traffic noise levels in 2030 are expected to approach or exceed the NAC. Because noise wall configuration depends on roadway design, the location, length, and height of noise walls would vary for each design option. Based on the evaluation, WSDOT proposed noise walls only where modeling indicated that they would meet the guidelines for reasonableness and feasibility (see previous section for a discussion of these guidelines).

The proposed noise walls that are common among Options A, K, and L include (Exhibit 5.7-3):

- Noise walls along the north side of SR 520 from the 10th and Delmar lid to the Montlake lid
- Noise walls along the south side of SR 520 from the 10th and Delmar lid to just west of Montlake Boulevard
- Noise walls on the south side of SR 520 along the Madison Park neighborhood
- Noise walls along both sides of SR 520 from just east of the floating span to Evergreen Point Road

In areas where the evaluated noise walls would not meet the WSDOT reasonableness and/or feasibility criteria (for example, between Montlake Boulevard NE and the Arboretum), noise walls are not proposed. The 6-Lane Alternative peak-hour traffic noise levels with noise walls represent the worst-case traffic noise levels that could be expected with 2030 traffic flow conditions if the recommended noise walls were constructed. Exhibits 5.7-3 and 5.7-4 show the receiver locations where noise walls would be located and modeled noise levels.

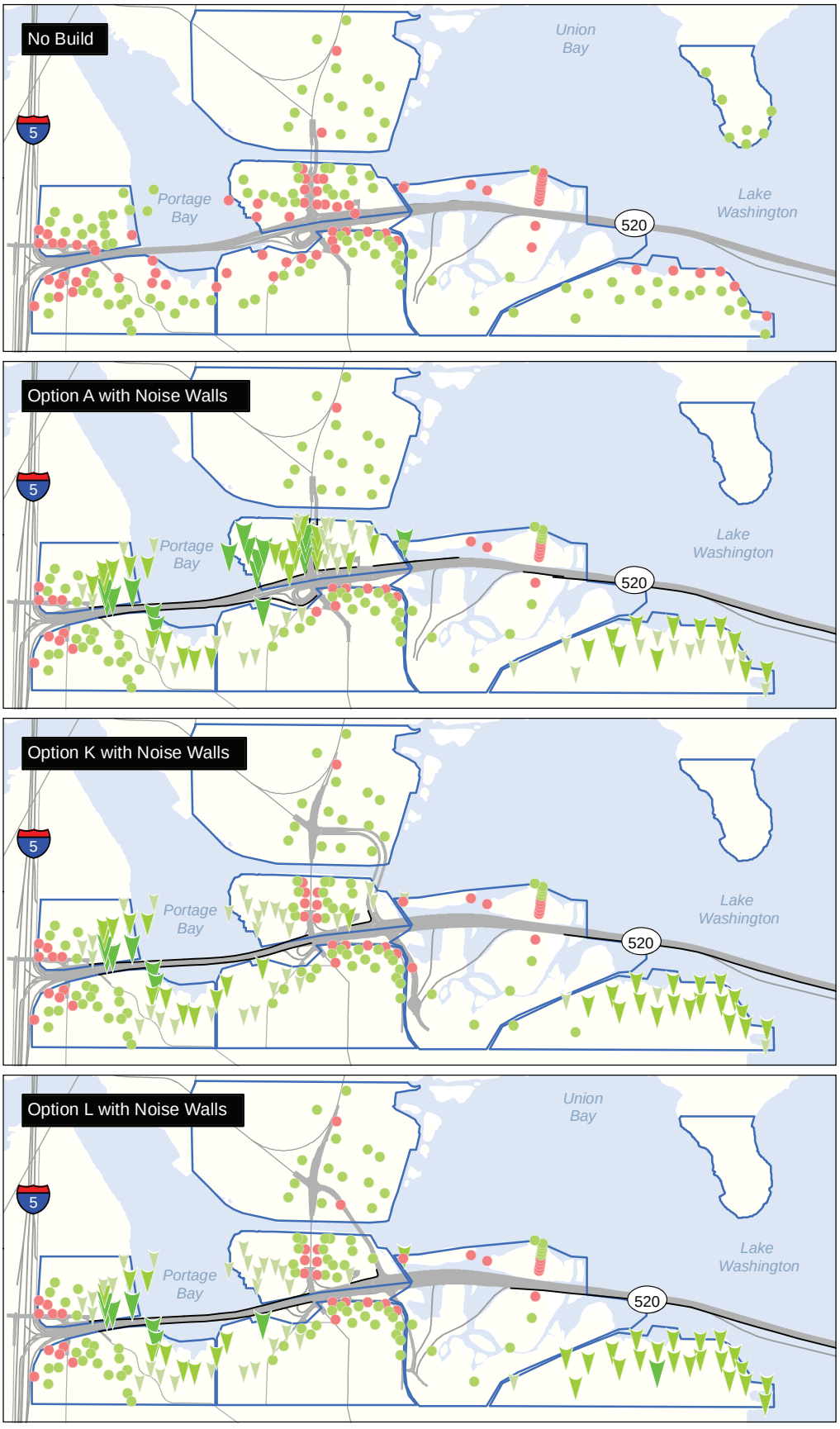
As noted previously, a 3-dB change in noise level is normally perceived as a barely noticeable change. The 3-dB change is a useful metric for noticeable change when comparing the 2030 No Build Alternative and the 2030 6-Lane Alternative noise levels. When considering how effective a noise wall would be at reducing noise levels, it is helpful to keep in mind that decreases of 5 dB or more are clearly noticeable and that most people

KEY POINT

Noise Walls

Noise modeling done for the project indicates that noise walls would meet all FHWA and WSDOT requirements for avoidance and minimization of negative effects. Quieter pavement has not been demonstrated to meet these requirements in tests performed in Washington state, and therefore cannot be considered as noise mitigation as discussed later in this section. The SDEIS evaluates all of the design options both with and without noise walls. WSDOT and FHWA will work with the affected property owners after a design option is selected to make a final determination of reasonable and feasible mitigation measures for project-related noise effects.

Exhibit 5.7-3. Noise Modeling Results for Receivers - Noise Walls - Seattle - (2030)



No Build Noise Levels

- Below the noise abatement criteria 49 - 65 (dB)
- Approach or exceed the noise abatement criteria 66 - 80 (dB)

Change - Noise levels are 49-65 (dB)

- -10 to -13 (dB)
- -7 to -9 (dB)
- -3 to -6 (dB)
- Noticeable increase
- No noticeable change

Change - Noise levels approach or exceed the NAC

- Noticeable decrease
- No noticeable change
- Potential noise wall
- Noise analysis area
- Pavement

Note: No noise walls were evaluated for the Laurelhurst neighborhood because noise levels from SR 520 would remain below the NAC for the 6-Lane Alternative with the design options.

N

0 750 1,500 3,000 Feet

perceive reductions of 10 dB as reducing noise to a level considered half as loud.

What effect would noise walls have on the noise levels?

Table 5.7-2 presents the results of the traffic noise analysis in terms of relative noise level changes that could be expected with noise walls for each neighborhood. Exhibits 5.7-3 and 5.7-4 show the noise modeling sites and notes where there would be a noticeable change in traffic noise with noise walls in Seattle and the Eastside, respectively. Overall, the noise walls, if constructed, would substantially lower the number of residences where noise levels exceed the NAC.

Option A

If noise walls were included in Option A, their overall length would be 18,819 feet, with heights varying from 8 to 14 feet. The taller noise walls would be necessary in areas where residents are located uphill from the project corridor. Exhibits 5.7-3 and 5.7-4 show the locations of the potential noise walls.

A total of 468 residences (19 with noise levels of 70 dB or higher) would benefit from construction of noise walls. Each wall would meet WSDOT cost criteria.

Option K

If noise walls were included in Option K, overall length would be 16,528 feet, with heights varying from 8 to 16 feet. Exhibits 5.7-3 and 5.7-4 show where noise walls would be located if they were included in this option.

A total of 409 residences (8 with noise levels of 70 dB or higher) would benefit from construction of noise walls. All the walls would meet the WSDOT cost criteria with the exception of the one wall in Washington Park Arboretum. Although with Option A the noise walls on the south and north sides of SR 520 would be cost-effective for the Arboretum, the project roadway profile with Option K would require higher (more expensive) noise walls near the Arboretum to achieve similar noise level reductions. The wall that would extend along the south side of SR 520 in the Arboretum would not be cost-effective.

Option L

The noise walls included in Option L would be 16,738 feet in total length, with heights varying from 8 to 16 feet. Exhibits 5.7-3 and 5.7-4 show the locations and heights of noise walls with Option L.

Exhibit 5.7-4. **Noise Modeling Results for Receivers - With Sound Walls - Eastside - (2030)**

Table 5.7-2. Residences where Noise Levels Would Approach or Exceed the NAC in 2030 with Noise Walls

		2004	2030	2030 with Noise Walls		
	Total Residences	Existing	No Build	Option A	Option K	Option L
Project Corridor	862	288	327	94	123	119
Portage Bay/Roanoke	83	24	24	13	16	16
North Capitol Hill	219	99	109	35	35	35
Montlake North of SR 520	106	37	47	0	19	18
Montlake South of SR 520	142	63	70	28	24	24
University of Washington[a]	83	2	4	2	2	4
Washington Park Arboretum	54	22	27	16	27	22
Madison Park	99	16	16	0	0	0
Laurelhurst	15	0	0	0	0	0
Medina	61	26	30	0	0	0

[a] This metric is in residential equivalents.
Notes:
No measurable differences between predicted noise levels would be expected between 2004 and 2008 traffic data.
Noise levels were modeled at 211 receiver locations (representing 862 residences) for the No Build and Existing Conditions, at 208 receiver locations (representing 858 residences) for Options A and K, and 207 receiver locations (representing 855 residences) for Option L.
The locations were chosen based on aerial mapping and onsite visits.
Adding the suboptions to Option A, K, or L would not change the noise conditions listed in this table.

A total of 400 residences (8 with noise levels of 70 dB or higher) would benefit from construction of the proposed noise walls. Each proposed wall would meet WSDOT cost criteria.

What has been done to avoid or minimize negative effects?

The 6-Lane Alternative includes up to five landscaped lids (depending on the design option) over depressed sections of the roadway. Although these lids are included in the 6-Lane Alternative as community enhancements, they would also help prevent noise from reaching noise-sensitive receiver locations near the lidded areas. The Noise Discipline Report (Attachment 7) provides a detailed explanation of how lids work to reduce noise levels.

Another design element that reduces noise levels is depressing (lowering) sections of the roadway. A depressed roadway can provide substantial noise reduction, depending on the amount of depression. Under the 6-Lane Alternative, SR 520 would be depressed at the approach to the I-5 interchange and the Montlake interchange. With Option K, the depressed SPUI and tunnel under the Montlake Cut would substantially reduce noise levels in the immediate surrounding areas compared to Option L with the elevated SPUI. Options K and L also include a depressed intersection at NE Pacific Street/Montlake Boulevard East.

What would be been done to mitigate negative effects that cannot be avoided or minimized?

When project-related noise impacts are identified, mitigation measures must be considered. Mitigation measures that meet applicable feasibility and reasonableness criteria must be recommended for inclusion into the project. Feasibility is determined primarily by engineering considerations, such as whether substantial noise level reductions can be achieved or whether there would be a negative effect on property access. Reasonableness is a cost-benefit analysis based on predicted future noise levels.

Several different traffic noise abatement measures are evaluated whenever noise impacts are expected. Under FHWA and WSDOT policy, the following abatement measures must be considered:

- Traffic management measures (for example, traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive land designations)
- Highway design measures (for example, alteration of horizontal/vertical alignments)
- Acquisition of property rights (either in fee or lesser interest) for construction of sound barriers
- Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic sound
- Noise insulation of public use or nonprofit institutional structures
- Construction of noise barriers (including landscaping for aesthetic purposes) whether within or outside the highway right-of-way

The analysis showed that, according to WSDOT and FHWA guidelines, noise walls would be warranted for consideration along both sides of SR 520 from the Delmar Drive East lid to the west end of the Evergreen Point Bridge and along both sides of SR 520 from the east end of the Evergreen Point Bridge to Evergreen Point Road. Between Montlake

Boulevard NE and the Arboretum, the analysis indicated that noise walls would not be effective.

What other types of traffic noise reduction measures have been considered?

Several types of noise mitigation have been used in other areas with some success. Application of any of these measures would require additional study after identification of a preferred alternative to determine its feasibility and reasonableness according to FHWA and WSDOT standards. Examples include acoustical absorptive noise walls, wall treatments, and special pavements.

Mitigation for Potential Noise Reflection

Given that the SR 520, I-5 to Medina project corridor could have parallel noise walls along much of the alignment, an additional analysis of barrier reflections might be required once a final alternative has been selected. For highways flanked by parallel noise walls, retaining walls, or a combination of the two, traffic noise can reflect back and forth across the highway before ultimately progressing outwards towards nearby residences. These reflections have the potential to increase the sound levels at nearby residences. Under these circumstances, it is possible that a noise wall would provide less attenuation than predicted. Potential mitigation for this phenomenon could include widening the distance between barriers to ensure the distance between the barriers was at least 10 times the average height of the barriers. Other mitigation for this parallel barrier effect could include placing absorptive treatment on the roadway side or canting the barriers. Further analysis will be performed once a preferred alternative has been identified.

Quieter Pavement

Currently, WSDOT is evaluating multiple 5-year studies on quieter pavement test sections and various types of pavement to determine if quieter pavement is an effective and feasible method for reducing highway noise for future projects. Given the unique driving and climate conditions in the study area, it is important to study the noise-reduction performance and durability of quieter pavement over time, as well as to consider the smoothness and safety of the product.

The different pavement types that WSDOT is looking at are:

- Dense-graded hot mix asphalt (HMA) pavement
- Portland cement concrete (PCC) pavement
- Open-graded friction course (OGFC) pavement

OGFC pavement is primarily used in the southern states, where temperatures are hotter. In Washington, with colder temperatures, studded tires are allowed in the winter. In past asphalt-mix designs in the 1990s, such use led to rapid deterioration of the pavement, creating ruts and unsafe driving conditions. WSDOT is evaluating updated asphalt mixes consistent with California and Arizona test locations.

WSDOT is also studying quieter concrete. Means such as the following are used to change the texture of the surface, making the concrete quieter:

- Longitudinal tining
- Diamond and whisper grinding, where crews use diamond saw blades to remove a thin layer of hardened concrete that creates a texture pattern similar to corduroy
- Dragging over the concrete to change the texture

To date, the HMA, PCC, and OGFC pavements have not proven to be a reliable form of noise reduction. Roadside measurements along the test sections have shown reductions of less than 3 dB after only 2 years in service. Furthermore, WSDOT's Quieter Pavements: Options and Challenges for Washington State (WSDOT 2005) concludes that, on high-traffic urban highways in Washington, quieter pavements performed poorly, with pavement lives ranging from 4 to 10 years. The average lifespan of standard western Washington pavements in similar locations is 16 years. Large reductions in pavement lifespan significantly increase life-cycle costs, a major factor in managing the Washington State Highway Preservation Program. For these reasons, quieter pavement is not currently considered an effective mitigation measure in the Puget Sound region.

Noise Expert Review Panel Recommendations

To further study potential traffic noise-reducing measures, WSDOT convened a Noise Expert Review Panel (ERP). This panel consisted of 11 acoustical experts from all over the world, including a university professor, an economist, pavement experts, and several transportation noise specialists.

The ERP developed recommendations that focused on noise-reduction strategies that WSDOT could consider for the SR 520 Program. These strategies, and the panel's recommendations, are described in more detail in the Noise Discipline Report in Attachment 7.

Some of the recommendations (such as lids and noise walls) have been included in the evaluation for this SDEIS. Other components are beyond the project's scope (such as banning studded tires). However, many of the other recommendations (including quieter pavement) will be reviewed and considered on a case-by-case basis after a preferred alternative is identified. It should also be noted that WSDOT only allows the use of feasible and

reasonable noise mitigation measures in the analysis within this noise discipline report. Some prospective measures have not yet been proven to meet these criteria, including the quieter pavement.

5.8 Air Quality

Washington is subject to air quality regulations issued by EPA, Ecology, and local air agencies. EPA's NAAQS set limits on concentration levels of criteria pollutants. Concentration levels of the criteria pollutants must not exceed the NAAQS over specified time periods. Ecology and PSCAA monitor air quality in the Puget Sound region to compare the levels of criteria pollutants found in the atmosphere with the NAAQS.

KEY POINTS

Air Quality

All options would meet air quality standards. The modeled concentrations of air pollutants are well below the 1-hour and 8-hour NAAQS for all design options.

Currently, no standards establish allowable concentrations of mobile source air toxics emissions in the air. Ecology conducted a study to monitor several air toxic compounds in the Seattle area from 2000 to 2001. This study indicated that the primary contributors to air toxics are diesel exhaust and wood smoke (Ecology 2001).

This section is based on the Air Quality Discipline Report (Attachment 7) and discusses how the project would affect criteria pollutants and mobile source air toxics.

How would the project affect air quality?

Local Air Quality

Because the project is in a maintenance area for CO, a project-level analysis is necessary to verify that no localized effects would cause or contribute to a violation of the NAAQS. The analysis must also include air dispersion modeling to calculate CO concentrations in the vicinity of selected intersections chosen based on their high level of traffic and delay. The purpose for this is to demonstrate that the project would not cause a new violation or increase the frequency or severity of an existing violation of the air quality standards.

Localized concentrations of criteria pollutants were evaluated in the vicinity of five signalized intersections in the project corridor (Exhibit 5.8-1). All of the design options would meet air quality standards (see Tables 5.8-1 and 5.8-2). The modeled concentrations are well below the 1-hour and 8-hour NAAQS for all design options.

Regional Air Quality

The project team performed an emissions burden analysis to evaluate emissions effects on a regional basis. The team calculated the emissions from vehicles in the region for each option of the 6-Lane Alternative and compared them to the emission budget for the region, as calculated by

Exhibit 5.8-1 Intersections Evaluated for CO

Air quality study intersection

1 - Boylston Ave/E Lynn St

2 - Boylston Ave/E Roanoke St

3 - Montlake Blvd/Pacific Pl

4 - Pacific S/15th Ave. NE

5 - Montlake Blvd/Pacific St

N

0 1,000 2,000 4,000 Feet

PSRC. This budget, established and approved as a part of the SIP, is the allowed pollutant emissions for motor vehicles within the region. Effects from MSATs were addressed qualitatively.

Table 5.8-1. Maximum 1-Hour Carbon Monoxide Concentrations (ppm)

Intersection Name	2008 Existing	2030 No Build	2030 Option A	2030 Option K	2030 Option L
Boylston Avenue/East Lynn Street	7.6	6.6	6.6	6.6	6.6
Boylston Avenue/East Roanoke Street	7.5	6.4	6.4	6.4	6.4
Montlake Boulevard/ Pacific Place	9.6	7.8	7.8	8.5	8.5
Pacific Street/ 15th Avenue NE	9.6	7.8	7.8	7.8	7.8
Montlake Boulevard/ Pacific Street	10.4	8.1	8.0[a]	9.2	9.5

[a] Adding the suboptions to Option A would result in an additional 0.2 ppm.
Notes:
1-hour NAAQs is 35 ppm. All concentrations include a background concentration of 5 ppm.
Adding the suboptions to Option K or L would not change the CO concentrations listed in this table.

Table 5.8-2. Maximum 8-hour Carbon Monoxide Concentrations (ppm)

Intersection Name	2008 Existing	2030 No Build	2030 Option A	2030 Option K	2030 Option L
Boylston Avenue/ East Lynn Street	6.8	6.1	6.1	6.1	6.1
Boylston Avenue/East Roanoke Street	6.8	6.0	6.0	6.0	6.0
Montlake Boulevard/Pacific Place	8.2	7.0	7.0	7.4	7.4
Pacific Street/15th Avenue NE	8.2	7.0	7.0	7.0	7.0
Montlake Boulevard/ Pacific Street	8.8	7.2	7.1a	7.9	8.1

[a] Adding the suboptions to Option A would result in an additional 0.1 ppm.
Notes:
8-hour NAAQs is 9 ppm. All concentrations include a background concentration of 5 ppm.
Adding the suboptions to Option K or L would not change the CO concentrations listed in this table.

In addition to the localized analysis, an emissions burden analysis was performed to determine if the project would have an effect on regional air quality. This analysis used a regional emission factor and forecasted daily

vehicle miles traveled (VMT) on SR 520 and I-90. Emission factors are stated in terms of grams of pollutants per vehicle mile traveled.

Table 5.8-3 shows that emissions are almost identical for all 6-Lane Alternative options and the No Build Alternative. The predicted VMT would slightly decrease for Option A and increase for Options K and L over the No Build Alternative, but the differences are so small that they do not affect the emissions estimates. The decrease in Option A is a result of the reduced capacity of the Seattle interchanges caused by elimination of the Lake Washington Boulevard ramps. All options would result in lower emissions than current conditions primarily because of higher vehicle emission standards.

Table 5.8-3. Emissions Burden Analysis—Daily Project Emissions of Criteria Pollutants for the Region

Alternative	Daily VMT within Region	CO (tons per day)	CO % of SIP Budget	VOCs (tons per day)	NOx (tons per day)	PM_{10} (tons per day)	$PM_{2.5}$ (tons per day)
2008 Existing	10,996,900	222	9	15.5	23.3	0.6	0.4
2030 No Build	13,803,200	175	7	7.7	7.5	0.4	0.2
2030 Option A	13,785,200	175	7	7.7	7.5	0.4	0.2
2030 Option K/L	13,866,800	175	7	7.7	7.6	0.4	0.2
SIP Budget	--	2,510	--	--	--	--	--

Notes:

Daily project emissions were calculated based on daily VMT within the region (an area greater than just SR 520).

Emissions were calculated using the MOBILE6.2 emission factor for 30 miles per hour and the daily VMT from the Transportation Discipline Report (Attachment 7). SIP inventory data are from 61 CFR 53323 (October 11, 1996), which was established through the year 2010. Pollutant emissions in tons/day should not be compared to NAAQS, which are pollutant concentrations (ppm).

Adding the suboptions to Option A, K, or L would not change the daily emissions projections shown in this table.

MSATs

FHWA bases its recommendation for MSAT analysis on a project's average daily traffic volume. Projects with an annual average daily traffic volume (AADT) of 140,000 or more should be analyzed quantitatively. Since the highest AADT among the design options is 133,750 (Options K and L), the effects were evaluated qualitatively.

MSATs emitted in 2030 would be roughly proportional to the VMT, which varies by less than 0.6 percent. Therefore the predicted MSAT emissions would also be approximately the same across the design options and compared to No Build. Emissions would likely be lower than present levels in 2030 as a result of EPA's national control programs, which are projected to reduce MSAT emissions by 57 to 87 percent between 2000 and 2020

(FHWA 2006). The control programs regulate vehicle technology to lower emissions over time.

Because the project is not anticipated to create any new violations, nor increase the frequency of an existing violation of the CO or PM_{10} standards, the project conforms with the purpose of the current SIP (as discussed in Chapter 4) and the requirements of the federal Clean Air Act and the Washington Clean Air Act.

Effects of Suboptions

- Adding the suboptions to Option A, K, or L would result in no measurable differences in the impacts described above.

What has been done to avoid or minimize negative effects?

Air quality would improve from current conditions with all alternatives and options, including the No Build Alternative, because of the introduction of cleaner fuels and more efficient vehicle engines. No mitigation would be necessary for project operations, as there are no negative air quality effects.

5.9 Energy and Greenhouse Gases

Policies at the federal, state, and local levels support energy conservation for all sectors, including transportation. Transportation energy efficiency is largely regulated though requirements on vehicle manufacturers rather than on transportation infrastructure. The information in this section is based on the Energy Discipline Report (Attachment 7).

How would the project affect energy use?

In 2030, the annual VMT across SR 520 under the No Build Alternative would be approximately 806 million miles. Under No Build, vehicles operating in the study area would consume about 5,400,000 MBtu of energy per year (Table 5.9-1). With the project, the VMT across SR 520 is expected to be lower because tolls would be in effect.

As shown in Table 5.9-1, all options would result in an annual fuel consumption between 5 and 10 percent less than the No Build Alternative. The reduction in energy use under the build options is attributable to three factors:

- A reduction in VMT because of tolling in the SR 520 corridor, which would cause commuters to shift transportation modes or find alternative routes across Lake Washington
- The addition of HOV lanes, which would improve traffic flow for buses and carpools

Measuring Energy

Different energy sources (petroleum, natural gas, hydropower, wind, solar) are typically measured in different units, such as gallons of fuel or watts of electricity. To compare energy amounts for all sources, this report converts them all to British thermal units (Btus). For example, the energy content of one gallon of diesel is about 130,000 Btus. One kilowatt-hour of electricity is about 3,400 Btus. An MBtu is one million Btus.

- More people using transit and carpooling rather than driving alone, which would also improve mobility in the general-purpose lanes

Table 5.9-1. Annual Energy Consumption During Operation

Alternative/ Option	Annual VMT (millions)[a]	MBtu	Gallons of Fuel (millions)	Percent Change from No Build Alternative
Existing Conditions	562	3,818,000	30.3	–
2030 No Build Alternative	806	5,474,000	43.4	–
2030 Option A	738	5,012,000	39.8	-8%
2030 Option K or L	756	5,134,000	40.7	-6%

[a] Energy consumption was calculated using an annualization factor of 340 to convert daily VMT to annual VMT. The actual calculation used for energy consumption is daily VMT on SR 520-only.
Note: Adding the suboptions to Option A, K, or L could result in minor changes to the energy consumption estimates shown in this table, but the relative effects of the three options would still be similar.

Source: Energy Discipline Report (Attachment 7), Department of Energy (2008).

Annual energy consumption was calculated by applying an energy consumption factor to VMT. This analysis did not take into account the improved vehicle speed that is anticipated under the 6-Lane Alternative, nor did it account for changes in fuel efficiency standards for future vehicles. The analysis focuses on the changes in VMT and uses current vehicle energy consumption factors to estimate the energy consumed during future operations. Incorporating expected improvements in vehicle speed under each of the build options would likely lead to a greater decrease in fuel consumed by the build options when compared to the No Build Alternative than what is presented in Table 5.9-1. Any such differences would be consistent across the design options.

Effect of Suboptions

- Adding the potential suboptions to Option A, K, or L could result in minor changes to the energy effects described above, based on estimated vehicle miles traveled, traffic operations, and the expected mix of vehicles. However, the relative effects of the three options would still be similar.

KEY POINTS

Energy and Greenhouse Gases

All options would reduce annual fuel consumption between 5 and 10 percent on SR 520 between Seattle and Medina as compared to No Build.

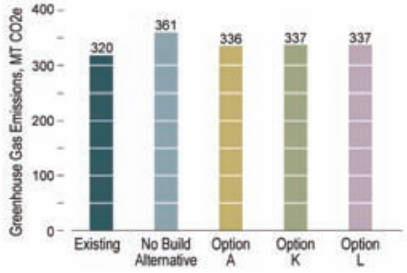
All options would reduce greenhouse gas emissions by slightly less than 7 percent in the project area compared to No Build.

What effect would the project have on greenhouse gas emissions?

Greenhouse gas emissions are typically measured as carbon dioxide equivalent units (CO_2e). Exhibit 5.9-1 shows the estimated CO_2e emissions in metric tonnes (MT) produced during the peak traffic periods on weekdays (5:30 a.m. to 10:15 a.m. and 3:00 p.m. to 7:45 p.m.). The peak

periods were used for comparison because they are the most congested times of day.

Exhibit 5.9-1. **Weekday Peak Period Greenhouse Gas Emissions**



Congestion noticeably affects fuel economy, and in turn, greenhouse gas emissions. Changes in the roadway configuration would affect traffic mainly during these time periods because of the high number of vehicles on the road and the greater likelihood of congested conditions. The 6-Lane Alternative includes tolling, which would help optimize system efficiency. The No Build Alternative does not include tolling.

All 6-Lane Alternative design options would reduce greenhouse gas emissions during weekday peak periods by about 85 MT per day compared to No Build. This is a reduction of almost 10 percent, which would contribute to regional and national efforts to reduce emissions of greenhouse gases. However, the overall effect of the project on GHG emissions in the region could be lower or higher than the figures reported because the analysis does not include project effects on roadways other than SR 520, which are influenced by SR 520. All of the options should be considered equal in their operational GHG emissions because the differences fall within the margin of error of the analysis.

Effect of Suboptions

- Adding the potential suboptions to Option A, K, or L could result in minor changes to the greenhouse gas emissions effects described above, based on estimated vehicle miles traveled, traffic operations, and the expected mix of vehicles. However, the relative effects of the three options would still be similar.

What has been done to avoid or minimize negative effects?

Each build option includes elements that would reduce VMT on the corridor. The addition of an HOV lane would improve traffic flow for buses and carpools, which would encourage some travelers to change transportation modes. Based on the traffic modeling results, tolling of the corridor would encourage some travelers to seek alternative modes of transportation or alternative routes to cross Lake Washington. The reduced VMT would result in less energy being used and fewer greenhouse gases being emitted by vehicles traveling on the SR 520 corridor than the No Build Alternative.

5.10 Water Resources

This section examines the potential effects of the project on water resources, including surface water and groundwater. More detailed and technical discussions of the information presented in this section can be found in the Water Resources Discipline Report in Attachment 7.

How do stormwater regulations affect the project's design?

The Washington State Department of Ecology is the primary agency that regulates stormwater in the state. Ecology requires stormwater from all new pollutant-generating impervious surfaces, such as highways, to be treated before it is discharged. Ecology and WSDOT have agreed that runoff from highway projects will be treated using BMPs from the *Highway Runoff Manual* (WSDOT 2008a). Ecology requires certain stormwater flows to be controlled or detained before they are treated and discharged.

The HRM establishes the level of water quality treatment ("basic" or "enhanced") required for a project. It also identifies if, and where, detention of stormwater runoff is required. Using the guidelines provided in the HRM, Lake Union, Portage Bay, Union Bay, and Lake Washington have been determined to be exempt from detention requirements (WSDOT 2008a). However, stormwater discharges into these waters must still be treated. Even though Ecology only requires basic treatment for discharges to these water bodies, WSDOT has included enhanced treatment wherever possible to protect fish and aquatic habitat.

WSDOT determined the size of the treatment facilities based on the expected volume of stormwater that would be generated by what is termed the "water quality design storm." The water quality design storm is defined as the predicted volume of runoff that would occur from a 6-month, 24-hour storm (Ecology 2005). The total volume of stormwater runoff is a function of the design storm, and the area of impervious surface on which rain falls.

Highway stormwater facility design takes place within the context of threshold discharge areas (TDAs) (see definition at right). Essentially, the TDA is the portion of the overall basin within the project limits that could be contributing surface water runoff by redirecting precipitation from infiltrating the ground into stormwater runoff. Consequently, the water quality effects of this project are based on the amount of impervious surfaces located in the TDAs that would generate stormwater runoff before and after construction.

Basic versus Enhanced Treatment

Basic and enhanced stormwater treatment BMPs are different types of BMPs that have been designated in the *Highway Runoff Manual* to treat stormwater (see page 3-15, Chapter 3 of the HRM [WSDOT 2008a]).

Basic treatment BMPs remove pollutants such as metals, suspended solids, and nutrients from contaminated stormwater. The HRM performance goal for basic treatment BMPs is 80 percent removal of total suspended solids (WSDOT 2008a).

Enhanced treatment BMPs are designed to achieve greater removal of dissolved metals than basic treatment. In addition to removing 80 percent total suspended solids, the HRM performance goal for enhanced treatment is 50 percent removal of dissolved copper and zinc for influent concentrations, ranging from 0.003 to 0.02 milligram per liter (mg/L) for dissolved copper and 0.02 to 0.3 mg/L for dissolved zinc (WSDOT 2008a).

While these families of BMPs have different performance goals for the stormwater they are designed to treat, the intent of treatment is the same—to produce stormwater discharges that comply with state and federal water quality criteria.

DEFINITION

Water Resource Terminology

Water resource inventory areas (WRIAs) were established by state legislative acts, which gave the overall responsibility for the development and management of these administrative and planning boundaries to Ecology.

Watersheds are areas of land where all of the water that is under it or drains off of it goes into the same place.

A **basin** is the portion of land drained by a river and its tributaries. A watershed can be composed of a single or multiple basins.

A **threshold discharge area** (TDA) is an onsite area draining to a single natural discharge location or multiple natural discharge locations that combine within 0.25 mile downstream (as determined by the shortest flow path).

How would the project affect stormwater runoff?

All 6-Lane Alternative design options would increase impervious surface area compared to No Build. Table 5.10-1 shows these increases by design option. WSDOT designed each stormwater treatment facility based on space constraints and discharge location. The facilities were sized to meet the HRM requirements for the 6-Lane Alternative, with individual variations for each design option. Each option has a different road profile and requires different design criteria to convey the stormwater to the

treatment facilities. The facilities were located to meet those conveyance needs.

The proposed stormwater treatment facilities for each of the receiving waters are discussed below and summarized in Table 5.10-2. Exhibit 5.10-1 shows the locations of these facilities, including outfalls and flow directions.

KEY POINTS

All options would increase the amount of land covered by pollutant-generating impervious surfaces in the project area (Option A – 35 percent increase, Option K – 45 percent increase, and Option L – 44 percent increase).

By including stormwater treatment in the designs, all options would meet state and federal water quality regulations and would provide more water quality treatment than is required for stormwater under the specific conditions of WSDOT's *Highway Runoff Manual* for several sections of this project.

Table 5.10-1. Pollutant-Generating Impervious Surface (acres)

	Total Acres
Option A – Pollutant-Generating Impervious Surface (acres)	
Existing (Untreated)	57.5
Total Future (Treated)	77.5
Option K – Pollutant-Generating Impervious Surface (acres)	
Existing (Untreated)	64.2
Total Future (Treated)	93.3
Option L – Pollutant-Generating Impervious Surface (acres)	
Existing (Untreated)	60.4
Total Future (Treated)	87.0

Note: Adding the suboptions to Option A, K, or L would slightly increase the amount of PGIS. However, there would be no measurable difference in water quality impacts because 100 percent of the PGIS would be treated.

Lake Union

Stormwater from the I-5 interchange would drain to three treatment facilities (P, Q, and T) before entering Lake Union via an existing stormwater system outfall located at Allison Street (see Exhibit 5.10-1).

Facility P would consist of a treatment wetland (an enhanced treatment BMP), while facilities Q and T would use media treatment vaults (a basic treatment BMP). All three options (A, K, and L) would use the same treatment BMPs at each facility location.

Portage Bay

Stormwater from the Portage Bay Bridge would discharge to Portage Bay through two existing outfalls—one on the eastern shoreline of Portage Bay and one on the western shoreline. Stormwater from the western half of the bridge would be treated at facility O with a treatment wetland (an enhanced treatment BMP) prior to discharge at the western shoreline. Stormwater from the eastern half would be treated with individual constructed wetlands and then discharged to Portage Bay on the eastern shoreline (Exhibit 5.10-1). Options A, K, and L would use the same stormwater treatment designs for all discharges to Portage Bay.

Exhibit 5.10-1. Proposed Stormwater Facilities in Seattle Project Area

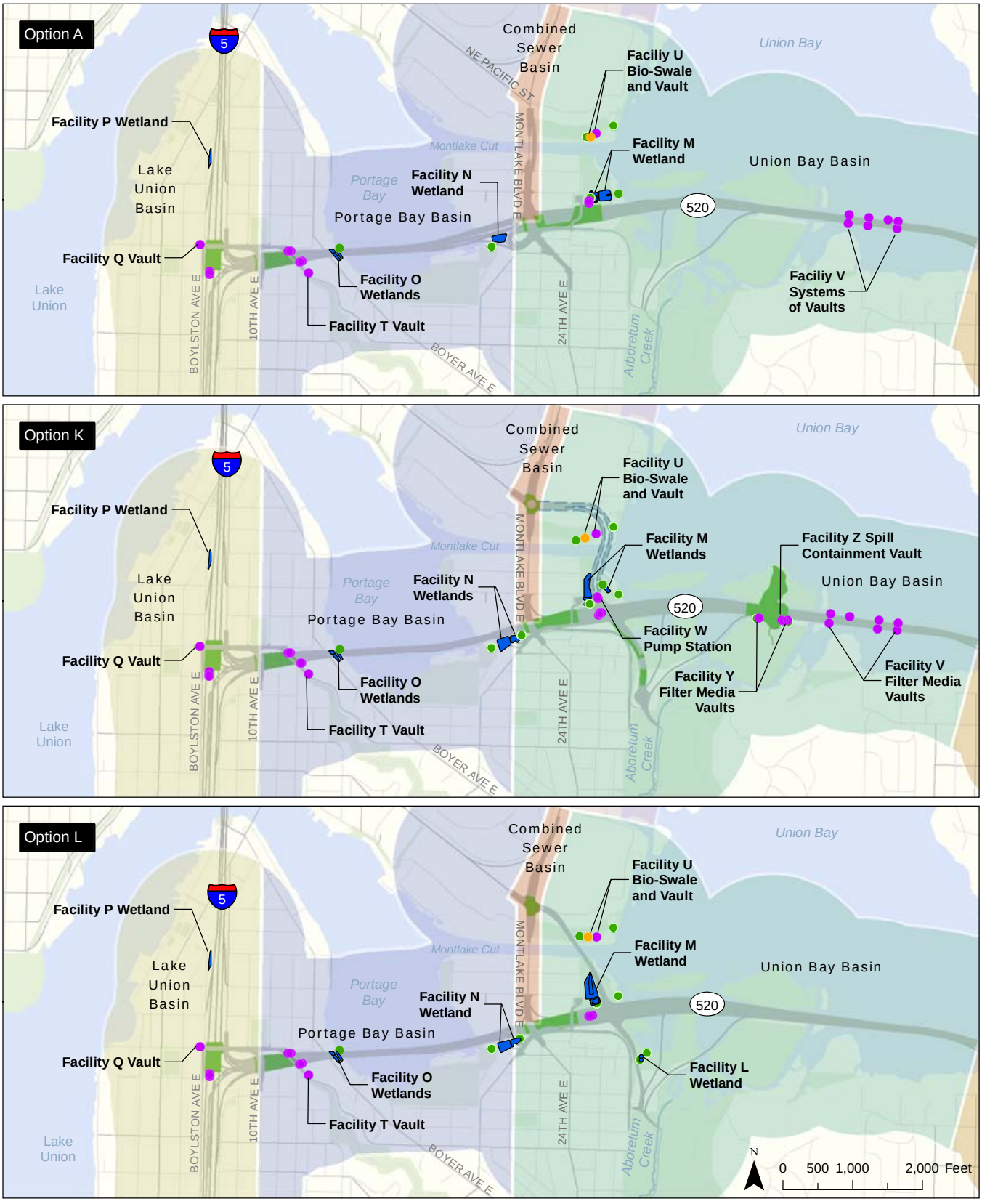


Table 5.10-2. Proposed Stormwater Facilities

Basin	TDA	Proposed Facility	Type of Proposed Facility
Lake Union	14	P, Q, T	Treatment wetland, media filter vault, media filter vault
Portage Bay	11, 12, 13	O, N	Treatment wetland, treatment wetland
Union Bay	10	M, U, L	Treatment wetland, treatment wetland, media filter vault
Lake Washington	7, 8, 9	V, Y, K	Media filter vault, media filter vault, biofiltration swale

Note: Exhibit 5.10-1 shows the location of each stormwater facility.

Union Bay

Stormwater from the west approach would discharge to Union Bay using an existing outfall (see Exhibit 5.10-1). Options A and K would convey stormwater to treatment facility M, which would consist of a stormwater treatment wetland/pond. Option L would also use these two facilities, and would add treatment facility L, a media filler vault (a basic treatment BMP), east of Lake Washington Boulevard.

Lake Washington

West Approach

Under Option A, stormwater from the west approach would be treated using media filter vaults (a basic treatment BMP) prior to discharge to Lake Washington. For Option K, stormwater would be treated with media filter vaults at two treatment facilities, both discharging to Lake Washington. All stormwater from Option L would be conveyed to a treatment facility near MOHAI and then discharged to Union Bay. Stormwater on the floating bridge would be treated separately (see next section).

Floating Bridge

Stormwater treatment on the floating bridge would differ from treatment elsewhere in the corridor. Standard stormwater treatment facilities are difficult or infeasible to construct on floating bridges. Conventional BMPs would add weight to the floating bridge, and turbulence during storms would limit the stormwater facilities' ability to settle out sediments. To address these challenges, WSDOT conducted a series of evaluations of technologies that could be applied in the bridge setting. This is referred to

The West Approach Profile and Stormwater Management

The profile of a roadway can affect the movement of stormwater away from the traveling lanes, and toward stormwater conveyance and treatment facilities.

The west approach profiles for Options A and K currently create low points along the roadway that would make stormwater movement more difficult. Enhanced water quality treatment could only be achieved by pumping the water to the new treatment facilities located at East Montlake and McCurdy Parks. Pumping and piping would result in additional environmental effects due to limited space below the bridge and into water. A less effective water quality treatment option that could eliminate pumping would be to use media filter vaults suspended under the bridge, or on adjacent in-water platforms.

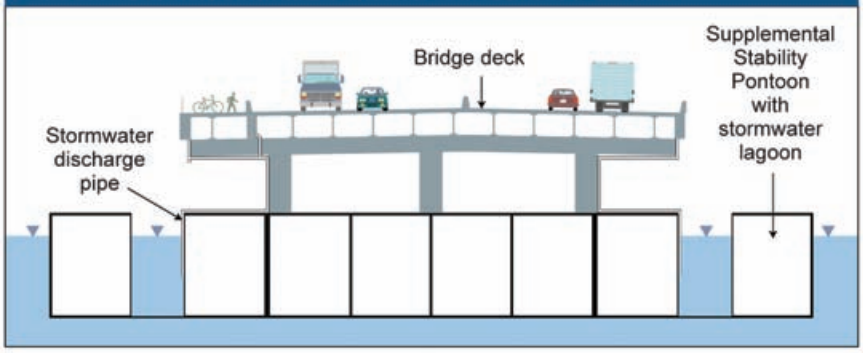
The profile identified for Option L provides for enhanced water quality treatment by working with gravity to move stormwater to the Montlake treatment facility. No pumping would be required, and the current design would enhance water quality runoff discharged to the fish migratory corridor in the project area.

The Option L profile could be applied to the Option A design, and is included as a suboption for Option A.

as an "all known, available, and reasonable technologies" (AKART) analysis (CH2M HILL 2009a; CH2M HILL 2009b).

After application of a set of screening criteria, the AKART analysis determined that the most effective stormwater treatment technology would be high-efficiency sweeping of the paved roadway in conjunction with modified catch basin stormwater BMPs on the floating portion of the proposed bridge (see sidebar). The proposed floating bridge design creates separate, enclosed spill-containment lagoons (Exhibit 5.10-2) within the supplemental stability pontoons. Exhibit 5.10-2 also provides a schematic plan view drawing of the spill containment lagoon currently being evaluated for the SR 520, I-5 to Medina project. In addition to providing structural stability, the supplemental stability pontoons would create an area where roadway spills of petroleum or other pollutants would be contained. Surface pollutants in the lagoons would be removed on a periodic basis under normal monitoring and maintenance activities. The lagoons would also allow dilution of pollutants in stormwater prior to discharge beneath the bridge.

Exhibit 5.10-2. **Stormwater Lagoons on the Floating Bridge**



Eastside

Stormwater discharge to Fairweather Bay would be treated using a constructed wetland to enhance water quality. This treatment facility would not be required to have flow control (because it would discharge to Lake Washington).

How would the stormwater treatment system from the project affect water quality?

All options of the 6-Lane Alternative would construct a stormwater treatment system that, overall, would reduce pollutant loading to surface waters in the project area (Table 5.10-3). Stormwater discharges from these areas would meet water quality criteria according to the HRM's evaluation methods.

AKART Analysis

An AKART (all known, available and reasonable technologies) analysis is conducted when a determination has been made that the standard BMPs identified in applicable stormwater management manuals cannot be used in a specific project or component of a project. The purpose of the AKART analysis is to develop and implement a project approach that meets WSDOT's and Ecology's objectives for stormwater treatment and discharge, to evaluate stormwater treatment options, and to identify and document the design constraints that define the range of feasible engineering options.

DEFINITION

Modified Catch Basin Cleaning

This technology consists of combining larger than standard catch basin drainage structures (sized for increased sediment trapping capability) with a scheduled cleaning of trapped pollutants. Larger than standard sumps would provide increased residence time for sediments to collect prior to removal. In addition, oil/grease trapping could be provided with submerged outlets.

DEFINITION

High-Efficiency Sweeping

This technique is an "emerging technology" described in the Stormwater Management Manual for Western Washington (Ecology 2005). This alternative uses "new generation" sweeping equipment to prevent pollutants from entering the drainage systems and receiving waters. The technology consists of high-pressure air circulation and vacuuming of pollutants from the bridge road surface into a sweeping vehicle. Pollutants are collected in the sweeping vehicle and driven off the bridge.

Stormwater discharges to Lake Union, Portage Bay, and Union Bay would receive enhanced treatment that would exceed the minimum level of treatment required by the HRM. Pollutant loadings were calculated based on HRM requirements. As shown in the table, loadings of all pollutants would be reduced compared to No Build in all surface waters except Lake Washington, which would experience slight increases in dissolved copper under Options K and L, thereby improving project area water quality.

How might pollutant discharge change in the future?

Predictions of future pollutant loading presented here are based on the assumption that the composition of automobile brakes and tires (the sources of copper and zinc deposited on pavement) would not change between now and 2030.

A coalition of brake pad manufacturers and environmental groups is currently evaluating the contribution of copper from brake pads to stormwater (Brake Pad Partnership 2004). If their study concludes that brake pads are an important source of copper, the manufacturers have agreed to voluntarily reformulate their products.

Such unknown future changes in roadway pollutant sources could affect the calculations presented here.

Option A

The stormwater treatment system proposed under Option A would decrease pollutant loading to Lake Union, Portage Bay west, and Union Bay compared with the No Build Alternative (Table 5.10-3). The total project load of all five pollutants evaluated would decrease under Option A relative to No Build.

Option A Suboptions

- Adding the Lake Washington Boulevard ramps and eastbound HOV direct-access ramp to Option A would result in no measurable differences to the water resource impacts described above because 100 percent of the PGIS would be treated and spill containment systems would be applied.

Option K

Under Option K, loading of dissolved copper would increase slightly to Lake Washington. Similarly to Option A, total loading for TSS, total and dissolved copper, and total and dissolved zinc would decrease relative to No Build.

Option K Suboption

- Adding the eastbound off-ramp to Montlake Boulevard to Option K would result in no measurable differences to the water resource impacts described above because 100 percent of the PGIS would be treated and spill containment systems would be applied.

Option L

The stormwater treatment system proposed under Option L would decrease pollutant loading to Lake Union, Portage Bay west, and Union Bay compared with the No Build Alternative. Loading of dissolved copper would increase slightly to Lake Washington. The total project load of all five pollutants to all TDAs under Option L would decrease relative to No Build.

Option L Suboptions

- Adding northbound capacity on Montlake Boulevard to Option L would result in no measurable differences to the water resource impacts

described above because 100 percent of the PGIS would be treated and spill containment systems would be applied.

Table 5.10-3. Net Changes in Pollutant Loads Compared to No Build

Basin	TDAs	Total Suspended Solids (lb)	Total Zinc (lb)	Dissolved Zinc (lb)	Total Copper (lb)	Dissolved Copper (lb)
Option A–Stormwater Treatment Applied						
Lake Washington	7,8,9	-13,631	-18.74	-2.84	-2.83	-0.03
Union Bay	10	-6,625	-10.31	-2.42	-1.68	-0.21
Portage Bay	11,12,13	-6,884	-9.8	-1.71	-1.51	-0.07
Lake Union	14	-1,872	-2.74	-0.53	-0.43	-0.03
Total load		-29,013	-41.58	-7.52	-6.47	-0.34
Option K–Stormwater Treatment Applied						
Lake Washington	7,8,9	-14,225	-18.29	-1.85	2.63	0.17
Union Bay	10	-9,551	-13.97	-2.72	-2.2	-0.16
Portage Bay	11,12,13	-6,424	-9.49	-1.91	-1.5	-0.12
Lake Union	14	-1,872	-2.74	-0.53	-0.43	-0.03
Total load		-32,074	-44.49	-7.02	-6.77	-0.14
Option L–Stormwater Treatment Applied						
Lake Washington	7,8,9	-12,460	-15.49	-1.16	-2.17	0.23
Union Bay	10	-9,527	-14.62	-3.31	-2.37	-0.26
Portage Bay	11,12,13	-6,344	-9.21	-1.75	-1.44	-0.09
Lake Union	14	-1,872	-2.74	-0.53	-0.43	-0.03
Total load		-30,204	-42.06	-6.75	-6.42	-0.15

How would the No Build Alternative affect water quality?

Under the No Build Alternative, surface water quality in Lake Union, Portage Bay, and the west side of Lake Washington would be unchanged. Stormwater from the highway discharging to Lake Union, Portage Bay, and the west side of Lake Washington would continue to be untreated. Planning-level forecasts conducted as part of this project estimated that traffic levels between the I-5/SR 520 interchange and the Montlake interchange would increase by 5 percent over existing levels between 2002 and 2030. This could increase future pollutant loading to SR 520. Surface water effects under the No Build Alternative would be the same as for

existing conditions, where water resources affected by discharges of untreated stormwater or water quality could slightly degrade due to predicted increased pollutant loading.

How would the project affect groundwater?

The increased impervious surface associated with all options of the 6-Lane Alternative in the study area would have little or no effect on groundwater recharge because the increase in impervious surface of the overland portions of the roadway is only a fraction of the total recharge area of the groundwater system.

Groundwater quality would not be affected because the 6-Lane Alternative would treat all stormwater prior to discharging to surface waters. Considering that groundwater moves from adjacent aquifers into project area surface water (rather than the reverse), stormwater discharged to these water bodies would not be a source of groundwater contamination in nearby aquifers. As noted in Chapter 4, there are no known drinking water supply wells in the project area.

Foundations, fills, or ground improvements included in the project design could alter groundwater flow paths beneath the ground surface. The volume of earth affected by the project would be very limited relative to the groundwater flow regimes in the area. Therefore the potential direct effects on groundwater flow are considered low for all options.

Effect of Suboptions

- Adding the suboptions to Option A, K, or L would result in no measurable differences to the groundwater effects described above.

What has been done to avoid or minimize permanent adverse effects on water resources?

Permanent negative effects of the 6-Lane Alternative would be avoided by including stormwater treatment facilities as part of the project. Overall, these facilities would either maintain or reduce current pollutant loading levels to water bodies in the study area.

How could the project mitigate for unavoidable negative effects on water resources?

Although the 6-Lane Alternative would increase the amount of land covered by impervious surface in the study area, this increase would not cause a detectable change to water quality or groundwater recharge. Therefore, no unavoidable negative effects are expected to result from the project.

Coordination with U.S. Army Corps of Engineers

The SR 520, I-5 to Medina project requires a permit under Section 404 of the Clean Water Act, which regulates filling in wetlands and open water. This permit is issued by the U.S. Army Corps of Engineers. To issue a permit, the USACE must determine that FHWA and WSDOT have chosen the least environmentally damaging practicable alternative (LEDPA) that meets the project purpose and need.

In anticipation of LEDPA requirements, FHWA and WSDOT coordinate with the USACE early on in project development. For this project, the USACE has been involved in the regulatory agency coordination process described in Chapter 1, and in several technical working groups associated with the regulatory agency coordination process. The USACE has also reviewed and commented on several discipline reports and the SDEIS. When a preferred alternative is identified, WSDOT will request that USACE experts concur on wetland boundaries. WSDOT and FHWA will also continue to work with the USACE on mitigation design as the project moves forward. Submittal of the Section 404 permit application will occur after the Record of Decision.

5.11 Ecosystems

This section discusses how the project could affect wetlands, fish, wildlife, and habitat in the project area, including endangered and other protected species. The Ecosystems Discipline Report (Attachment 7) provides a detailed, technical discussion on the potential effects of the project.

How would the project affect wetlands?

Filling a wetland or altering its vegetation reduces the wetland's capacity to store stormwater, filter pollutants, protect stream banks and lakeshores, and provide wildlife habitat. These alterations can also reduce the uniqueness of wetlands (by decreasing vegetation diversity) or decrease their educational or scientific value by limiting access, reducing wetland size, or changing the wetland character. Loss of wetland area also reduces the wetland's potential to remove pollutants from stormwater. Filling parts of project area wetlands may reduce their capacity to provide flood storage, although this capacity is very limited. Some of the shoreline habitat functions provided by wetlands would be lost.

KEY POINT

All of the options would reduce the availability and quality of wetland and wetland buffer habitat due to filling and shading. Option K would fill the most wetland and wetland buffer area.

All 6-Lane Alternative options would reduce the availability and quality of wetland and wetland buffer habitat. Most effects would occur to Category II and III wetlands within the Portage Bay area and west approach area, with smaller effects on Category IV wetlands. There are no Category I wetlands in the project vicinity. Category II wetlands are those rated as having moderately high level functions and Category III wetlands have a moderate level of function based on Ecology wetland rating system (Hruby 2004).

Table 5.11-1 summarizes the permanent fill and shading effects on wetlands and buffers from project operation. The affected wetlands are primarily lake fringe wetlands, containing aquatic bed, emergent, scrub-shrub, and forested classes. As shown in Exhibits 5.11-1, 5.11-2, and 5.11-3, Options A and L would fill the least amount of wetland because the majority of the roadway would be on a bridge. As such, the fill footprint would consist of mostly individual support columns and stormwater facilities. The fill footprint for Option K would be larger due to the depressed SPUI and tunnel near the Montlake shoreline and the Foster Island land bridge in the Arboretum.

Most of the permanent effects on wetlands from project operation would be due to shading from the bridge roadway. Shading a wetland can reduce the distribution, density, and growth of wetland vegetation. The intensity of the shade would vary between the options and would be based on the height and width of the proposed structures. While the shaded wetlands would continue to function, the reduced light levels underneath the bridge could limit or retard plant growth, which could alter water quality, change

the type and/or quality of the habitat, and potentially reduce wildlife use of the wetlands.

Table 5.11-1. Permanent Wetland and Buffer Fill Effects by Geographic Area (in acres)

Option	Portage Bay Area		Montlake Area		West Approach Area		Total Effects	
	Fill	Shading	Fill	Shading	Fill	Shading	Fill	Shading
Option A								
Wetland	0.1	0.4	<0.1	0.1	<0.1[a]	2.6[a]	0.1[a]	3.2[a]
Buffer	0.3	0.1	<0.1	0.1	0.4[a]	0.8	0.7[a]	0.9
Option K								
Wetland	0.1[b]	0.1	0.1	<0.1	1.6[b]	2.7	1.8[b]	2.8
Buffer	0.4[b]	0.1	1.5	<0.1	3.6	0.1	5.4[b]	0.1
Option L								
Wetland	0.1	0.2	0.1[c]	1.0[c]	0.1	3.1	0.3[c]	4.3[c]
Buffer	0.4	0.1	0.6[c]	0.4	0.5	0.9	1.5[c]	1.3

[a] Adding the Lake Washington Boulevard ramps to Option A would result in an additional less than 0.1 acre of wetland and an additional 0.1 acre of buffer fill. An additional 0.1 acre of wetlands would also be shaded.
[b] Adding the eastbound off-ramp to Montlake Boulevard to Option K would fill an additional less than 0.1 acre of wetland in both the west approach and Portage Bay areas (totaling less than 0.1 acre) and an additional less than 0.1 acre of buffer in the Portage Bay area.
[c] Adding northbound capacity on Montlake Boulevard to Option L would fill an additional less than 0.1 acre of wetland and an additional less than 0.1 acre of buffer in the Montlake area. It would shade an additional less than 0.1 acre of wetland in the Montlake area.
Note: Totals may not add up due to rounding.

The effect of the relationship between structure height and width on shading is complex. The height of the bridge and the width of the structure would both affect shading of wetlands under the bridge. Higher bridge heights would decrease the effects of shading on wetlands under a bridge of a fixed width. A wider bridge structure would result in more shading. WSDOT is working with resource agencies to further assess the effects of shading on wetlands.

Effects of Suboptions

Option A Suboptions

- Adding the Lake Washington Boulevard ramps to Option A would result in additional filling of less than 0.1 acre of wetland and 0.1 acre of buffer. An additional 0.1 acre of wetlands would also be shaded.
- Adding the eastbound HOV direct-access ramp and constant-slope profile in the west approach area would also have no effect on wetlands.

Exhibit 5.11-1. Permanent Effects on Wetlands and Buffers in Portage Bay

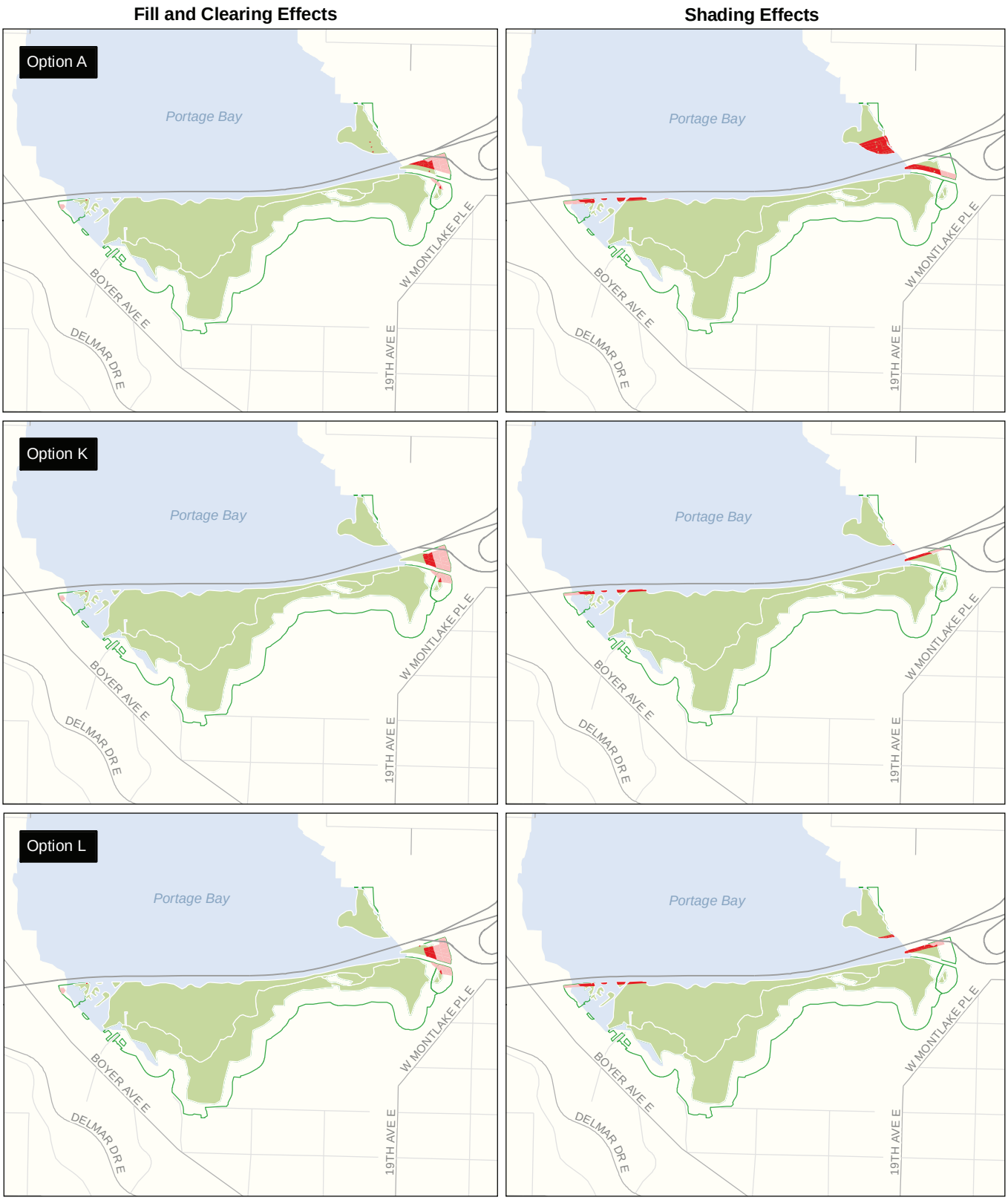
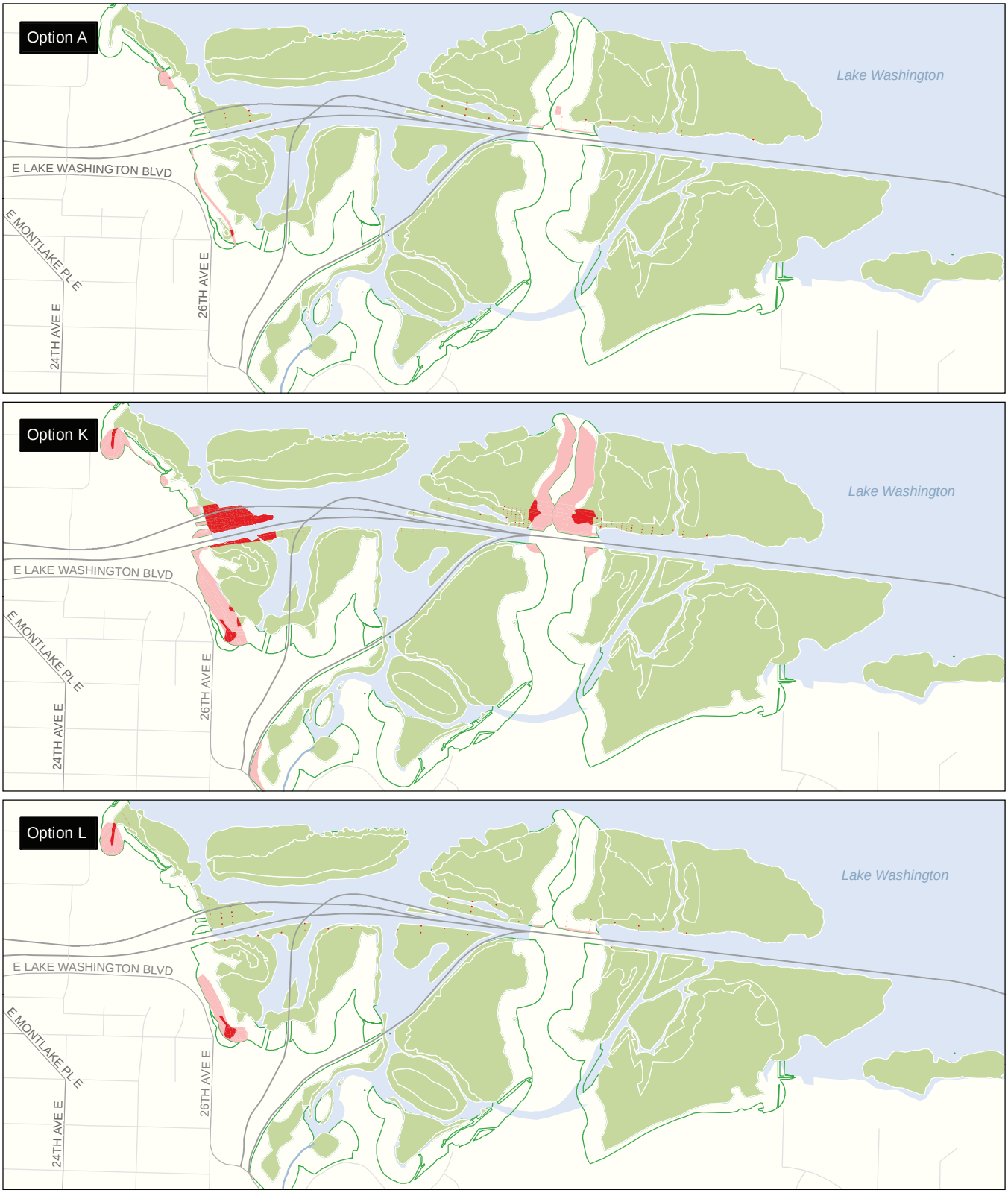


Exhibit 5.11-2. Permanent Fill and Clearing Effects on Wetlands and Buffers in Lake Washington



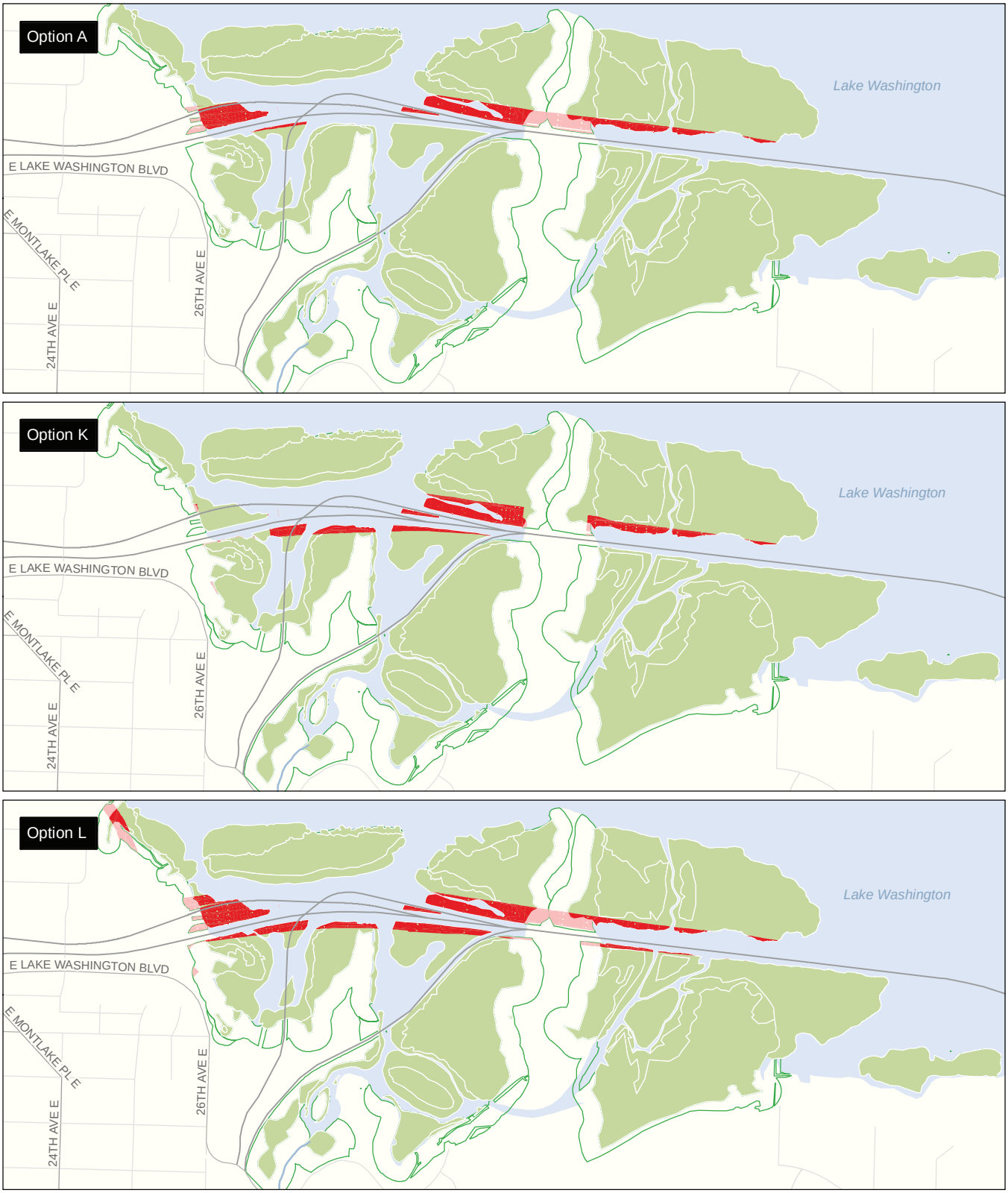
Operational Effect

- Affected wetland
- Affected buffer
- Wetland
- Wetland buffer

N

0 250 500 1,000 Feet

Exhibit 5.11-3. Permanent Shading Effects on Wetlands and Buffers in Lake Washington



Option K Suboption

- Adding the eastbound off-ramp to Montlake Boulevard to Option K would fill an additional less than 0.1 acre of wetland and an additional less than 0.1 acre of buffer. No additional shading effects would occur. The added ramp would be located within the existing right-of-way of the current Montlake Boulevard interchange.

Option L Suboptions

- Adding northbound capacity on Montlake Boulevard to Option L would fill less than 0.1 additional acre of wetland and less than 0.1 additional acre of buffer. Less than 0.1 acre of additional wetland would be shaded. These effects would be from construction activities related to the increased capacity northbound on Montlake Boulevard Northeast and the relocation of a stormwater facility.
- Adding left-turn access from Lake Washington Boulevard onto the SPUI south ramp would result in no changes to wetland impacts as described under Option L.

How would the project affect fish resources?

All 6-Lane Alternative options would create larger areas of reduced habitat function compared to existing conditions, primarily due to increased shading by the larger overwater structures. Each option would also eliminate some aquatic habitat due to placement of columns and other in-water structures. Compared to the existing structures, the proposed overwater structures are about twice as wide for all 6-Lane Alternative options. About half of the overwater structures (22.1 acres) are associated with deep-water habitat (more than 30 feet deep) under the floating portion of the Evergreen Point Bridge.

Nearshore habitats would also experience shading effects. Shading in these areas could affect fish and alter fish movement and distribution by reducing the growth of aquatic vegetation in shallower areas. This would alter the habitat conditions and potential fish use of these areas, including juvenile salmonids and their predators. Juvenile salmonids also tend to avoid or hesitate entering shaded areas such as under docks and bridges.

In the west approach area, the shadow of the bridge may delay, but not prohibit, outmigration of juvenile salmonids (Celedonia et al. 2008). Such delays could result in an increase in predation.

The amount of shading in the habitats would vary among the options. Table 5.11-2 shows that Option L would have the most overwater structure that could cause shading effects, while Option K would have the least. However, for Option K the SPUI is below the high water elevation of the lake, resulting in a fill effect rather than overwater shading (see the Ecosystems Discipline Report in Attachment 7 for more information).

Table 5.11-2. Area of Shade from Overwater Structures (acres)

Option	Portage Bay Area	Montlake Area	West Approach Area	Floating Bridge	Eastside Transition Area	Total
No Build	3.1	0.2	11.0	11.6	0.4	26.3
Option A	5.7	0.2	15.9[a]	25.6	1.8	49.2[a]
Option K	4.6	0.0	16.8	25.6	1.8	48.8
Option L	4.8	1.8	18.3	25.6	1.8	52.3

[a] Adding the Lake Washington Boulevard ramps to Option A would affect an additional 2.3 acres of aquatic habitat shading.

Note: Adding the suboptions to Options K and L would result in no additional aquatic habitat shading.

In addition to the overwater area shaded for each option, the overwater structures would create differing intensities of shade, based on the height of each structure above the water surface. Table 5.11-3 compares the heights of the No Build Alternative and 6-Lane Alternative structures. Option K has the lowest profile along the alignment and a relatively wider overwater footprint, so it would have the greatest potential for effects on fish resources. As noted above, the effect of the relationship between structure height and width on shading is complex, but in general, a design that increases the overwater height would decrease the effects of shading.

All three options include support piers for permanent bridge structures, which would occupy a small amount of substrate and result in loss of salmonid habitat but may correspondingly increase habitat for predators. Table 5.11-4 shows the number of columns or other structures and the resulting habitat loss by design option. Effects range from approximately 0.5 acre for Option A to 2.7 acres for Option K.

Effects on tribal fishing could result from loss of access, from effects to fish habitat, and from any potential effects on fish populations. These effects are discussed below as applicable.

Portage Bay Area

Through Portage Bay, Option A would result in slightly more shading than Options K and L because it includes a westbound auxiliary lane (see Table 5.11-2). All of the options would be similar in elevation. Approximately 800 linear feet of overwater roadway on the west side of Portage Bay would be constructed on an alignment slightly lower than the existing profile; the remaining proposed 1,200-linear-foot bridge structure at the east end would be about twice the height of the existing bridge (see Table 5.11-3).

Table 5.11-3. Approximate Structure Height (feet) Above High Water Level by Option

Location	Existing (No Build)	Option A	Option K	Option L
Portage Bay				
West shoreline	50	48	48	48
Mid-point	10	16	16	16
East shoreline	8	13	13	13
Montlake				
Montlake Cut	35-46	35-46	0[a]	43-57
Union Bay				
West Arboretum shoreline	2.5	17	<0[b]	8
West Foster Island shoreline	6	25	<0[b]	13
West Approach				
East Foster Island shoreline	4	23[d]	<1	15
Mid-point[c]	4	8[d]	5	19
West Highrise	44	50[d]	50	47
East Approach				
East Highrise	55-64	70	70	70

[a] Option K would tunnel under the Montlake Cut.
[b] The proposed roadway would be several feet below the high-water elevation in the nearshore area of the Arboretum.
[c] About 1,400 feet east of Foster Island, midway between Foster island and west highrise.
[d] Adding the constant-slope profile to Option A would result in structure heights through the west approach similar to Option L.
Note: Height above high water level is measured from the underside of the bridge structure.

Montlake Area

Options A and L would involve construction of a bascule bridge across the Montlake Cut. Because the Option A bridge would be constructed on an axis that is perpendicular to the cut, a smaller area of bridge structure would be over the water as compared to the more angled alignment of Option L (see Table 5.11-2). In addition, the Option A bridge would be about 7 feet narrower (53 feet) than the Option L bridge (60 feet). However, this difference would be at least partially offset by the height of the Option L bascule bridge, which would be approximately 10 feet higher than the Option A bridge. Neither bridge would require new columns in the water. For Option K, two tunnels would be constructed under the Montlake Cut, and therefore there would be no overwater shading. Because the new bridges and tunnel would not have in-water structures, they are not expected to affect tribal fishing.

Table 5.11-4. Estimated Numbers of Concrete Columns for Portions of the Proposed Bridges and Area of Substrate Occupied, by Option

Alternative	Portage Bay	West Approach	East Approach	Total
No Build (Existing)	119 1,890 sq/ft	404 6,590 sq/ft [a]	14 350 sq/ft [a]	537 8,830 sq/ft
Option A	47 18,020 sq/ft [a]	187 5,290 sq/ft [b]	4 450 sq/ft	238 23,760 sq/ft [b]
Option K	42 17,850 sq/ft [a, c]	928 [d] 97,890 sq/ft [c]	4 450 sq/ft	974 116,190 sq/ft [c]
Option L	48 18,160 sq/ft [a]	185 9,150 sq/ft	4 450 sq/ft	237 27,760 sq/ft

[a] Area includes footings or shaft caps at the mud line supporting the columns.

[b] Adding the Lake Washington Boulevard ramps to Option A would require an additional 27 columns and occupy an additional 760 sq ft of substrate in the West Approach. Other suboptions would have no additional effects.

[c] Adding the eastbound off-ramp to Montlake Boulevard to Option K would require an additional 6 columns and occupy an additional 310 sq ft of substrate in Portage Bay.

[d] Columns range from 2 to 7 feet in diameter in Option K, while the other options range from 6 to 10 feet.

[e] Area includes the entire in-water fill of the submerged roadway entering the SPUI. Many columns driven into the lakebed would be underneath the submerged roadway for support.

Note: Adding the suboptions to Option L would result in no additional effects.

West Approach Area

In the west approach area, Option L would result in the largest area of overwater shading (see Table 5.11-2). However, shading is also dependent on the bridge height, which varies as follows:

- For Option A through Union Bay and east of Foster Island, the proposed bridge would be higher than the existing bridges and Options K and L.
- For Option K, SR 520 would be below the high-water elevation for several hundred feet east of the Montlake shoreline because of the depressed SPUI in the Montlake area. East of Foster Island, the bridge profile would be slightly lower than existing conditions, but much lower than the other options.

For Option K, the below-ground SPUI configuration would result in filling a wedge of nearshore aquatic area, rather than just fill from support piles as in Options A and L. This fill would result in a permanent loss of approximately 2.7 acres of aquatic habitat. Based on discussions to date with resource agencies, this amount of in-water fill could result in difficulties in permitting Option K as it is currently configured.

The increased bridge width, structures, and aquatic fill in this area, particularly Option K, would affect tribal fishing. Although less fishing takes place in nearshore areas, shading and loss of habitat could reduce fish

Union Bay shoreline at Foster Island

KEY POINT

All of the options would create larger areas with reduced fish habitat functions, primarily due to increased shading by the larger overwater structures. Compared to the existing structures, the proposed overwater structures are about twice as wide for all options. Option L would result in the most overwater shading in the west approach area. Option K would result in the overall greatest loss of fish habitat due to the filling for the depressed SPUI.

use in the west approach area. WSDOT will continue working with the Muckleshoot Tribe to assess potential effects.

- For Option L, the proposed bridge profile over Union Bay and at the Foster Island shoreline would be slightly higher than existing conditions and higher than Option K, but lower than Option A. East of Foster Island, the proposed bridge would be higher than what is proposed for Options A and K (see Table 5.11-3).

Results of SR 520 Fish Tracking Study

Fish react to the presence of overwater and in-water structures. Celedonia et al. (2008) recently evaluated the migratory behavior of juvenile Chinook salmon near the west approach of the Evergreen Point Bridge and found both migratory and holding behavior patterns near the bridge, with highly variable behaviors within each general pattern. Approximately two-thirds of the actively migrating juvenile Chinook salmon tagged for the study tended to hold (pause) before migrating under the west approach area of the bridge. However, approximately half of these fish held for only a few minutes. In contrast, tagged fish that were not actively migrating appeared to selectively choose to reside in areas near the bridge for prolonged periods. These fish were observed to often cross beneath the bridge to the north and later return to holding immediately adjacent to the bridge's southern edge (typically within approximately 65 feet from the bridge edge). These fish may have been using the bridge as cover.

The fish tracking study began in 2007 and continued for a second year in 2008. Although the report has not been finalized, similar results were reported for both years. In general, both years' studies indicated that although the bridge appeared to have some effect on the migration of some juvenile Chinook salmon, many of the fish showed little to no migration delay. It should be noted that only one salmonid species (Chinook salmon) was examined and that there may have been other factors affecting fish behavior, such as fish origin (hatchery versus naturally spawned fish), seasonal effects (early season migration versus late season migration), and migration path location (fish were released only near the west approach). Despite the potential unknowns, these study data represent the best available science on juvenile salmon outmigration in the study area.

Effects of Suboptions

Option A Suboptions

- Adding the Lake Washington Boulevard ramps to Option A would require an additional 27 permanent support piers between Montlake and Foster Island. These piers would occupy approximately 760 more square feet of lake bed than Option A. Shading would affect 2.3 acres of aquatic bed wetlands more than described for Option A.

- Adding the constant-grade profile to Option A would result in a lower bridge structure from Montlake to just past Foster Island, and a higher structure approaching the west highrise. The overall area of shading would remain the same, but the shade's intensity would increase west of Foster Island and decrease east of Foster Island.
- Adding the eastbound HOV direct-access ramp to Option A would result in no additional effects on fish resources.

Option K Suboption

- Adding an eastbound off-ramp to Montlake Boulevard to Option K would result in six additional in-water piles near the southeast shoreline of Portage Bay and approximately 310 square feet of additional lake bed that would be occupied compared to Option K. Effects from shading would be similar to those described for Option K.

Option L Suboptions

- Adding northbound capacity on Montlake Boulevard to Option L would result in no measurable differences to the fish and aquatic resource impacts described under Option L.
- Adding left-turn access from Lake Washington Boulevard onto the SPUI south ramp would result in no measurable differences to the fish and aquatic resource impacts described under Option L because it would not affect any overwater or shoreline area.

Lake Washington

The floating portion of the Evergreen Point Bridge would be the same for all options. It would be built over deep open-water habitat where bridge columns are not feasible. The new bridge structure would be approximately 22 feet higher and 29 feet above the lake surface.

The new floating bridge would use larger pontoons than the existing bridge. The width of the floating bridge would be almost three times wider than the existing structure (60 feet versus 175 feet) when the supplemental stability pontoons are included (see Exhibit 2-16). In addition, the pontoons would have a deeper draft (22 to 28 feet) below the surface of the water than the existing pontoons (8 feet).

The potential effects of shading from the in-water structures on fish and aquatic species would be minimal, given the relatively small size of the bridge structure compared to the size of the open-water portion of the lake. This habitat contains little to no aquatic vegetation and would not likely be a primary migration route for anadromous salmonids, although some surface-oriented migrating fish could travel along the perimeter of the floating portion of the bridge, rather than passing under it. However, it is possible that the increased width and draft of the new bridge pontoons could present a greater barrier to fish migrating or foraging near the surface.

The current configuration of pontoons provides a relatively uniform surface in the upper water column that fish can use when accessing deeper water for foraging and rearing, or for crossing the lake. The variable spacing of the supplemental stability pontoons along the longitudinal pontoons of the new floating bridge would produce periodic recesses along the face of the pontoons, which would substantially increase the migration distance if fish followed the face of the pontoons. However, these recesses could also provide additional deep-water forage habitat for fish using the edge of the pontoons as cover.

The existing Evergreen Point Bridge impedes the movement of Lake Washington surface water that is driven by winds. The force of strong northerly or southerly winds tends to mix the surface waters and increase the height of the water slightly on the upwind side of the floating bridges, thus forcing a small movement of water under and around the ends of the bridges. However, calculated velocities of this water movement, even under the "worst case" scenario of a 100-year design storm, would not be of a sufficient magnitude to substantially affect fish migration (Darnell 2009). Under calm conditions there would be no such effect.

The new floating portion of the bridge would be about 130 feet longer than the existing floating bridge (equivalent to less than 2 percent of the existing pontoon length) and the depth (draft) of the new pontoons would increase 14 to 20 feet. However, based on the relatively small magnitude of the increase and considering overall lake volume, the increased size of the new pontoon structures is not expected to substantially increase the partial "dam" provided by the floating bridge. There is no information available that indicates that the increased depth and length of the new bridge pontoons would substantially alter the movement of Lake Washington's surface water or stratification processes from the No Build condition. In addition, all options would have the same floating bridge structure and dimensions. Thus, if there were effects not currently known, they would be the same for all options. Conducting detailed modeling and field studies would not provide information that would distinguish effects between options. WSDOT will continue to work with resource agencies as design progresses to advance understanding of the issue.

As discussed in Section 5.4, the increased width of the floating span, its anchors, and its alignment north of the existing bridge would affect access to tribal fishing in the usual and accustomed fishing areas of the Muckleshoot Indian Tribe. WSDOT is coordinating with the tribe to better understand these effects and develop appropriate mitigation measures.

Lake Washington east shoreline crossing location

East Approach Area

The east approach area structure would be identical for all options. The bridge would be higher than the existing structure by approximately 13 feet along most of the approach.

The shoreline of Lake Washington at the existing and proposed east end of the Evergreen Point Bridge was identified in the past as a place where sockeye salmon have spawned based on WDFW map records. The map records were from the mid 1970s. No recent formal surveys have been conducted to determine if spawning sockeye have used the area. Prior to initiating new spawning studies, a shoreline habitat survey was conducted to evaluate if suitable spawning habitat existed in the area. The aquatic habitat survey found limited suitable (gravel) spawning habitat (Parametrix 2008). Much of the nearshore area consists of relatively consolidated sediments, while the offshore areas consist primarily of sandy substrate with moderate to dense patches of aquatic vegetation. Neither of these typical habitat types appears to provide the habitat conditions preferred for sockeye beach spawning. Therefore, no formal spawning surveys were conducted in the area.

In addition to the apparently limited habitat in the area, there are no indications that the presence of an overwater structure would affect the spawning of sockeye salmon even if appropriate spawning conditions were present. This is due to the height of the proposed approach structure (70 feet), which is approximately 23 percent higher than the existing structure (57 feet). The previous reports of spawning in this area were made with the existing structure in place and operational.

Although the presence of the overwater structure is not expected to affect sockeye spawning, construction of new in-water support piers and removal of existing piers could affect spawning habitat if it occurs in the area. Any spawning habitat encompassed by the drilled shafts for the proposed bridge support structures would be lost. Four drilled-shaft support columns would be constructed to support the east approach structure. These 6-foot-diameter shafts would displace approximately 452 square feet of lakebed and potential spawning habitat. In addition, the presence of the columns could affect the utilization of any spawning habitat located between the columns, resulting in a total potential affected area of approximately 700 square feet.

Bridge Maintenance Facility

The bridge maintenance facility under the east approach would consist of an upland facility and a dock with a wave barrier extending approximately a hundred feet offshore. The maintenance facility dock would add an over-water structure in the shallow nearshore environment, which could affect the migration and rearing behavior of juvenile salmonids in the area. To compensate for some of the potential effects on the nearshore habitat, the project would remove an adjacent residential dock.

The wave barrier would reduce wave action on the south side of the maintenance pier and change hydrodynamic conditions in the area. This could change the substrate characteristics around the structure and alter the

size and intensity of waves along a portion of the shoreline. Changes in substrate characteristics could positively or negatively alter the suitability of the area for use by beach-spawning sockeye. The low-elevation dock and wave barrier are also expected to affect the movement or migration of juvenile salmon and other fish occurring in the area. It could also create habitat for small-mouth bass, which prey on juvenile salmonids.

Eastside Transition Area

There would be no operational effects on aquatic habitat in the Eastside transition area.

How would project operation affect federally or state-listed fish species?

All anadromous salmonids (fish that migrate to the ocean) in the Lake Washington watershed travel under or adjacent to the Portage Bay and Evergreen Point bridges. The previous sections described the project's potential effects on fish resources, including habitat of ESA-listed fish species. Based on these potential effects, the project has the potential to negatively affect individual fish in the Lake Washington watershed—including the ESA-listed populations of Chinook salmon, steelhead, and bull trout—by altering a portion of their rearing and migration habitat. However, current analysis indicates that the project is not expected to negatively affect overall salmonid populations or ESUs in the watershed.

There are no state-listed fish known to occur in the project vicinity.

How is WSDOT working with NOAA and USFWS to evaluate effects on ESA-protected species?

As described in Chapter 4, the federal agencies with jurisdiction over endangered species in the project area are NOAA Fisheries (responsible for protecting Chinook and steelhead salmon) and the U.S. Fish and Wildlife Service (responsible for protecting bull trout). WSDOT has done extensive early coordination with the NOAA and USFWS, including biweekly meetings and opportunities for review of discipline reports and the preliminary draft of this SDEIS. The consultation process occurs during the NEPA process, but it is separate.

When FHWA and WSDOT have identified a preferred alternative, WSDOT will prepare a biological assessment that evaluates effects on ESA-listed species in detail. The biological assessment will incorporate more specific design information that will be developed for the preferred alternative, along with descriptions of the potential effects of proposed construction techniques. The biological assessment is anticipated to be submitted to NOAA and USFWS by May 2010. After reviewing the biological assessment, NOAA and USFWS will each issue a "biological

KEY POINT

All of the options would affect wildlife by permanently removing vegetation and wildlife habitat, and increasing shading. Although, habitat quality is generally low for the Urban Matrix cover type, urban-adapted species such as black-capped chickadees, American robins, and eastern gray squirrels would be affected. Option K would result in the greatest loss of wildlife habitat.

opinion" with terms and conditions designed to minimize adverse effects on the species. The results of the ESA consultation process will be documented in the Final EIS and the Record of Decision.

How would the project affect wildlife and habitat?

All the 6-Lane Alternative options could affect wildlife by permanently removing vegetation and wildlife habitat, increasing shading, and adding noise disturbance from increased highway operations.

The new roadway would displace some high-quality wildlife habitat (including wetlands and trees) throughout the corridor and thereby reduce cover, nesting, and foraging habitat for some wildlife species. However, the area is already highly fragmented by the existing roadway and surrounding development.

Vegetation would be removed from areas where new roadway would be on the ground, and some vegetation would be removed for columns to support the roadway (Table 5.11-5). Removing vegetation would reduce cover for urban-adapted species such as black-capped chickadees, American robins, and eastern gray squirrels. In summary, Option K would result in the greatest loss of wildlife habitat, mostly within the Urban Matrix and Parks and Other Potential Areas cover types (see Table 5.11-5). Option K would remove 8 to 9 more acres of vegetation than Options A and L (see Table 5.11-5). Habitat quality is generally low for the Urban Matrix cover type. In the Open Water and in the Parks and Other Protected Areas cover types (specifically the Washington Park Arboretum), existing wildlife habitat quality is relatively high, and upland and wetland vegetation removal would represent a loss of wildlife cover and forage. Waterfowl such as Canada geese and mallards would likely continue to use the area.

The proposed project would remove a large beaver lodge in Union Bay adjacent to Foster Island, which would displace the animals, but is not expected to reduce the viability of the beaver population in this area. Operation of any of the options would have minimal effects on bald eagles and peregrine falcons.

Vegetation would be shaded where the roadway (bridges and approaches) would be elevated, and through the Washington Park Arboretum. Actual shading effects in individual areas would depend on roadway height in the area and existing vegetation cover.

Also of potential concern is shading of wetlands in the Parks and Other Protected Areas and in the Open Water cover types. The wetland habitat type provides a great deal of diversity for wildlife. The height of the elevated roadway through the Washington Park Arboretum area in Options A and L would accommodate shrubs and some trees; however, the increased bridge width would limit light and rain, and would likely affect

Cover Types

Parks and other protected areas contain mostly upland deciduous forests, riparian forests, and wetlands. The upland forests provide habitat for a variety of birds, mammals, reptiles, and amphibians.

Open water provides habitat for a variety of marine-associated wildlife including waterfowl.

Urban matrix provides limited wildlife habitat. Mostly commercial and residential areas with buildings, asphalt, ornamental gardens, lawns, and scattered trees.

This beaver lodge near Foster Island is within the footprint of the 6-Lane Alternative.

vegetation growth. However, reduced wildlife use under the roadway would more likely be due to noise than to changes in vegetation.

Two specimen tree collections near MOHAI that are associated with the Arboretum would be affected. The tree collection located west of 24th Avenue NE and south of Hamlin Street includes Scotch pine, Italian cypress, Port Orford cedar, and incense cedar. These trees may be removed for the bicycle/pedestrian path and the Montlake Boulevard off-ramps. The tree collection nearest MOHAI may also be affected, including possible removal of several species of pine and birch. The main portion of a stormwater facility would be constructed at this site. The extent of the effect on the specimen tree site is not known at this time.

Typical habitat in the Urban Matrix cover type in the study area.

Table 5.11-5. Permanent Vegetation Removal by Cover and Habitat Type (acres)

	I-5 Area	Portage Bay Area	Montlake Area	West Approach Area	Floating Bridge Area	Total
Option A						
Parks and Other Protected Areas	0.1	0.2	0.1	1.7[a]	-	2.1
Open Water	-	<0.1	-	<0.1	-	<0.1
Urban Matrix	1.4	1.8	2.5	0.8	2.7	9.2
Option K						
Parks and Other Protected Areas	0.1	0.2[b]	2.9	5.4	-	8.7
Open Water	-	<0.1		1.1	-	1.1
Urban Matrix	1.4	2.5	2.6	0.4	2.7	9.7
Option L						
Parks and Other Protected Areas	0.1	0.2	1.4[c]	1.1	-	2.8
Open Water	-	<0.1	<0.1	<0.1	-	<0.1
Urban Matrix	1.4	2.5	1.2	0.2	2.7	8.0

[a] Adding the Lake Washington Boulevard ramps to Option A would remove an additional 0.2 acre of vegetation in the west approach area.
[b] Adding the eastbound off-ramp to Montlake Boulevard to Option K would remove an additional less than 0.1 acre of vegetation in the Portage Bay area.
[c] Adding the northbound capacity on Montlake Boulevard to Option L would remove an additional 0.1 acre of vegetation in the Montlake area.

Option A

Approximately 11.4 acres would be permanently removed from mostly the Urban Matrix cover type, evenly spread among all areas; approximately 0.1 acre of this area of wetland would be filled. In addition, approximately 3.2 acres of vegetation would be shaded, with all of this area in wetlands.

Option A Suboptions

- Adding the Lake Washington Boulevard ramps to Option A would result in an additional 0.2 acre of vegetation impact, all in the Parks and Other Protected Areas cover type.
- Adding the eastbound HOV direct-access and a constant-slope profile through the west approach area would have no effect on wildlife habitat.

Option K

Approximately 19.5 acres of vegetation would be removed under Option K, primarily within the Urban Matrix cover type, with most in the Montlake area. In addition, of the 19.5 acres removed, 1.8 acres of wetland would be filled, and approximately 4.2 acres of vegetation would be shaded; of this area, 2.8 acres would be wetlands.

Option K Suboption

- Adding an eastbound off-ramp to Montlake Boulevard to Option K would result in virtually no additional clearing or shading of vegetation (less than 0.1 acre). The added ramp would be located within the current footprint of the Montlake Boulevard interchange.

Option L

Approximately 10.8 acres of vegetation would be removed, primarily within the Urban Matrix cover type, spread somewhat evenly between the geographic areas of this 10.8 acres. Approximately 0.3 acre of wetland would be filled and 7.1 acres of vegetation would be shaded; of this area, 4.3 acres would be wetlands.

Option L Suboptions

- Adding the northbound capacity on Montlake Boulevard to Option L would remove an additional 0.1 acre of habitat.
- Adding left-turn access from Lake Washington Boulevard onto the SPUI south ramp would result in no changes to wildlife impacts as described under Option L because it would not involve any additional right-of-way or structures.

Lake Washington and Eastside Transition Areas

Less than 3 acres of vegetation would be removed with any of the options in association with the bridge maintenance facility. These numbers are included in the total areas above.

How would project operation affect federally and state-listed wildlife species?

There would be no effects on any wildlife species protected under the ESA or state lists from the operation of the project, because none occur in these portions of the project. Operation of any of the options would have

minimal effects on bald eagles, which are protected under the Bald and Golden Eagle Protection Act as discussed above.

What has been done to avoid or minimize permanent adverse effects on wetlands, fish resources, wildlife, and habitat?

WSDOT has designed the project to minimize the permanent and construction effects of the 6-Lane Alternative design options. Specific aspects of the design that have been incorporated to avoid and minimize effects on ecosystems are as follows:

- Stormwater treatment facilities would be constructed to treat roadway runoff before it is discharged to downstream aquatic habitat. This would improve water quality in the study area.
- The spacing of the columns for Options A and L would be increased compared to existing conditions to reduce the number of columns in wetlands, wetland buffers, and open waters.
- Overall, the elevated structure would be wider, which would decrease light under the structures. However, in many areas bridge heights would be higher than today's, allowing more light under the elevated roadway sections. This would improve aquatic habitat conditions in some areas and offset and minimize potential negative effects in other areas.
- Existing roadway ramps would be removed to offset some of the effects of new impervious surface and create areas for habitat restoration.
- The bridge alignment was shifted north of the existing alignment in Portage Bay and Union Bay to minimize effects on wetlands.
- Retaining walls would be used instead of standard fill slopes to reduce the footprint of the at-grade roadway sections and the amount and extent of wetland fill.
- An existing residential dock adjacent to the east transition span would be removed to partially offset potential nearshore effects of the proposed maintenance facility dock and boat slip.

Wetlands

Federal and state laws require that any project with the potential to adversely affect wetlands must try to avoid and minimize impacts wherever possible. If impacts are not avoidable, the project must compensate for these impacts by restoring or creating new wetland areas to ensure that the overall environmental functions provided to the area are not diminished. Many jurisdictions also restrict activities within a certain distance of wetlands, known as buffer zones.

Fish and Aquatic Resources and Wildlife and Habitat

Specific aspects of the design that have been incorporated to avoid and minimize effects on aquatic resources in addition to those listed above.

What mitigation is proposed for effects that are not avoidable?

Wetlands

Compensatory mitigation would be required for all of the 6-Lane Alternative options. The information presented in this section is from the Initial Wetland and Aquatic Habitat Mitigation Plans for the projects, which are included as Attachment 9 to this SDEIS.

As described in Chapter 1, WSDOT has engaged the regulatory agencies with jurisdiction over wetlands and aquatic habitat in collaborative technical working groups to assist in the development of appropriate mitigation for project effects. WSDOT identified candidate mitigation sites using a hierarchical selection process based on the watersheds in the study area. These sites are being further analyzed to determine the best sites for mitigation. The mitigation site(s) will be selected after the preferred alternative is identified so as to best match the mitigation to the project impacts.

The compensatory mitigation for the project will be a comprehensive package designed to follow Ecology and USACE's joint guidance, as found in *Wetland Mitigation in Washington State: Part 1*: *Agency Policies and Guidance* (Ecology et al. 2006a) as well as local "no net loss" policies. The project would also be designed to meet the mitigation sequencing, compensation, reporting, and monitoring requirements typically used in WSDOT projects.

Table 5.11-6 summarizes the area of wetland fill by option and the corresponding required mitigation for the filled wetlands. Most of the affected wetlands in the study area are Category II and Category III, with smaller effects on Category IV wetlands. These effects would be mitigated at one or more sites with the greatest potential for successful mitigation.

Mitigation ratios shown in Table 5.11-6 are based on the wetlands ordinance for the City of Seattle (Seattle Municipal Code [SMC] Wetlands Ordinance [SMC 25.09.160 E, October 2008], retrieved July 10, 2009. Mitigation ratios may be adjusted depending on the timing of mitigation construction relative to the effects. Ratios shown in Table 5.11-6 reflect only one type of wetland effect (filling) and one potential mitigation activity (wetland creation). As a result, the data presented in this section do not necessarily reflect the final mitigation activities and ratios that would be used in the compensatory mitigation for the SR 520, I-5 to Medina: Bridge Replacement and HOV Project. Conceptual mitigation plans will be

developed in collaboration with regulatory agencies and tribes and will be available for the FEIS.

Table 5.11-6. Potential Wetland Mitigation Needs for the Project (acres)

		Option A		Option K		Option L	
Wetland Category	Mitigation Ratio[a]	Wetland Fill	Mitigation Required	Wetland Fill	Mitigation Required	Wetland Fill	Mitigation Required
II	3:1	<0.1	-	0.5	1.5	<0.1	-
III	2:1	0.1	0.2	1.2	2.4	0.2	0.4
IV	1.5:1	<0.1	-	0.1	0.15	0.1	0.15
Total		0.1	0.2	1.8	4.05	0.3	0.55

[a] Ratios are based on Ecology et al. (2006a) and City of Seattle SMC 25.09.160 E. Mitigation ratios assume creation or reestablishment of wetlands.

Notes: Suitable mitigation ratios for shading effects have not yet been determined.

Additional fill under suboptions to A, K, and L would be mitigated at the same ratio as for the base options.

There are no specific mitigation ratios for shading effects on wetlands. As a result, WSDOT would develop mitigation measures for wetland shading in consultation with the regulatory agencies and the City of Seattle. WSDOT anticipates that the amount and type of mitigation measures would be determined based on the goal of replacing lost or impaired wetland functions associated with the shaded areas. For planning purposes, WSDOT anticipates that the necessary compensatory mitigation for shading effects would be addressed first by onsite wetland enhancement and then by offsite mitigation elements (for example, wetland restoration, rehabilitation, or enhancement) available within the set of identified candidate mitigation sites. (These candidate sites are identified within the Initial Wetland Mitigation Report, Attachment 9.)

WSDOT will also add appropriate buffers to wetlands in the mitigation areas. The City of Seattle does not specify mitigation for wetland buffers.

The three Lake Washington Boulevard ramps would be removed, which would offset some of the fill and shading by exposing previously shaded areas. These ramps are mainly over upland or open-water areas, as opposed to vegetated wetlands, but their removal would expose 0.8 acre of previously shaded aquatic bed, emergent, and forested wetlands. In addition, 18 support columns (less than 0.1 acre of fill) would be removed.

Fish and Aquatic Resources

In cooperation with resource agencies, WSDOT is developing conceptual plans for habitat improvements, restoration, or construction to mitigate the effects of bridge construction, the increased width of shoreline and open-water crossings, and direct physical impacts from construction activities.

Specific plans would be included in permit applications for construction of the project.

Because of the different types of potential project effects on fish and aquatic resources, and because these potential effects would occur in several distinct habitat types (for example, open water versus shoreline), WSDOT may conduct specific mitigation activities at more than one location within the WRIA 8 watershed. These include mitigation opportunities within Lake Washington and the important tributaries for fish production, such as the Cedar River or Bear Creek, as well as opportunities within Lake Union, the Ship Canal, or the marine shorelines. The primary mitigation goal would be to compensate for the project's physical and biological effects while enhancing the production and survival of fish species to the maximum extent practicable. Specific mitigation actions would support spawning, rearing, or migrating salmonids and could include the following:

- Restoring Lake Washington, Lake Union, or Ship Canal shoreline habitat, which could include removal of existing overwater and in-water structures (such as docks or piers) and debris that provide in-water shade and may provide habitat for salmonid predators.
- Conducting shoreline improvements such as converting steep vertical shorelines that have bulkhead or riprap armoring to lower gradient beaches with sand-gravel substrate.
- Planting shoreline areas with nearshore native vegetation while removing invasive species (for example, Eurasian milfoil).
- Installing habitat features, such as large woody debris (LWD) or other natural/artificial habitat elements that could provide cover to migrating or rearing fish within Lake Washington or the Ship Canal. These habitat features could increase migration success and decrease predation on migrating juvenile salmonids.
- Enhancing key reaches of riverine spawning, rearing, and migration areas (located upstream of the project) through bank restoration, riparian vegetation enhancement, substrate enhancement, and/or installation of habitat structure (such as large woody debris).
- Enhancing nearshore marine areas that support juvenile salmonids within WRIA 8. Specific activities may include enhancing shoreline habitat, riparian reserves, aquatic macrophytes (for example, eelgrass), or removing overwater and in-water structures and debris.
- Protecting functioning habitat through land acquisitions and easements.
- Designing lighting on the bridge to minimize effects on aquatic habitat, likely through the use of downlights similar to those on the I-90 floating bridges.

Water Resource Inventory Area (WRIA)

WRIA 8 (the Cedar River-Lake Washington watershed) is the land area in which rainwater drains to Lake Washington and out through the Hiram Chittenden locks. It includes the Cedar River and its tributaries and the Sammamish River.

Wildlife and Habitat

There are no mitigation measures proposed specifically for wildlife.

5.12 Geology and Soils

The Pacific Northwest is a geologically active region and experiences earthquakes both large and small, as well as landslides and erosion along vulnerable slopes. Careful consideration of design, location, and construction techniques improves the safety of transportation structures during seismic events and increases stability in areas prone to erosion and landslides. The information presented in this section is based on the Geology and Soils Discipline Report (Attachment 7).

KEY POINT

Geologic Hazards

All options include supporting the roadway on columns, improving soils beneath bridge columns, designing bridge columns to withstand seismic motion, and/or excavating areas of vulnerable soils and replacing them with stronger materials.

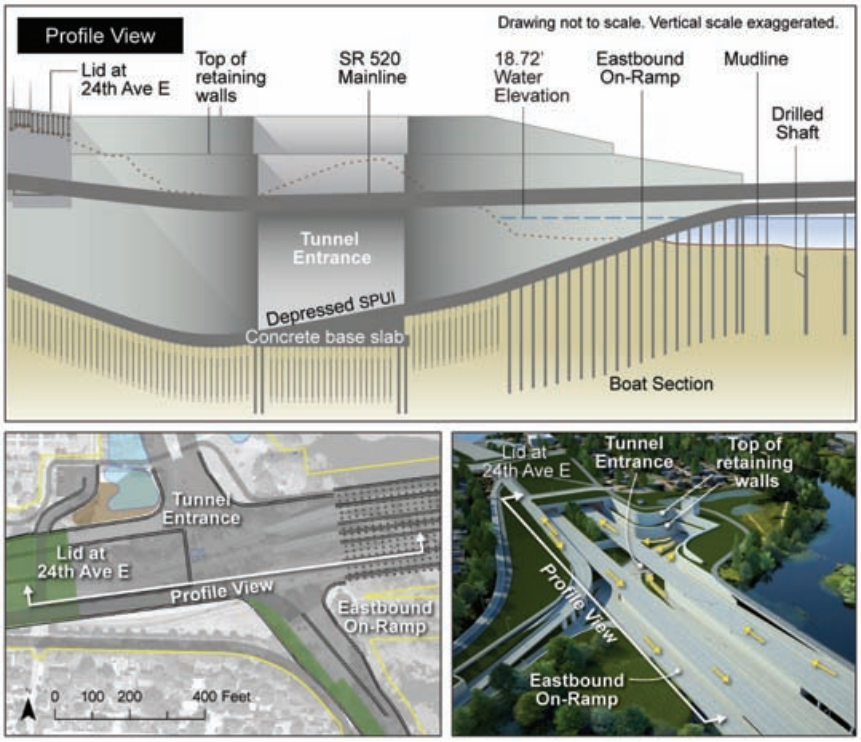
How would the project design account for geologic hazards?

Without the project, geologic hazards would continue to threaten SR 520's integrity and the safety of commuters. Seismic design was not a consideration when the existing SR 520 corridor was built in the early 1960s. Over the last several years, WSDOT studies have demonstrated that older, hollow-column spans such as the Portage Bay and west approach bridges are highly vulnerable to earthquakes. The new structures proposed by the 6-lane Alternative options would be far better able to withstand earthquakes than the existing structures.

For all options, project designers would include a number of features to reduce potential geologic hazards. Areas would be stabilized where soils are liquefiable and/or prone to settlement or landslide, including the eastern end of the Portage Bay Bridge and the Evergreen Point Bridge west approach structure. These measures could include supporting the roadway on columns, improving soils beneath bridge columns, designing bridge columns to withstand seismic motion, and/or excavating areas of vulnerable soil and replacing them with stronger material. Due to the sensitive nature of Foster Island as a presumed TCP, ground disturbance and excavation in this area would be limited as much as possible and other measures would be used to address soil stabilization. As described in Chapter 2, many of the existing bridges in the SR 520 corridor have a strong probability of being damaged during an earthquake; the new bridges would be designed to handle an earthquake without substantial damage, as required by current WSDOT standards.

While the 6-Lane Alternative options have similar risks for most segments, some differences occur in the Montlake and west approach areas. Option K would have some unique geologic considerations due to constructing the depressed SPUI structures below the lake level (Exhibit 5.12-1). Piles or tie-down anchors would be required to resist the buoyancy forces that would tend to cause the large structural slabs for the roadways to float. Although extensive design and load testing would be performed on these elements, the risk of damage to the facilities would be greater for this option than if the facilities were located above the lake level.

Exhibit 5.12-1. **Option K SPUI**



Although the below-water structures, including the tunnels, would be designed to be watertight, some leakage would likely occur, and an active pumping system would be required to remove water. Back-up pumping systems would be designed to limit the risk of flooding.

Effects of Suboptions

- Adding the Lake Washington Boulevard ramps and eastbound HOV direct-access ramp to Option A would result in no measurable differences in the geology and soils considerations and effects described above. The ramps would be located within and adjacent to the main line of SR 520. They would be located considerably farther west than they are currently, but would not cut through the Arboretum as the current ramps do. Most of the length of the on- and off-ramps would run along the north and south sides of the main line, introducing little additional effect to geology and soils.
- Adding the eastbound off-ramp to Montlake Boulevard to Option K would result in no measurable differences in the geology and soils considerations and effects described above because the added ramp would be located within the existing right-of-way of the current Montlake Boulevard interchange.

- Adding northbound capacity on Montlake Boulevard to Option L would result in no measurable differences to the geology and soils considerations and effects described under Option L because only minor grading would be required.

How would the project affect topography?

The topography of the project area would change somewhat through the construction of new embankments and the excavation of some areas. However, these changes would be relatively small because the widened roadway would follow the same corridor as the existing roadway, much of the roadway is on bridges, and the footprint has been kept as small as possible by the use of retaining walls. One exception would be the deep cut for the depressed SPUI in Option K, which would create a localized but dramatic change in land form just west of the Montlake shoreline. The land bridge over Foster Island would also noticeably change the island's topography.

Effect of Suboptions

- Adding the suboptions to Option A, K or L would result in no measurable differences in the topography effects described above.

What has been done to avoid or minimize negative effects?

All options would be designed to WSDOT and American Association of State Highway and Transportation Officials (AASHTO) design standards, which address seismic loading, retaining walls, and related components of the project.

5.13 Hazardous Materials

Project operations would employ a variety of hazardous materials (fuels, lubricants, asphalt, paint, solvents, etc.). Any time such materials are used, there is a risk that they could be accidentally released to the environment. The information presented in this section is based on the Hazardous Materials Discipline Report (Attachment 7).

KEY POINT

Hazardous Materials

Project operations would employ a variety of hazardous materials (fuels, lubricants, asphalt, paint, solvents, etc.). Any time such materials are used, there is a risk that they could be accidentally released to the environment.

How could the project affect hazardous materials?

During project operation, the main potential effect from hazardous materials would be the risk of a spill into water or on land. Project stormwater facilities would reduce this risk because they would collect polluted runoff from traffic operations. This runoff includes fuels, lubricants, heavy-metal compounds from tires and brakes, and automobile-engine coolants (such as ethylene glycol). Section 5.10, Water Resources,

includes more information on water quality treatment methods proposed for each design option.

Option K's tunnels under the Montlake Cut would involve greater safety risks if an accidental spill were to occur. The fire and explosion risk of a vehicle carrying hazardous materials would be much greater if such an incident were to occur in a tunnel compared with non-tunnel options. Flammable cargo may be banned in the tunnels to minimize this risk, similar to the I-90 tunnels. This could result in more circuitous routes for vehicles transporting such materials.

The bridge maintenance facility under the east approach would increase the likelihood of potential releases to the environment because hazardous materials such as fuels, adhesives, cleaners, epoxies, propane, grease, lubricants, paints, and solvents would be stored at the facility and used in the study area during maintenance activities. The risk of potential releases to the environment is considered low, however, because the amounts of each of these materials onsite would be small, in most cases a few gallons each, and spill pollution prevention measures would be implemented during the facility's operation.

The bridge maintenance facility would also have a diesel storage tank (size undetermined) onsite. This diesel tank, located either above ground or underground, would be used to supply the emergency power generator. Again, the risks of potential releases to the environment would be low if spill pollution prevention measures are implemented during the tank's design and operation.

Effects of Suboptions

- Adding the Lake Washington Boulevard ramps and the eastbound HOV direct-access ramp to Option A would result in no measurable differences in the hazardous materials impacts described above. This is because the added ramps would be located within and adjacent to the main line of SR 520. The ramps would be located in an area primarily already affected by Option A.
- Adding the eastbound off-ramp to Montlake Boulevard to Option K would result in no measurable differences in the hazardous materials impacts described above because the added ramp would be located within the existing right-of-way of the current Montlake Boulevard interchange.
- Adding northbound capacity on Montlake Boulevard to Option L would result in no measurable differences in the hazardous materials impacts described above, if any effects related to the existing landfill are mitigated during construction (see Section 6.13 for more information).
- Adding left-turn access from Lake Washington Boulevard onto the SPUI south ramp to Option L would result in no measurable

differences in the hazardous materials impacts described above because it would not affect any additional area.

What has been done to avoid or minimize negative effects?

As described above, stormwater treatment facilities and operational practices incorporated into project design and maintenance procedures would minimize the risk of spills.

5.14 Navigation

When proposing changes to structures that cross Lake Washington, project staff considered the beneficial or adverse effects of the project on navigation. The information presented in this section is based on analyses found in the Navigable Waterways Discipline Report (Attachment 7).

KEY POINT

Navigation

Under all options, the west transition span of the new Evergreen Point Bridge would be 3 feet lower than the No Build Alternative, the draw span would be removed, and the east transition span would be 15 feet higher. The changes would impose a height restriction of 70 feet for vessels passing under the replacement SR 520 bridge. Boats with an overhead clearance of more than 41 feet would only be able to pass under the east transition span. The new bascule bridge under Options A and L would coordinate openings with the existing bridge and would not impose height restrictions.

How would the project affect navigation channels?

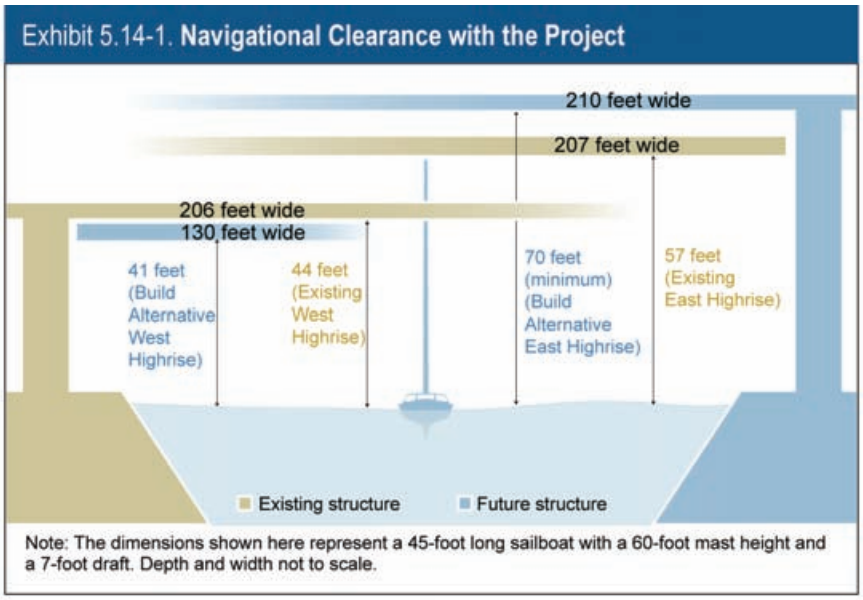
The 6-Lane Alternative would not change the current limits on ship passage through the Lake Washington Ship Canal or Lake Union. However, as Table 5.14-1 shows, there would be some changes in Lake Washington east of the Montlake Cut. Although Options A and L would add a new bascule drawbridge across the Montlake Cut, the new bridge would create no new navigational challenges because there would be no height restrictions, and the bridge openings would be coordinated with the existing Montlake Bridge.

Table 5.14-1. Changes in Navigational Restrictions in Lake Washington with 6-Lane Alternative

	Existing		Proposed	
Bridge	**Width (ft)**	**Height (ft)**	**Width (ft)**	**Height (ft)**
New Montlake Bascule Bridge (Options A and L only)	N/A	N/A	100	N/A, drawspan
Evergreen Point Bridge				
West transition span	206	44	130	41
Drawspan	200	N/A	Drawspan removed	Drawspan removed
East transition span	207	55 to 64	210	70

Note: Adding the suboptions to Options A, K, and L would not change the proposed navigational restrictions listed in this table.

All options would change the navigational channels under the Evergreen Point Bridge (see Table 5.14-1 and Exhibit 5.14-1). The west navigation channel of the new Evergreen Point Bridge would be 3 feet lower, the drawspan would be removed, and the east navigation channel would be between 6 and 15 feet higher depending on where in the channel



a vessel crossed. The only effect from these changes would be on sailboats with an overhead clearance of more than 41 feet and less than 44 feet. These sailboats would need to pass under the east transition span instead of the west transition span. All other vessels could continue using the same channels they use today.

Effects of Suboptions

- Adding the suboptions to Option A, K or L would result in no changes to the navigation channel impacts described above.

What would be done to avoid or minimize effects on navigation channels?

The permanent effect of a height restriction for vessels passing under the replacement SR 520 bridge has been avoided by essentially matching the new east navigation channel's maximum vertical clearance of 70 feet with I-90's east channel bridge clearance of 71 feet. Any vessel that can currently pass under the I-90 east channel bridge would also be able to pass under the replacement Evergreen Point Bridge.

The Coast Guard approves the locations and clearances of bridges through the issuance of bridge permits or permit amendments under the authority of Section 9 of the Rivers and Harbors Act of 1899, the General Bridge Act of 1946, and other statutes. Permits are required for new construction, reconstruction, or modification of a bridge or causeway over waters of the United States.

5.15 Phased Implementation Scenario

As discussed in Chapter 2, there is a possibility that WSDOT would construct the project in phases over time. If the project is phased, WSDOT

would first complete one or more of those project components that are vulnerable to windstorms and earthquakes. These components include the following:

- The Evergreen Point Bridge, which is vulnerable to windstorms
- The Portage Bay Bridge, which is vulnerable to earthquakes
- The west approach of the Evergreen Point Bridge, which is vulnerable to earthquakes

The Phased Implementation scenario would provide new structures to replace the vulnerable bridges in the SR 520 corridor, as well as transitional sections to connect the new bridges to existing facilities. It would include stormwater facilities, noise mitigation, and the width for the regional bicycle/pedestrian path, but lids would be deferred until a subsequent phase. WSDOT would develop and implement all mitigation needed to satisfy regulatory requirements.

If project construction is phased, only the permanent effects associated with the vulnerable structures replacement would occur. However, all of the effects would occur once the project was completed to its "full build" status. The subsections below discuss the effects of phased implementation by discipline. The construction effects of phased implementation are described in Section 6.16.

Transportation

Traffic modeling for the Phased Implementation scenario assumed that the SR 520, Medina to SR 202: Eastside Transit and HOV Project would be complete and that a new six-lane floating bridge (two general-purpose lanes and one inside HOV lane in each direction) would be constructed between Evergreen Point Road and the west transition span of the Evergreen Point Bridge. The westbound inside HOV lane would extend across the bridge and taper into two general-purpose lanes near the west transition span that would continue to I-5. Similarly, the eastbound HOV lane would begin near the west transition span, cross the new 6-lane Evergreen Point Bridge and tie into the Eastside Transit and HOV project at Evergreen Point Road on the east side of Lake Washington. If the new Portage Bay and west approach bridges were built as part of phased implementation, it is assumed that they would be striped to 4 lanes, as described in Chapter 2.

The Phased Implementation scenario assumes the same toll as the 6-Lane Alternative. The addition of a toll would result in some differences in traffic volumes compared to the No Build Alternative; however local traffic volume forecasts for the Seattle interchange areas (SR 520/Montlake, SR 520/Roanoke, I-5/ NE 45th Street, I-5/Mercer Street, and I-5/Stewart Street) would be similar to those for the No Build Alternative. For the purposes of comparatively analyzing the operational effects on transportation, the Phased Implementation scenario was evaluated based on

a design year of 2030, the same as assumed for full buildout of the 6-Lane Alternative.

The Phased Implementation Scenario would operate similarly to the No Build Alternative because SR 520 would be striped to 4 lanes west of the Evergreen Point Bridge – no additional capacity would be provided on SR 520 between the west end of the floating bridge and the I-5 interchange. The benefits of full HOV lane operation would not be realized until completion of the entire 6-lane corridor, when the HOV system from I-5 to SR 202 would be complete. The Montlake Freeway Transit Station would be closed for construction of the west approach. Effects on transit operations would be the same as described in Section 5.1.

Morning Commute

The Phased Implementation scenario would replace the Evergreen Point Bridge, provide wider shoulders, and extend the HOV lane across the bridge to the west transition span. However, as described above, the Phased Implementation scenario would operate similarly to the No Build Alternative. Traffic operations under the Phased Implementation scenario during the morning commute are described below. A comparative evaluation of the No Build Alternative with the 6-Lane Alternative is included in Section 5.1.

Westbound

Volumes and Mode Share

Under the Phased Implementation scenario, SR 520 would carry the same number of people per hour and vehicles per hour as the No Build Alternative during the westbound morning commute. Table 5.15-1 summarizes demand and throughput for the vehicles per hour and persons per hour.

Table 5.15-1. Westbound AM Peak Period Cross-Lake Vehicle and Person Trips

	Vehicles per Hour	Persons per Hour
2030 No Build Alternative		
Demand	4,400	8,200
Throughput	3,900	7,600
2030 Phased Implementation Scenario		
Demand	4,400	8,200
Throughput	3,900	7,600

Congestion Points

During the westbound morning commute under the No Build Alternative, the most severe congestion going west on SR 520 would begin near the 84th Avenue NE on-ramp and the termination of the westbound HOV lane. Congestion in the general-purpose lanes would extend back to the

108th Avenue NE interchange area and would last for approximately 3.5 hours during the morning commute. Congestion along this portion of the corridor would limit the amount of traffic throughput across the bridge.

There would also be some congestion in the HOV lanes as vehicles attempt to merge into the congested general-purpose lanes.

Under the Phased Implementation scenario, the acceleration lane from the Evergreen Point transit stop (Eastside Transit and HOV project) would be extended. This would allow buses to merge into the inside HOV lanes on the floating bridge at higher speeds. The congestion point would move to the west end of the floating bridge where the HOV lanes merge into the 4-lane roadway. This congestion point would affect all vehicles including transit coaches; additional study of this merge of the 6-lane floating bridge into a 4-lane highway will be completed, if applicable, as part of the Final EIS, following selection of a preferred alternative.

- Under the Phased Implementation scenario, the corridor would be tolled west of I-405. Drivers going to Bellevue and Kirkland would likely choose to exit at the I-405 interchange instead of ramps to Bellevue and Kirkland that are west of the interchange. This could increase congestion approaching I-405 from westbound SR 520; however, it would not affect the inside HOV lane operations.

Travel Time

Under the Phased Implementation scenario, general-purpose travel times between I-5 and SR 202 would increase slightly (by 1 to 3 minutes) compared to the No Build Alternative. Travel times in HOV lanes would be 1 to 2 minutes faster than those for the No Build Alternative, which assumes the Medina to SR 202 project is operational. HOV trips would be able to bypass the congestion in the general-purpose lanes. Table 5.15-2 shows the travel times for SR 520 between I-5 and SR 202.

Table 5.15-2. Westbound AM Peak Period Travel Times (minutes) – I-5 to SR 202

	General-Purpose		HOV	
	Average[a]	Peak[b]	Average[a]	Peak[b]
2030 No Build Alternative	20	22	16	17
2030 Phased Implementation scenario	21	25	15	15

[a] Average of the 3-hour AM peak period from 6 AM to 9 AM.

[b] The highest 60-minute time period during the 3-hour peak period.

Eastbound

Under the No Build Alternative, SR 520 would continue to be congested between I-5 and the west end of the Evergreen Point Bridge (see Section 5.1). This would be the case for the Phased Implementation scenario as well. HOV lanes would begin on the bridge, easing congestion;

however overall travel times for general-purpose and HOV lanes between I-5 and SR 202 would be similar to the westbound commute travel times shown in Table 5.15-2 due to the congestion approaching the bridge.

Afternoon Commute

Traffic operations under the Phased Implementation scenario during the afternoon commute are compared to the No Build Alternative below. In general, the afternoon commute would be congested for the same reasons as for the morning commute, but more severely. By 2030, congestion on I-405 will have a profound effect on the westbound SR 520 commute east of I-405. Traffic on I-405 through downtown Bellevue will back up onto the SR 520 ramps and affect how much traffic will be able to get through the SR 520/I-405 interchange. Congestion lasting more than 3 hours would extend from I-405 as far back on SR 520 as the NE 40th/NE 51st Street interchange.

Westbound

Volumes and Mode Share

With the Phased Implementation scenario, SR 520 would carry 200 more people per hour and 100 more vehicles per hour (3 percent) than the No Build Alternative. Table 5.15-3 summarizes the person and vehicle demand and throughput for the No Build Alternative and the Phased Implementation scenario.

Table 5.15-3. Westbound PM Peak Period Cross-Lake Vehicle and Person Trips

Alternative	Vehicles per Hour	Persons per Hour
2030 No Build Alternative		
Demand	4,600	8,200
Throughput	3,800	6,700
2030 Phased Implementation Scenario		
Demand	4,600	8,200
Throughput	3,900	6,900

Congestion Points

As described above, I-405 congestion during the westbound afternoon commute will cause queues on the SR 520/I-405 interchange ramps to back up onto SR 520. This congestion will limit the amount of traffic that can exit from SR 520 to I-405, and also will limit how much traffic can enter SR 520 from I-405. Carpools and buses on SR 520 would be able to bypass this congestion in the inside HOV lane.

As described for the morning commute, congestion on westbound SR 520 under the No Build Alternative would begin near the 84th Avenue NE on-ramp and would extend at least as far back as the 108th Avenue NE interchange, lasting for the entire peak period during the afternoon commute.

Under the Phased Implementation scenario, the congestion point would move to the west end of the floating bridge where the HOV lanes merge into the 4-lane roadway. Additional study of this merge of the 6-lane floating bridge into a 4-lane highway will be completed, if applicable, as part of the Final EIS, following selection of a preferred alternative.

Travel Times

Under the No Build Alternative, the average travel time between I-5 and SR 202 during the westbound afternoon commute would be approximately 49 minutes for general-purpose trips and 16 minutes for HOV trips.

General-purpose and HOV travel times for the Phased Implementation scenario would be similar to the No Build Alternative. Table 5.15-4 shows the travel times for SR 520 between I-5 and SR 202.

Table 5.15-4. Westbound PM Peak Period Travel Times (minutes) – I-5 to SR 202

Alternative	General-Purpose		HOV	
	Average[a]	Peak[b]	Average[a]	Peak[b]
2030 No Build Alternative	49	66	16	17
2030 Phased Implementation scenario	47	62	17	19

[a] Average of the 3-hour PM peak period from 3 PM to 6 PM.

[b] The highest 60-minute time period during the 3-hour peak period.

Eastbound

Volumes and Mode Share

The Phased Implementation scenario would carry 200 more people per hour and 100 more vehicles per hour (a 3 percent increase) than the No Build Alternative during the eastbound afternoon commute. Table 5.15-5 summarizes the person and vehicle demand and throughput for the No Build Alternative and the Phased Implementation scenario.

Congestion Points

- As described above, I-405 would be severely congested on both northbound and southbound lanes during the afternoon commute. I-405 congestion would cause the SR 520/I-405 interchange ramps to back up onto SR 520. Carpools and buses would be able to bypass this congestion in the inside HOV lane and avoid the congested general-purpose lanes.

Table 5.15-5. Eastbound PM Peak Period Cross-Lake Vehicle and Person Trips

Alternative	Vehicles per Hour	Persons per Hour
2030 No Build Alternative		
Demand	4,100	8,200
Throughput	3,600	7,000
2030 Phased Implementation Scenario		
Demand	4,100	8,200
Throughput	3,700	7,200

Similar to the morning eastbound commute, SR 520 would also be congested between I-5 and the west end of the Evergreen Point Bridge (see Section 5.1) during the afternoon commute. This would be the case for the No Build Alternative and the Phased Implementation scenario.

Travel Times

As described for the morning commute, SR 520 would continue to be congested between I-5 and the west end of the Evergreen Point Bridge (see Section 5.1). This would be the case for the Phased Implementation scenario as well. Overall travel times for general-purpose and HOV lanes between I-5 and SR 202 would be similar to the No Build Alternative, averaging 22 minutes in the general-purpose and HOV lanes between I-5 and SR 202.

Land Use and Economic Activity

Land Use

WSDOT would acquire land adjacent to the existing corridor for new permanent right-of-way in order to build the 6-Lane Alternative, including replacement of the vulnerable structures. No land would be acquired to replace the Evergreen Point Bridge. Two parcels on the Eastside totaling 1.2 acres have been purchased as part of WSDOT's early acquisition of right-of-way. Table 5.15-6 shows the number of acres that phased implementation would affect in the Portage Bay and west approach areas.

Table 5.15-6. Phased Implementation Permanent Right-of-Way Effects (acres)

Option	Portage Bay Area	West Approach Area
Option A	**2.2**	5.1
Option K	1.8	7.3
Option L	**1.0**	6.3

Replacement of the vulnerable structures and development of the stormwater facilities would require relocation and/or removal of some of the structures that would also be affected as part of the full build of the 6-Lane Alternative. These include one single-family residence in the Roanoke/Portage Bay neighborhood and the MOHAI building. Relocations of moorage slips at the Queen City Yacht Club and the Bayshore Condominiums would also need to be relocated. A dock on the Medina shoreline purchased by WSDOT as part of early right-of-way acquisition may also be removed to construct the east approach structure. Other structure removals and relocations identified for the 6-Lane Alternative, including two additional single family homes, a business, buildings at the NOAA Northwest Fisheries Science Center, and the WAC, would occur when the Montlake interchange is constructed as part of a later phase (Section 5.2).

The Phased Implementation scenario would be consistent with regional and local land use plans and policies as described for the 6-lane Alternative (Section 5.2). The City of Seattle's Shoreline Master Program is currently undergoing a comprehensive update; development standards currently listed for shoreline areas could change as part of this update. WSDOT would obtain all required shoreline permits and approvals for the Phased Implementation scenario.

Economic Activity

Under the Phased Implementation scenario, benefits to businesses overall from improved mobility and accessibility along the SR 520 corridor (as influenced by travel times, safety, and transportation choices) would be realized over a longer overall time period. No business relocations would occur to replace the vulnerable structures. Businesses located on routes through transition zones could also experience construction-related effects more than once for periods of multiple months under phased construction (see Section 6.16).

As described above under Land Use, WSDOT would acquire additional right-of-way to construct the 6-Lane Alternative. Table 5-15-7 shows the initial estimated property tax decreases for the City of Seattle for vulnerable structure replacement for each option.

Table 5.15-7. Estimated Property Tax Decreases for City of Seattle, Phased Implementation Scenario

Option	Estimated Assessed Value of Right-of-Way	Estimated Taxable Value of Right-of-Way	Initial Property Tax Decrease	Percent of Budgeted 2008 Property Tax Revenues
Option A	$5,955,809	$1,309,019	$1,430	Less than 0.01
Option K	$4,555,016	$1,299,865	$1,405	Less than 0.01
Option L	$3,840,818	$1,303,795	$1,416	Less than 0.01

Source: King County Assessor (2009).

Applying the 2008 tax levy rate for the City's portion of the taxable right-of-way, the loss of property tax revenue for the City of Seattle under the Phased Implementation scenario would be less than a 0.01 percent decrease, compared to the 2008 budgeted property tax revenues, similar to the 6-Lane Alternative.

WSDOT has purchased two parcels in the city of Medina for replacement of the Evergreen Point Bridge. No other property acquisition would be required for the Phased Implementation scenario. The City of Medina's loss of annual property tax revenue would be approximately $920, compared to the 2008 budgeted property tax revenues. The losses of property tax revenue in Seattle and Medina would not represent a substantial effect on the cities' overall tax revenues.

Social Elements

Neighborhoods, Public Service Providers, and Utilities

The Phased Implementation scenario would defer completion of the I-5 and Montlake interchange improvements, including the lids and regional bicycle/pedestrian path. Operational effects on the Eastlake, North Capitol Hill, Roanoke/Portage Bay, University District, Montlake, and Madison Park neighborhoods that benefit community cohesion, visual quality, noise levels, and pedestrian and bicycle connections would be delayed until full build of the 6-Lane Alternative.

Benefits to transit service reliability from a continuous HOV lane on SR 520 would also be delayed because under the Phased Implementation scenario, the highway would be striped to four lanes from the west end of the Evergreen Point Bridge to I-5.

Replacement of the vulnerable structures would accommodate full shoulders, which would allow public service vehicles to bypass traffic; however, reductions in congestion associated with a complete HOV system would be delayed until the 6-lane corridor was complete. No operational effects on utilities would occur under the Phased Implementation scenario.

Effects on Low-income, Minority, and Limited-English-Proficient (LEP) Residents

- No low-income, minority, or LEP households would be relocated as a result of the 6-Lane Alternative, including the Phased Implementation scenario. Benefits from a complete HOV system on SR 520, lids crossing I-5 and SR 520, and a fully operational regional bike bath would be delayed until the full build of the 6-Lane Alternative was complete for all residents of the Eastlake, North Capitol Hill, Roanoke/Portage Bay, University District, Montlake and Madison Park neighborhoods–including low-income, minority, and LEP populations.

- Tolling of SR 520 would be implemented and the effect on low-income populations and mitigation measures would be the same as described for the 6-Lane Alternative (see Section 5.3).

Effects on "usual and accustomed" tribal fishing areas would also be the same as described for the 6-Lane Alternative for replacement of the Evergreen Point Bridge and Portage Bay Bridge. Where new bridges are elevated over water bodies, the resulting shading could affect fish in tribal fishing areas, especially in shallow habitats near the shore. The new bridges will have a substantially wider footprint than the existing Evergreen Point Bridge and the alignment will be shifted north, reducing access to "usual and accustomed" tribal fishing areas for the Muckleshoot Tribe. WSDOT would continue to coordinate closely with the Muckleshoot Tribe to understand the extent to which the wider bridges would affect access to their usual and accustomed fishing areas and work with the tribe to develop a plan for mitigating adverse effects on access (see Section 5.3).

Recreation

Acquisition of park land including Bagley Viewpoint, McCurdy Park and land in the Arboretum would occur as described for the 6-Lane Alternative. Right-of-way needed to construct the vulnerable structures would be acquired as part of the Phased Implementation scenario. Acquisition of land needed for construction of a SPUI and tunnel or new bascule bridge (Options K and L) in East Montlake Park and the University of Washington Open Space could be deferred to when the Montlake interchange improvements are constructed in a later phase; however, full mitigation for land needed to construct the 6-Lane Alternative would be implemented (see Section 5.4). Table 5.15-8 summarizes acres of park land that would be needed for the Phased Implementation scenario.

Table 5.15-8. Phased Implementation Scenario, Park Acquisition (acres)

Resource	Option A	Option K	Option L
East Montlake Park[a]	2.8	2.9	2.5
McCurdy Park	1.5	1.5	1.5
Washington Park Arboretum	0.9	1.4	0.6
Total Acquisition	5.2	5.8	4.6

[a] Total land in East Montlake Park needed for construction of the 6-Lane Alternative under Options K and L would be 4.5 and 4.3 acres, respectively; the acquisition of the additional 1.6 to 1.8 acres could be deferred under the Phased Implementation scenario.

Improved connectivity between and within park areas from pathways and landscaping on lids in the I-5 and Montlake interchange areas would be deferred until a later phase. In addition, the regional bike path would not be fully operational until completion of the 6-Lane Alternative.

Visual Quality

Operational effects on visual quality from changes in the scale and appearance of the replaced vulnerable structures would be similar to those described for the 6-Lane Alternative in the Portage Bay, west approach, Lake Washington and Eastside transition area landscape units (see Section 5.5). Removal of the Lake Washington Boulevard ramps may be deferred to a later phase if interim connections are made to allow continued use of these ramps during the Phased Implementation scenario; this would delay the benefit of more open views to the surrounding natural areas. Changes to visual quality in the Roanoke and Montlake landscape units, including the benefits from new lids across I-5 and SR 520, would also be deferred until a later phase.

Cultural Resources

Operational effects on historic properties along the SR 520 corridor would include effects from reduced noise and additional green space, and/or negative effects from increased visual intrusion associated with a more dominant and noticeable roadway or bridge (depending on location of the property and the design option). Under the Phased Implementation scenario, historic properties in the Roanoke Park/Portage Bay area, west approach area, at NOAA, at the Seattle Yacht Club, and along the SR 520 corridor in the Montlake Historic District would experience the same effects as described for the 6-Lane Alternative. Potential project effects on Foster Island, a presumed TCP, are of concern to Native American tribes; potential effects and coordination with tribes on the cultural significance of Foster Island would be the same as described for the 6-Lane Alternative (see Section 5.6).

Demolition of the NRHP-eligible floating bridge is considered an adverse effect and is discussed in Section 6.16. Potential effects on tribal fishing from the Phased Implementation scenario are discussed under the evaluation of effects on low-income and minority populations, above.

Potential effects on other historic properties, on the Montlake Historic District, on the Canoe House, and on the Roanoke Park Historic District in the I-5 area would be deferred until a later phase when the I-5 and Montlake interchange improvements are constructed.

Noise

FHWA policies require that noise mitigation be considered when project-related noise impacts are identified. Mitigation measures that meet applicable feasibility and reasonableness criteria must be recommended for inclusion in the project (see Section 5.7). The analysis of the 6-Lane Alternative showed that noise walls would be warranted for consideration along the Portage Bay Bridge and east and west approaches to the

Evergreen Point Bridge. Noise mitigation for replacement of the vulnerable structures would be considered when these project components are constructed. Noise abatement that would occur with the lids would be deferred until a later phase.

Air Quality

Air quality would improve from current conditions under all of the 6-Lane Alternative options, the No Build Alternative, and the Phased Implementation scenario because of the introduction of cleaner fuels and new emissions standards requiring more efficient vehicle engines. Operational effects on air quality would be the same as described for the 6-Lane and No Build alternatives.

Energy and Greenhouse Gases

The Phased Implementation scenario would operate similarly to the No Build Alternative. SR 520 would be striped to 4 lanes between the Evergreen Point Bridge and the I-5 interchange. Energy consumption and greenhouse gas emissions would be similar to what is described for the No Build Alternative. The benefits of improved traffic flow from a complete HOV system would not occur until the full 6-lane corridor is complete.

Water Resources

In the portions of SR 520 constructed under the Phased Implementation scenario, WSDOT would build stormwater management facilities to treat the runoff from the new Evergreen Point Bridge and approaches and the Portage Bay Bridge. The Phased Implementation scenario assumes that the floating bridge would be built to its full 6-lane width and that the "spill containment lagoons" in the supplemental stability pontoons would be operational.

Stormwater treatment facilities for project elements would be in place and operational in conjunction with completion of construction; runoff from pollutant-generating impervious surfaces would be treated prior to discharge. Section 5.10, Water Resources, provides additional detail on types, locations, and levels of proposed stormwater treatment facilities.

Ecosystems

Wetlands

The majority of effects on wetlands and buffers from the Phased Implementation scenario would occur in the Portage Bay and west approach areas and would be the same as described for the 6-Lane

Alternative (see Table 5.11-1). There are no wetlands in the I-5 area and only small portions of wetlands extend into the Montlake area.

In the west approach area, the effects of shading would depend on the design option and are linked to both structure height and area shaded. WSDOT is working with resource agencies to assess the effects of shading and to evaluate compensatory mitigation with the goal of achieving no net loss of wetland area or function (see Section 5.11).

Fish

The Phased Implementation scenario would replace the vulnerable bridge structures along the corridor, which would be about twice as wide as the existing structures. The bridge maintenance facility and dock would also be constructed. The effects on aquatic habitat associated with these structures would be similar to the 6-Lane Alternative; shading effects would be the same as described for the 6-Lane Alternative. Total area of shade from overwater effects would depend on the design option (Option A, K, or L) as quantified for the 6-Lane Alternative in Section 5.11, Ecosystems. Under the Phased Implementation scenario, a new crossing of the Montlake Cut would be deferred until a later phase.

Because the Montlake interchange is on land, interim structures to improve mobility to Montlake Boulevard during a phased scenario would not affect aquatic habitat; a potential flyover connection to the existing Lake Washington Boulevard ramps could potentially increase shading in that area by a small amount until the final Montlake interchange is built.

Areas of habitat located within the transition zones between project phases would be affected more than once as a result of phased construction. See Section 6.16 for a discussion of potential in-water construction effects on fish and aquatic habitat from the Phased Implementation scenario.

Potential effects on tribal fishing from the Phased Implementation scenario are discussed above in the evaluation of effects on low-income and minority populations.

Wildlife

Vegetation that provides the highest quality habitat for wildlife is located in the Portage Bay, west approach, and Montlake areas of the SR 520 corridor. Vegetation removal that reduces cover, nesting, and foraging habitat for some species would be similar to that described for the 6-Lane Alternative.

Geology and Soils

The vulnerable structures built for the Phased Implementation scenario would be designed to withstand seismic events as required by WSDOT and AASHTO design requirements. Structures would also be designed to

account for geologic hazards along the corridor (i.e., steep slopes or areas where soils are liquefiable). Operational effects for these project elements would be the same as described for the 6-Lane Alternative.

Hazardous Materials

Types of effects from potential hazardous materials spills would be the same as described for the 6-Lane Alternative, with the exception of risks associated with the tunnel crossing under the Montlake Cut (Option K). Under the Phased Implementation scenario, improvements to the Montlake interchange, Montlake Cut crossing, and Montlake Boulevard/NE Pacific Street intersection would be deferred until a later phase.

Navigable Waterways

The Evergreen Point Bridge, Portage Bay Bridge, and west approach structure would be replaced as part of the Phased Implementation scenario. The navigation restrictions would be the same as described for the 6-Lane Alternative.

5.16 Summary of Project Operation and Permanent Effects

Table 5.16-1 summarizes the project operation and permanent effects of the 6-Lane Alternative options on each element of the environment. Additional effects resulting from the suboptions are shown in italics. Effects from adding the suboptions to each option are noted only where they would result in a measurable difference to the effects described. Table 5.16-2 lists the quantifiable effects (those effects that could be estimated as measurable quantities, e.g., acres). Effects from adding the suboptions to each option are shown in parentheses in Table 5.16-2.

Table 5.16-1. Summary Comparison of Operation Effects of the 6-Lane Alternative Options

Element of the Environment	Option A	Option K	Option L
Transportation	All options include HOV lanes in both directions, an HOV direct-access ramp to I-5 express lanes, and HOV bypass lanes on all on-ramps. All options would serve more vehicles and more people than the No Build Alternative. Overall congestion and travel times for both general-purpose and HOV trips would be reduced, particularly during the eastbound morning and westbound afternoon peak periods.		
Travel Demand and Freeway Operations	The 6-Lane Alternative would allow SR 520 to serve more traffic than the No Build Alternative during the peak period: up to approximately 700 more vehicles per hour and 2,100 more people per hour. Comparing the No Build Alternative with the 6-Lane Alternative, year 2030 congestion and HOV travel times between I-5 and SR 202 would be reduced between an average of 2 to 8 minutes during the morning peak period and 5 minutes during the evening peak period. However, during the peak of the evening commute period the completion of the eastbound HOV lane could save both general-purpose and HOV vehicles approximately 40 minutes.		
Local Traffic Volumes and Operations	The greatest effect on traffic volumes would occur in the Montlake Boulevard interchange area.		
	Under Option A, traffic volumes north and south of the Montlake Cut would be similar to the No Build Alternative, except on Lake Washington Boulevard south of the SR 520/ Arboretum ramps. Volumes at this location would decrease with the closure of the Lake Washington Boulevard off ramps. Traffic operations within the Montlake area would improve at one intersection during the a.m. peak hour and four intersections during the p.m. peak.	Under Options K and L, traffic volumes north and south of the Montlake Cut would increase when compared to the No Build and Option A. This is because drivers would take advantage of the capacity made available with the new interchange (SPUI) and its connecting ramps north and south of the Montlake Cut. Traffic volumes would decrease on the existing Montlake Bridge because access to SR 520 would occur via the new SPUI ramps. Traffic operations within the Montlake area would improve at one intersection during the a.m. peak hour and three intersections during p.m. peak.	
Suboptions	*Adding the Lake Washington Boulevard ramps to Option A would result in improved intersection operations in the Montlake Boulevard interchange area. Traffic volumes at Lake Washington Boulevard would be similar to the No Build.*	*Adding the eastbound off ramp to Montlake Boulevard to Option K would allow drivers to head directly south on Montlake Boulevard without having to use the new SPUI and turnaround, thereby reducing delay compared to Option K.*	*Adding the northbound lane on Montlake Boulevard north of the Montlake Cut would result in shorter delays at the Montlake Boulevard/NE Pacific Street intersection, although it would still operate at LOS F.* *Adding the left turn access at Lake Washington Boulevard to Option L would allow drivers south of the cut on Montlake Boulevard to access the SR 520/SPUI, resulting in a shift away from the Montlake Bridge to Lake Washington Boulevard, which would worsen operations at the SR 520*

Table 5.16-1. Summary Comparison of Operation Effects of the 6-Lane Alternative Options

Element of the Environment	Option A	Option K	Option L
			ramps/Lake Washington Boulevard intersection compared to Option L
Transit	All options would substantially increase the demand for transit service, allowing SR 520 to carry more people with greater efficiency. This increase reflects the effect of tolling on mode choice, the reversible connection to the I-5 express lanes and other corridor improvements. The capacity added across the Montlake Cut with all options would improve local traffic operations and allow transit to move faster and more reliably than the No Build Alternative.		
Suboptions	*Adding the Lake Washington Boulevard ramps and eastbound HOV direct-access ramp to Option A would further reduce transit travel times compared to the No Build Alternative and Option A.*		
Montlake Freeway Station	All options would remove the Montlake Freeway Transit Station and replace its function at other nearby transit stops. Loss of the transit station would require passengers to change their current travel routes and these changes could include using light rail, additional bus transfers, and finding alternate bus routes to get to the same destination.		
Mitigation	The design modifications that mitigate effects on traffic include number of lanes needed for on- and off-ramps, intersection configurations, and stop controls adjacent to the corridor.		
Land Use and Economic Activity	WSDOT would acquire land in order to accommodate right-of-way for the 6-Lane Alternative options. All options would permanently remove a residence on the west end of the Portage Bay Bridge and the MOHAI building.		
	Option A would require the least amount of new right-of-way (11.1 acres). This option would result in 7 full parcel acquisitions, and would remove two additional residences, the Montlake 76 gas station, and 9 of the 11 buildings on the south campus of NOAA's Northwest Fisheries Science Center.	Option K would require the most new right-of-way (15.7 acres). This option would result in 6 full parcel acquisitions, and the University of Washington's WAC would be relocated for a multiple-year period.	Option L would require 11.9 acres of new right-of-way. This option would result in 5 full parcel acquisitions.
	Estimated property tax effects would be similar across all options, and result in a less than 0.01 percent decrease in tax revenue.		
Suboptions			*Adding northbound capacity on Montlake Boulevard would require an additional 1.4 acres of right-of-way acquisition.*
Mitigation	Property acquisition and relocations will be completed in accordance with Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.		
Social Elements	All 6-Lane Alternative options include lids that would benefit community cohesion by reconnecting neighborhoods originally bisected by SR 520 and I-5, providing linkages between adjacent and nearby parks, improving views toward the highway from nearby residences, and providing safe passage across I-5 and SR 520. Option K includes three additional landscape features: one across Foster Island, one across East Lake Washington Boulevard (partial lid), and one at the NE Pacific Street and Montlake Boulevard NE intersection. Option L also includes a lid at the NE Pacific Street and Montlake Boulevard NE interchange.		

Table 5.16-1. Summary Comparison of Operation Effects of the 6-Lane Alternative Options

Element of the Environment	Option A	Option K	Option L
	Low-income populations would experience disproportionately high and adverse effects as a result of tolling. The most affected low-income populations would be those that are car-dependent and populations living in areas with limited transit service.		
	The north shift of the bridge could change tribal fishing locations somewhat, but it would not reduce overall access to Lake Washington by fishing boats.		
Mitigation	WSDOT would implement measures to mitigate the burden that electronic tolling would place on low-income and LEP drivers. The Final EIS will contain WSDOT commitments for mitigation appropriate to the project effects.		
Recreation	Loss of parkland would occur for ROW acquisition of all or part of up to five recreational properties (depending on the option). The largest acquisitions would occur at McCurdy and East Montlake Parks. There could be negative effects related to visual quality and aesthetics where widening of the roadway would bring the project footprint closer to parks. All options would acquire Bagley Viewpoint in its entirety. Under all options the west approach bridge through the Arboretum would be much wider than the existing bridges which could change boaters and park users' experience in this area.		
	Option A would acquire 5.55 acres of park land.	Option K would acquire 7.55 acres of park land.	Option L would acquire 7.05 acres of park land.
		The Option K land bridge located on the north portion of Foster Island would change the island from a wetland viewing area to a more landscaped upland setting.	
	The landscaped lids at I-5, 10th Avenue E. and Delmar Drive E., and in the Montlake area would provide new areas for passive recreation. Trails across these lids would further improve connectivity for bicyclists and pedestrians. The proposed regional bicycle/pedestrian path across SR 520 would provide a new connection between the City of Seattle's bicycle and pedestrian system and the Points Loop Trail in Medina.		
Mitigation	Where park property is proposed for conversion to non-park use, WSDOT will continue to work with the City of Seattle Department of Parks and Recreation, the University of Washington, the Recreation and Conservation Office, the National Park Service, and the FHWA to identify suitable replacement property (discussed in Attachment 7). Mitigation may include enhancement of existing parks and recreational properties in accordance with applicable plans.		
Visual Quality	All options would affect visual quality as a result of the new lids and wider bridges and roadways that would be shifted in some areas and raised or lowered in other areas.		
	All options would improve the visual quality of the Roanoke landscape unit near the I-5 interchange with the addition of the I-5 and 10th Avenue East and Delmar Drive East lids.		
	The overall quality of the Portage Bay landscape unit would not change but views under the Portage Bay bridge would open up because of the wider column spacing, especially looking northward from the south side of the bridge.		
	All options would result in changes to the visual character and quality in the Montlake area. The mainline profile for all options through the Montlake area would be at roughly the same height as the existing SR 520 main line and therefore would be about as visible as the existing roadway from most residences, where not covered by the lid. However, Option K and L would include additional structures in the McCurdy Park and East Montlake Park areas that would be most visible to motorists and park users. These structures would dominate views much more than the existing ramps and main line.		

Table 5.16-1. Summary Comparison of Operation Effects of the 6-Lane Alternative Options

Element of the Environment	Option A	Option K	Option L
		Option K would include a SPUI and tunnel configuration that would require tall retaining walls at the tunnel entrance and columns to support the main line over the SPUI.	Option L would include an elevated SPUI over the main line and a new bridge through East Montlake Park and over the Montlake Cut.
	Under Option A, the SR 520 bridge over Foster Island would be higher than the existing bridge and the bridge proposed for Option L.	Under Option K, the land bridge at Foster Island would remove naturalized woodlands on both sides of SR 520.	Under Option L, the bridge on Foster Island would be wider than the existing bridge and 2 to 4 feet higher at the Arboretum Water Trail.
Suboptions	*The eastbound HOV direct-access on-ramp could be visible from distant viewpoints because of its height, and the ramp itself would add to the complexity of the overall structure. Adding the Lake Washington Boulevard ramps to Option A would remove mature trees to the east of Lake Washington Boulevard East. These trees now buffer the view of the roadway from several Montlake homes and the boulevard. Adding the constant-slope profile would result in a bridge height similar to Option L.*		
Mitigation	WSDOT has developed draft urban design guidelines for the project in collaboration with community members, and will continue to update and expand these guidelines as design progresses.		
Cultural Resources	Several effects on historic properties of the built environment were identified from the 6-Lane Alternative options. Based on available information, some of these effects will be considered adverse (all effects determinations are preliminary, pending SHPO concurrence), as follows: ▪ NOAA Northwest Fisheries Science Center – experiences an adverse effect under Option A ▪ Montlake Bridge – experiences an adverse effect under Option A ▪ 2111 East Shelby Street – experiences an adverse effect under Option A ▪ Montlake Historic District – experiences an adverse effect under Options A and L ▪ 2158 E. Shelby Street – experiences an adverse effect under Option L ▪ 2159 E. Shelby Street – experiences an adverse effect under Option L ▪ Foster Island presumed TCP – experiences potential adverse effect under Option K At this time, WSDOT, on behalf of FHWA, has not made a definitive Section 106 effects determination for the project. Once a preferred alternative has been selected and all effects can be fully evaluated, a determination of effect for the project will be made. As noted in section 5.6, all effects determinations are preliminary, pending SHPO concurrence.		
Suboptions	*Adding the Lake Washington Boulevard ramp suboption to Option A would result in*	*Adding the eastbound off-ramp to Montlake Boulevard to Option K would result in a*	*Adding northbound capacity on Montlake Boulevard would result in replacement of the*

Table 5.16-1. Summary Comparison of Operation Effects of the 6-Lane Alternative Options

Element of the Environment	Option A	Option K	Option L
	increased visual effects on the NRHP-eligible Montlake Historic District and two houses that are individually NRHP-eligible, such as changes to the setting and feeling, affecting contributing properties along Lake Washington Boulevard East and 26th Avenue East.	*minimal additional effect on the Montlake Historic District.*	*three NRHP-eligible pedestrian bridges over Montlake Boulevard NE, constituting an adverse effect.*
Mitigation	As noted in section 5.6, adverse effects on historic properties must be resolved through the Section 106 process and the preparation of an MOA. Ways to avoid, minimize, and mitigate adverse effects must be reached through consultation. Consultation with WSDOT, FHWA, the SHPO, and interested tribes would be necessary to mitigate any potential adverse effect on Foster Island.		
Noise	Without noise mitigation, all options would have a somewhat smaller number of residences where noise levels exceed the Noise Abatement Criteria (NAC) than the No Build Alternative. This is because of the noise-reducing elements of the proposed design, which include lids, depressed roadway sections, and roadway realignments. The addition of lids and landscape features over the highway would be the primary reasons for the reduction in noise levels.		
Residences Exceeding the NAC	Under Option A, 249 residences would exceed the NAC. With noise walls, 94 residences would exceed the NAC.	Under Option K, 256 residences would exceed the NAC. With noise walls, 123 residences would exceed the NAC.	Under Option L, 235 residences would exceed the NAC. With noise walls, 119 residences would exceed the NAC.
Mitigation	According to WSDOT and FHWA guidelines, noise walls would be warranted for consideration along both sides of SR 520 from the Delmar Drive East lid to the west end of the Evergreen Point Bridge and along both sides of SR 520 from the east of the Evergreen Point Bridge to Evergreen Point Road. Between Montlake Boulevard NE and the Arboretum, the analysis indicated that noise walls would not meet WSDOT reasonableness or feasibility criteria. Options that include noise walls would meet all WSDOT and FHWA requirements for avoidance and minimization of negative effects. As noted above, all noise walls recommended in the design (with the exception of the south Arboretum wall under Option K) would meet WSDOT criteria for feasibility and cost-effectiveness.		
Air Quality	All options would meet air quality standards. The modeled concentrations of air pollutants are well below the 1-hour and 8-hour NAAQS for all design options.		
Suboptions	*Adding the suboptions to Option A would result in a slight increase in CO concentrations at the Montlake Boulevard/Pacific Street intersection.*		
Energy and Greenhouse Gases	All options would reduce annual energy consumption between 5 and 10 percent on SR 520 between Seattle and Medina.		
	All options would reduce greenhouse gas emissions by approximately 10 percent in the project area.		
Water Resources	All options would increase the amount of land covered by pollutant-generating impervious surfaces in the project area (Option A – 35 percent increase, Option K – 45 percent increase, and Option L – 44 percent increase). By applying stormwater treatment in the designs, all options would meet state and federal water quality regulations and would provide more water quality treatment than is required for stormwater under the specific conditions of WSDOT's HRM at several locations.		

Table 5.16-1. Summary Comparison of Operation Effects of the 6-Lane Alternative Options

Element of the Environment	Option A	Option K	Option L
Mitigation	All options would reduce overall pollutant loading compared with existing levels because stormwater would be treated before discharge.		
Ecosystems	All of the options would reduce the availability and quality of wetland and wetland buffer habitat due to filling and shading. Option K would fill the most wetland and wetland buffer area. All of the options would reduce fish habitat functions, primarily due to increased shading by the larger overwater structures. Compared to the existing structures, the proposed overwater structures are about twice as wide for all options. Option L would result in the most overwater shading in the west approach area. Option K would result in the overall greatest loss of fish habitat due to the filling for the depressed SPUI. All of the options would affect wildlife by permanently removing vegetation and wildlife habitat, and by increasing shading. Increased bridge elevation could have both positive and negative effects on wildlife movement and behavior. Option K would result in the greatest loss of wildlife habitat.		
Wetlands	Option A would fill 0.1 acre of wetland and 0.7 acre of wetland buffer. Option A would shade 3.2 acres of wetland and 0.9 acre of wetland buffer.	Option K would fill 1.8 acres of wetland and 5.4 acres of wetland buffer. Option K would shade 2.8 acres of wetland and 0.1 acre of wetland buffer.	Option L would fill 0.3 acre of wetland and 1.5 acres of wetland buffer. Option L would shade 4.3 acres of wetland and 1.3 acres of wetland buffer.
Suboptions	*Adding the Lake Washington Boulevard ramps to Option A would fill an additional <0.1 acre of wetland and an additional 0.1 acre of wetland buffer. It would also shade an additional 0.1 acre of wetland.*	*Adding the eastbound off-ramp to Montlake Boulevard to Option K would fill an additional <0.1 acre of wetland and an additional <0.1 acre of wetland buffer.*	*Adding northbound capacity on Montlake Boulevard would fill an additional <0.1 acre of wetland and an additional <0.1 acre of wetland buffer, and would shade an additional <0.1 acre of wetland.*
Fish Resources	Option A would result in the most shading through Portage Bay – 5.7 acres. Option A would be higher than Options K and L, and the existing bridges through Union Bay and east of Foster Island. It would result in 16.1 acres of shading in the Montlake and west approach areas.	Option K would result in the least shading through Portage Bay – 4.6 acres. Option K would be below the high-water elevation east of the Montlake shoreline, and much lower than the other options through Union Bay and east of Foster Island. It would result in filling approximately 2.7 acres of aquatic habitat and 10.3 acres of shading in the Montlake and west approach areas.	Option L would result in 4.8 acres of shading through Portage Bay. Option L would be higher than Option K, but lower than Option A. It would result in 12.5 acres of shading in the Montlake and west approach areas.
Suboptions	*Adding the Lake Washington Boulevard ramps to Option A would shade an additional 2.3 acres of aquatic habitat in the west approach*		

Table 5.16-1. Summary Comparison of Operation Effects of the 6-Lane Alternative Options

Element of the Environment	Option A	Option K	Option L
	area. *Adding the constant-slope profile to Option A would result in a bridge height similar to Option L in the west approach area.*		
Wildlife Habitat	Option A would remove 11.4 acres of mostly the Urban Matrix cover type, evenly spread among all areas.	Option K would remove 19.5 acres of mostly the Urban Matrix cover type, with most in the Montlake area.	Option L would remove 10.8 acres of mostly the Urban Matrix cover type, with effects evenly distributed among the geographic areas.
Suboptions	*Adding the Lake Washington Boulevard ramps to Option A would remove an additional 0.2 acre of vegetation in the west approach area.*	*Adding the eastbound off-ramp to Montlake Boulevard to Option K would remove an additional <0.1 acre of vegetation in the Portage Bay area.*	*Adding the northbound capacity on Montlake Boulevard to Option L would remove an additional 0.1 acre of vegetation in the Montlake area.*
Mitigation	Compensatory mitigation would be required for all of the 6-Lane Alternative design options. The information presented in this section is from the Initial Wetland and Aquatic Habitat Mitigation Plans for the SR 520, I-5 to Medina project, which are included as Attachment 9 to this SDEIS. The final compensatory mitigation for the project will be a comprehensive package designed to meet the requirements of the Federal Rule on Compensatory Mitigation and to be consistent with federal and state "no net loss" policies. The project would also be designed to meet the mitigation sequencing, compensation, reporting, and monitoring requirements typically used in WSDOT projects.		
Geology and Soils	All options include designing bridge columns to withstand seismic motion, and/or excavating areas of vulnerable soils and replacing them with stronger material. Option A would have a lower risk of damage from liquefaction and long term settling than Options K or L. This is because Options K and L both have a large structure-supported interchange (SPUI) located at the Montlake shoreline.		
		The risk of damage to the below-water facilities for Option K would be greater than if the interchange were constructed above water.	
Mitigation	All options would be designed to WSDOT and AASHTO design standards to address seismic loading, bridges, retaining walls, and other components of the project.		
Hazardous Materials	Project operations would include a variety of hazardous materials (fuels, lubricants, asphalt, paint, solvents, etc.) being transported along the SR 520 corridor. Any time such materials are transported, there is a risk that they could be accidentally released to the environment.		
		Under Option K, operational restrictions on hazardous materials transport through the tunnel may be employed to minimize fire and explosion risk.	
Mitigation	Project stormwater facilities would reduce the risk of hazardous material spills to waters of the state by collecting and treating polluted runoff from traffic operations.		

Table 5.16-1. Summary Comparison of Operation Effects of the 6-Lane Alternative Options

Element of the Environment	Option A	Option K	Option L
Navigation	Under all options the west transition span of the new Evergreen Point Bridge would be 3 feet lower than the No Build Alternative, the draw span would be removed, and the east transition span would be 15 feet higher. The changes would impose a height restriction of 70 feet for vessels passing under the new Evergreen Point Bridge. Boats with an overhead clearance of more than 41 feet would only be able to pass under the east transition span.		
	Under Option A, the new bascule bridge would coordinate openings with the existing bridge and would not pose height restrictions.		Under Option L, the new bascule bridge would coordinate openings with the existing bridge and would not pose height restrictions.
Mitigation	The permanent effect of a height restriction for vessels passing under the new Evergreen Point Bridge has been minimized by increasing the new east navigation channel's maximum vertical clearance to 70 feet, which is similar in height to the I-90 east channel bridge clearance of 71 feet.		

Table 5.16-2. Project Operation and Permanent Effects – Quantitative Impacts Summary

Element	Type of Effect	Operation Effects		
		Option A	Option K	Option L
5.1 Transportation		Please see qualitative effects summary in Table 5.16-1.		
5.2 Land Use and Economics	Land converted to right-of-way (acres)	11.1	15.7	11.9 (1.4)
	Full parcel acquisitions	7	6	5
5.3 Social Elements		Please see qualitative effects summary in Table 5.16-1.		
5.4 Recreation	Parks effects (acres)	5.55	7.55	7.05
5.5 Visual Quality		Please see qualitative effects summary in Table 5.16-1.		
5.6 Cultural Resources		Please see qualitative effects summary in Table 5.16-1.		
5.7 Noise	Residences where noise levels would approach or exceed the NACs – without noise walls	249	256	235
5.8 Air Quality	Local NAAQS violations	0	0	0
5.9 Energy and Greenhouse Gases	Estimated gallons of fuel (millions) consumed annually during operation (2030)	39.8	40.7	40.7
	GHG emissions in metric tons of carbon dioxide equivalents (MT CO2e) as compared to No Build Alternative	-10%	-9%	-9%
5.10 Water Resources	Total pollutant generating impervious surface area (acres)	77.5[a]	93.3[a]	87.0[a]
5.11 Ecosystems	Wetland fill (acres)	0.1 (<0.1)	1.8 (<0.1)	0.3 (<0.1)
	Wetland buffer fill (acres)	0.7 (0.1)	5.4 (<0.1)	1.5 (<0.1)
	Wetland shading (acres)	3.2 (0.1)	2.8	4.3 (<0.1)
	Wetland buffer shading (acres)	0.9	0.1	1.3
	Wetland mitigation needed (acres)	0.2[b]	4.05[b]	0.55[b]
	Aquatic habitat filled (acres)	0.5 (0.01)	2.7 (0.01)	0.6
	Vegetation removal (acres)	11.4 (0.2)	19.5 (<0.1)	10.8 (0.1)
	Overwater structures (acres)	49.2 (2.3)	48.8	52.3
5.12 Geology and Soils		Please see qualitative effects summary in Table 5.16-1.		
5.13 Hazardous Materials		Please see qualitative effects summary in Table 5.16-1.		
5.14 Navigation		Please see qualitative effects summary in Table 5.16-1.		

[a]Adding the suboptions to Option A, K, or L would slightly increase the amount of PGIS.

[b] Wetland impacts added by the suboptions would be mitigated at the same ratio as other effects, resulting in slightly greater mitigation needs compared to the base options.

Note: Additional effects that would result from adding the suboptions to the options are shown in parentheses.