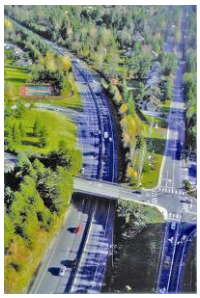




Chapter 5: Project Operation and Permanent Effects

This chapter focuses on the permanent effects that the Preferred Alternative and the SDEIS 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. It also describes the permanent direct and indirect effects, both positive and adverse, that the project would have on the built and natural environment.

What type of effects did WSDOT evaluate?

(a) Direct effects, which are caused by the project and occur at the same time and place.

(b) Indirect effects, which are caused by the project and are later in time or farther removed in distance, but are still reasonably foreseeable.

(c) Cumulative effects, which are caused by the incremental effect of the project when added to other past, present, and reasonably foreseeable actions. Chapter 7 addresses the cumulative effects for this project.

5.1 Transportation

The transportation analysis conducted for the Final EIS evaluated an updated No Build Alternative and the Preferred Alternative. The Preferred Alternative and the SDEIS options are designed to improve the corridor safety and mobility by addressing traffic flow and operations of SR 520 and access between the freeway and the local road system. As part of the mobility improvements on the corridor, the Preferred Alternative and the SDEIS options A, K, and L would also improve transit connections and reliability, as well as the interactions of nonmotorized transportation (bicycles and pedestrians) with cars, trucks, and buses along SR 520. This section provides a summary of findings from the SDEIS, which included an analysis of the No Build Alternative and Options A, K, and L, and compares them with the findings from the updated Final EIS No Build Alternative and Preferred Alternative analyses.

How was traffic evaluated for this project?

WSDOT used the Puget Sound Regional Council (PSRC) four-county travel demand model that was updated in 2006 to identify where and how traffic volumes would increase as a result of the growth in population and employment. Taking into account the projected population and employment growth, the transportation analysis identified the average daily traffic by evaluating the number of people and vehicles expected to move through the study area over the course of a day, in terms of person demand (the number of people forecasted to need to travel through an area) and vehicle demand (the number of vehicles forecasted to want to travel through an area). WSDOT also evaluated peak period traffic that would occur on SR 520 during the busiest times of day—in terms of the morning and evening commute times when demand would be highest and traffic conditions would likely be the worst—and modeled the anticipated throughput (the number of vehicles or persons forecasted to be able to travel through an area) for those peak times. Mode choice (the type of vehicle—whether single occupant vehicle, carpool, bus or other type of multi-person transit) was a factor in identifying how much person throughput (number of people modeled who would be likely to make a trip) would occur on cross-lake roadways (I-90 and SR 520) by vehicle type. This led to findings about congestion and travel times on SR 520 under the No Build Alternative and build alternatives during those peak periods, and provided more information about how the highway would operate under all alternatives. WSDOT forecasted traffic volumes on the local streets and at intersections within the study area to determine how local streets would function and intersection levels of service (LOS, a measure of intersection operations) that would be expected with each alternative.

How have growth projections used in the travel demand model changed since the SDEIS?

The population and employment information used for the Final EIS travel demand model has been supplemented by the Puget Sound Regional Council (PSRC) since publication of the SDEIS.

The SDEIS used the population growth estimates that were current at the time, which predicted that the region would add 1.1 million people and 850,000 new jobs between 2010 and 2030. For the SDEIS, this led to a finding that traffic on area roadways would increase by 50 percent. The updated growth estimates used for the Final EIS showed an increase of 1 million people and 640,000 jobs, resulting in an estimated 40 percent increase in traffic by 2030. While less than the previous estimate, this is still a substantial level of traffic growth to be absorbed by an already overburdened transportation system.

The lower increases in employment and population used for the Final EIS generally resulted in less demand for area roadways. Lower levels of demand resulted in lower levels of congestion on study area highways than described in the SDEIS. Nevertheless, as discussed in this chapter, traffic growth would continue to increase congestion on SR 520 between now and 2030. The Preferred Alternative would reduce traffic and congestion on SR 520 compared to the No Build condition without appreciably increasing it on alternate routes. Similar relative findings would likely result for Options A, K, and L as they were described in the SDEIS.

How does the traffic analysis for the Final EIS differ from the analysis conducted for the SDEIS?

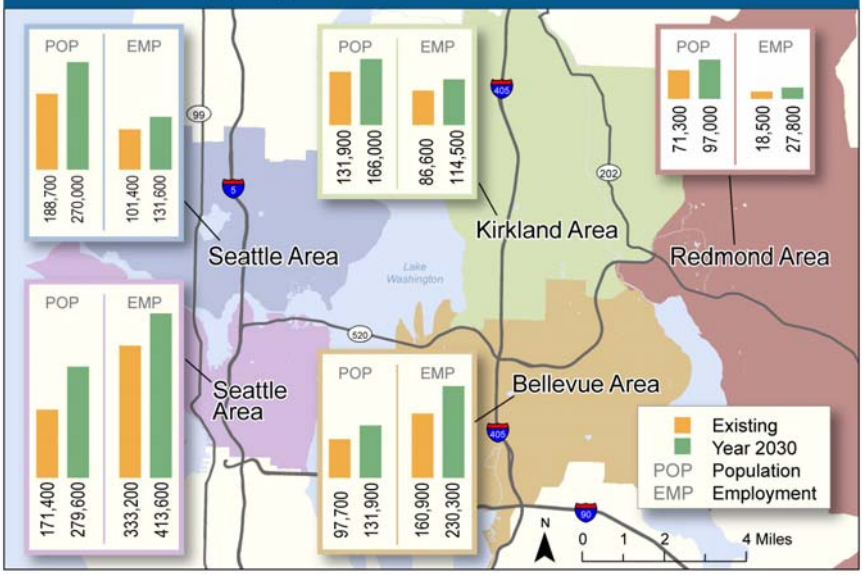
The first step in analyzing traffic for both the SDEIS and the Final EIS was to determine how much the traffic on area roadways is estimated to grow in the region by the year 2030. As noted in the text box on the previous page, this analysis was updated between the SDEIS and the Final EIS because the PSRC released an updated travel demand model and new data to supplement their population and employment estimates. The new estimates indicate that between today and the year 2030, the region's population is expected to grow by 1 million people and employers in the region are likely to add over 640,000 new jobs. This higher population and the expanded employment opportunities generate a need to accommodate close to 40 percent more traffic (PSRC 2010e) on area roadways. This is less than the 50 percent traffic growth estimated under the SDEIS; however, it still represents a large additional increment of demand on a transportation system that is already over capacity for many hours on weekdays. Projected population and employment growth for selected Seattle and Eastside areas are shown on Exhibit 5.1-1. Both Seattle and Eastside 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.

How did the updated transit assumptions affect the travel demand model used in the Final EIS?

The more extensive light rail network that will be operational by 2030 will provide new travel options to meet demand. Use of light rail by commuters is expected to change vehicle volumes on roadways throughout the region, as well as within the SR 520 corridor.

For instance, with the connection of the North Link and East Link light rail systems, transit riders could have a "one seat" transit trip between Northgate and Seattle on the west side of Lake Washington to Mercer Island, Bellevue, and Overlake on the east side of the lake. With this type of new service, some transit riders that today use SR 520 bus service are forecasted to use light rail service across I-90.

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



As with the SDEIS, the analysis for the Final EIS was completed in a manner consistent with regional plans and policies in place at the time of the analysis. The transportation system modeled for the Final EIS uses some different assumptions than those used for the SDEIS about the road improvements and transit services that would be in place by 2030.

The Final EIS analysis also includes the latest assumptions for tolling on SR 520 as outlined through the Washington State Legislature in Engrossed Substitute Senate Bill (ESSB) 6392. See Chapter 1 for more information on tolling assumptions. Table 5.1-1 summarizes the differences in daily traffic assumptions between the SDEIS and Final EIS analyses.

Table 5.1-1. Comparison of SDEIS and Final EIS Traffic Modeling

Assumption	SDEIS	Final EIS
Transportation System	Included road and transit projects that were planned and funded when transportation analysis began in spring 2008. East Link light rail and other Sound Transit 2 (ST2) improvements were not included because they had not yet been approved by voters.	Includes road and transit projects that were planned and funded when transportation analysis began in spring 2010. All of the ST2 improvements, including East Link light rail, approved by voters are reflected in the analysis.
Regional Land Use and Economy	Included up-to-date factors for population, employment, and user costs, which were periodically updated based on new regional data.	Uses updated population and employment forecasts provided by PSRC.
2030 Modeling Scenarios	Travel demand and operations analysis for direct project effects: • No Build Alternative – No toll • 6-Lane Options A, K, and L – Segmental toll Travel demand evaluation: • Tolled 4-Lane Alternative	Travel demand and operations analysis for direct project effects: • No Build Alternative – No toll • Preferred Alternative – Single-point toll Travel demand evaluation: • No Build • Tolled, transit-optimized 4-Lane Alternative • 6-Lane Alternative with initial light rail transit (LRT)
Tolling Locations	Included segmental tolling, from an earlier (2007) toll finance analysis, which would have collected smaller tolls at more locations along the SR 520 corridor between I-5 and I-405.	Includes single-point tolling, which was authorized by the legislature in 2009 after analysis by the Tolling Implementation Committee. Tolls to cross Lake Washington on SR 520 would be collected at a single location on the Evergreen Point Bridge.

See Chapter 2 for a more detailed description of the travel demand evaluations.

For the SDEIS, tolling on the SR 520 corridor was assumed to be "segmental." This meant that tolls would be collected from people who traveled between interchanges, but did not necessarily cross the SR 520 floating bridge. In the Final EIS, this was changed to assume a single-point toll (tolls would only be collected for trips that cross the SR 520 floating bridge). The modification occurred after an extensive outreach process was completed with the Tolling Implementation Committee (discussed in Chapter 1) in 2008. They found through their outreach program that there was very little support for segmental tolling and that the benefits of additional revenue might not offset the management costs. Therefore, single-point tolling has been assumed for the Final EIS transportation modeling.

How would a tolled No Build Alternative compare with the untolled No Build Alternative evaluated in this EIS?

Traffic modeling for the Draft EIS, the SDEIS, and this Final EIS have all assumed that the 2030 No Build Alternative would not include a toll on SR 520. Section 1.11 explains the reasons for this assumption. However, FHWA and WSDOT recognize that SR 520 might be tolled in 2030 for reasons unrelated to the SR 520, I-5 to Medina project. In order to determine how this might affect the traffic modeling results, WSDOT performed a sensitivity analysis, which is included in Attachment 19.

In the sensitivity analysis, WSDOT used the PSRC travel demand model to estimate traffic volumes on a tolled 4-lane SR 520 in 2030. The tolling assumptions used were the same as those discussed in Chapter 1 and Table 5.1-1. The results of the analysis can be summarized as follows:

- Overall vehicle-trips and person-trips on SR 520 would be lower with a tolled No Build Alternative than with either the untolled No Build Alternative or the Preferred Alternative because the tolls would reduce travel demand in the SR 520 corridor.
- Transit and HOV use would increase with a tolled No Build Alternative, but only by about half as much as they would under the Preferred Alternative. Although the toll would cause some drivers to switch to transit and carpooling, the four existing general-purpose lanes would not provide the travel time and reliability benefits of the dedicated HOV lanes. Hence, there would be less incentive to switch to transit in the SR 520 corridor.
- The tolled No Build Alternative would move about 10,000 fewer people each day through the SR 520 corridor than the untolled No Build Alternative, and about 20,000 fewer people than the Preferred Alternative. In other words, the mobility benefits of the Preferred Alternative are even greater when compared to a tolled No Build Alternative than they are compared to the untolled No Build Alternative used for the EIS analysis.
- Vehicle miles traveled (VMT) would be slightly higher for the Preferred Alternative than for a tolled No Build Alternative, and therefore would result in slightly higher energy use and greenhouse gas emissions in the SR 520 corridor. At a subregional level, the difference between the Preferred Alternative and either a tolled or untolled No Build Alternative in VMT, energy use, and greenhouse gas emissions is expected to be negligible.
- The changes in traffic volume between a tolled and untolled No Build Alternative would not be large enough to affect noise modeling results for the Preferred Alternative.

In response to comments on the SDEIS, WSDOT also evaluated a 4-lane SR 520 with higher tolls to determine whether it could achieve transit benefits similar to those of a dedicated HOV lane. The results of that analysis are discussed in Section 2.4 of this Final EIS.

The differences in predicted traffic volumes and operations between Option A from the SDEIS and the Preferred Alternative as a result of the updated modeling are summarized in Table 5.1-2 and are also highlighted in this section's traffic discussion. Option A is used for comparison because its configuration is most similar to that of the Preferred Alternative. As discussed above, the differences are largely due to the changes in travel demand modeling assumptions rather than differences in how Option A and the Preferred Alternative would operate. More information is provided in the following section.

Table 5.1-2. SR 520 Cross-lake Trips, Year 2030 Daily

Alternative	SDEIS	Final EIS	Findings
No Build Alternative	135,000	127,400	
Option A	131,000 (-3% compared to No Build)	Not updated	Traffic volumes decrease compared to No Build due to addition of toll on the corridor and increased use of HOV lane.
Option A with Suboptions	132,400 (-1% compared to No Build)	Not updated	Not much different than Option A because traffic is mostly governed by 6-lane SR 520 corridor.
Options K, L, and Options K, L with Suboptions	133,800 (-1% compared to No Build)	Not updated	Not much different than Option A because traffic is mostly governed by 6-lane SR 520 corridor.
Preferred Alternative	Not applicable	120,900 (-5% compared to No Build)	Decrease similar to No Build, as shown under Option A in the SDEIS. Additional decrease for 6-Lane Alternative due to travel demand model sensitivity to toll.

How did WSDOT compare the results of the SDEIS and Final EIS transportation analyses?

As discussed above, the use of updated road project, transit service, and tolling assumptions in the travel demand model for the Final EIS analysis led to lower overall projected vehicle and transit demand on study area highways than was projected as part of the SDEIS analysis. This overall finding was true for both the Final EIS No Build Alternative and the Preferred Alternative because both were based on the same PSRC assumptions about traffic growth. These highway findings also affected local traffic and intersection operations. This means that the numeric findings for the SDEIS options cannot be directly compared to those for the Preferred Alternative, since they are based on different baseline conditions. However, the potential effects of the SDEIS options and the Preferred Alternative can be compared in a relative manner. WSDOT reviewed Options A, K, and L as presented in the SDEIS relative to the No Build Alternative, and reviewed the Preferred Alternative relative to the Final EIS No Build Alternative. WSDOT then considered how the SDEIS options would affect the environment relative to the No Build condition and how the Preferred Alternative would affect the environment relative to the Final EIS No Build condition. The degree of improvement in freeway operations and travel times under the Preferred Alternative compared to No Build is relatively similar to the improvement under the SDEIS options compared to No Build. For each topic of discussion below, there is a comparison of the effects of Options A, K, and L to those of the Preferred Alternative. Comparisons are provided in Tables 5.1-2, 5.1-3, and 5.1-4 that describe daily, average morning peak hour, and average afternoon peak hour traffic volumes.

How does tolling affect transportation?

The project demand model was updated to represent the most current transportation network, tolling assumptions, land use, and transit data for the Final EIS analysis. For the transportation analysis included in this Final EIS, HOVs (3+ carpools and buses) were assumed to be exempt from tolling. Tolling on SR 520—along with completion of the HOV lane, which would make transit a faster and more reliable choice—would reduce daily vehicle volumes across SR 520 by up to 6,500 vehicles (or 5 percent) compared to the updated No Build Alternative. This is because some people would choose to take other modes of travel (such as transit, carpools, vanpools, or bicycles), change their time of travel, or select a different route. Chapter 1 includes more information on project tolling assumptions.

Daily SR 520 cross-lake trips under the Final EIS No Build Alternative are lower than the SDEIS No Build Alternative forecasts. Similarly, the SDEIS options would result in proportionately lower daily trips using the Final EIS model updates. An increase in population and employment on the Eastside associated with the planned Bel-Red corridor land use updates may reduce the number of cross-lake trips. Also, light rail across I-90 may reduce the number of trips made across the lake in private vehicles.

Table 5.1-2 illustrates a comparison of year 2030 daily cross-lake vehicle trips between the SDEIS options and SDEIS No Build Alternative. Each of the options evaluated in the SDEIS showed a decrease in daily traffic compared to the SDEIS No Build Alternative. The same pattern is seen in the Final EIS analysis that was completed for the Preferred Alternative and Final EIS No Build Alternative. It is anticipated that Option A, with or without the Lake Washington Boulevard ramps, would result in daily cross-lake trips similar to the Preferred Alternative, if they were evaluated using the updated Final EIS model. It is further anticipated that if the SDEIS options were rerun in the new model, Options K and L would have slightly

higher daily traffic volumes than the Preferred Alternative. If the SDEIS options were updated to reflect current regional plans and policies, it is expected that the daily cross-lake travel demand for SR 520 would be in the range of 120,000 to 127,000 vehicles, which is the range of daily travel demand results for the Final EIS shown in Table 5.1-2.

When are the peak traffic periods on SR 520?

While daily trips are expected to decrease with the Preferred Alternative compared to No Build, during the peak period traffic volume growth still occurs at levels similar to the SDEIS options. This is because most trips made during the peak commute periods are employment-based trips.

The Preferred Alternative and the SDEIS options would all reduce congestion on the corridor and improve vehicle throughput. This would be achieved by reducing the number of bottlenecks on the corridor through measures such as providing shoulders on the floating bridge and extending the HOV lane to I-5 under the Preferred Alternative.

During the morning peak period, the SDEIS No Build and Final EIS No Build Alternative serve 7,600 vehicles per hour (vph) cross-lake. Volumes are consistent between the two models because this represents the throughput of the highway at peak operating conditions (Table 5.1-3). Throughput is primarily a function of the highway design, and is also influenced by the amount of travel demand at a particular time. In other words, the capacity of each design option is constant regardless of variations in travel demand assumptions. The actual throughput during peak periods is closely related to the capacity, with some variation resulting from differences in travel demand.

Table 5.1-3. SR 520 Cross-lake Traffic Throughput, Year 2030 Peak Periods

	AM Peak Period		PM Peak Period		
Alternative	**SDEIS**	**Final EIS**	**SDEIS**	**Final EIS**	**Findings**
No Build Alternative	7,600 vph	7,600 vph	7,400 vph	7,600 vph	Due to capacity constraints on the corridor, the vehicle throughput is the same for the SDEIS and Final EIS No Build Alternatives.
Option A	8,100 vph	Not applicable	7,800 vph	Not applicable	Would likely have similar results if the model were rerun.
Option A with Suboptions	8,400 vph	Not applicable	7,900 vph	Not applicable	Would likely have similar results if the model were rerun.
Options K, L, and Options K, L with Suboptions	8,600 vph	Not applicable	8,400 vph	Not applicable	Would likely have similar results if the model were rerun.
Preferred Alternative	Not applicable	8,300 vph	Not applicable	7,900 vph	Would fall between Option A and Option A with suboption volumes, similar to daily volume comparison.

In the SDEIS morning peak hour analysis, all options would serve between 8,100 and 8,600 vph, an improvement over the SDEIS No Build Alternative. In the Final EIS analysis, the Preferred Alternative would increase the amount of traffic served to 8,300 vph, similar to Option A with the suboption to add Lake Washington Boulevard ramps. It is estimated that if the SDEIS options were updated to reflect current regional plans and policies, the cross-lake trips served would be consistent as reported in the SDEIS (ranging from 8,100 to 8,600 vph).

Afternoon peak hour findings are similar to the morning peak hour. Throughput volumes are consistent between the SDEIS and Final EIS models because of the close relationship between throughput and the highway design. As the SR 520 and adjacent corridors reach congested levels, cross-lake volumes are expected to approach 7,400 to 7,600 vph in the No Build Alternative configuration. In the SDEIS, we found that all 6-Lane Alternative options would serve between 7,800 and 8,400 vph, an improvement over the No Build Alternative. In the Final EIS, we found that the Preferred Alternative increased the amount of afternoon peak hour traffic served to 7,900 vph, similar to Option A with the suboption (Table 5.1-3). It is estimated that if the SDEIS options were updated to reflect current regional plans and policies, the amount of morning peak hour cross-lake trips served would be consistent as reported in the SDEIS (ranging from 7,800 to 8,400 vph).

Demand and Throughput

Demand is a term used to refer to the number of people and/or vehicles that are expected to use a given roadway during a particular time period. Throughput refers to the number of people and/or vehicles that the roadway can actually carry during that period.

More about Travel Demand

Planners use the terms *person demand* and *vehicle demand* to help evaluate and understand total volumes of people and vehicles traveling and the modes of travel that people may choose (e.g., carpools, buses, or single occupant vehicles). Person demand means the number of people who would choose to travel a route, regardless of how many vehicles they would be in. Vehicle demand is then used to relate the likely number of vehicles to the number of persons traveling to identify likely modes of travel for given routes.

How much traffic would cross Lake Washington daily in 2030?

Daily and peak hour traffic volumes were described in the previous section to illustrate the relationship between the SDEIS options (A, K, and L) and the Final EIS Preferred Alternative. This section describes how the changes in traffic volume on SR 520 correlate with traffic volume changes on the two other primary alternate routes (SR 522 and I-90).

Final EIS No Build Alternative and Preferred Alternative

Without the project, the average daily volumes of traffic on SR 520, SR 522, and I-90 would be slightly less than (although similar to) the volumes expected under the SDEIS No Build condition. As seen in Exhibit 5.1-2, traffic on SR 520 and SR 522 without the project would increase by 11 percent and 9 percent, respectively, over existing conditions. Forecasts show that there would be little to no change in traffic volumes on I-90 compared to today because light rail would be in place on I-90, resulting in less vehicular growth on that corridor while still moving more people.

The Preferred Alternative would result in 5 percent lower volumes of traffic on SR 520 than the Final EIS No Build condition, and slightly more traffic on both SR 522 (2 percent) and I-90 (1 percent). The increases on SR 522 and I-90 would result from people diverting from SR 520 to non-tolled

Exhibit 5.1-2. Daily Vehicle Demand Volumes on SR 522, SR 520, and I-90

SR 522 West of 61st Ave NE

ALTERNATIVE	VEHICLES	% CHANGE
Existing Conditions	49,000	
Year 2030 No Build Alternative	53,200	9%[1]
Year 2030 Preferred Alternative	54,400	2%[2]

SR 520 at Mid-span

ALTERNATIVE	VEHICLES	% CHANGE
Existing Conditions	115,000	
Year 2030 No Build Alternative	127,400	11%[1]
Year 2030 Preferred Alternative	120,900	-5%[2]

I-90 at West Bridge

ALTERNATIVE	VEHICLES	% CHANGE
Existing Conditions	149,000	
Year 2030 No Build Alternative	149,400	0%[1]
Year 2030 Preferred Alternative	151,500	1%[2]

[1] Compared to existing conditions
[2] Compared to year 2030 No Build Alternative

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

routes across the lake. Traffic volumes on all three of these roadways would still be higher than today under both the No Build and build alternative conditions.

Exhibit 5.1-3 compares expected vehicle demand and person demand on SR 520 in 2030. Note that overall demand for transit in the SR 520 corridor is expected to decrease by 2030 because implementation of the East Link project would absorb much of the demand for cross-lake transit. However, significantly more people per day (39 percent) would choose to travel across SR 520 in carpools or by bus under the Preferred Alternative than under No Build. This is because transit would be a more attractive option, allowing users to avoid the toll and also to gain the benefit of increased transit speed and reliability in the HOV lanes.

Even considering that relatively more people would choose to travel in carpools or by bus in 2030, the total (person and vehicle) demand would exceed throughput on SR 520 during the peak periods with the Preferred Alternative because of congestion within the general transportation system, as demonstrated by Exhibit 5.1-4. Even with the proposed improvements, the roadway would simply not have the capacity to handle the traffic.

More about Throughput

Throughput refers to the number of vehicles that a roadway can actually carry during a particular 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 way of saying that a roadway has more traffic than it can handle.

Exhibit 5.1-3. Daily Vehicle and Person Demand by Mode Across the SR 520 Bridge (mid-span)

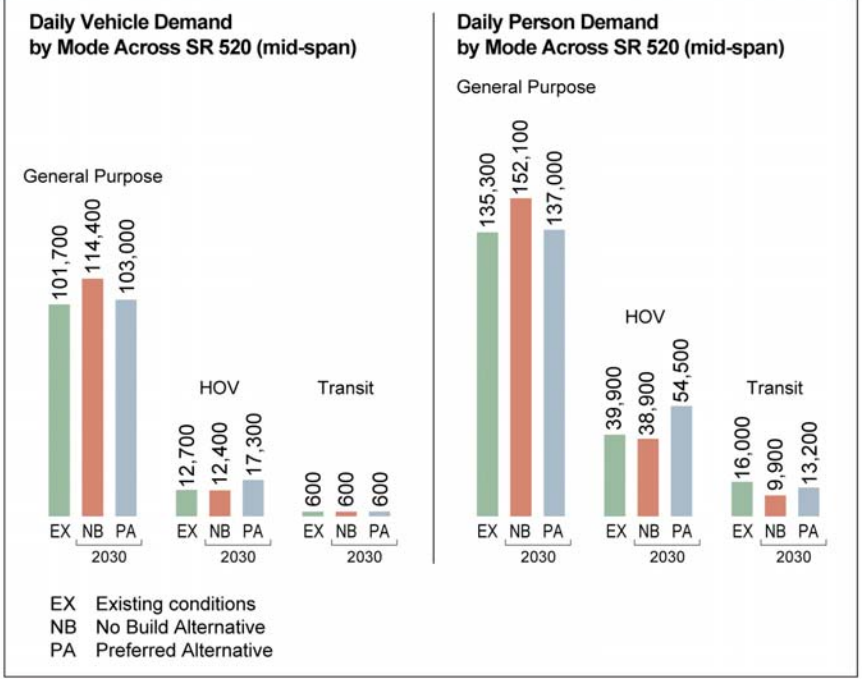
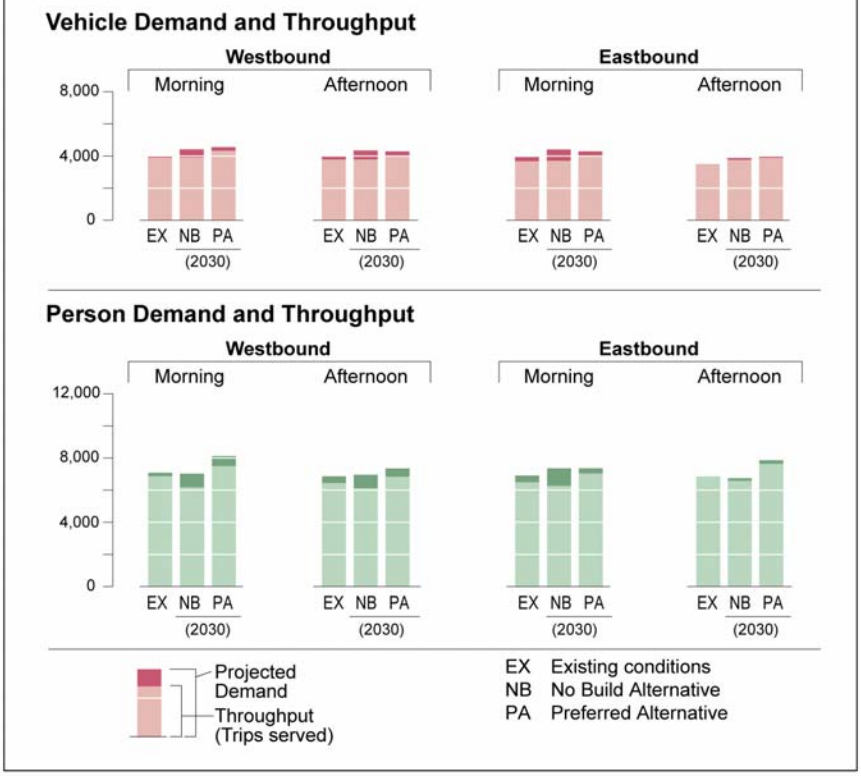


Exhibit 5.1-4. Traffic Demand and Throughput during Peak Periods Today and in 2030



However, as noted above, a significant benefit of the project would be the continuous HOV lanes and new transit access facilities, which would increase transit and HOV use and reliability.

The next section discusses the effects (including benefits to both general purpose and HOV travel times) with the project compared to the effects without it. Since the peak periods represent the worst-case scenario on local roadways and freeways, the following discussion focuses on the findings about SR 520 and local roadway operations during the morning and evening peak periods.

SDEIS No Build Alternative and Options A, K, and L

While average daily vehicle traffic is expected to grow considerably between now and 2030, the vehicle demand for the SDEIS options is not expected to be much different than for the SDEIS 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 by traveling in a bus or carpool or on a different corridor, or canceling their trip entirely. 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 SDEIS options 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 5.1-4).

Table 5.1-4. SDEIS Analysis – Daily Vehicle Demand – Area Freeways

Alternative	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

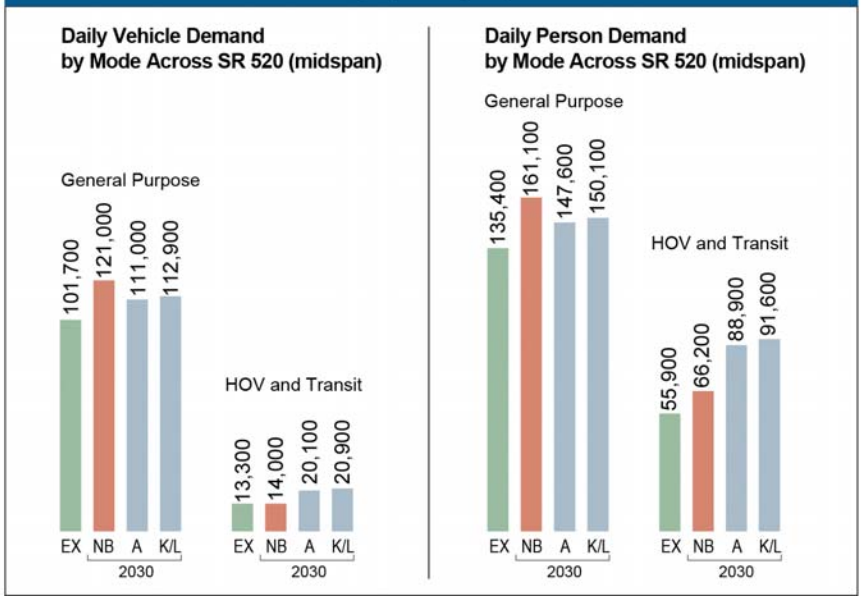
Note: Adding the suboptions to Options A, K, and L would result in no substantial change in the daily vehicle demand listed in this table.

However, daily person demand on SR 520 is expected to increase more under the SDEIS options than under 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 SDEIS options would carry up to 6 percent more people per day than the SDEIS No Build Alternative in about the same number of vehicles. Changes in daily person demand between now and 2030 are summarized in Exhibit 5.1-5. All options result in improved person mobility in fewer vehicles. This is the result of completing the HOV lane system and tolling the bridge.

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.

Exhibit 5.1-5. **SDEIS Analysis – Daily Vehicle and Person Demand by Mode Across the SR 520 Bridge (mid-span)**



It is anticipated that if the SDEIS options were updated to reflect current regional plans and policies, they would show similar vehicle and person trip demand as shown for the Preferred Alternative while maintaining their relative differences.

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. This section discusses freeway operations in terms of congestion during the peak periods of the day, including how congestion affects travel times.

Before looking at the details of operations for the east and west directions by peak time of day below, we can summarize freeway operations by saying that, without the project, congestion and travel times during the morning and evening commute would continue to worsen over existing conditions. Similar to the SDEIS findings about Options A, K, and L, the Preferred Alternative would reduce congestion and travel times for both general purpose and HOV trips, particularly during the westbound afternoon and eastbound morning peak periods. The project would also improve transit travel times and provide more reliable bus timing with the new HOV lanes. However, even with the improved throughput and travel times, not all the forecasted demand for SR 520 in 2030 would be served, due to congestion on I-405 and I-5.

Peak Period versus Peak Hour

When we refer to **peak period** in this analysis, we are referring to a 4-hour peak period.

The morning peak period for the SR 520 I-5 to Medina project occurs weekdays between 6:00 a.m. and 10:00 a.m. The evening peak period occurs weekdays between 3:30 p.m. and 7:30 p.m.

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

The project would improve the ramp designs for the Montlake Boulevard interchange with SR 520 in the study area to current design standards, which would address current safety issues and is expected to lead to:

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

Since the SDEIS analysis, there have been changes in regional planning and policies that would affect the year 2030 No Build and build alternative conditions. These include the following:

- The travel demand model used for the program has been updated for the Final EIS to be consistent with the current PSRC model for year 2030 conditions.
- ST2 improvements were assumed complete in the year 2030 in the Final EIS analysis. This includes light rail on I-90, which reduces the person trips on SR 520 compared to the SDEIS analysis in the year 2030.
- The build alternative was assumed to be tolled under both the SDEIS and Final EIS analyses. However for the SDEIS analysis, the toll was defined as a segmental toll. This means trips that used SR 520 but did not cross the lake would also pay a toll. Since the SDEIS was published, legislation has determined that the toll associated with the build alternative would be a single-point toll. This means only trips that use the Evergreen Point Bridge would pay the toll.

The following describes the Final EIS No Build and Preferred Alternative forecasted traffic operations for SR 520 and I-5 (express lanes and the main line). Following the Final EIS findings is a summary of the SDEIS No Build Alternative and 6-Lane Alternative options. Exhibits from the SDEIS are included and a description of how the SDEIS options would operate if they were rerun in the Final EIS travel demand model.

What do the project's travel times assume about the Eastside portion of SR 520?

All travel times shown in this chapter, including the updated No Build, assume that the SR 520, Medina to SR 202: Eastside Transit and HOV Improvement Project is completed. The SR 520, Medina to SR 202 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.

Final EIS No Build Alternative and Preferred Alternative

Morning Peak Period - Westbound

In 2030 without the project, SR 520 would continue to be congested approaching the Evergreen Point Bridge from the Eastside because of the termination of the HOV lane near the floating bridge east approach in Medina (Exhibit 5.1-6; Exhibit 5.1-7 shows the average travel times). Congestion would last several hours.

Average travel times during the peak period for the Final EIS 2030 No Build Alternative between SR 202 and I-5 would be 27 minutes for general

Exhibit 5.1-6. **Westbound Areas of Congestion during the Morning Commute Peak Period**

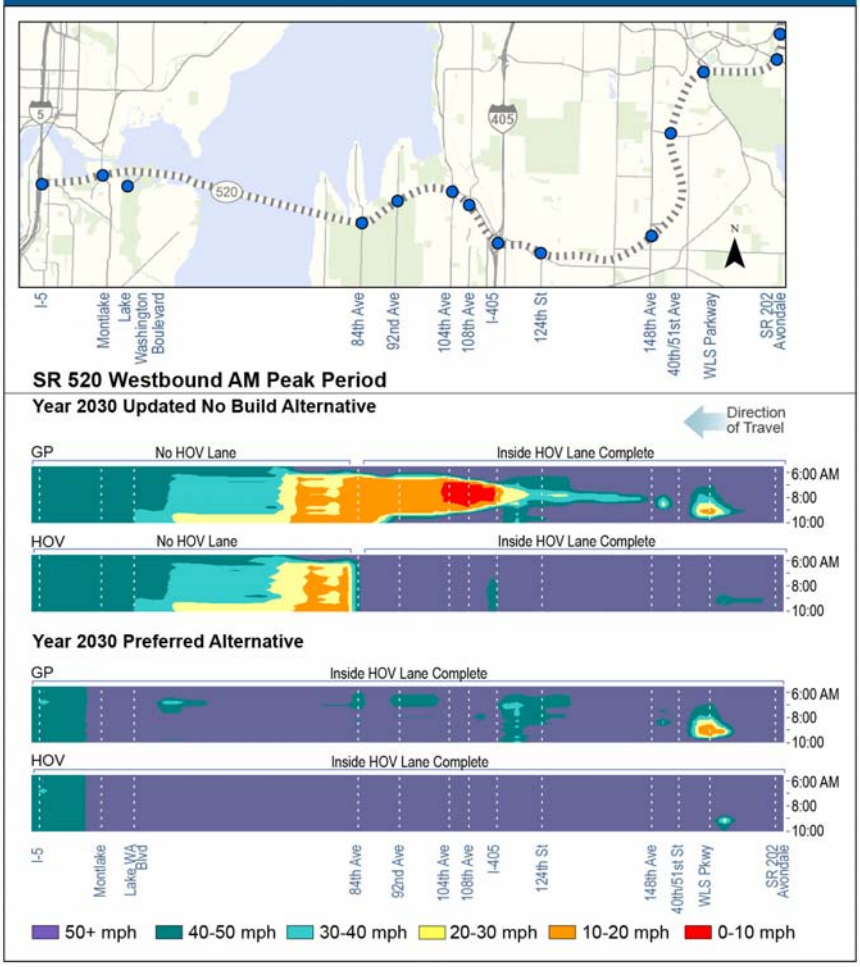
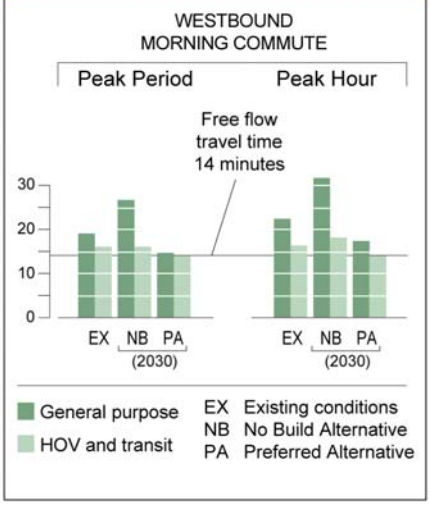


Exhibit 5.1-7. **Westbound Average Travel Times (in minutes), SR 202 to I-5, Morning Commute**



purpose traffic and 16 minutes for HOV traffic, compared to 19 minutes and 16 minutes, respectively, today (Exhibit 5.1-7).

Under the Preferred Alternative, congestion on westbound SR 520 approaching the Evergreen Point Bridge would decrease substantially because the HOV lanes would be extended across the bridge to the I-5 express lanes, eliminating the westbound merge just before the bridge. Travel times would be faster than under the 2030 No Build conditions (and faster than today) for both general purpose and HOV traffic. As a result, vehicle and person throughput across the Evergreen Point Bridge would increase.

In year 2030 the average travel time for general purpose traffic between SR 202 and I-5 under the Preferred Alternative would be 15 minutes compared to 27 minutes under the Final EIS No Build Alternative. The HOV lane travel time would be 14 minutes compared to 16 under the No Build condition (Exhibit 5.1-7) between SR 202 and I-5. There is less improvement to be seen for the HOV lane because there is an existing

inside HOV lane westbound east of the floating bridge, helping HOV traffic bypass some of the congestion on SR 520.

Travel time improvements would be even more noticeable with the project during the peak hour of the peak period. General purpose trips would go from 32 minutes under the No Build condition to 17 minutes under the Preferred Alternative. HOV times would go from 18 minutes under the No Build condition to 14 minutes under the Preferred Alternative.

Morning Peak Period - 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 5.1-8; Exhibit 5.1-9 shows the average travel times). SR 520 congestion would spill back onto mainline I-5, affecting the I-5 northbound operations. Congestion would occur at the west transition span because of the short acceleration lane for traffic merging from the Lake Washington Boulevard on-ramp, the mainline grade change approaching the west transition span, and shoulder widths that are much narrower than prescribed by the current Washington state design guidelines.

Exhibit 5.1-8. **Eastbound Areas of Congestion during the Morning Commute Peak Period**

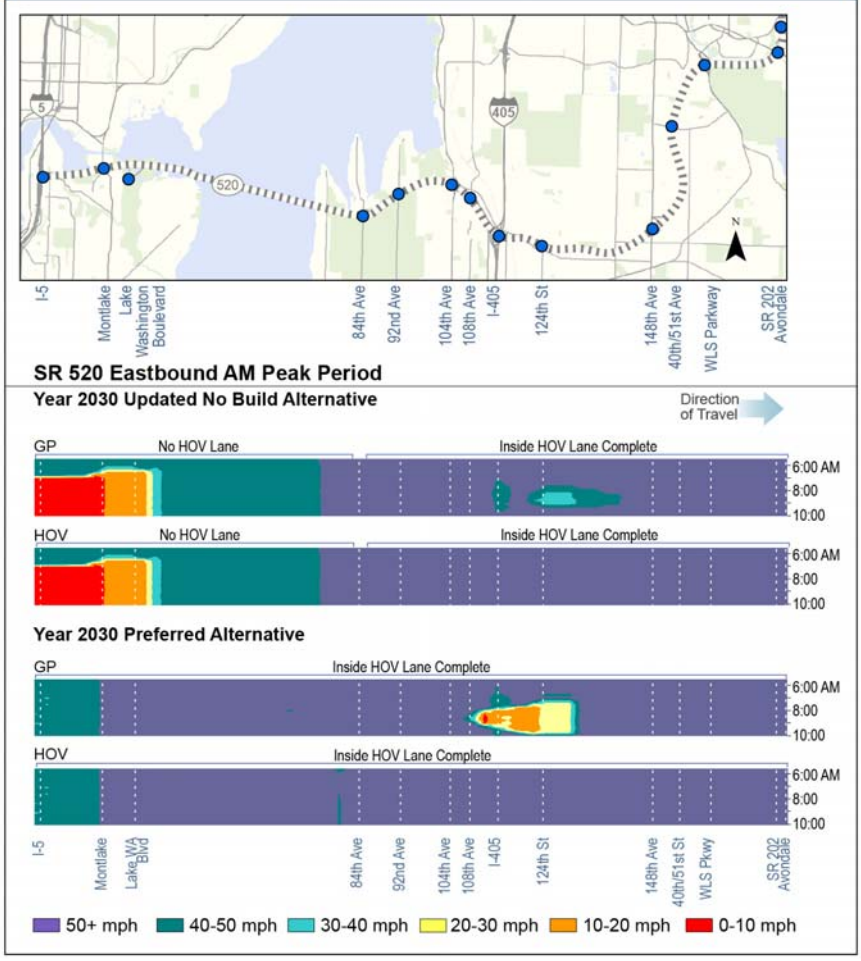
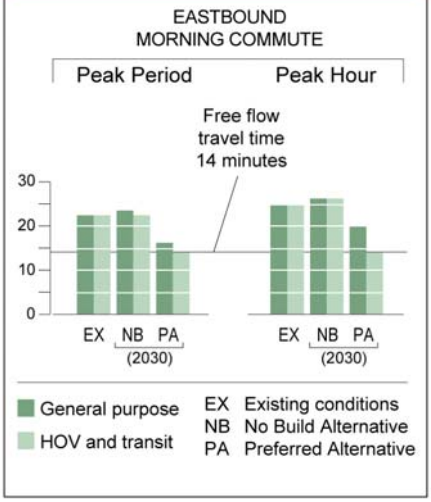


Exhibit 5.1-9. **Eastbound Average Travel Times (in minutes), I-5 to SR 202, Morning Commute**



Without the project, congestion would last for about 3 hours and would limit the amount of traffic that could cross the floating bridge. General purpose and HOV average travel times would be 23 minutes and 22 minutes, respectively, from I-5 to SR 202 (Exhibit 5.1-9). With the additional congestion that would spill back to I-5, a trip starting from downtown Seattle on I-5 across SR 520 to Bellevue would take up to 44 minutes for general purpose vehicles at the peak of congestion.

With the project, average travel times between I-5 and SR 202 would improve compared to the No Build Alternative. It would take 16 minutes for general purpose traffic and 14 minutes for HOV trips to travel from I-5 to SR 202 (Exhibit 5.1-9).

The improvements to SR 520 would result in less congestion spilling back onto mainline I-5 than under No Build conditions. During the peak hour, the travel time for general purpose trips between Seattle and Bellevue would be 11 minutes—33 minutes faster than No Build conditions. HOV trips would take 10 minutes, 28 minutes faster than without the project.

As in the SDEIS analysis (and as shown in Exhibit 5.1-9), the additional throughput on SR 520 west of the lake would result in more traffic moving faster east of the lake toward a heavily congested area (Exhibit 5.1-8) at the merge from I-405 northbound to eastbound SR 520. Although the more efficient movement of traffic on the west side would allow eastbound traffic to reach the Eastside congestion points sooner, and that congestion would be worse than No Build conditions, overall congestion and travel times on the SR 520 corridor would be improved.

Evening Peak Period - 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. Drivers using the Montlake on-ramp 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. Today, moderate congestion lasts approximately 2 to 3 hours in this area.

Without the project in 2030, the SR 520 westbound general purpose lanes would continue to be congested at the three worst current locations—approaching the east side of the floating bridge and at I-405, as well as at the Portage Bay Bridge (Exhibit 5.1-10). The congestion at the approach to the floating bridge and at I-405 would compound each other, and general purpose vehicle travel times from SR 202 to I-5 under the No Build condition would increase from an average 33 minutes today during the peak period to 39 minutes in 2030. However, peak period HOV travel time would improve over existing conditions from 23 minutes to 18 minutes due to implementation of the SR 520, Medina to SR 202 project. The HOV travel time would be much faster than general purpose travel time because HOVs would bypass congestion east of the floating bridge (Exhibit 5.1-11).

Congestion across the Portage Bay Bridge itself would last approximately 3 to 4 hours. Westbound drivers changing lanes to access the I-5 off-ramps and congestion from the Montlake Boulevard on-ramp merge contribute to congestion in this area (Exhibit 5.1-10).

Exhibit 5.1-10. **Westbound Areas of Congestion during the Evening Commute Peak Period**

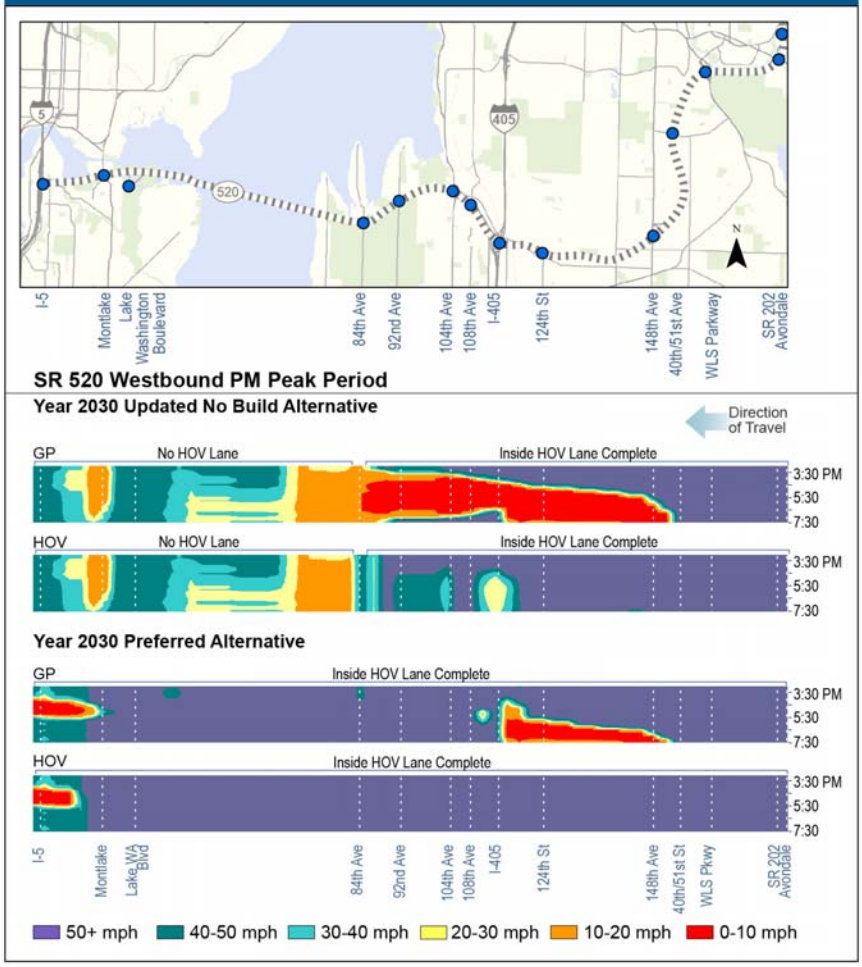
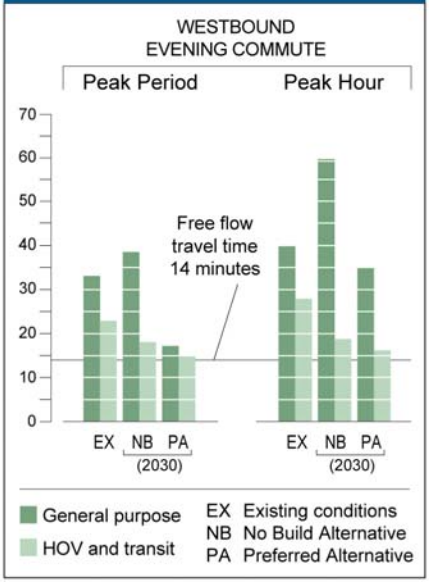


Exhibit 5.1-11. **Westbound Average Travel Times (in minutes), SR 202 to I-5, Evening Commute**



Similar to the SDEIS options, congestion across the Portage Bay Bridge would continue under the Preferred Alternative, but the duration would be shorter (2 hours or less) than under No Build conditions. Under the No Build Alternative, this congestion occurs because the on-ramp merge from Montlake Boulevard does not provide enough distance for people to accelerate and find a gap in traffic to merge. Also, the westbound on-ramp is not metered. The safety and operating conditions near the Montlake on-ramp would be improved under the Preferred Alternative with the ramp meter and the shoulder-running auxiliary lane. However, enough traffic would get to I-5 so that congestion would start to spill back onto SR 520.

With the completion of the HOV lane to I-5 and an improved corridor with shoulders, the average general purpose travel times westbound across

the corridor would improve from 39 minutes without the project to 17 minutes (Exhibit 5.1-11). Under the Preferred Alternative, peak hour travel times through the corridor would also improve. General purpose travel times would be 35 minutes as opposed to 60 minutes without the project. HOV travel times with the project would be 16 minutes, only 3 minutes faster than the 19 minutes without the project.

Evening Peak Period – Eastbound

Under the Final EIS No Build conditions, by 2030 traffic congestion on the I-405 main line would affect the SR 520 eastbound afternoon commute, but to a much lesser degree than found in the SDEIS analysis. Exhibit 5.1-12 shows the eastbound areas of congestion; Exhibit 5.1-13 shows the average travel times during the evening peak period. The SDEIS analysis found that general purpose congestion would extend as far back as I-5, blocking eastbound carpools and buses from reaching the HOV lane that would then be in place starting near the eastern lake shore. As discussed earlier in this chapter, the difference is due to the updated travel demand model, which predicts less growth in traffic volumes by 2030 than the SDEIS forecast, but would still be 30 percent higher than existing conditions. The Final EIS

Exhibit 5.1-12. **Eastbound Areas of Congestion during the Evening Commute Peak Period**

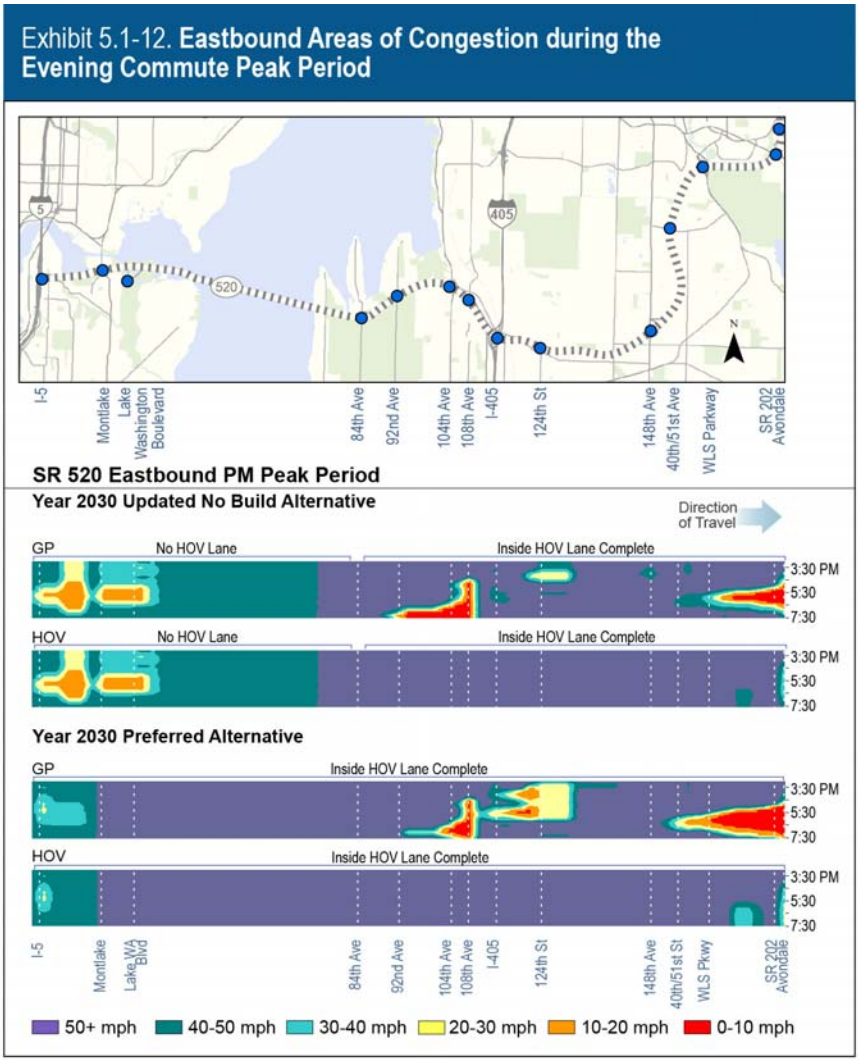
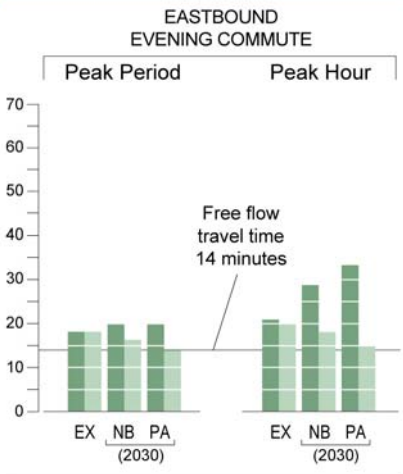


Exhibit 5.1-13. **Eastbound Average Travel Times (in minutes), I-5 to SR 202, Evening Commute**



No Build analysis shows a lesser degree of congestion, with some traffic from I-405 backing up onto eastbound SR 520 in 2030. However, congestion would only extend back as far as the 92nd Avenue NE on-ramp.

The Final EIS No Build analysis also found that congestion would occur near the Montlake Boulevard and Lake Washington Boulevard interchange areas. This would occur because the intersection of the SR 520 off-ramp with Montlake Boulevard would operate over capacity, and traffic would back up onto SR 520 eastbound.

Under the Preferred Alternative, general purpose traffic from I-405 would still back up onto eastbound SR 520 in 2030, with the same congestion as under the Final EIS No Build conditions. The HOV lane improvements constructed as part of the SR 520, Medina to SR 202 project would facilitate HOV and transit traffic movements around the congested general purpose lanes. HOV traffic trips would take 14 minutes instead of 16 minutes without the project.

There would be no overall improvement in peak period travel times for general purpose traffic under the Preferred Alternative—the average would remain at 20 minutes as shown in Exhibit 5.1-13.

Under the Preferred Alternative, demand for eastbound SR 520 during the evening peak hour would be slightly higher than under the Final EIS No Build Alternative, and vehicle throughput would increase with the reduction in congestion on the west side of the lake. This increased throughput across the lake would lead to an increase in trips approaching the back of the queue at Avondale and SR 202. While the peak *period* average travel time for general purpose vehicles would not change between the No Build condition and Preferred Alternative, the time for peak *hour* trips for general purpose traffic would, in fact, take longer than the No Build (33 minutes as opposed to 29 minutes without the project). However, with the inside HOV lane from I-5 to SR 202, buses and carpools would bypass the additional congestion and still receive an average 3-minute travel time savings compared to the No Build Alternative.

SDEIS No Build Alternative and Options A, K, and L

Consistent with the Final EIS analysis, the SDEIS analysis found that without the project, congestion and travel times during the morning and evening commute would continue to worsen over existing conditions. 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. Table 5.1-5 and the following discussion highlight some of the key changes in findings between the SDEIS and Final EIS analysis, including operations for SR 520 and I-5 in the morning and evening commutes.

Table 5.1-5. Regional Land Use and Transportation Plans – Comparison of SDEIS and Final EIS Assumptions and Findings

Assumption	SDEIS	Final EIS	Findings
ST2 – Light rail on I-90	Light rail on I-90 not included in year 2030 background assumptions. East Link light rail and other Sound Transit 2 (ST2) improvements were not included because they had not yet been approved by voters.	Light rail on I-90 included in year 2030 background conditions. Results in lower transit ridership and fewer trips by other modes on SR 520	The Preferred Alternative and SDEIS options would result in increased person trips compared to the No Build Alternative. The SR 520 cross-lake person trips under the No Build and SDEIS options would be similar to the results in the Final EIS due to changes in the travel demand model.
I-405 severely congested north of SR 520 interchange area through downtown Bellevue	Traffic volumes were forecasted to increase by 80 percent during the evening.	Traffic volumes are forecasted to increase by 40 percent during the evening.	Traffic forecasts on I-405 under the No Build Alternative and SDEIS options would be consistent as reported in the Final EIS due to updates with the current travel demand model. This means less congestion would spill back onto SR 520 than reported in the SDEIS.
Toll definition	The analysis assumed a segmental toll. This means it would cost a driver to travel between I-5 and Montlake across Portage Bay Bridge. Under the SDEIS options, this movement would decrease compared to the No Build Alternative.	The analysis assumes a single-point toll. This means it would not cost a driver to travel between I-5 and Montlake across Portage Bay Bridge. Under the Final EIS Preferred Alternative, this movement would increase compared to the No Build Alternative.	Some additional congestion would occur on Portage Bay Bridge and approaching I-5 under the SDEIS options as shown in the Final EIS analysis due to changes in the toll definition.

It is important to note that the Preferred Alternative and SDEIS options are similar in terms of the SR 520 traffic operations improvements. The Preferred Alternative and SDEIS options would differ primarily in local circulation in the Montlake area. Levels of congestion and vehicle trips reported for the Final EIS and SDEIS differ mainly because of regional-level decisions that affect the way future traffic volumes are forecasted. These include updates to the travel demand model, to include currently planned and programmed projects, and changes in toll definition. At the freeway corridor level, however, the SDEIS options provide similar safety and HOV/transit improvements and, therefore, would operate similar to the Preferred Alternative.

Morning Peak Period – Westbound

As shown in the SDEIS analysis, congestion from the I-405 main line would spill back onto SR 520 westbound (Exhibit 5.1-14; Exhibit 5.1-15 shows the travel times).

Exhibit 5.1-14. **SDEIS Analysis – Westbound Areas of Congestion during the Morning Commute Peak Period**

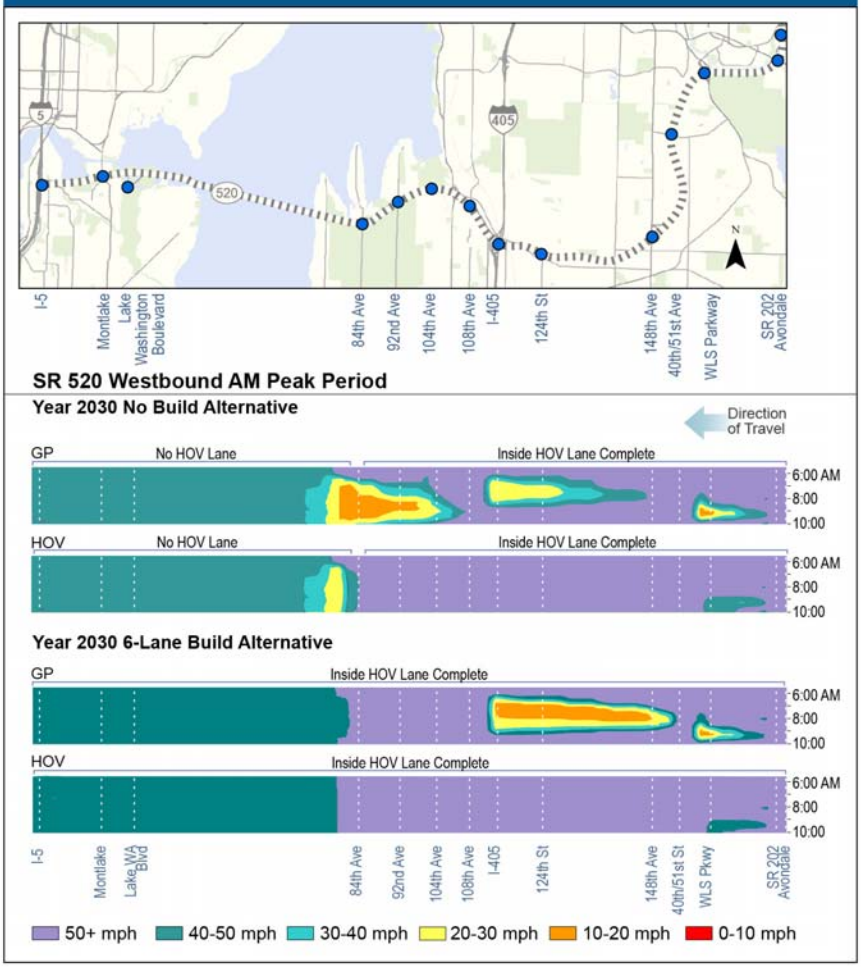
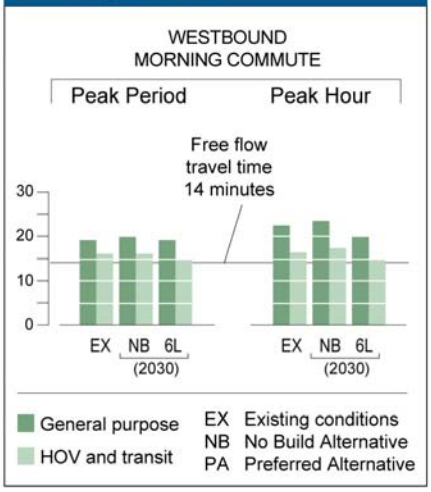


Exhibit 5.1-15. **SDEIS Analysis – Westbound Average Travel Times (in minutes), SR 202 to I-5, Morning Commute**



In the SDEIS analysis, traffic growth (as compared to today) on I-405 increased up to 90 percent in the vicinity of the SR 520 interchange. With the updated travel demand model forecasts completed for the Final EIS, this growth on I-405 was projected to be less, at about 30 percent (as compared to today). If the SDEIS options were updated with the Final EIS travel demand model forecasts, operations on I-405 would be better than reported in the SDEIS analysis and SR 520 would operate similar to the Preferred Alternative. In the morning, congestion would not spill back from I-405 onto the SR 520 corridor, resulting in near free-flow operations westbound for both HOV and general purpose trips.

Morning Peak Period – Eastbound

Eastbound operations for the SDEIS No Build and Options A, K, and L are similar to the Final EIS No Build and Preferred alternatives (Exhibits 5.1-16 and 5.1-17).

Exhibit 5.1-16. **SDEIS Analysis – Eastbound Areas of Congestion during the Morning Commute Peak Period**

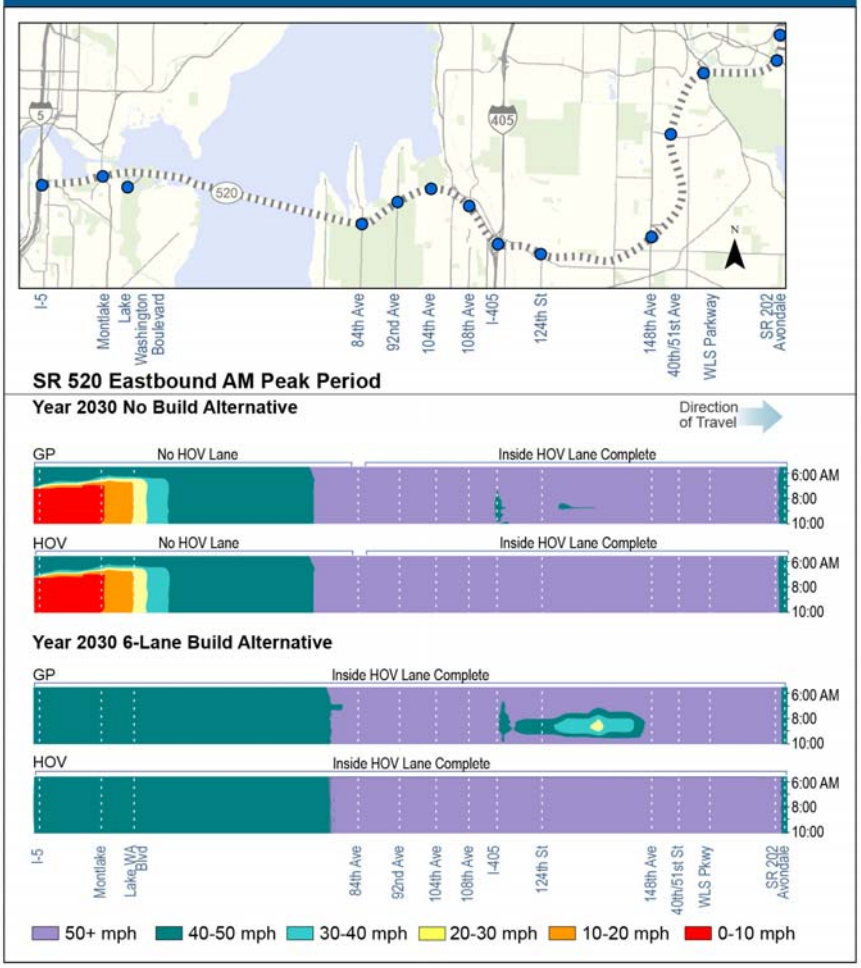
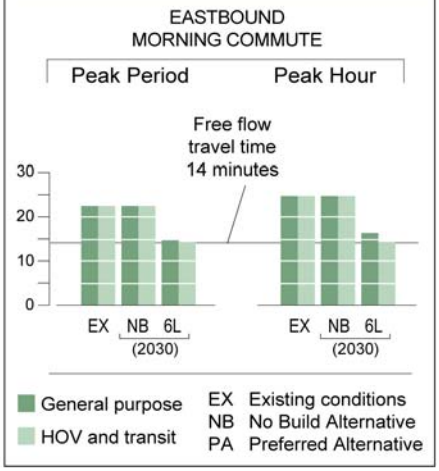


Exhibit 5.1-17. **SDEIS Analysis – Eastbound Average Travel Times (in minutes), I-5 to SR 202, Morning Commute**



Under the No Build Alternative, a driver would experience congestion on SR 520 eastbound approaching the west highrise and Lake Washington Boulevard on-ramp. This congestion on SR 520 would actually spill back onto I-5 and affect I-5 operations. The Final EIS Preferred Alternative and SDEIS options both improve this area by providing an HOV lane from I-5 to Medina, and by improving shoulders and merge conditions at the ramps to SR 520 from the Montlake interchange.

Evening Peak Period – Westbound

The congestion shown in Exhibits 5.1-18 and 5.1-19 is due to congestion from the I-405 main line spilling back onto SR 520 westbound. In the SDEIS analysis, traffic was forecasted to increase up to 80 percent compared to today on I-405 near the SR 520 interchange during the evening peak period. With the updated travel demand model forecasts completed for the Final EIS, growth on I-405 is projected to be less, an increase of about 30 percent (compared to today).

Traffic System Management Center

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

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

Exhibit 5.1-18. **SDEIS Analysis – Westbound Areas of Congestion during the Evening Commute Peak Period**

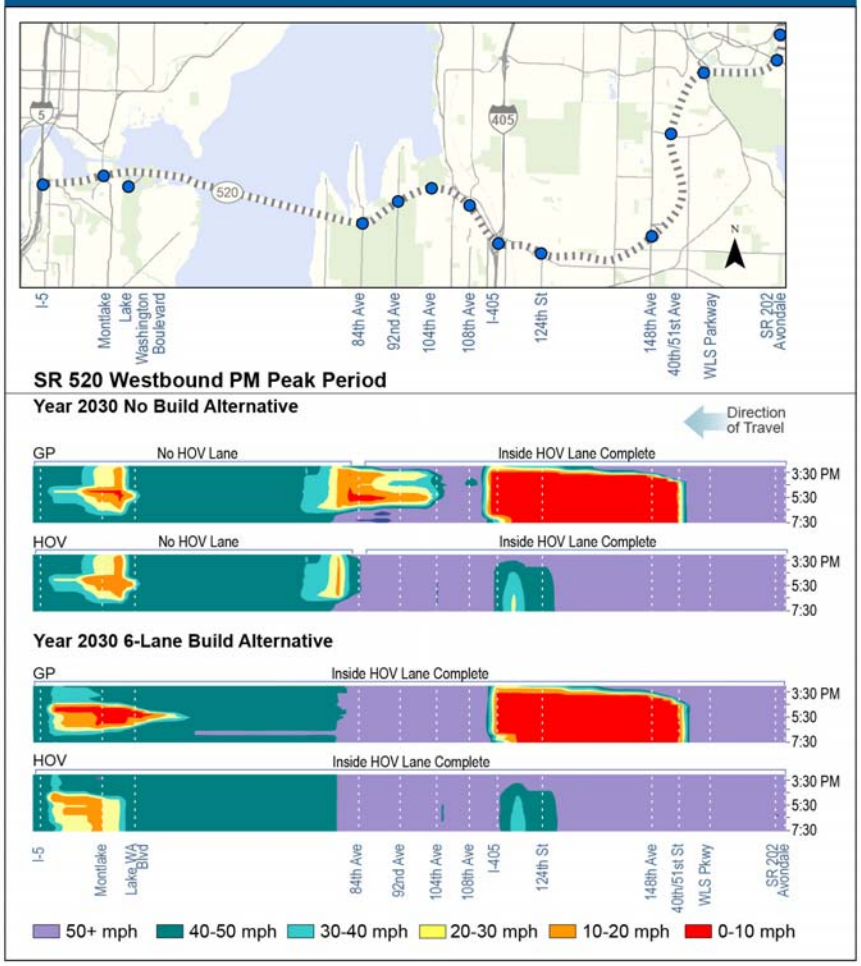
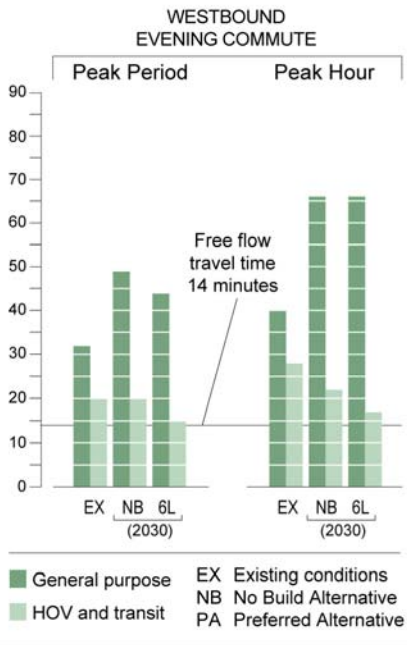


Exhibit 5.1-19. **SDEIS Analysis – Westbound Average Travel Times (in minutes), SR 202 to I-5, Evening Commute**



If the SDEIS options were updated with the Final EIS travel demand model forecasts for I-405, operations on I-405 would improve and spillback onto SR 520 would be as reported in the Final EIS. Congestion would affect general purpose trips from I-405 to the 40th/51st Street interchange area for up to 2 hours. The SDEIS analysis indicated congestion spilling back to the 40th/51st Street interchange area for the entire evening commute. Travel in the HOV lane approaching I-405 would be free flowing. Travel times for the SDEIS No Build and Options A, K, and L would be similar to the Final EIS No Build and Preferred alternatives.

Evening Peak Period – Eastbound

The congestion shown in Exhibits 5.1-20 and 5.1-21 is due to the I-405 main line spilling back onto SR 520 eastbound. As discussed in the Evening *Peak Period – Westbound* section, in the SDEIS analysis, traffic volumes were forecasted to increase up to 80 percent compared to today on I-405 in the vicinity of the SR 520 interchange. With the updated travel demand model

forecasts completed for the Final EIS, traffic volumes on I-405 are projected to increase about 30 percent (compared to today).

Exhibit 5.1-20. **SDEIS Analysis – Eastbound Areas of Congestion during the Evening Commute Peak Period**

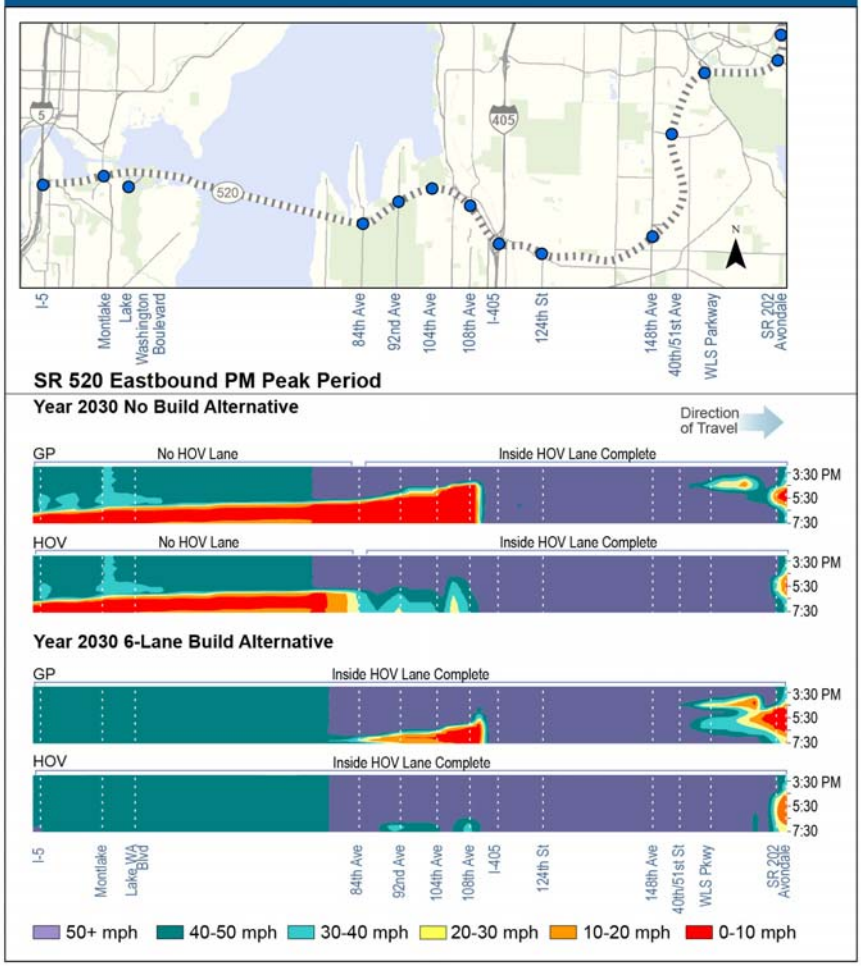
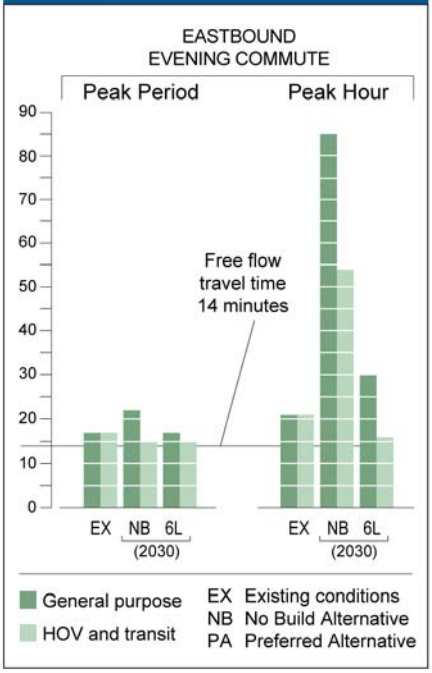


Exhibit 5.1-21. **SDEIS Analysis – Eastbound Average Travel Times (in minutes), I-5 to SR 202, Evening Commute**



If the SDEIS options were updated with the Final EIS travel demand model forecasts for I-405, operations on I-405 would improve and the amount of congestion on SR 520 would be substantially less. Congestion from I-405 would spill back onto SR 520 in the eastbound direction, affecting operations between the 92nd Avenue NE interchange area to I-405 at the peak of congestion. Most of the peak period congestion would affect only the area between Bellevue Way and I-405. This is substantially less than the congestion shown in the SDEIS analysis from I-5 to I-405.

How would the project affect I-5 during the morning and evening peak periods?

Congestion on the I-5 corridor impacts the operations of SR 520 and *vice versa*. In addition, the project includes a reversible ramp between SR 520 and the express lanes to and from the south. The transportation study area

included the I-5 corridor through the entire EIS process, including the Draft EIS, the SDEIS, and the Final EIS. Based on comments received on the SDEIS, the transportation analysis for the I-5 corridor has been added into the Final EIS.

Final EIS No Build Alternative and Preferred Alternative

By reducing congestion or bottlenecks on SR 520 with the construction of the Preferred Alternative and improving throughput, I-5 would operate differently. In 2030, the No Build Alternative would exhibit substantial congestion during the morning hours from the Montlake area on SR 520 back onto mainline I-5. As a result of the SR 520 congestion, I-5 northbound would be congested from I-90 to SR 520 for over 3 hours. The travel time from Seattle to Bellevue would be over 44 minutes at the peak of the commute.

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

In 2030, under the No Build Alternative, I-5 southbound would be congested in the afternoon through downtown Seattle from the SR 520 interchange area to the I-90 collector-distributor roadway. The travel time from Bellevue to Seattle would increase up to 41 minutes during the evening commute.

With the congestion relief on SR 520 provided by the Preferred Alternative, up to 200 vph more would be served on I-5 southbound. A 200-vph increase on I-5 is an increase in volume of about 3 percent in the downtown Seattle area. Because this section of roadway is operating at capacity today, this increase in trips would result in some increase in congestion on I-5 southbound, with congestion lasting an hour longer than under the No Build Alternative. However, with the improvements to the SR 520 corridor, the travel time between Bellevue and Seattle would still improve to 28 minutes during the evening peak commute under the Preferred Alternative—a 12-minute savings compared to the No Build Alternative.

I-5 Express Lanes Morning Peak Period

The reversible express lanes on I-5 operate southbound in the morning and northbound in the afternoon between downtown Seattle and the Northgate area. Under the Final EIS No Build Alternative, congestion in the morning would occur for four hours beginning north of SR 522 (Lake City Way), where the three-lane corridor narrows down to two lanes. This congestion would extend north to the express lane entrance at Northgate. Because the congestion would serve to meter traffic onto the express lanes, they would

not experience any congestion between the Ship Canal Bridge and their southern end point.

To provide space for a single new HOV ramp to and from SR 520, the Preferred Alternative would convert the 42nd Street NE express lanes on-ramp to a merge rather than an add lane. The resulting throughput across the Ship Canal Bridge is expected to be similar to today, with a volume of about 5,000 vehicles per hour. This volume could be served by the remaining three through lanes across the Ship Canal Bridge, with the new HOV ramp adding capacity for buses and carpools during the morning peak period. Travel times for the southbound express lanes in the morning between Northgate and the downtown/I-5 main line under the Preferred Alternative would be the same as the No Build Alternative, as shown in Table 5.1-6.

Table 5.1-6. Peak Commute Travel Times for General Purpose and Transit Trips on I-5 in 2030

	AM Peak Period			PM Peak Period		
Location	**Existing**	**No Build Alternative**	**Preferred Alternative**	**Existing**	**No Build Alternative**	**Preferred Alternative**
General Purpose Trips						
I-5 Express Lanes Southbound from Northgate to I-5 Main Line	26	31	31	13	34	34
Transit Travel						
I-5 Express Lanes Southbound from SR 520 Interchange to Stewart Street	N/A	N/A	1	N/A	N/A	1
I-5 Main Line Southbound from SR 520 Interchange to Stewart Street	2	5	5	3	4	5

The travel time for transit in the express lanes between SR 520 and Stewart Street under the Preferred Alternative would improve by 4 minutes compared to travel on the main line.

I-5 Express Lanes – Evening Peak Period

By 2030, traffic volumes on the express lanes are expected to increase by 10 percent during the evening peak period under the Final EIS No Build Alternative. This increase in demand would result in increased congestion compared to today. In the afternoon, congestion from northbound express lane traffic merging onto the I-5 main line at Northgate would affect operations on the express lanes for 4 hours, with the peak of congestion

extending as far south as Mercer Street. Where there is no HOV lane on the mainline freeway, transit and carpools would be in the same congested lanes as other traffic, but the HOV lanes would operate at free-flow speeds between SR 522 and Northgate, and operations would be near free flow south of the Mercer Street interchange.

Under the Preferred Alternative, northbound traffic volumes in the express lanes would be higher between downtown Seattle and the I-5/SR 520 interchange than under No Build with the new ramp connection. However, because congestion occurs near the north end of the express lanes, overall travel time for trips between downtown Seattle and Northgate would be the same under both the No Build and Preferred alternatives (34 minutes) (Table 5.1-6). Travel for HOVs going to the SR 520 interchange ramp would be faster in the express lanes than on the I-5 main line (1 minute from downtown Seattle to the interchange in the express lanes compared to 5 minutes for the main line).

I-5 Main Line – Morning Peak Period

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

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

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

Improvements to westbound SR 520 would allow over 200 more vehicles per hour to reach southbound I-5. The increase in westbound throughput (more vehicles), combined with the reduction in congestion from eastbound SR 520 backing onto I-5 southbound, results in similar travel times between the No Build and Preferred alternatives. Travel between NE

45th Street and I-90 would decrease from 19 minutes under the No Build Alternative to 17 minutes under the Preferred Alternative (Table 5.1-7).

Table 5.1-7. Peak Commute Travel Times for General Purpose Trips on I-5 and SR 520 in 2030

Location	AM Peak Period			PM Peak Period		
	Existing	No Build Alternative	Preferred Alternative	Existing	No Build Alternative	Preferred Alternative
I-5 Northbound (main line) from I-90 to NE 45th	9	31	7	11	13	15
I-5 Southbound (main line) from NE 45th to I-90	11	19	17	22	20	29
Seattle to Bellevue (I-5 at University to I-405 at NE 4th/8th)	25	44	11	15	23	19
Bellevue to Seattle (I-405 at NE 4th/8th to I-5 at University)	19	25	13	43	41	28

I-5 Main Line – Evening Peak Period

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

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

Despite the slight increase in travel times during the evening commute, both I-5 and SR 520 would serve more vehicles and more people in these vital segments of the network. Table 5.1-7 summarizes the peak travel times during the evening commute for Existing Conditions and the No Build and Preferred Alternatives.

SDEIS No Build Alternative and Options A, K, and L

Outside of the Montlake interchange area, Options A, K, and L would operate similarly to the Preferred Alternative. The I-5 main line and express lane traffic operations under Options A, K, and L would closely match the operations of the Preferred Alternative. The Final EIS and SDEIS analyses both show similar increases in throughput from westbound SR 520 to I-5, and show a reduction in congestion from SR 520 eastbound spilling back onto I-5.

Option A would operate most similarly to the Preferred Alternative. Under Options K and L, traffic volumes on I-5 between SR 520 and NE 45th/50th Street would be slightly less (up to 220 vph in the evening) than the Preferred Alternative or Option A. Options K and L provide an additional crossing of the Montlake Cut. This would allow traffic traveling westbound from SR 520 to I-5 and NE 45th Street, and the reverse, to exit at the new interchange and travel north across the Montlake Cut via a new bridge (Option L) or tunnel (Option K).

The Preferred Alternative and SDEIS options include an HOV/transit ramp connection between the I-5 express lanes and the SR 520 HOV lanes. Again, the differences between the Preferred Alternative and the SDEIS options are focused around the Montlake interchange area and local connections. These differences would not result in different findings for the I-5 express lane operations or the travel demand on the new ramp. Therefore, the results summarized for the Final EIS Preferred Alternative apply to the SDEIS options.

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

The SDEIS analysis modeled traffic operations at 39 key intersections in the transportation study area. For the Final EIS, intersections in the Seattle interchanges along the I-5 corridor were not studied further because the traffic volume changes at these interchanges were less than 1 percent compared to the FEIS No Build Alternative. Table 5.1-8 identifies traffic volume forecasts for interchange areas along the I-5 corridor for the SDEIS and Final EIS.

Table 5.1-8 Forecast Volumes Reported for the 6-Lane Alternative in the EIS Analysis

Location	SDEIS 6-Lane Alternative (Option A with suboption) compared to No Build Alternative		Final EIS Preferred Alternative compared to No Build Alternative	
	AM	PM	AM	PM
NE 45th/42nd Street	+1%	+1%	-1%	-1%
Harvard/Roanoke	+10%	+2%	-1%	+1%
Mercer Street	0%	0%	+1%	+1%
Stewart Street	0%	0%	+1%	+1%

The I-5 corridor intersections were studied previously because the early definition of the study area was based on the limits of construction for a variety of potential improvements with numerous interchange options. Some of the options would have extended onto the I-5 main line, I-5 express lanes, and the City of Seattle street system as far south as I-90. For that reason, there was a need to study the intersections adjacent to the I-5 ramps from NE 42nd Street south to Stewart Street. This included the Harvard/Roanoke intersection network and the Mercer Street interchange area. This network was evaluated in the Draft EIS even after the determination that no additional construction would occur as part of the SR 520 Bridge Replacement and HOV Project. The same intersections were again studied in the SDEIS because there was a potential change in traffic volumes at the Harvard/Roanoke interchange as a result of changes in the interchange options.

WSDOT developed an analysis methodology that provided that they would perform traffic operations analysis at intersections where the total approaching traffic increased by 5 percent or more compared to the No Build Alternative. In each of the interchange areas shown in Table 5.1-8, the traffic volume growth between the Final EIS Preferred Alternative and the No Build Alternative is clearly below the threshold set for additional analysis per the transportation methodology.

Further analysis of intersections within the interchanges listed in Table 5.1-8 are not included in the Final EIS for the following reasons:

- The SR 520, I-5 to Medina project does not propose any new construction on the I-5 main line between NE 45th Street and Stewart Street.
- The traffic volume forecasts show that the Preferred Alternative has a traffic volume effect less than the threshold set in the transportation analysis methodology.

Also since the SDEIS analysis, there have been changes in regional planning and policies that affect the project's year 2030 No Build and Preferred alternatives. These include the following:

- The travel demand model used for the program has been updated for the Final EIS to be consistent with the current PSRC model for year 2030 conditions.
- The build alternative was assumed to be tolled under both the SDEIS and Final EIS analyses. However, for the SDEIS analysis, the toll was defined as a segmental toll, which meant that trips that used SR 520, but did not cross the lake, would pay a toll. Since the SDEIS was published, legislation has determined that the toll associated with the build alternative would be a single-point toll. This means only trips that cross the lake via SR 520 would pay the toll.

Traffic Levels of Service

Levels of service are a way to rate 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 or less) and the letter F representing the longest delays (80 seconds or more at signalized intersections).

For this Final EIS, 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 complete results of the LOS analysis are presented in the Final Transportation Discipline Report (Attachment 7).

The following describes the Final EIS No Build and Preferred Alternative forecasted traffic operations for the Montlake interchange area. Following the Final EIS findings is a summary of the SDEIS No Build Alternative and 6-Lane Alternative options. In the SDEIS section, exhibits from the SDEIS are included and a description of how the SDEIS options would operate if changes incorporated into the Final EIS analysis were included.

Final EIS No Build Alternative and Preferred Alternative

Further analysis of local street operations was performed for the Preferred Alternative at the Montlake interchange area. Exhibit 5.1-22 shows the predicted traffic congestion at project area intersections in 2030 during both the morning and evening peak hours in the Montlake interchange area. As with the SDEIS, the intersections near the Montlake Boulevard interchange were the places where local traffic volumes would be most affected by the project. Those intersections are discussed further below.

Under the Final EIS No Build Alternative, traffic forecasts for 2030 show an overall growth in traffic of 15 percent and 23 percent over existing conditions during the morning and afternoon peak hours, respectively. Travel patterns in the Montlake interchange area would not be expected to change; existing congestion on SR 520 would continue to affect local traffic operations on Montlake Boulevard, Lake Washington Boulevard, and other intersections approaching the interchange.

Exhibits 5.1-23 and 5.1-24 compare local street operations and traffic volumes between the No Build and the Preferred alternatives. Under the Preferred Alternative, travel patterns on local streets in the area would change due to the direct-access HOV ramp from SR 520 and the removal of the Lake Washington Boulevard ramps. From the north, more trips from the University District to I-5 would travel along Montlake Boulevard southbound and across the Portage Bay Bridge westbound than under the No Build Alternative. This is because there would be a toll implemented for crossing the SR 520 floating bridge, reducing cross-lake trips. With cross-lake trips reduced, more capacity would be open for travel along Montlake Boulevard to and from I-5.

Access to eastbound SR 520 from the south would be provided at the Montlake loop ramp (for general purpose trips) and at 24th Avenue East (for HOV trips). The existing ramp to eastbound SR 520 from Lake Washington Boulevard would be removed. This would result in a reduction in traffic using Lake Washington Boulevard through the Arboretum to access eastbound SR 520 compared to the No Build Alternative. Another lane of capacity added to the Montlake loop ramp would accommodate the new traffic. Improvements would also be made to the intersection of Montlake Boulevard and Lake Washington Boulevard to accommodate changes in traffic.

How do the Final EIS and SDEIS analyses of local roadways compare?

Remember that:

WSDOT reviewed the effects of Options A, K, and L (compared to the No Build Alternative) *relative to* the effects of the Preferred Alternative and the updated No Build Alternative.

So, the SDEIS findings compared to the Final EIS findings are as follows:

- 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 – same as the Final EIS.
- Option A would add 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 in both directions of Montlake Boulevard between East Roanoke Street and NE Pacific Street – same as the Final EIS.
- Local traffic operations along Montlake Boulevard NE and NE Pacific Street would be better with Option A than without the project – same as the Final EIS.
- 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 – similar to the Final EIS.

Exhibit 5.1-22. Traffic Congestion at Seattle Project Area Intersections 2030 AM and PM Peak Hours

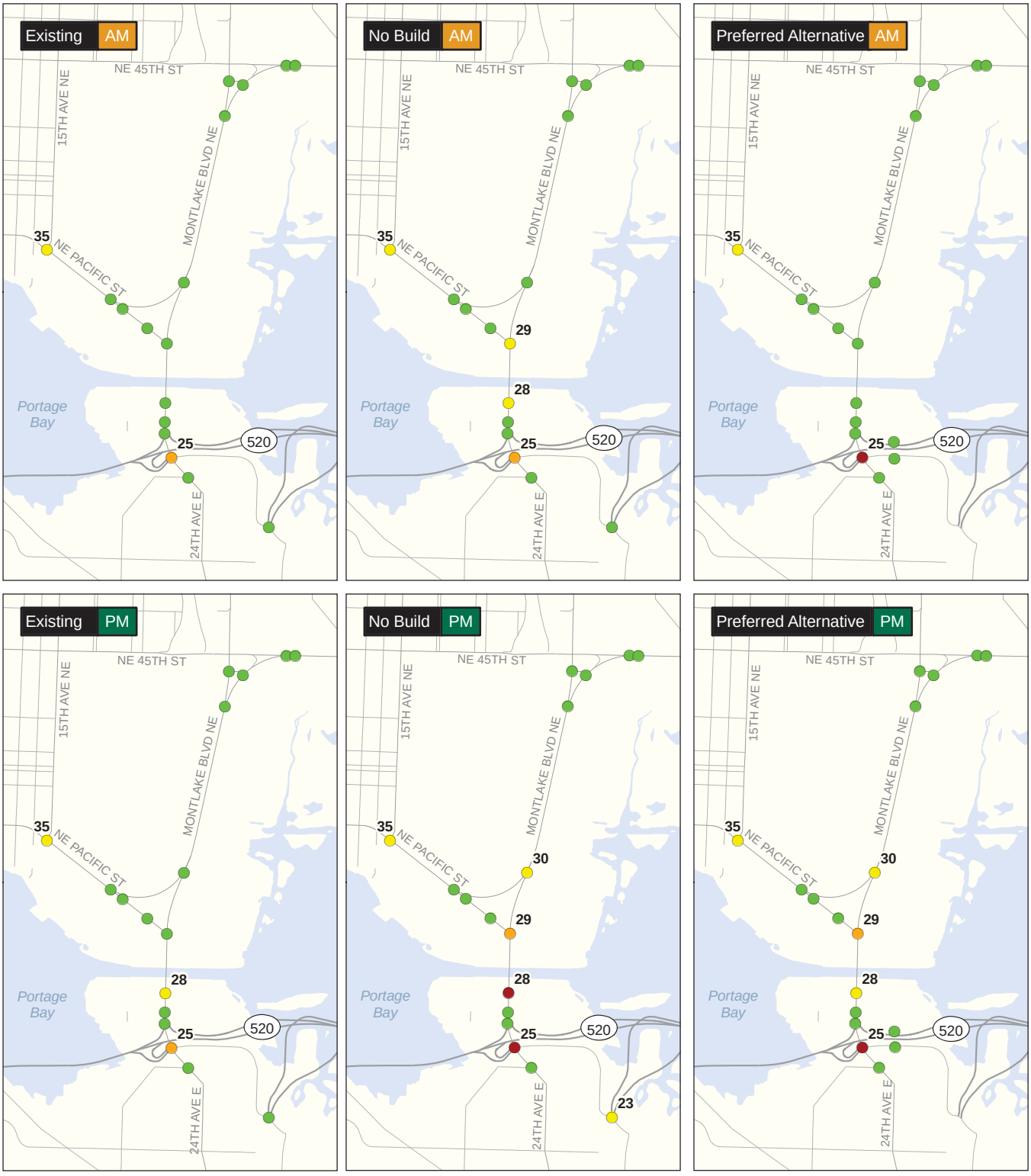


Exhibit 5.1-23. **Traffic Volume Changes during the AM Peak Period**

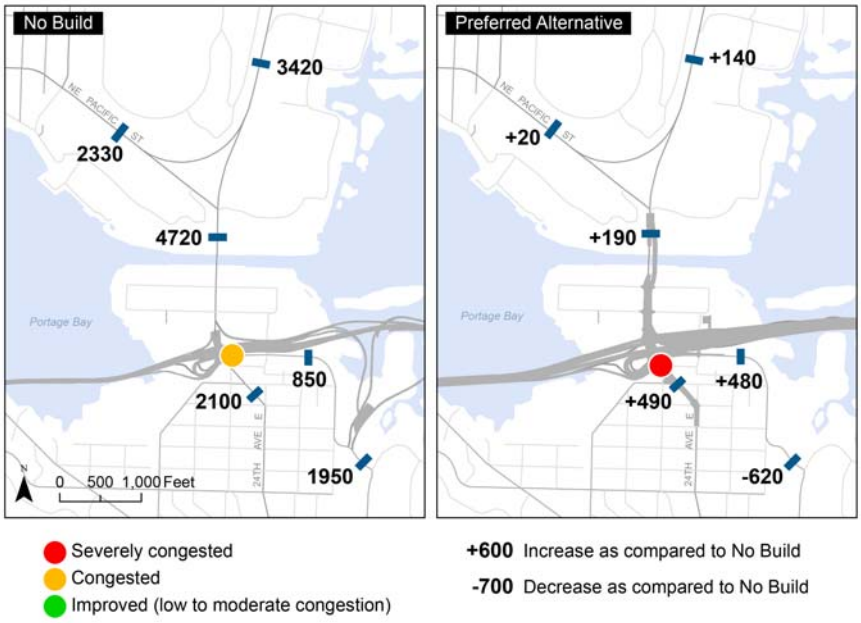
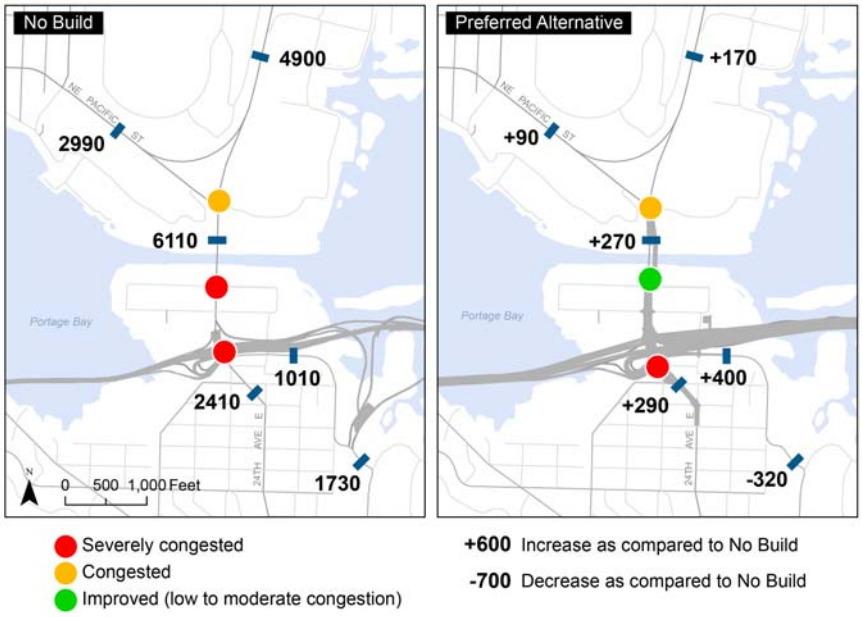


Exhibit 5.1-24. **Traffic Volume Changes during the PM Peak Period**



The following four local roads and intersections in the interchange area are the ones where congestion is expected to continue or worsen under the 2030 No Build Alternative or that have been of specific concern to the community:

- Lake Washington Boulevard/SR 520 ramps and through the Washington Park Arboretum

- Montlake Boulevard/Lake Washington Boulevard/SR 520 Eastbound Ramps
- Montlake Boulevard/NE Pacific Street
- Montlake Boulevard/East Shelby Street

Specific traffic results for these areas are discussed in greater detail in the following sections.

Lake Washington Boulevard/SR 520 Ramps and Traffic through the Washington Park Arboretum

As occurs today, half of the vehicle trips on Lake Washington Boulevard through the Washington Park Arboretum under the No Build Alternative would be traveling to and from SR 520. Today, those volumes are highest (1,590 vehicle trips per hour) in the morning peak period. Due to population and employment growth, this morning volume would increase by 23 percent to 1,950 vph under the Final EIS No Build Alternative (Exhibit 5.1-23). During the evening peak period, existing volumes of 1,400 vph in this area would increase to 1,730 vph in 2030 (Exhibit 5.1-24). However, even with the growth in traffic on Lake Washington Boulevard, its intersection with the SR 520 ramps would continue to operate at LOS D or better in 2030. The significance of LOS D is described in the text box to the right.

Level of Service D

LOS D is considered to be the threshold for acceptable peak period operations because the intersection is typically still operating under capacity. At this level, operations are still stable, and the intersection is able to accommodate small surges in traffic demand.

Because the Lake Washington Boulevard ramps to and from SR 520 would be removed under the Preferred Alternative, traffic volumes through the Washington Park Arboretum would be lower than under the Final EIS No Build Alternative (and less than today). About half of the Lake Washington Boulevard trips heading toward eastbound SR 520 during the morning peak period are anticipated to shift to Montlake Boulevard. Vehicles exiting westbound SR 520 and heading south would exit at 24th Avenue East and would have the option to use either Lake Washington Boulevard or Montlake Boulevard. About half of these trips from westbound SR 520 are expected to shift to Montlake Boulevard.

Traffic heading south on Lake Washington Boulevard and through the Washington Park Arboretum under the Preferred Alternative would be about 1,330 vph during the morning peak period, which is a reduction of 620 vph compared to Final EIS No Build conditions during the morning peak period (Exhibit 5.1-23). This means that morning traffic volumes through the Arboretum under the Preferred Alternative would be less than they are today. During the afternoon peak period, traffic volumes heading south on Lake Washington Boulevard through the Arboretum would be 1,410 vph, lower than Final EIS No Build conditions (1,730 vph) and similar to volumes today (1,400 vph), as shown in Exhibit 5.1-24. Access to and from the south would be relocated from the Lake Washington Boulevard ramps to 24th Avenue East; this would result in an increase in

trips along Lake Washington Boulevard between Montlake Boulevard and the area of the existing Lake Washington Boulevard ramps.

Montlake Boulevard/Lake Washington Boulevard/SR 520 Eastbound On-ramp

Under No Build conditions, eastbound SR 520 would continue to be congested for approximately 3 hours during the morning peak period. The intersection of the eastbound SR 520 on-ramp with Montlake Boulevard and Lake Washington Boulevard would continue to operate at LOS E in the morning, with congestion resulting from southbound traffic on Montlake Boulevard attempting to access the freeway. Vehicles lining up attempting to access the ramp would continue to cause congestion on Montlake Boulevard, extending as far back as NE 45th Street. Increasing traffic volumes (15 percent higher in this location) would mean slower access to the ramp for vehicles on Montlake and Lake Washington Boulevards. This same congestion on Montlake Boulevard would delay southbound vehicles on Montlake Boulevard attempting to access the westbound SR 520 on-ramp in the morning. Northbound congestion on Montlake Boulevard would also affect its intersection with East Roanoke Street.

During the morning peak hour, there would be 5,240 vph approaching the Montlake triangle (Exhibit 5.1-23). During the afternoon peak hour, the operation of this intersection would worsen from LOS E today to LOS F in 2030, with 7,000 vph entering the Montlake triangle (Exhibit 5.1-24). The intersection would be 50 percent over capacity at this time of day. Large queues would occur on all approaches to the intersection and would affect adjacent intersections. At its worst, congestion on the eastbound SR 520 off-ramp would extend back onto the eastbound SR 520 main line.

With the closure of the Lake Washington Boulevard ramps, traffic volumes through the Montlake Boulevard/Lake Washington Boulevard/SR 520 eastbound ramps intersection would increase under the Preferred Alternative. The greatest increase would occur in the morning, with up to an additional 640 vph traveling through the intersection. This includes volume changes near the intersection along Montlake Boulevard and Lake Washington Boulevard, shown in Exhibit 5.1-23, and also changes on the Montlake interchange southbound and eastbound ramps. Additional turn lanes (a second northbound left-turn lane and an additional lane on the east- and westbound approaches at this intersection) would be included with the Preferred Alternative to accommodate these additional trips.

With the improvements to the SR 520 main line and the addition of a second general purpose lane on the on-ramp, congestion on the eastbound SR 520 on-ramp would be reduced and traffic would no longer back up onto Montlake Boulevard in the morning peak period, substantially reducing the congestion on Montlake Boulevard southbound.

While the intersection would operate better under the Preferred Alternative than the No Build Alternative during the afternoon peak hour, there would still be congestion on the northbound, southbound, and westbound approaches to the intersection because the intersection would still be over capacity. Northbound congestion would queue through the Montlake Boulevard/East Roanoke Street intersection, and southbound congestion would affect how quickly vehicles could access the westbound SR 520 on-ramp intersection. During the evening peak hour, the intersection would operate at LOS F under the Preferred Alternative, at 15 percent over capacity. Under the Preferred Alternative, an additional 350 vph would travel through this intersection as compared to the Final EIS No Build Alternative. This includes volume changes near the intersection along Montlake Boulevard and Lake Washington Boulevard (shown in Exhibit 5-1-24) and also changes on the Montlake interchange southbound and eastbound ramps. The afternoon peak operations would, however, be significantly better than the Final EIS No Build operations, which would be 50 percent over capacity. This is because the Preferred Alternative would include additional capacity at this intersection to help serve the new trips. The ability to provide capacity improvements in this area is limited by adjacent properties; however, the Preferred Alternative would include an additional northbound left-turn lane and a westbound left-turn lane, and add an eastbound left-turn from the off-ramp.

The intersection would operate at LOS F in the morning peak hour with a volume to capacity ratio of 1.10. This is similar to the operations of the No Build Alternative (LOS E with a volume to capacity ratio of 1.05). Chapter 12 of the Final Transportation Discipline Report (Attachment 7 to this Final EIS) discusses additional coordination with the City of Seattle to manage the operations of this intersection.

Montlake Boulevard/NE Pacific Street

During the morning peak hour, the Montlake Boulevard/NE Pacific Street intersection is projected to operate near capacity, serving 4,840 vehicles per hour and maintaining existing LOS C operations with delays similar to existing conditions. During the afternoon peak hour, the operation of the intersection would worsen from LOS D today to LOS E in the year 2030. This intersection, which is currently at capacity, would be 20 percent over capacity in 2030 without the project, with traffic volumes of 6,300 vph (Exhibit 5.1-24)

Traffic volumes at the intersection of Montlake Boulevard with NE Pacific Street under the Preferred Alternative would be similar to those under the No Build Alternative. There would be 5,030 vph approaching the intersection in the morning and 6,570 vph in the afternoon peak hour, and it would operate at LOS E during the afternoon peak hour. However, under the Preferred Alternative, a southbound HOV receiving lane along Montlake Boulevard would be provided to facilitate the movement from

Montlake Boulevard onto SR 520, and traffic would move through slightly faster with the project in the afternoon peak period than under the No Build.

Montlake Boulevard/East Shelby Street

During the morning peak hour, intersection operations would degrade from LOS B to LOS D under the No Build Alternative. The intersection would operate near capacity, serving 4,780 vph. During the afternoon peak hour, operations would worsen from LOS D today to LOS F in 2030, and traffic from the intersection would create congestion extending into adjacent intersections to the north and south. There would be 6,190 vehicles using the intersection.

The Montlake Boulevard/East Shelby Street intersection would improve to LOS B during the morning peak hour under the Preferred Alternative. Traffic volumes entering the intersection would increase to 4,970 vph, but intersection improvements under the Preferred Alternative would provide additional capacity and reduce delay. During the afternoon peak hour, operations would improve to LOS D, as opposed to LOS F under No Build conditions.

Today, Montlake Boulevard north of its intersection with East Shelby Street is limited to two lanes in each direction. This requires northbound traffic to narrow from three lanes to two through this intersection. The Preferred Alternative would address this bottleneck by adding capacity across the Montlake Cut with a new bascule bridge, resulting in three lanes in each direction. The increased north-south capacity through the Montlake Boulevard/East Shelby Street intersection would result in less delay for the 6,480 vph traffic traveling through this intersection during the evening peak hour.

SDEIS No Build Alternative and Options A, K, and L

Traffic growth reported for the Final EIS and the SDEIS differ mainly because there were changes at the regional level. These changes include updates to the travel demand model, assumptions for future projects, and changes in toll definition. The following discussion highlights some of the key changes between the Final EIS and the SDEIS analysis and describes operations of the Montlake interchange area for the morning and evening commute periods.

Table 5.1-9 illustrates that background growth under the No Build Alternative would be higher than what was forecasted for the SDEIS. The increase in growth is about 4 percent. That level of difference is not typically considered to be a substantial change for a 20-year forecast. The Preferred Alternative shows a zero net growth in the Montlake interchange area compared to the No Build.

In a Nutshell

- Higher growth would occur under the No Build Alternative in the morning and less growth in the evening commute periods.
- SDEIS traffic volumes would be slightly higher compared with No Build if they were reforecast using the Final EIS model.
- All options would maintain similar operational findings relative to one another, as described in the SDEIS.
- The Preferred Alternative would be most similar to the suboption to Option A.
- Changes in traffic volume would not be substantial enough to modify any of the SDEIS option definitions

Table 5.1-9. Montlake Interchange Area Growth, Year 2030

Alternative	AM Peak Hour		PM Peak Hour	
	SDEIS	Final EIS	SDEIS	Final EIS
No Build Alternative	+11% compared to existing	+15% compared to existing	+24% compared to existing	+21% compared to existing
Option A	-14% compared to No Build	-	-7% compared to No Build	-
Option A with Suboptions	-5% compared to No Build	-	-2% compared to No Build	-
Option K, L, and Option K, L with Suboptions	+23% compared to No Build	-	+23% compared to No Build	-
Preferred Alternative	-	0% compared to No Build	-	2% compared to No Build

Note: Traffic forecasts were updated for the Final EIS based on the updated PSRC travel demand model for consistency with regional plans and projects.

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. Option A with suboption would add a direct-access ramp from southbound Montlake to eastbound SR 520, and would replace the ramps to Lake Washington Boulevard, located farther northwest from the current ramp location and farther from the arboretum.

Option K would include a new lowered single-point urban interchange 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. 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 single-point urban interchange, drivers would choose to take advantage of the capacity made available on Montlake Boulevard.

Traffic forecasts, travel patterns, and operations are the same under 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 would turn right to access the new bridge connection to the new interchange. As a result, Montlake Boulevard traffic volumes under Option L would not decrease as much as under Option K compared to the No Build. 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.

Lake Washington Boulevard/SR 520 Ramps and Traffic through the Washington Park Arboretum

Under Option A, traffic volumes through the Arboretum were forecasted to decrease compared to the No Build Alternative (Exhibits 5.1-25 and 5.1-26). The Final EIS Preferred Alternative would include westbound off-ramp access to 24th Avenue NE, similar to Option A with suboption, but would provide eastbound on-ramp access only at Montlake, similar to Option A. Traffic volumes through the Arboretum under the Final EIS Preferred Alternative would be greater than Option A, but less than Option A with the suboption.

Exhibit 5.1-25. **SDEIS Analysis – Traffic Volume Changes During the AM Peak Period**

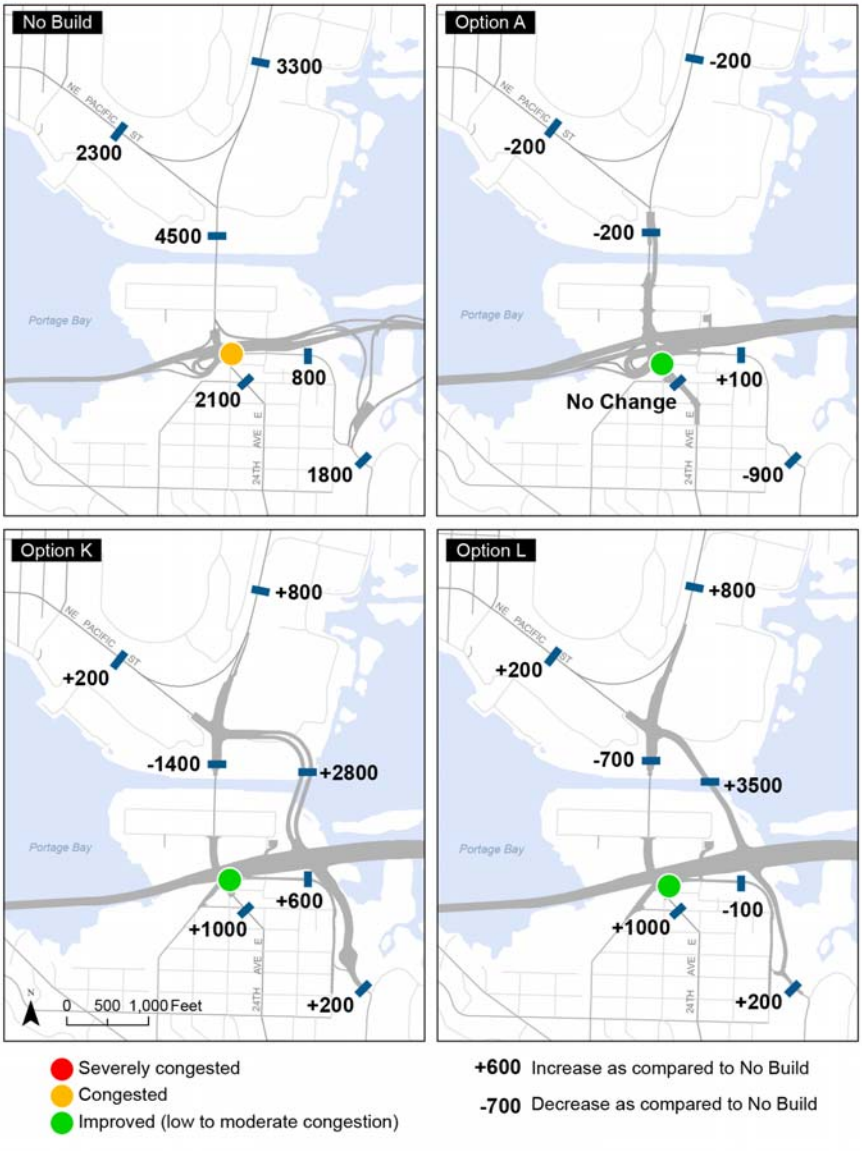
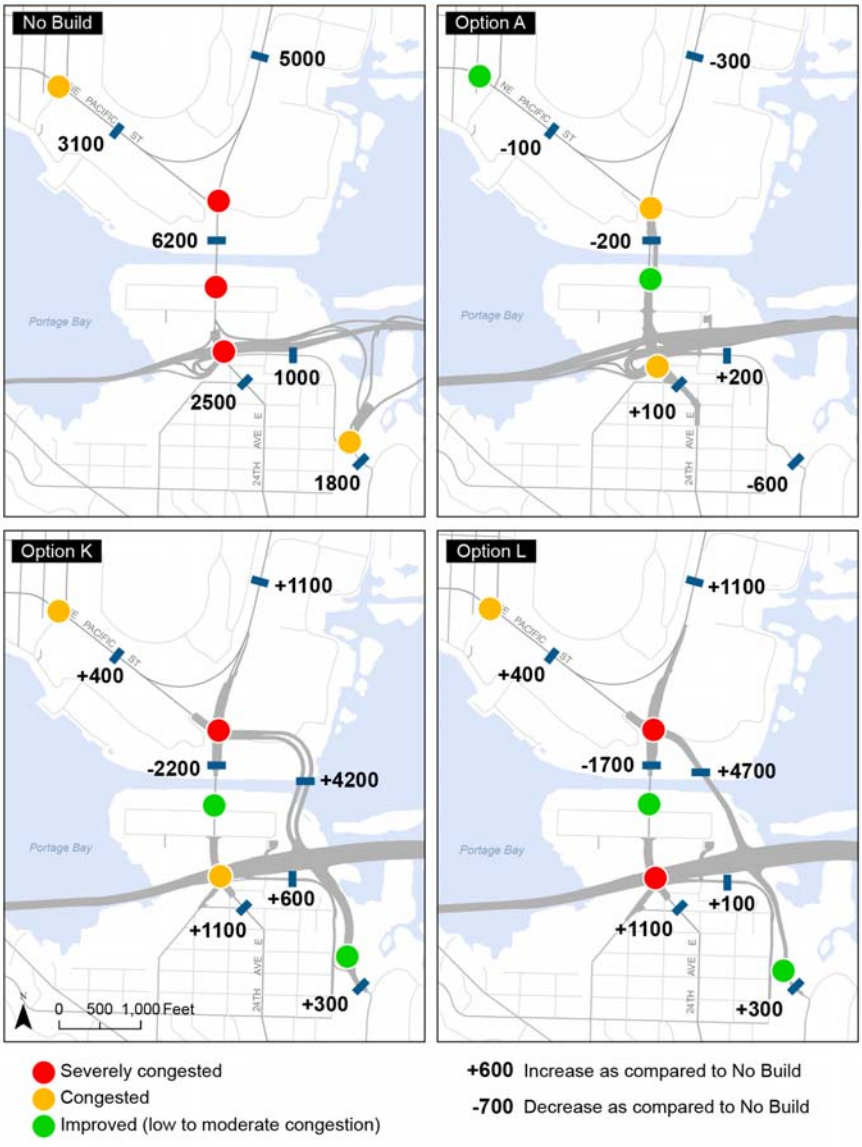


Exhibit 5.1-26. **SDEIS Analysis – Traffic Volume Changes During the PM Peak Period**



Under Options K and L, traffic volumes would shift to the Montlake interchange area to access the new crossing of the Montlake Cut. This would increase in traffic volumes through the Arboretum.

There would be no changes to distribution of traffic volumes through the local roadway networks, and the operations for each of the options would be similar to what was reported in the SDEIS. The relative differences in operations of the SDEIS options compared to each other would be consistent.

Table 5.1-10 summarizes traffic volumes through the Arboretum under each of the Final EIS Preferred Alternative and the SDEIS options.

Table 5.1-10. Traffic Volume through the Arboretum, Year 2030

Alternative	AM Peak Hour		PM Peak Hour	
	SDEIS	Final EIS	SDEIS	Final EIS
No Build Alternative	1,800 vph	1,950 vph	1,800 vph	1,730 vph
Option A	900 vph	-	1,200 vph	-
Option A with Suboptions	1,900 vph	-	1,800 vph	-
Option K and Option K with Suboption	2,000 vph	-	2,100 vph	-
Option L and Option L with Suboptions	2,000 vph	-	2,100 vph	-
Preferred Alternative	-	1,330 vph	-	1,410 vph

Montlake Boulevard/Lake Washington Boulevard/SR 520 Eastbound On-ramp

The Montlake Boulevard/Lake Washington Boulevard/SR 520 eastbound on-ramp intersection has been identified as having operational issues in the year 2030 conditions with and without the project during the morning and afternoon peak hours.

Traffic volumes decreased at this intersection under the SDEIS options compared to the No Build Alternative, with the exception of Option A (Table 5.1-10). Under Option A, all access to and from SR 520 would occur from the Montlake Boulevard interchange, resulting in higher traffic volumes than the other options. In addition, Option A would provide additional capacity through the interchange area. The result is that all SDEIS options would operate better than the No Build Alternative.

The updates to the travel demand model and toll scenario resulted in an increase in traffic demand through this intersection in the Final EIS on SR 520 during the morning peak hour. Because operations in the morning peak are at LOS E under the No Build Alternative, the SDEIS options would operate at LOS E or F, similar to the Preferred Alternative. Traffic forecasts and operations are summarized in Table 5.1-11.

The SDEIS analysis indicated that under Options A and K, the intersection would operate better than the No Build Alternative, but still at LOS E in the evening peak hour. This intersection would operate at LOS F with Option L. Options A and K would operate similar to the Preferred Alternative if updated with the same assumptions (toll definition and travel demand model version). Option L would likely continue to operate worse

than the No Build Alternative at this location. Traffic forecasts and operations are summarized in Table 5.1-12. A volume to capacity ratio was also provided where the LOS is F, to better explain the magnitude of failing operations.

Table 5.1-11. Volume Entering Montlake Boulevard/Lake Washington Boulevard/SR 520 Eastbound Ramps Intersection, Year 2030

	AM Peak		PM Peak	
Alternative	**SDEIS**	**Final EIS**	**SDEIS**	**Final EIS**
No Build Alternative	4,440 vph	4,550 vph	5,510 vph	5,410 vph
Option A	4,640 vph	-	5,810 vph	-
Option A with Suboptions	4,260 vph	-	5,400 vph	-
Option K	4,090 vph	-	4,800 vph	-
Option K with Suboption	4,050 vph	-	4,750 vph	-
Option L	4,090 vph	-	4,800 vph	-
Option L with Suboptions	4,090 vph	-	4,800 vph	-
Preferred Alternative	-	5,190 vph	-	5,760 vph

Table 5.1-12. LOS and V/C Ratio of Montlake Boulevard/Lake Washington Boulevard/SR 520 Eastbound Ramps, Year 2030

	AM Peak		PM Peak	
Alternative	**SDEIS**	**Final EIS**	**SDEIS**	**Final EIS**
No Build Alternative	LOS E	LOS E/1.05	LOS F/1.26	LOS F/1.50
Option A	LOS D	-	LOS E	-
Option A with Suboptions	LOS C	-	LOS E	-
Option K	LOS D	-	LOS E	-
Option K with Suboption	LOS C	-	LOS C	-
Option L	LOS D	-	LOS F/1.32	-
Option L with Suboptions	LOS C	-	LOS E	-
Preferred Alternative	-	LOS F/1.10		LOS F/1.20

Montlake Boulevard/NE Pacific Street

The Final EIS analysis assumed that there would be a single-point toll and that drivers would not pay a toll to cross the Portage Bay Bridge. So under the Preferred Alternative, there would be more trips made across the Portage Bay Bridge between I-5 and Montlake compared to the SDEIS analysis, which assumed a segmental toll. This means if the toll scenario for the Options A, K, and L analyses were updated, there would be an increase in trips across the Portage Bay Bridge between I-5 and Montlake to the north. This would result in more traffic entering the Montlake triangle area than was reported in the SDEIS for Options A, K, and L (Table 5.1-13). Traffic volumes entering the Montlake triangle under Options K and L would be expected to be over 9,000 vph during the afternoon peak hour using the Final EIS travel demand model and toll definition.
Option A with the suboption would be similar to the Preferred Alternative. Option A would be similar to the Final EIS No Build Alternative.

Table 5.1-13. Volume Entering Montlake Triangle, Year 2030

	AM Peak Hour		PM Peak Hour	
Alternative	**SDEIS**	**Final EIS**	**SDEIS**	**Final EIS**
No Build Alternative	5,050 vph	5,240 vph	7,150 vph	7,000 vph
Option A	4,750 vph	-	6,850 vph	-
Option A with Suboptions	4,750 vph	-	7,050 vph	-
Option K with suboption	6,250 vph	-	8,900 vph	-
Option L	6,950 vph	-	9,400 vph	-
Option L with Suboptions	6,250 vph	-	8,900 vph	-
Preferred Alternative	-	5,410 vph	-	7,270 vph

Table 5.1-14 shows the LOS for the Montlake Boulevard/Pacific Street intersection. During the morning peak hour, the intersection would operate at LOS D or better under the No Build Alternative and SDEIS options, which is considered acceptable. During the afternoon peak hour, Options K and L would operate with a LOS F grade and worse than the No Build Alternative (Table 5.1-14). For the LOS F conditions where the intersection would be over capacity, we have also provided a v/c ratio to better explain the magnitude of failing operations.

The SDEIS analysis identified significant operational issues with Options K and L and their suboptions at the Montlake Boulevard/Pacific Street intersection during the afternoon peak hour. Traffic volumes in this area were substantially greater than the capacity of the intersection. With an

anticipated increase in traffic with the single-point toll and the updated travel demand model used in the Final EIS, the operations of the Montlake Boulevard/Pacific Street intersection would be expected to be similar or worse than was reported in the SDEIS for Options K and L and their suboptions.

Table 5.1-14. LOS of Montlake Boulevard/Pacific Street Intersection, Year 2030

	AM Peak Hour		PM Peak Hour	
Alternative	**SDEIS**	**Final EIS**	**SDEIS**	**Final EIS**
No Build Alternative	LOS C	LOS C	LOS F/1.26	LOS E
Option A	LOS C	-	LOS E	-
Option A with Suboptions	LOS C	-	LOS E	-
Option K and Option K with Suboption	LOS C	-	LOS F/1.38	-
Option L	LOS D	-	LOS F/1.32	-
Option L with Suboptions	LOS C	-	LOS F	-
Preferred Alternative	-	LOS C	-	LOS E

How would the project affect bus facilities and service?

The Preferred Alternative and the SDEIS options would all provide improved access for HOV and transit in the Montlake interchange area, but design details would vary. As shown in Exhibit 5.1-27, the Preferred Alternative and the SDEIS options would all affect bus operations with the following changes:

- Add HOV lanes in both directions across SR 520 from Evergreen Point Road 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 direct-access ramps to the Montlake interchange area, connecting with SR 520 to and from the east. Option A is the only exception because it did not provide direct access from Montlake to the east.
- Remove the Montlake Freeway Transit Station.
- The Preferred Alternative, which was developed by refining SDEIS Option A, would also include (see Exhibit 5.1-28):
  - Providing bus stops on the new Montlake lid to help replace the function of the Montlake Freeway Transit Station.

How was bus service evaluated for the project?

For all alternatives, WSDOT evaluated the demand for buses and determined the bus capacity that would be available based on information from King County Metro, Sound Transit, Community Transit, and Microsoft Corporation (as a private shuttle operator).

The information about demand and capacity for the transit system was considered for each alternative, and WSDOT evaluated how each alternative would affect the transit infrastructure and operations.

WSDOT considered not only what the demand for buses would be, but also what effect the project itself would have on demand.

- Adding HOV lanes to Montlake Boulevard NE from SR 520 (southbound between NE Pacific Street and East Shelby Street and northbound between SR 520 to the Montlake Cut).
- Providing for the addition of signal priority at the interchange area.

Exhibit 5.1-27. **HOV and Transit Improvements Along SR 520 with the Preferred Alternative**

Option A would include a westbound transit-only off-ramp to northbound Montlake Boulevard, while the Preferred Alternative and Options K and L would include 3+carpools and transit direct-access ramps to and from the east at the new interchange east of Montlake Boulevard.

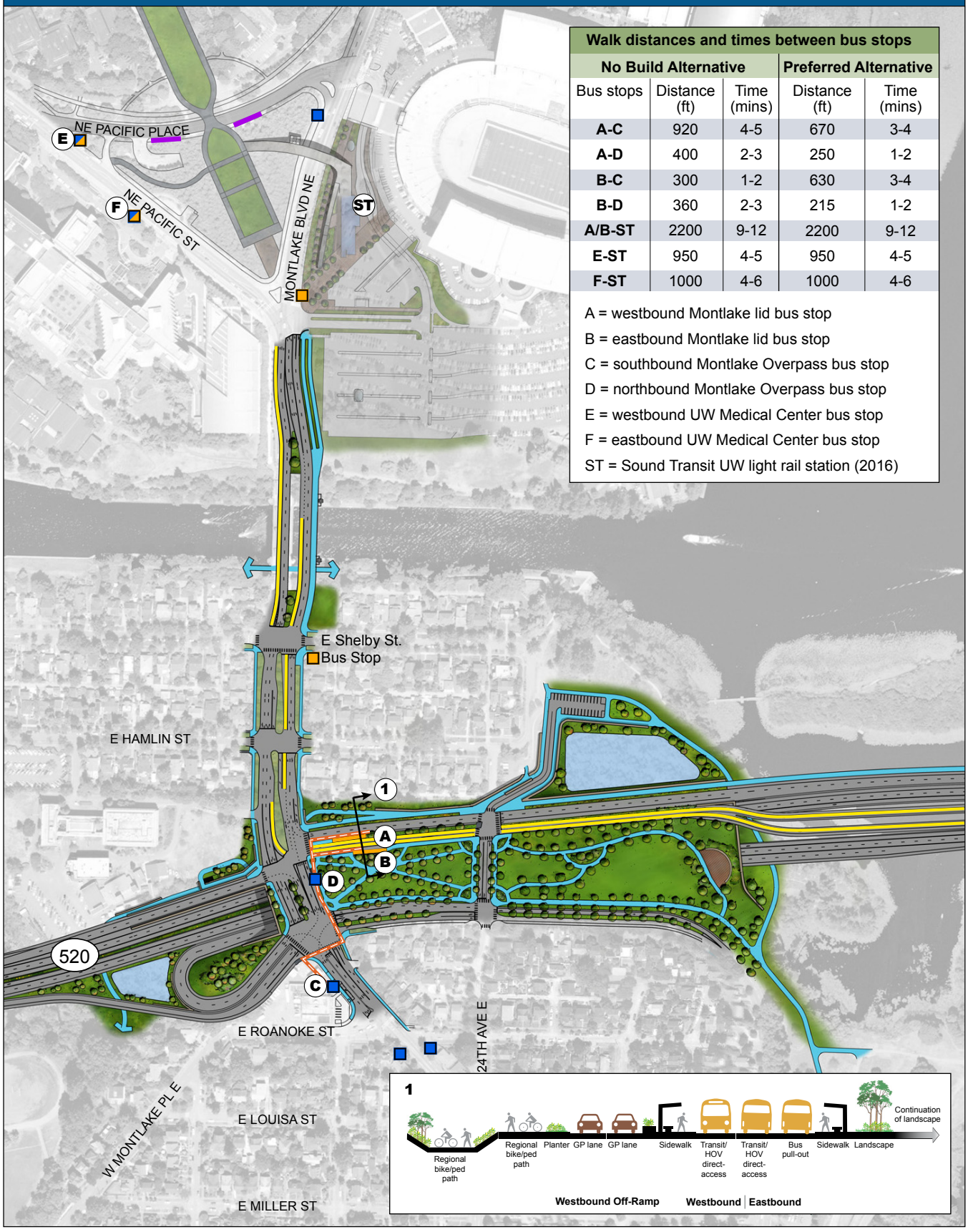
Would bus capacity on SR 520 meet demand in 2030?

The Final EIS analysis assumed that expanded light rail service would be in place in 2030 with the implementation of ST 2, and used the corresponding changes to bus routes and ridership on SR 520 as provided by King County Metro and Sound Transit. The East Link light rail line across I-90, which would serve downtown Seattle, Mercer Island, Bellevue, and Overlake (Redmond), would be operating by this time. Exhibit 5.1-28 shows the current and forecasted daily and peak-period person demand by bus in 2030.

Exhibit 5.1-28. **Preferred Alternative Transit and HOV Facilities within the Montlake Area**

Walk distances and times between bus stops				
	No Build Alternative		Preferred Alternative	
Bus stops	Distance (ft)	Time (mins)	Distance (ft)	Time (mins)
A-C	920	4-5	670	3-4
A-D	400	2-3	250	1-2
B-C	300	1-2	630	3-4
B-D	360	2-3	215	1-2
A/B-ST	2200	9-12	2200	9-12
E-ST	950	4-5	950	4-5
F-ST	1000	4-6	1000	4-6

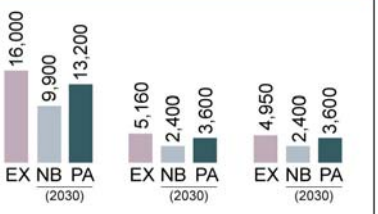
A = westbound Montlake lid bus stop
B = eastbound Montlake lid bus stop
C = southbound Montlake Overpass bus stop
D = northbound Montlake Overpass bus stop
E = westbound UW Medical Center bus stop
F = eastbound UW Medical Center bus stop
ST = Sound Transit UW light rail station (2016)



Bus Stop (Local Route)
Bus Stop (SR 520 Route)
Bus Stop (Local and SR 520 Route)
Layover Area
HOV Lanes
Bicycle/Pedestrian Path
N

Under the Final EIS No Build Alternative, which includes East Link and associated changes in SR 520 bus service, daily person demand for buses on SR 520 would decrease by 38 percent between now and 2030, as seen in Exhibit 5.1-29. Transit ridership demand would decrease by about 50 percent during the morning and evening commute periods, compared to today. Much of this decrease would be due to a switch of ridership from SR 520 buses to East Link light rail on I-90.

Exhibit 5.1-29. **Daily Person Trips by Bus**



The Preferred Alternative, similar to the SDEIS options, would increase person demand for buses over the No Build Alternative. Daily transit ridership would increase by approximately 33 percent with the Preferred Alternative than without the project. This increase reflects the effect on mode choice of tolling, completing the HOV lanes in both directions across the bridge, adding a reversible connection to the I-5 express lanes, and adding direct-access ramps at the Montlake Boulevard interchange. Transit ridership demand with the project would increase by about 50 percent during both morning and evening commute periods compared to the No Build Alternative.

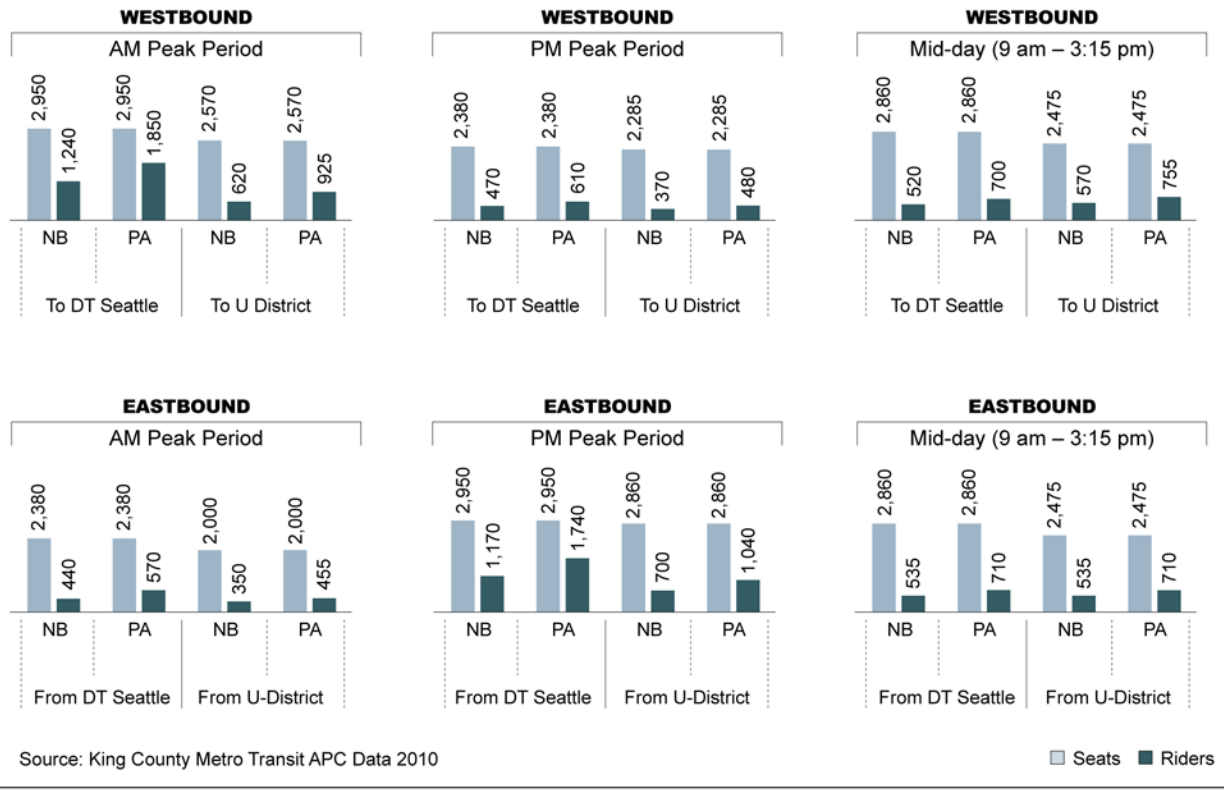
East Link and the corresponding bus service changes were not included in the SDEIS direct effects transit analysis because ST 2 had not yet been approved by voters. However, East Link was included in the SDEIS cumulative effects analysis and the results were similar to the Final EIS in that there was a net decrease in transit ridership on the SR 520 corridor. Transit ridership on SR 520 under the SDEIS cumulative effects scenario was about 85 percent lower than it was under the SDEIS No Build Alternative (without East Link) and about 55 percent lower than it was under the SDEIS options. The fact that there was less of a decrease under the build options (55 versus 85 percent) demonstrates the benefit of the HOV lane improvements included in the SDEIS options.

As shown in Exhibit 5.1-30, there were similar changes in daily transit trips in the Final EIS analysis with the Preferred Alternative, resulting in an increase in transit trips compared to the No Build Alternative, but a net decrease compared to today. It was estimated that SR 520 bus routes would provide approximately 6,800 westbound seats during the morning commute period (6:00 a.m. to 9:00 a.m.), with an actual demand for approximately 5,700 seats. This means that during its busiest time, the SR 520 corridor bus transit system would be operating at 84 percent capacity.

The combination of a decrease in bus ridership over today along with improved headways (shorter time between bus arrivals on a given route) suggests that there would be available seat capacity on buses in the SR 520 corridor. A comparison of bus seat capacity and bus ridership demand for the No Build and Preferred Alternatives was prepared using ridership information for the two busiest SR 520 transit markets (Eastside-downtown Seattle buses and Eastside-University District) and the assumed route headways. The purpose of this comparison was to determine the

effects of the Preferred Alternative and the removal of the Montlake Freeway Transit Station, which is anticipated to increase ridership on Eastside-University District routes. Exhibit 5.1-30 shows the anticipated ridership and bus capacities.

Exhibit 5.1-30. **Year 2030 Bus Capacity vs Ridership across SR 520 Bridge**



As shown in Exhibit 5.1-30, it was estimated that SR 520 bus routes would provide approximately 5,500 westbound seats during the morning commute period (6:00 a.m. to 9:00 a.m.), with a demand for approximately 2,780 seats (Eastside- downtown Seattle buses and Eastside-University District combined). This means that during its busiest time, the SR 520 corridor bus transit system would be operating at 50 percent capacity, which is better than under the SDEIS options. These data appear to illustrate that there would be adequate capacity available to meet the anticipated 33 percent increase in ridership demand along the corridor throughout the day.

What would bus travel times be on the SR 520 corridor?

Under the Final EIS No Build Alternative, HOV travel times in either direction on SR 520 would be the same or slightly longer than today in the morning peak period, and faster than today in the evening peak period. During the morning peak period, HOV travel times westbound between

SR 202 and I-5 would be a maximum of 18 minutes (2 minutes more than today); eastbound, the maximum HOV trip time would be 26 minutes from I-5 to SR 202 compared to 25 minutes today. The increase in HOV travel times would be due to additional congestion resulting from the growth in demand between today and 2030. In the evening, the maximum HOV travel time westbound between SR 202 and I-5 would improve by 9 minutes (28 minutes today compared to 19 minutes in 2030); eastbound, the maximum HOV travel time from I-5 to SR 202 would improve by 2 minutes (20 minutes today compared to 18 minutes in 2030). The improvement in the evening commute would occur because of the other planned improvements to the corridor. These changes are similar to those under the SDEIS No Build Alternative, except for eastbound HOV travel times under SDEIS Option K during the evening commute. This difference is discussed in Section 5.1.3 under *Evening Peak Eastbound*.

The Preferred Alternative would further improve bus reliability and travel times on SR 520 over the No Build Alternative, as well as the connections between bus service and other travel modes in the Montlake interchange area. The project would keep westbound and eastbound HOV lane speeds consistently at or near free-flow conditions throughout the peak periods (even during the peak hour of the peak period). As a result, westbound and eastbound HOV travel times would reliably be an average of 14 to 16 minutes between I-5 and SR 202, helping buses to stay on schedule.

Westbound, the maximum HOV travel times between SR 202 and I-5 would improve by up to 3 to 4 minutes for HOV traffic during both morning and evening peak periods, compared to No Build conditions. Eastbound, HOV maximum travel times would improve by up to 12 minutes compared to No Build conditions during the morning peak period, and up to 3 minutes during the evening peak period. The improvement would be due to completion of the new Montlake interchange, which would improve local traffic operations as well as travel times and reliability for SR 520 buses compared to the Final EIS No Build Alternative. The Preferred Alternative would maintain the HOV priority treatments on NE Pacific Street eastbound and Montlake Boulevard NE southbound; it would also add HOV lanes to Montlake Boulevard NE from SR 520 to across the Montlake bascule bridges. These HOV facilities would allow buses to bypass traffic congestion associated with off-peak openings of the Montlake Bridge. These changes are similar to those for the SDEIS options. For more information about freeway travel times, see Section 5.1.3.

How would bus service change with I-90 East Link light rail in place?

With new light rail service in place, King County Metro and Sound Transit would revise bus service to facilitate bus-light rail connections and create transit service efficiencies

The number of downtown Seattle-Eastside routes would be reduced from 15 to 7 and the number of U-District/North Seattle – Eastside routes would be reduced from 8 to 6. All-day service across the floating bridge would continue to be provided by the same four all-day routes that operate today.

While the overall number of routes would be reduced, route headways would be improved to provide more frequent bus service than today across the SR 520 bridge.

How would the Montlake Freeway Transit Station be affected?

Under the Final EIS No Build Alternative, King County Metro and Sound Transit would restructure SR 520 bus service to downtown Seattle to support East Link and University Link light rail and King County Metro

transit service changes. These changes would result in seven fewer bus routes across SR 520 and, therefore, fewer bus routes serving the Montlake Freeway Transit Station. As a result of these service changes, a forecasted 1,100 riders would use the station compared to 1,700 today. The implementation of Sound Transit route 542 between Redmond and the University District in October 2010 is anticipated to further decrease use of the Montlake Freeway Transit Station during the peak periods. Route 542 provides direct service to the University District, and is an option to using route 545. Using route 542 allows bus riders to avoid walking or busing from the Montlake Freeway Transit Station.

Like all of the SDEIS options, the Preferred Alternative would remove the Montlake Freeway Transit Station. SR 520 transit travel patterns would not be substantially affected by this change. Under the Preferred Alternative, new westbound and eastbound bus stops would be provided on the new Montlake lid. These stops would continue to be accessible to pedestrians, bicyclists, and other transit riders. Eastside-University District/North Seattle bus routes would continue to exit at the Montlake interchange and serve this stop.

Adding the westbound and eastbound stops to the Montlake lid would allow transit agencies to maintain SR 520 bus service to the Montlake interchange area via Eastside-downtown Seattle bus routes during off-peak periods. Westbound buses would be able to exit via the new HOV direct-access ramps, serve the stop on the Montlake lid, and then continue on westbound SR 520 to downtown Seattle or other destinations via I-5. Eastbound buses would be able to exit SR 520 at the Montlake off-ramp, turn left onto Montlake Boulevard, and then turn right onto the direct-access ramps to pick up or drop off passengers. As result, riders would have access to both downtown Seattle-Eastside and University District-Eastside bus routes during midday, evenings, and weekends.

During the morning and evening peak periods, downtown Seattle-Eastside bus routes would have one less stop on their route, resulting in travel time savings. Because downtown Seattle-Eastside bus routes would not serve the Montlake lid bus stops during the a.m. and p.m. peak periods, riders would lose access to approximately 220 bus trips between Montlake Boulevard and the Evergreen Point or Yarrow Point freeway transit stations compared to the No Build Alternative.

Transit riders who would normally use one of these routes would need to use one of the University District-Eastside bus routes instead. They would have access to an additional 55 bus trips between Eastside-University District as well as East Link, which would serve the University of Washington (UW) at the station near Husky Stadium. Some riders using SR 520 bus service might need to transfer at the Evergreen Point Freeway Transit Station to reach their destination. Transfer time between westbound downtown Seattle and University District buses at the Evergreen Point

station would be between 3 to 4 minutes during both peaks. This estimate is based on the combined bus frequency for the Eastside-University District routes as it is assumed that most riders destined for the University District would be able to catch any University District route. Riders traveling eastbound who need to catch a downtown Seattle bus to their final destination would be able to catch any eastbound University District route, which would also have a combined frequency of every 3 to 4 minutes during the peak periods, to the Evergreen Point freeway station. Once there, some riders might have to wait up to 45 minutes if they do not consult bus schedules. During the off-peak and weekends, riders would be able to use Eastside-downtown Seattle routes to access the Montlake area. For many riders, the addition of 3 to 4 minutes to transit trip time would be offset by time saved through replacing walk time from the Montlake Freeway Transit Station with direct service to the Montlake Multimodal Center (about a 5 minute savings).

What would be the effects on local bus service on Montlake Boulevard NE?

Under the Final EIS No Build Alternative, transit agencies plan that routes 272 (an express bus route between the University District and Bellevue) and route 556 (an express bus route between Northgate and Issaquah) would be discontinued and would no longer be available at the East Shelby Street and Montlake Boulevard southbound bus stops. This would have a minimal effect because total boardings and alightings are expected to decrease by less than 1 percent at each of those stops on a daily basis as a result of the change in service.

Based on the travel demand modeling that assumed light rail ridership in 2030, it is also anticipated that ridership would decrease on some of the local King County Metro routes traveling through the Montlake area as transit riders switch to light rail. For example, transit riders traveling between Capitol Hill and the University District on route 43 might choose to take light rail via the John Street, UW, and Brooklyn stations. Transit riders who are traveling between Capitol Hill and Overlake might also choose to take East Link.

Under the Preferred Alternative, two bus stops would be relocated due to the reconstruction of the Montlake interchange area (see Exhibit 5.1-28 for details of the transit facilities that would exist with the project). The Montlake Boulevard southbound bus stop, currently on a traffic island at the SR 520 eastbound on-ramp, would be permanently relocated 270 feet to the south to near East Roanoke Street (as requested by the City of Seattle through the ESSB 6392 process described in Chapter 1). The Montlake Boulevard northbound bus stop at the SR 520 westbound off-ramp would be permanently relocated 100 feet to the south on the Montlake overpass.

The new bus stop would be designed as a pull-out lane to allow buses to stop without affecting local traffic operations.

Southbound Travel Times

Travel time for local buses traveling eastbound along NE Pacific Street and southbound along Montlake Boulevard NE would be approximately 16 minutes under the Final EIS No Build Alternative (between 15th Avenue NE and East Roanoke Street). Under the Preferred Alternative, travel time for southbound local buses would improve to approximately 11 minutes because of capacity improvements to the local street system, including HOV lanes and an HOV direct-access ramp at the Montlake interchange. For a detailed description of the changes in the local street capacity and LOS improvements associated with the Final EIS No Build Alternative and the Preferred Alternative, please refer to the section in this chapter titled *How would the project affect traffic on local streets and at intersections?*

Southbound travel times under the Final EIS No Build Alternative and the Preferred Alternative would be slightly longer than the SDEIS No Build Alternative (9 minutes) and options (all were 3 to 5 minutes). This is due to different analysis limits, which were expanded to account for more of the congestion in the study area. With the same analysis limits, the SDEIS results would be similar because of the options all having similar travel times to each other and all being better than No Build.

Northbound Travel Times

Travel times for local buses traveling northbound along Montlake Boulevard NE and westbound along NE Pacific Street would be approximately 19 minutes under the Final EIS No Build Alternative (between 15th Avenue NE and East Roanoke Street). Under the Preferred Alternative, travel times for northbound local buses would improve to approximately 14 minutes because of capacity and HOV improvements to the local street system and at the Montlake interchange.

The Preferred Alternative travel times fell between Option A (18 minutes) and Option A with the suboption (10 minutes), reflecting the effect of combining the revised design characteristics of each. The Preferred Alternative travel times were also better than Options K and L (26 and 28 minutes, respectively). Northbound travel times under the Final EIS No Build Alternative are less than the SDEIS No Build Alternative (45 minutes). This is due to differences in background traffic growth in the Montlake interchange area, which were slightly less under the Final EIS No Build Alternative (21 percent in Final EIS compared to 24 percent in the SDEIS). Background traffic growth was updated to reflect updates from the PSRC travel demand model. Updated simulation modeling also provided improved U-turn simulation, which could have added to the improved operations. This decrease in traffic volumes and improved simulation

resulted in better traffic operations through the Montlake interchange area, particularly at the Montlake Boulevard NE/East Hamlin Street intersection.

Comparable traffic volumes would decrease travel times under the SDEIS No Build Alternative. The changes in volume would also apply to the SDEIS options; however, none of the options include the U-turn function, so that would not affect their results. Operational results would still be relatively similar between the options. Option A and Option A with the suboption would still have better travel times than Options K and L. This is because travel times under Options K and L are constrained by operational issues at the Montlake Boulevard/NE Pacific Street intersection, which was operating 40 percent over capacity. Reduced background growth in traffic volumes would not eliminate this constraint. For more detailed information on how the alternatives affect intersection operations, please refer to the section in this chapter titled *How would the project affect traffic on local streets and at intersections?*

How would the project interact with proposed improvements in the "Montlake Triangle" area?

At the time of the SDEIS, the City of Seattle, King County Metro, Sound Transit, UW, and WSDOT were considering several options to improve traffic circulation in the Montlake Triangle vicinity. The construction of the University Link light rail station at Husky Stadium, an increased concentration of bus and pedestrian traffic around the Montlake Triangle, and increased pedestrian and bicycle traffic from the new regional pedestrian and bicycle path across SR 520 would make this already busy area function as a multimodal center. The Montlake Multimodal Center would function as a primary commuter entry onto the University of Washington campus. The University of Washington has also been planning a project to improve the Rainier Vista, whose southern terminus is at NE Pacific Place across from the Montlake Multimodal Center. As part of the ESSB 6392 process, WSDOT coordinated with these agencies to ensure that the SR 520 project options would be compatible with other improvements at this location.

The SDEIS evaluated potential improvements at the Montlake Multimodal Center under Options K and L, which would have added a new leg to the intersection of Montlake Boulevard NE and NE Pacific Street. These options included a full or partial lid at the intersection to allow pedestrians to cross over Montlake Boulevard to access other portions of the campus. Option A did not require any changes to this intersection, and, therefore, did not propose a lid or other changes to pedestrian and bicycle facilities. Sound Transit's EIS for the University Link light rail station had evaluated a pedestrian bridge across Montlake Boulevard and Pacific Place, and the UW was conducting its own environmental review of the Rainier Vista project;

Option A assumed that these projects would proceed independently of the SR 520, I-5 to Medina project.

Like Option A, the Preferred Alternative does not propose any changes at the Montlake Boulevard/Pacific Street interchange. However, as noted above, the improvements to traffic circulation, transit, and bicycle/pedestrian access provided by the SR 520, I-5 to Medina project made it important for WSDOT to coordinate closely with the agencies planning projects in this area. As part of the ESSB 6392 work group process following the SDEIS, WSDOT continued to work with the Seattle Department of Transportation, the Seattle Design Commission, the UW, King County Metro, and Sound Transit on ways to improve circulation at the Montlake Multimodal Center. The intent of the coordination effort was to ensure that SR 520 project options would be compatible with other projects and improvements at this location. (A copy of ESSB 6392 is provided in Attachment 16 to this Final EIS.)

Together, the agencies identified conceptual design options that would provide safe, efficient transfers for bicyclists, pedestrians, and bus users to connect to the University Link light rail station near Husky Stadium. Exhibit 5.1-31 shows the likely configuration for the Montlake Triangle after completion of all planned projects there, as envisioned through the

Exhibit 5.1-31. **Rendering of Sound Transit's University of Washington Station Entrance with Pedestrian Bridge, (opening in 2016)**

coordination effort. Although WSDOT would not be responsible for implementing improvements in this area, it is providing part of the funding for the improvements in recognition of the need to serve additional nonmotorized traffic in this area.

Neither the Preferred Alternative nor SDEIS Option A would change or negatively affect other projects in the Montlake Triangle area proposed by others. The Preferred Alternative includes the same assumptions about operation of this area, including pedestrian connections, as Option A, although future pedestrian volumes were updated for the Final EIS analysis to be consistent with the North Link final environmental documentation (Federal Transit Administration and Sound Transit 2009). However, if Options K or L were ultimately chosen to move forward, the concept discussed above would need to be revisited, as it would not be compatible with the planned improvements.

University District and Montlake Multimodal Center Bus Service

Under the Final EIS No Build Alternative, the addition of Sound Transit's University Link light rail station would change the need for and usage of existing bus stops in the Montlake Triangle. After opening of the light rail line and station, the Montlake Triangle area would serve multiple transportation modes—buses, light rail, bicycles, and pedestrians—making it the Montlake Multimodal Center.

Sound Transit initiated construction of the new segment of light rail between downtown Seattle and the UW and the UW Station in 2009; the facilities are expected to open in 2016. The UW Station shown in Exhibit 5.1-31 would provide access to the UW campus, the UW Medical Center, nearby sports venues, and surrounding neighborhoods. Sound Transit forecasts that there would be approximately 23,000 total boardings and alightings per day at this station in 2030. This is compared to the 3,000 total boardings and alightings today at the UW Medical Center bus stops on NE Pacific Street. The new Sound Transit pedestrian bridge over Montlake Boulevard (also shown in Exhibit 5.1-31) would help to accommodate the additional pedestrian traffic, as would the new grade-separated pedestrian crossing between the Montlake Multimodal Center and the Rainier Vista walkway planned by the University of Washington. Specifically, this pedestrian crossing would cover NE Pacific Place, which would be lowered to below-grade.

Similar to the SDEIS options, the Preferred Alternative would be designed to be compatible with the planned UW Station. Coordination among WSDOT, King County Metro, Sound Transit, and the UW regarding the interaction of SR 520 with light rail and bus transit would continue throughout the design phase of the project. WSDOT, Sound Transit, King County Metro, and the UW have also developed a High-Capacity Transit

The SR 520 High-Capacity Transit Plan

The 2008 SR 520 High-Capacity Transit (HCT) Plan—developed by King County Metro, Sound Transit, the UW, and WSDOT—identified a planning vision for bus rapid transit (BRT) in the SR 520 corridor. The vision is for a network of up to five bus rapid-transit lines selected based on transit market demand. The routes would provide frequent (10-minute) all-day service in both directions, connecting downtown Seattle, the University District, and Eastside activity centers.

As discussed in Chapter 2 of this Final EIS, BRT has been identified as the preferred near-term form of HCT in the corridor, with light rail transit as a potential future enhancement if regional planning supports it.

The plan also includes options for developing the Montlake Triangle into a multimodal center to serve bus, pedestrian, bicycle, and light rail circulation and connections.

Implementation of the HCT plan is contingent on replacing the Evergreen Point Bridge, adding HOV lanes, and constructing critical transit facilities, including the new Evergreen Point Freeway Transit Station and transit/HOV direct-access facilities near the Montlake interchange. Additional funding would also be needed to provide the higher levels of bus service recommended in the plan.

Plan (WSDOT 2008), which provides a strategy for implementing bus rapid transit service on the SR 520 corridor (see text box at right).

With the opening of the UW Station, some existing transfer activity would relocate from the Montlake Freeway Transit Station to the Montlake Multimodal Center. For riders transferring between SR 520 buses and light rail, pedestrian walk times between the NE Pacific Street bus stops and the University Link light rail station entrance would be less than 5 minutes.

With relocation of the HOV lanes and freeway transit stations to the inside of SR 520, King County Metro has indicated that an important route now serving the Montlake Triangle area, route 271, could be re-routed to the 108th Avenue NE HOV direct-access ramp in Bellevue that would be constructed as a part of the SR 520, Medina to SR 202 project. This would allow route route 271 to serve the 92nd Avenue and Evergreen Point Freeway Transit stations and provide midday and off-peak service to the Montlake and University District neighborhoods.

Would there be effects on bicycle/bus connections?

In 2030 without the project, conditions would generally not improve from today, when bicycle riders are often delayed because of full bicycle racks, sometimes waiting up to 30 to 40 minutes for a bus with bicycle rack space (King County Metro 2002). The transit services' proposed improved headways could ease bicycle-bus coordination, but traffic congestion across SR 520 would still delay trips and lead to long wait times.

Under the Preferred Alternative, as with the SDEIS options, HOV travel times between I-5 and SR 202 would improve from today, as discussed above. This would lead to improved connections between transit services and other travel modes compared to existing conditions and the No Build Alternative. With the project, bicycle commuters would have the option of riding across the SR 520 bridge on their bicycles instead of waiting for a bus, which is likely to reduce their total commute travel time. Whether or not they choose to bicycle or use bus racks to transport bicycles along SR 520, the project would make their trip more reliable.

How would the project affect nonmotorized transportation?

For the Final EIS, WSDOT completed additional evaluation of nonmotorized transportation routes and features, using a higher level of planning detail than was available when the SDEIS was being prepared. The additional detail came from the efforts of the ESSB 6392 workgroup (described in Chapter 1). The workgroup, which included WSDOT, discussed and agreed on the network of primary nonmotorized routes that would connect to major destinations, such as the UW, and to other transportation components, such as the Burke-Gilman Trail. Although this analysis was refined in the context of the Preferred Alternative, many of the

general concepts developed for nonmotorized transportation are also applicable to the SDEIS design options.

The Preferred Alternative and the SDEIS options would meet the project goals of providing mobility benefits in the SR 520 corridor and to the region as a whole. Nonmotorized systems offer options for mobility that cannot be realized by highway systems; they may, if carefully designed, help to reconnect communities that were isolated by construction of the highway. The nonmotorized features of the SR 520, I-5 to Medina project are part of a larger, comprehensive transportation system, including connections to routes identified in the Seattle Bicycle Master Plan (City of Seattle 2007).

The following project features are common to the Preferred Alternative and Options A, K, and L:

- **Evergreen Point Bridge.** The regional bicycle/pedestrian path across the bridge is the most substantial improvement in nonmotorized connections provided by the project. Bicyclists and pedestrians would have the ability to travel directly east and west across Lake Washington along the SR 520 corridor, which is an option they do not have today.
- **10th Avenue East and Delmar Drive East Lid.** On the 10th Avenue East and Delmar Drive East lid, intersection connections would be improved to provide enhanced safety for bicyclists and pedestrians. The lid surface would offer a more aesthetic connection between neighborhoods adjacent to SR 520 and would include a meandering pathway from east to west between 10th Avenue East and Delmar Drive East.

While the Preferred Alternative and design options meet the basic project goals, they contain slight differences in their effects on nonmotorized transportation in the I-5 and Montlake interchange areas. These differences are primarily associated with the variations in design features in the following areas:

- **I-5/Roanoke Crossing.** The Preferred Alternative would add a path on the south side of the Roanoke Street bridge over I-5 and new crosswalks at the Harvard Avenue East/Roanoke Street intersection. This would improve safety in an area where bicyclists typically share the roads with vehicle traffic. These improvements would be provided via an enhanced bicycle/pedestrian overcrossing parallel to the existing East Roanoke Street Bridge.

  Under Options A, K, and L, a lid over I-5 would be provided at the existing East Roanoke Street crossing over I-5, extending to the north and south. Pedestrians, bicyclists, and emergency vehicles would be able to access the top of the lid for cross connections. The existing East Roanoke Street Bridge would be rebuilt under these design options.

- **Montlake Boulevard and 24th Avenue East Lid.** The Preferred Alternative and SDEIS options A, K, and L would allow pedestrians and bicycles to connect via the Montlake Boulevard and 24th Avenue East lid to the Evergreen Point Bridge path to the east, the Burke-Gilman Trail to the northeast and west, the Bill Dawson Trail to the southwest, and Lake Washington Boulevard/Arboretum trails to the southeast.

  The Preferred Alternative and Option A offer 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.

  Under Option L, the elevation differences at the single-point urban interchange 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.** The Preferred Alternative and Option A would improve connectivity for bicyclists and pedestrians with other modes of transportation via the Montlake Multimodal Center and University Link light rail station by expanding the pedestrian facilities across the Montlake Cut. A roadside bicycle/pedestrian path would be provided along the new Montlake bascule bridge, replacing the existing narrow sidewalk. Compared to the No Build Alternative, bicyclists would experience fewer conflicts with traffic by using the roadside path. This bicycle/pedestrian path would provide a direct connection with the Sound Transit pedestrian bridge that would cross over Montlake Boulevard and tie seamlessly with the UW Rainier Vista project, allowing cyclists and pedestrians access to the Burke-Gilman trail and the UW main campus.

  Under Options K and L, there would be a lid over the NE Pacific Street/Montlake Boulevard intersection that would provide more direct nonmotorized connections between local bus services and 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 either the narrow sidewalk on the existing Montlake drawbridge or the street. Because of the new crossing of the cut for vehicles, there would be less traffic on Montlake Boulevard and cyclists would experience fewer conflicts with vehicles as a result of the reduced traffic.

- **Arboretum/Lake Washington Boulevard.** The Preferred Alternative and Option A would reduce vehicular traffic in the Arboretum compared to the No Build Alternative, resulting in improved conditions for bicycle and pedestrian travel.

  Option K would provide a lid for bicyclists and pedestrians to connect from the SR 520 bridge exit to the Arboretum pathways via two overpass connections.

Under Option L, a bicycle/pedestrian path would briefly cross under Lake Washington Boulevard, both at the SR 520 ramp and farther south as Lake Washington Boulevard leads through the Arboretum area.

Options A, K, and L could include an optional land bridge at Foster Island that would provide additional connections from the SR 520 bridge to the existing arboretum trails.

The Preferred Alternative and SDEIS options A, K, and L would result in the loss of 54 bicycle locker spaces and 53 bicycle rack spaces near the existing Montlake Freeway Transit Station due to construction of the SR 520 westbound off-ramp. WSDOT, King County Metro, and Sound Transit are working together to determine the best way to replace these bicycle parking facilities.

Effect on Key Nonmotorized Routes

In response to public and agency comments and legislative direction, seven nonmotorized routes in the transportation study area were evaluated in more detail for the Final EIS (Exhibit 5.1-32). These routes, and the project's effects on them, are described below.

Route 1: Regional Connection - SR 520 Regional Path to Burke-Gilman Trail, the University of Washington, and Sound Transit's University Link Station

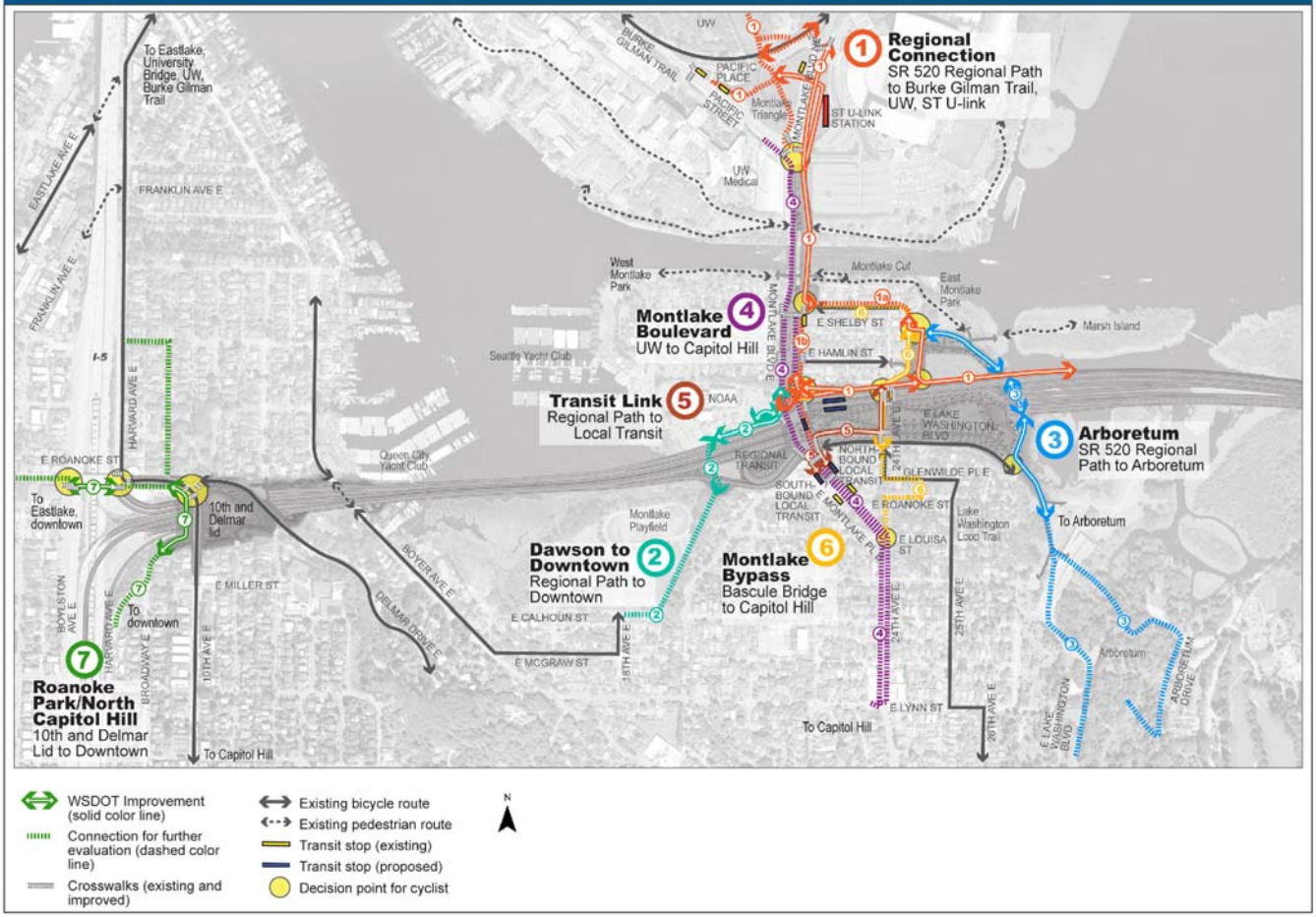
This route forms a vital connection between the UW in Seattle and the communities east of Lake Washington. Under the No Build Alternative as today, cyclists and pedestrians would board a bus to cross SR 520 or detour to the north or south to use their bicycles.

The Preferred Alternative and SDEIS options A, K, and L would build a new section of the SR 520 regional trail across the Evergreen Point Bridge from Montlake Boulevard to Medina, improving the capacity and efficiency of the nonmotorized network.

Under the Preferred Alternative and Option A, an off-street nonmotorized path that would be completed as part of a new bascule bridge across the Montlake Cut would help to safely connect the SR 520 regional trail to the Burke-Gilman Trail, existing transit stops, and the future University Station in and around the Montlake Triangle. The portion of this route on city streets between the bascule bridge and regional trail will be developed by the City of Seattle as agreed through ESSB 6392 coordination.

Under Options K and L, bicyclists would still be required to use Montlake Boulevard, but would experience fewer conflicts with vehicles as a result of reduced traffic. In the Montlake Triangle area, the NE Pacific Street lid would provide seamless nonmotorized connections between local and regional bus services, the University Link light rail station, and the Burke-Gilman Trail.

Exhibit 5.1-32. **Nonmotorized Routes**



The bicycle and pedestrian paths proposed for construction by the project are shown in orange on Exhibit 5.1-33. There are portions of the seven common routes that would be built by the SR 520, I-5 to Medina project.

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

Under the No Build Alternative, the Bill Dawson trail would operate as it does today, connecting Montlake Boulevard to East Calhoun Street near Montlake Playground, and also providing connections to Capitol Hill and downtown Seattle. The trail currently passes underneath SR 520 on the east side of Portage Bay, and this crossing would remain substantially the same under the Preferred Alternative.

The Preferred Alternative and Options A, K, and L would add an undercrossing for the trail beneath Montlake Boulevard just north of the proposed eastbound SR 520 off-ramp intersection, improving system connectivity by providing a direct connection to the new SR 520 regional trail. The crossing underneath SR 520 would be widened and relocated slightly west of its current location to accommodate new bridge structures. Short connector trails would maintain trail connections to Montlake Boulevard at both ends of the new undercrossing alignment.

Exhibit 5.1-33. **Future Trail Connectivity**

Route 3: Arboretum - SR 520 Regional Path to Arboretum

Under the No Build scenario, the route from the Arboretum to the Montlake Boulevard interchange would follow Lake Washington Boulevard to Montlake Boulevard.

Under the Preferred Alternative and Option A, a new trail would be constructed that would cross under SR 520 and connect to 24th Avenue between East Shelby Street and East Hamlin Street. Parking for the trail would be available at a new parking lot to be established in East Montlake Park. The new trail would separate pedestrians and cyclists from the flow of motorized traffic and increase the number of connection options across SR 520, enhancing safety, adding capacity, and improving efficiency for pedestrians and bicyclists. Bicyclists would also have the option to travel between Lake Washington Boulevard and the SR 520 regional path via 24th Avenue East.

Under Option K, two short lids would be built over the ramps between Lake Washington Boulevard and SR 520 to provide pedestrian and bicyclist connections between the neighborhoods and the Arboretum. This design would also provide a separate roadway parallel to the ramps that would be designated for local residents, cyclists, and pedestrians. This design feature would reduce the potential for pedestrian and bicycle conflicts with motorized vehicles.

Option L would provide a bicycle/pedestrian path that crosses briefly under Lake Washington Boulevard, both at the SR 520 ramp and farther south as Lake Washington Boulevard leads through the Arboretum area. This design would also maintain a connection between the neighborhoods and the Arboretum, and reduce the potential for pedestrian and bicycle conflicts with motorized vehicles.

Option K includes a land bridge at Foster Island to increase/maintain connectivity of regional trails to the Washington Park Arboretum. The SR 520 roadway would be lowered at the land bridge, and pedestrian/bicyclist access from the south side of Foster Island would be possible along a new path that follows the surface of the new land bridge. Short retaining walls would be constructed around the new land bridge north of SR 520.

Route 4: Montlake Boulevard – University of Washington to Capitol Hill

As under existing conditions, the No Build scenario would require bicyclists to use the sidewalk or board a bus to cross the historic bascule bridge because the steel-grated road surface is not safe for bicycles. Elsewhere, cyclists may choose to use the sidewalk for the majority of this route, both northbound and southbound, rather than riding in-lane with motorized traffic, although the City may provide "sharrows."

Under the Preferred Alternative and Option A, the new bascule bridge would provide a separate nonmotorized path to cross the bridge on

Sharrows

Sharrows (or sharing-arrows) are white pavement markings typically on the right side of a curbside travel lane that indicate the shared use of the lane with vehicles and bicycles on an established bicycle route. Sharrows typically consist of two or more chevron arrows pointing in the direction of travel and a small cyclist symbol.

Montlake Boulevard. In addition, safety for pedestrians traveling on Montlake Boulevard would be improved because crossing locations would be signal-protected and would not expose pedestrians to higher-speed, free-flow right-turn movements.

Under Options K and L, bicyclists would still need to use Montlake Boulevard, but would experience fewer conflicts with vehicles as a result of reduced traffic.

Route 5: Transit Link – Regional Path to Local Transit

This route represents the connections from the SR 520 regional path to local and regional transit routes. Under No Build conditions, the SR 520 regional path would not be built. Bicyclists and pedestrians would need to use transit to cross Lake Washington and then transfer in the Montlake area as they do today. The local transit stops would continue to be located on Montlake Boulevard near the eastbound and westbound SR 520 ramps.

As defined in the ESSB 6392 workgroup process, the Preferred Alternative would keep the existing northbound stop near its current location, construct a new stop on the Montlake lid between the east- and westbound ramps, and relocate the southbound stop about 250 feet south of its current location. The Preferred Alternative would include crossing improvements at the Montlake Boulevard and Lake Washington Boulevard intersection by removing the free right-turn movements for vehicles, as developed in coordination with the City of Seattle. Options A, K, and L could provide similar connections between the regional path and local transit service.

Route 6: Montlake Bypass - Bascule Bridge to Capitol Hill

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

Traffic volumes would increase on 24th Avenue East under the Preferred Alternative, reducing the level of safety for bicyclists sharing the street. The Preferred Alternative would add one more intersection crossing (signal-protected) to negotiate at the westbound off-ramp/direct-access ramp intersection with 24th Avenue East. It would also provide additional paths across the Montlake lid, accommodating more pedestrians and bicycles and facilitating north-south travel through the Montlake neighborhoods. In addition, it would create more convenient transit connections and would protect pedestrians with two signals at the intersections with 24th Avenue East.

Similar to the Preferred Alternative, Option A, K, and L would connect with the Seattle bicycle/pedestrian connection along 24th Avenue East and additional paths across the Montlake lid. Traffic volumes along 24th Avenue East would be lower than under the Preferred Alternative, which

could result in a slightly safer nonmotorized environment than under the Preferred Alternative.

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

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

The Preferred Alternative would improve safety and enhance connectivity for all nonmotorized users by providing a separate crossing of I-5 south of East Roanoke Street, of SR 520 west of 10th Avenue East, and multiple pathways on the SR 520 lid between 10th Avenue East and Delmar Drive East.

Options A, K, and L would provide improved connections over I-5 via a new lid and improvements over SR 520 between 10th Avenue East and Delmar Drive East, similar to the Preferred Alternative.

How would the project affect parking?

The Preferred Alternative would have fewer parking effects than SDEIS options A, K, and L. Option L would have the greatest overall effect on parking due to construction of the northern interchange ramps across the Montlake Cut, which would pass through the Husky Stadium's south parking lot. Exhibit 5.1-34 shows the locations of affected parking.

Table 5.1-15 lists the existing parking supply, average number of spaces in use, estimated utilization rate, and the number of spaces the Preferred Alternative and Options A, K, and L would affect.

The Preferred Alternative and Options A, K, and L would require removal of the existing lot at Bagley Viewpoint Park due to construction of the 10th and Delmar lid. WSDOT is considering replacement of part or all of this parking.

At the NOAA property, only the portion of the facility parking lot located on WSDOT right-of-way under the Portage Bay Bridge structure (38 spaces) would be removed under the Preferred Alternative. Under Option A, roughly 12 spaces could be removed from the portion of the parking lot that is not under the existing structure due to column placement. Options K and L would not affect parking at this location.

How was parking evaluated?

The analysis considered existing parking supply, conceptual project design, and field observations to estimate the number of affected parking spaces and new parking provided for the Preferred Alternative. WSDOT collected supply and demand field data for each parking area that would be affected. Parking demand was determined based on a field survey that measured parking utilization several times at each location during 2 consecutive days in October 2010.

The SDEIS parking results were based on data collected in 2004 and did not include field verification, although some supply and utilization rates were verified from other sources or estimated using aerial photography. For the Final EIS, the utilization rates and supply were verified during October 2010 field surveys and were comparable to the SDEIS utilization rates.

Exhibit 5.1-34. **Potentially Affected Parking**

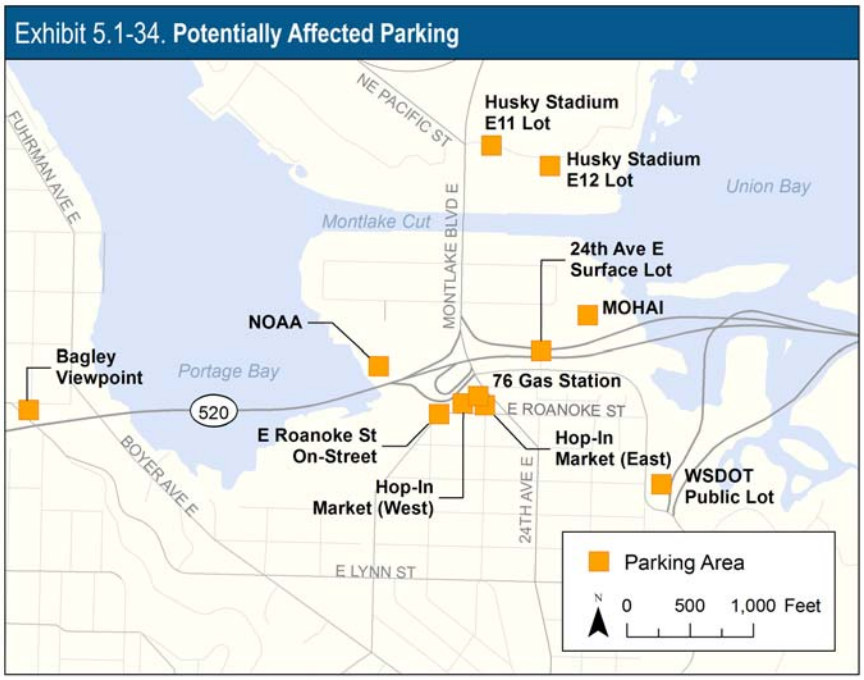


Table 5.1-15. Potentially Affected Parking Areas

Location	Existing Parking Supply	Utilization Rate	Spaces Removed by Build Alternative			
			Preferred Alternative	Option A	Option K	Option L
Lot at Bagley Viewpoint	10	10% [a]	10	10	10	10
NOAA NW Fisheries Science Center	132	90% [a]	38	12	0	0
East Roanoke Street (on-street)	6	50% [a]	0	0	6	6
76 Gas Station	5	100% [a]	0	5	0	0
Montlake Boulevard Market (west)	17	82% [a]	0	9	0	0
Montlake Boulevard Market (east)	10	50% [a]	0	10	0	0
24th Avenue East (on-street)	5	20% [a]	0	0	1	0
MOHAI	150	39% [b]	124 [e]	150 [e]	150 [e]	150 [e]
Husky Stadium E11 Lot	429	100% [c]	0	0	20	114
Husky Stadium E12 Lot	746	100% [c]	0	0	0	57
WSDOT Public Lot	24	100% [d]	0	0	24	0
Total Affected Spaces			**172**	**196**	**211**	**337**

[a] Utilization rate obtained by hourly field surveys in 2010.
[b] Utilization rate obtained by hourly field surveys in 2004.
[c] Utilization rate provided by the UW; updated to reflect post-Sound Transit build condition.
[d] Utilization rate estimated from multiple aerial photographs.
[e] Includes removal of the facility that requires the parking spaces; therefore, there would be no net loss at these locations. Under the Preferred Alternative, 26 spaces would be replaced for park users.
Note: Adding the suboptions to Options A, K, or L would not change the parking conditions listed in this table.

Under the Preferred Alternative and Options A, K, and L, most of the affected parking spaces are located at the MOHAI site, which would be relocated under the Preferred Alternative. Approximately 26 parking spaces at the existing MOHAI site would be replaced under the Preferred Alternative, supporting access to East Montlake Park. Off-site, Option K would also remove one on-street parking space west of MOHAI on the west side of 24th Avenue East, just south of East Hamlin Street.

In addition to these locations, Option A would require removal of the 76 Gas Station and its associated five parking spaces. Option A would also eliminate a total of 19 spaces from the front and back parking lots of the Montlake Boulevard Market.

Options K and L would extend West Montlake Place East to the intersection of Montlake Place East and East Lake Washington Boulevard, eliminating six on-street parking spaces on East Roanoke Street. Both options would also provide access to SR 520 near Husky Stadium, affecting the E11 and/or E12 Husky Stadium parking lots: Option K would result in a loss of approximately 20 parking spaces in lot E11, and Option L would result in a loss of approximately 114 parking spaces in lot E11 and 57 spaces in lot E12. Option K would also remove a WSDOT parking lot located east of Lake Washington Boulevard East at East Miller Street, eliminating 24 spaces.

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

What are the indirect effects of the project on transportation?

The travel demand model was used to estimate the project's potential indirect effects on transportation. Indirect effects would include changes in cross-lake travel patterns and regional travel patterns in Seattle and Eastside areas outside the project limits resulting from the project. For trips across Lake Washington, while daily vehicle demand on SR 520 would be about 5 percent lower under the Preferred Alternative, daily vehicle demand on other parallel facilities (that is, SR 522 and I-90) would be approximately 1 to 2 percent higher under the Preferred Alternative when compared to the No Build Alternative. This difference would be lessened during peak commute periods when cross-lake travel routes are typically more congested. During these periods, fewer drivers are expected to use SR 522 and I-90 to avoid a toll on SR 520. For both the Eastside and Seattle areas, the model predicts that vehicle and person trips for the Preferred Alternative and No Build Alternative would be similar (that is, the differences were slight). (See Chapters 5 and 11 of the Final Transportation Discipline Report [Attachment 7]). No additional, quantifiable, indirect effects were identified for the transportation analysis.

What has been done to avoid or minimize negative transportation effects?

Growth over the past two decades has resulted in worsening traffic levels and congestion on the SR 520 corridor. While growth will likely continue in the region, the level of growth is expected to be somewhat lower than historical trends; therefore, without the project, traffic levels and congestion on the SR 520 corridor would continue to degrade. One of the purposes of the SR 520, I-5 to Medina project is to improve mobility for people and goods on the SR 520 corridor. The project has also been designed to avoid negative effects on local roadways.

As part of ESSB 6392 coordination work and the general design refinement process, WSDOT has identified locations where the project would affect traffic and proposed design modifications to reduce those effects, including the number of lanes needed for on- and off-ramps and intersection configurations and stop controls adjacent to the corridor. Some examples of design modifications incorporated into the Preferred Alternative to minimize negative effects on transportation are as follows.

- Allow SR 520 buses to serve the Montlake lid stops during off-peak periods so that the transit agencies could incorporate that area into service.
- Remove the existing Lake Washington Boulevard ramps, reducing traffic volumes traveling through the Washington Park Arboretum compared to the No Build Alternative.
- Provide an improved bicycle/pedestrian pathway along the east side of the new Montlake Bridge to improve bicycle and pedestrian safety.
- Relocate transit stops from previous locations on Montlake Boulevard to minimize the walking distance to new bus connections on the Montlake lid.
- Provide an alternative safe route for pedestrians and bicycles to address the increase in traffic on 24th Avenue East under the Preferred Alternative.

Although these design refinements were specifically developed for the Preferred Alternative, similar modifications could also be considered for Options A, K, and L to address community concerns. Potential design refinements to Options A, K, and L that were identified in the SDEIS and have not been incorporated into the design options for this Final EIS are described in the following section.

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

Traffic Operations

In addition to reviewing project effects for the overall interchange area, WSDOT reviewed individual intersection operations to identify where additional design changes could be considered based on its LOS guidelines. During the morning peak hour, the Montlake Boulevard and Lake Washington Boulevard/SR 520 eastbound ramps intersection would operate at LOS F under the Preferred Alternative, which would be worse than the No Build Alternative. WSDOT reviewed project effects for the overall interchange area as well as specific intersection operations, and identified design changes that could be considered to address the morning LOS issue. Under the Preferred Alternative, the approach to the intersection on Lake Washington Boulevard would be striped for three lanes (a left-turn lane, a shared through left-turn lane, and a right-turn lane). Restriping the approach to a left-turn lane, a through lane, and a right-turn lane would improve intersection operations to LOS E, similar to the No Build Alternative.

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

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

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

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).

Nonmotorized Facilities

The Preferred Alternative and Options A, K, and L would result in the loss of 54 bicycle locker spaces and 53 bicycle rack spaces near the existing Montlake Freeway Transit Station. WSDOT, Metro, and Sound Transit are working together to determine the best way to replace these bicycle parking facilities.

Parking

Parking in some areas might not be replaced in-kind because of the shortage of space available for replacement. Coordination among WSDOT, the City of Seattle, and affected land owners would be necessary to determine the actual parking measures that might be implemented as part of the project. For instance, WSDOT is coordinating with the City of Seattle

to further develop design details for the lids, which could include replacement parking for the loss of 10 parking spaces at Bagley Viewpoint. WSDOT is also coordinating with NOAA Northwest Fisheries Science Center to further minimize or mitigate parking effects on that facility.

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 compares potential effects of the Preferred Alternative with those of Options A, K, and L on land uses adjacent to the corridor; describes the project's consistency with transportation and land use 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 Addendum and Errata (Attachment 7).

KEY POINT

Right-of-way Requirements

The Preferred Alternative would require less new right-of-way (10.6 acres) than the SDEIS design options. Like all the SDEIS design options, it would remove the MOHAI building, a single-family and duplex residence south of the Portage Bay Bridge, and two vacant single-family residences in Medina. Similar to SDEIS Option A, it would also remove two single-family residences in Montlake.

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 alignment and interchange improvements. Table 5.2-1 summarizes the number of acres that would be converted to right-of-way and the number of structures affected by the Preferred Alternative and Options A, K, and L. The exhibits in this section 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.

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.

Table 5.2-1. Land Use Effects Summary

Option	Acres Converted to Right-of-Way	Residential Structures Removed	Non-Residential Structures Removed
Preferred Alternative	10.6 acres	6	1
Option A	11.5 acres	6	11
Option K	15.5 acres	4	2
Option L[a]	12.4 acres	4	1

Note: Since the SDEIS was published, refinement of the project's construction staging requirements has identified the need for two additional property acquisitions south of the existing Portage Bay Bridge. The totals in this table have been updated to reflect this change.

[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.

The amount of property that the Preferred Alternative would convert into right-of-way would be similar to Options A and L (10.6 acres for Preferred alternative, 11.5 acres for Option A, and 12.4 acres for Option L).

Option K would convert the most total acreage to right-of-way (15.5 acres) because of 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 (Table 5.2-2). Option K would also convert additional acreage associated with the land bridge on Foster Island. Right-of-way requirements on the Eastside would be the same for the Preferred Alternative as for Options A, K, and L.

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

Area[a]	Preferred Alternative (acres)	Option A (acres)	Option K (acres)	Option L[b] (acres)
I-5 Area	0	0.1	0.1	0.1
Portage Bay Area	1.9	2.6	1.4	1.4
Montlake Area	6.6	6.7	11.4	9.1
West Approach Area	0.9	0.9	1.4	0.6
Evergreen Point Bridge and East Approach Area	1.2	1.2	1.2	1.2
Total	10.6	11.5	15.5	12.4

Note: Since the SDEIS was published, refinement of the project's construction staging requirements has identified the need for two additional property acquisitions south of the existing Portage Bay Bridge. The totals in this table have been updated to reflect this change.

[a] These areas correlate with Exhibits 5.2-2 through 5.2-8.

[b] 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.

Table 5.2-3 identifies the acreages 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.

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

Land Use Type	Preferred Alternative (acres)	Option A (acres)	Option K (acres)	Option L[a] (acres)
Park/open space/other	8.6	9.3	13.8	10.7
Single-family residential	2.0	2.0	1.7	1.7
Commercial	0	0.2	0.0	0.0
Total	10.6	11.5	15.5	12.4

Note: Since the SDEIS was published, refinement of the project's construction staging requirements has identified the need for two additional property acquisitions south of the existing Portage Bay Bridge. The totals in this table have been updated to reflect this change.

[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. None of the other SDEIS suboptions required additional right-of-way.

KEY POINT

The NOAA Northwest Fisheries Science Center and SR 520

Immediately north of SR 520, just east of the Portage Bay Bridge, is the campus of the National Oceanic and Atmospheric Administration (NOAA) Northwest Fisheries Science Center (NWFSC). Founded in 1931, this historic campus is now a major national fisheries research facility that employs approximately 400 people. The NWFSC is one of the leading research institutions for salmon recovery, and has a key role in the protection and rebuilding of Puget Sound's threatened and endangered fish and mammal species, including the killer whale.

NWFSC's south campus—the portion closest to SR 520—is home to laboratories that conduct state-of-the-art experiments in fish rearing and culture. When NOAA expressed concern regarding the effects of SDEIS Option A—which would have required removal of up to 11 south campus buildings—WSDOT engineers shifted the Preferred Alternative's alignment so that the buildings could be preserved. While this solved a major problem, the agencies also agreed that the effects of construction on the ongoing research must be considered and mitigated for. Accordingly, WSDOT and NOAA began a series of in-depth workshops in early 2011 to evaluate construction impacts and identify appropriate mitigation. These workshops are expected to culminate in a mitigation agreement in mid-2011, which will be documented in the Record of Decision.

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 Chapter 9, Section 4(f) Evaluation).

Structure Removal or Relocation

Structures that would be permanently removed or relocated under the Preferred Alternative or Options A, K, and L are described below and are shown on Exhibit 5.2-1. Long-term relocations (that is, for multiple years) of docks or moorage slips are also identified.

I-5 Area

Exhibit 5.2-2 shows right-of-way acquisitions in the I-5 area. No relocations would occur in this area.

Portage Bay/Roanoke Area

Exhibit 5.2-3 shows right-of-way acquisitions in the Portage Bay/Roanoke area. Relocations would include:

- **Portage Bay residence(s).** The Preferred Alternative and Options A, K, and L would remove one single-family residence and a duplex residence in the Portage Bay/Roanoke neighborhood (Exhibits 5.2-1 and 5.2-3). These residences are located just south of the Portage Bay Bridge and would be removed to accommodate the construction work bridge south of the existing Portage Bay Bridge, which would be in place for several years. The need to acquire the duplex was identified after the SDEIS was published; the property would support staging for construction of the bridge as well as stormwater treatment facilities. This relocation is the result of a design refinement based on more recent construction planning.
- **Moorage slips at Queen City Yacht Club and Bayshore Condominiums.** Approximately 10 moorage slips on the south side of the Queen City Yacht Club and 10 moorage slips associated with the Bayshore Condominiums south of Portage Bay Bridge would be relocated during construction of the bridge, which would occur over a 64-month construction period. WSDOT would provide equivalent moorage to boat owners during this period. WSDOT will work with affected property owners to identify specific moorage locations when construction staging information is further refined for each area prior to construction. It is anticipated that most of these moorage slips could be restored at their current locations after the Portage Bay Bridge is completed. After construction is complete, support columns for the new Portage Bay Bridge would be located very close to the docks at Queen City Yacht Club and the Bayshore Condominiums.

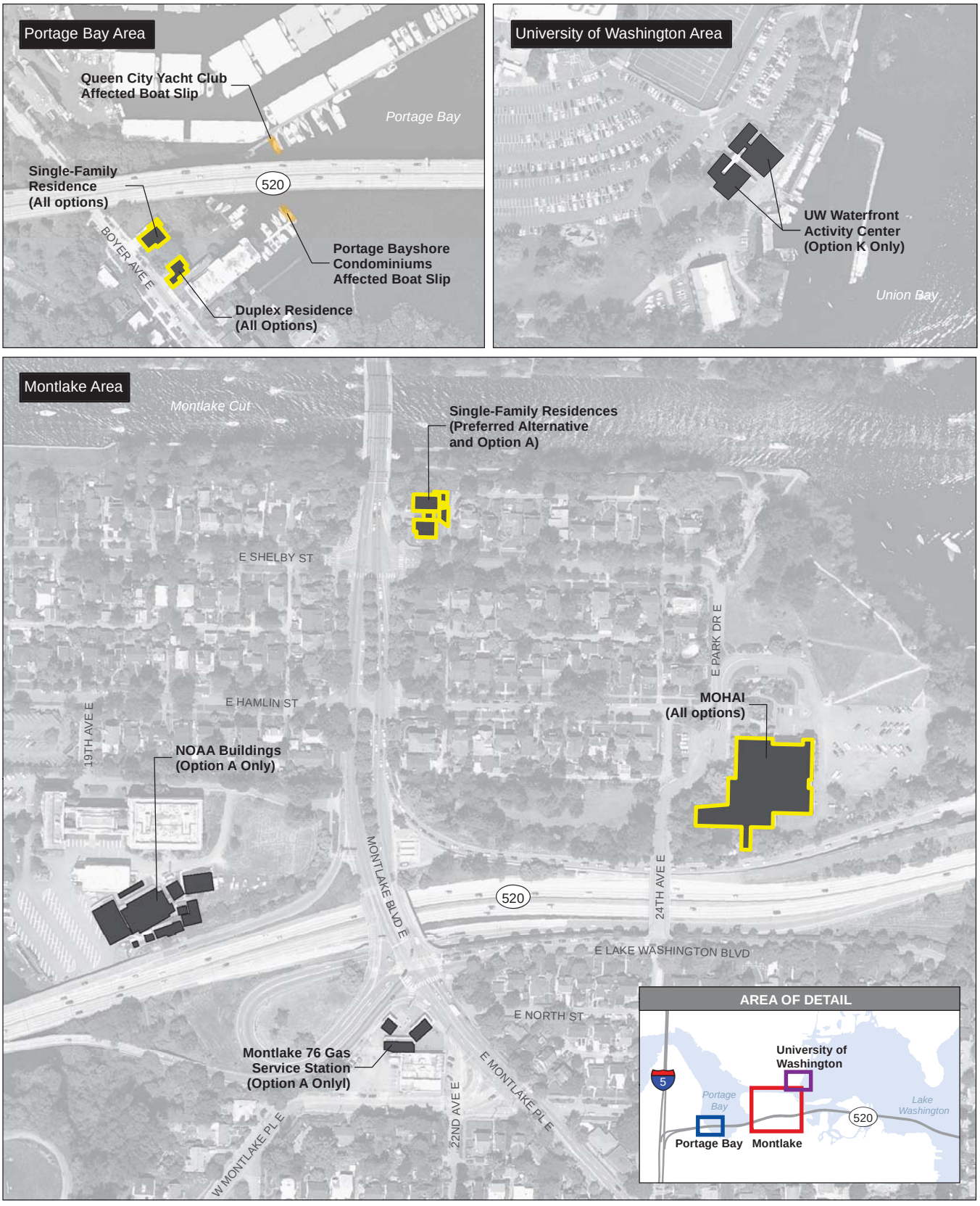
Property Ownership and WSDOT Right-of-Way in the Canal Reserve Area

Property ownership along SR 520 between Portage Bay and Union Bay is very complex. In this area, SR 520 generally follows a route set aside in the early 1900s for the eastern portion of the Lake Washington Ship Canal. After the Montlake Cut was ultimately sited farther north, these "Canal Reserve" lands were deeded to a variety of new owners. To further complicate matters, "new" land along the shoreline was created when the level of Lake Washington and Portage Bay dropped after the opening of the Ballard Locks.

WSDOT is working with land owners and conducting title searches to establish accurate property ownership records in this area. Ongoing research indicates that part of the existing SR 520 right-of-way east of Portage Bay may occupy an easement granted by NOAA, rather than being owned in fee by WSDOT. Similarly, existing SR 520 right-of-way south of the Portage Bay Bridge in the vicinity of the Montlake Playfield appears to be authorized under an easement from the City of Seattle, rather than being under WSDOT ownership.

Because of the complexity and age of the records, ownership information may take some time to confirm. However, the right-of-way lines shown in this Final EIS are accurate, regardless of whether or not the underlying property is owned in fee by WSDOT. When we discuss right-of-way acquisition, it means either (1) purchasing new right-of-way in fee, or (2) expanding the boundaries of an existing easement. Therefore, the estimates of new right-of-way quantities for the Land Use discussion remain the same irrespective of who owns the property.

Exhibit 5.2-1 Affected Structures



Permanently affected structure - Preferred Alternative

Permanently affected structure - SDEIS options

N

0 200 400 Feet

Exhibit 5.2-2. **Right-of-way Acquisitions in the I-5 Area**

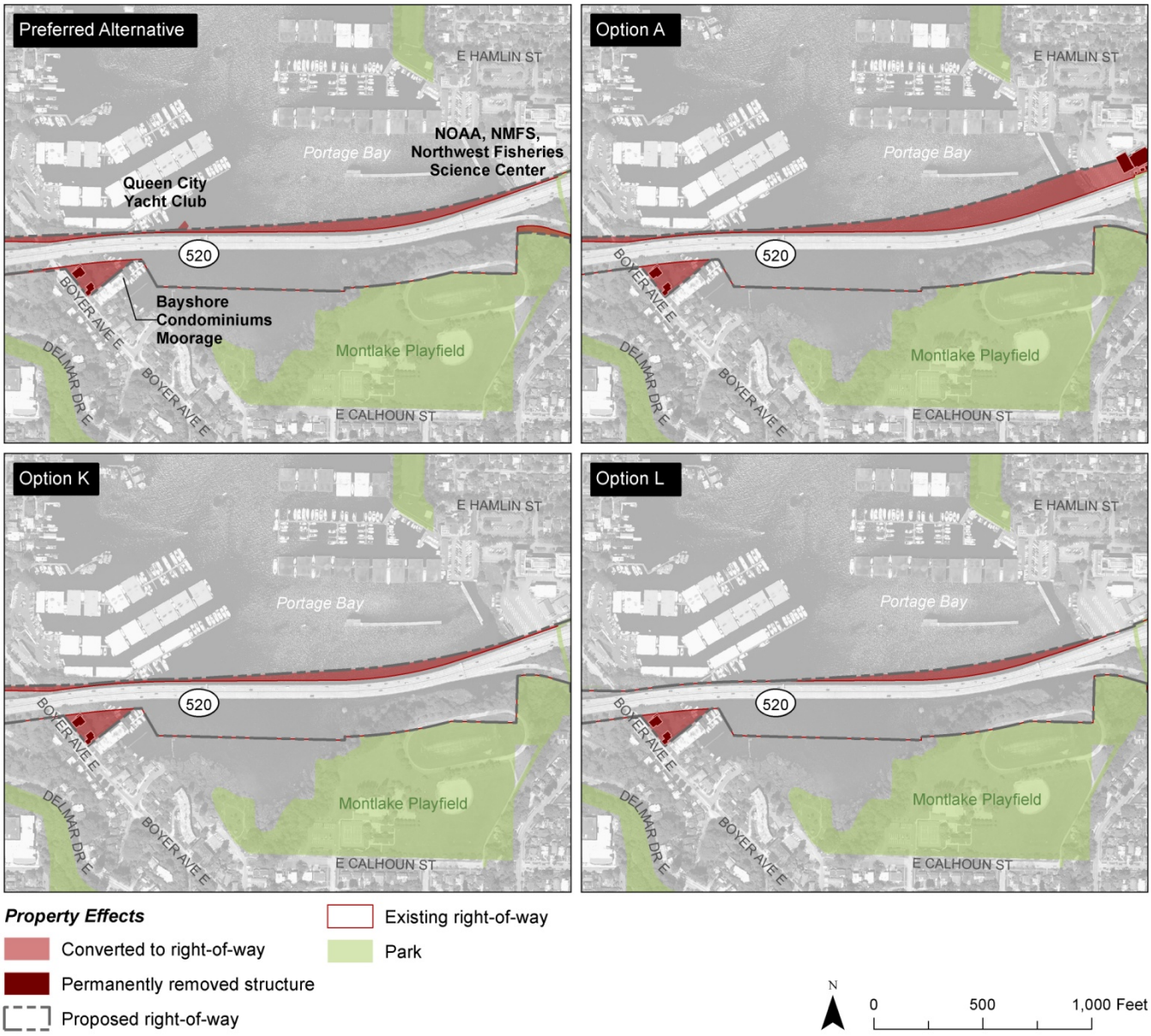
WSDOT anticipates the loss of one full boat slip at Queen City Yacht Club. Access to the finger piers on the north side of the Bayshore Condominium dock would require passage between bridge support columns with approximately 17 feet of clearance. The column located near the last finger pier slip on the north side of the condominium dock would limit the size and type of boat that could be moored in that slip. Vessels moored on the outer end of the dock may need to be positioned so that they do not extend beyond the north end of the finger pier.

Montlake Area

Exhibit 5.2-4 shows right-of-way acquisitions in the Montlake area. Relocations would include:

- **Museum of History and Industry (MOHAI) Building.** The Preferred Alternative, like Options A, K, and L, would remove the MOHAI building and its parking lot for construction of a permanent stormwater treatment wetland that would treat runoff from the west approach and Montlake interchange (Exhibits 5.2-1 and 5.2-4). MOHAI is planning to relocate to a new site.
- **Montlake Residences.** The Preferred Alternative, similar to Option A, would remove two single-family residences in the Montlake neighborhood (Exhibits 5.2-1 and 5.2-4). These residences are located

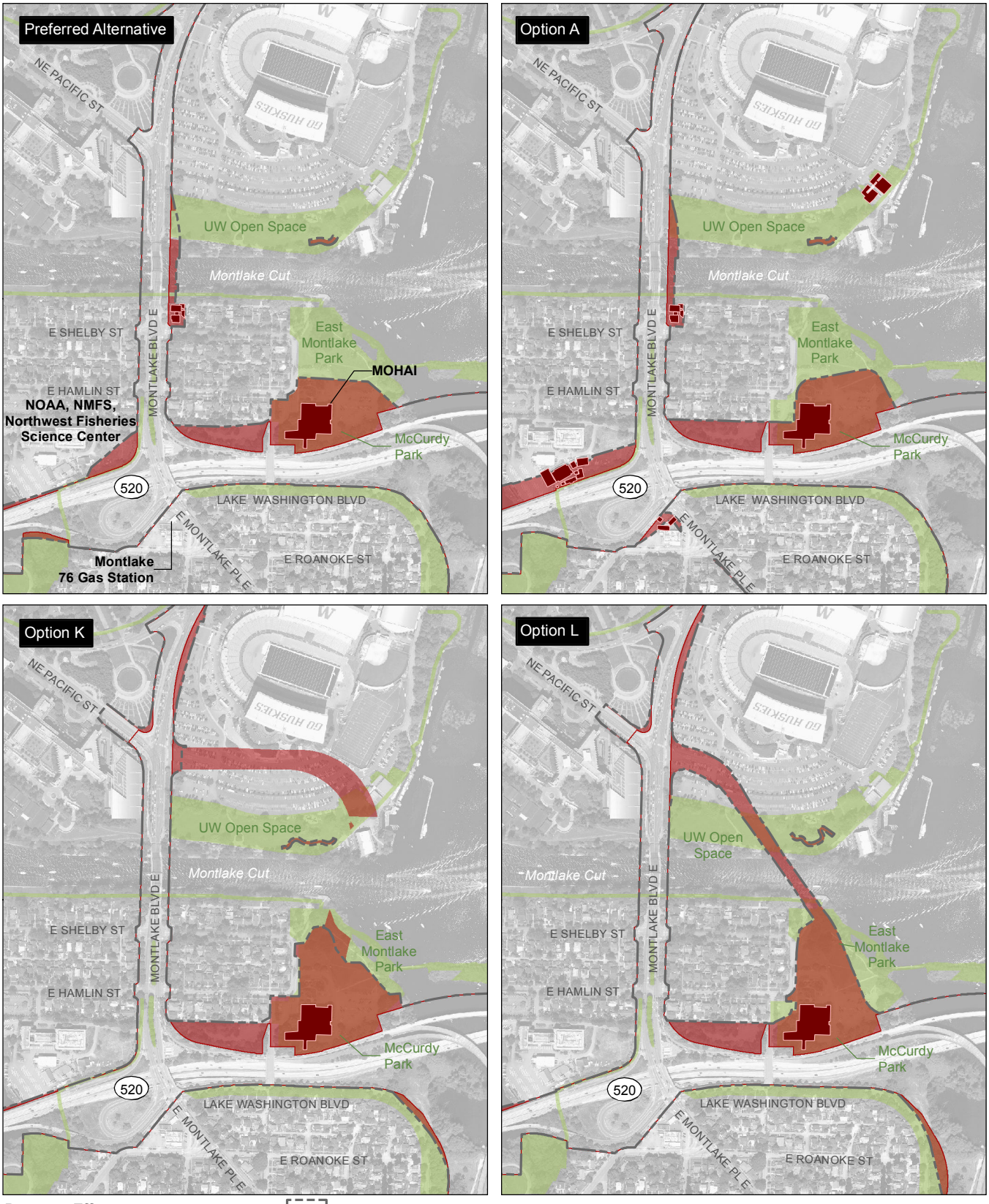
Exhibit 5.2-3. **Right-of-way Acquisitions in the Portage Bay Area**



on the east side of Montlake Boulevard East immediately south of the Montlake Cut. These effects would occur to accommodate the new bascule bridge across the Montlake Cut on Montlake Boulevard East.

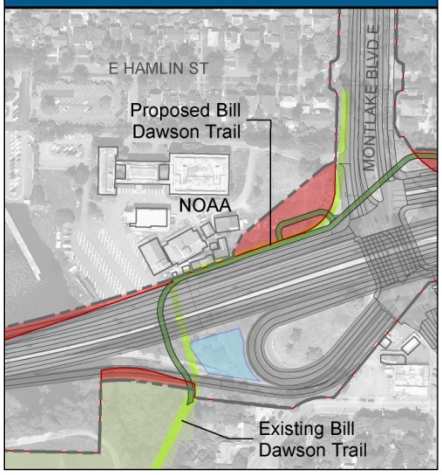
- **Montlake Business.** Option A would remove the Montlake 76 station located at the Montlake Boulevard East/Lake Washington Boulevard intersection, just south of the SR 520 on- and off-ramps, to allow for improvements to the existing Montlake interchange (Exhibits 5.2-1 and 5.2-4). The Preferred Alternative would not have this effect.

Exhibit 5.2-4. **Right-of-way Acquistions in the Montlake Area**



- **NOAA Northwest Fisheries Science Center**. Option A would remove 11 buildings that make up the south campus of the NOAA facility (Exhibit 5.2-4), which is used for fisheries-related research and experiments. Nine of these buildings would be removed to accommodate the westbound on-ramp and the auxiliary lane across the Portage Bay Bridge. Option A would not affect the two northernmost buildings on the south campus or any buildings on the north campus, which consists of offices, laboratories, a library, and a 150-seat auditorium. The Preferred Alternative changed the project design in this area to avoid removal of any NOAA campus buildings (Exhibit 5.2-5).
- **Waterfront Activities Center.** Option K would temporarily relocate the University of Washington Waterfront Activities Center buildings that are southeast of Husky Stadium on Union Bay and the Montlake Cut (Exhibit 5.2-1) to accommodate construction of the tunnel under the Montlake Cut.

Exhibit 5.2-5. **Preferred Alternative – Effects on NOAA, NMFS, Northwest Fisheries Science Center**



Converted to right-of-way
Proposed right-of-way
Existing right-of-way
Travel lane
Pavement
Stormwater facility
Proposed bicycle/pedestrian path
Existing trail/bicycle path

N
0 200 400 Feet

West Approach and Lake Washington Areas

Exhibit 5.2-6 shows right-of-way acquisitions in the west approach area. No relocations would occur in this area.

Lake Washington

WSDOT would obtain an aquatic land easement from the Washington State Department of Natural Resources for construction and right-of-way for the new Evergreen Point Bridge and new anchors placed in Lake Washington. The easement would be needed for both the west and east approaches, and the new floating bridge. WSDOT currently has approximately 254 acres of right of way for the existing bridge, and is working with DNR to obtain another 137 acres of aquatic easement for the new SR 520 alignment through the lake, as shown in Exhibit 5.2-7. No relocations would occur in the Lake Washington area.

Eastside Area

Exhibit 5.2-8 shows right-of-way acquisitions in the Eastside area. Relocations would include:

- **Medina Residences and Shoreline Docks**. Exhibit 5.2-8 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. An additional private dock to the north may not be usable during the 36-month construction period of the east approach.

Exhibit 5.2-6. Right-of-way Acquisitions in the West Approach Area

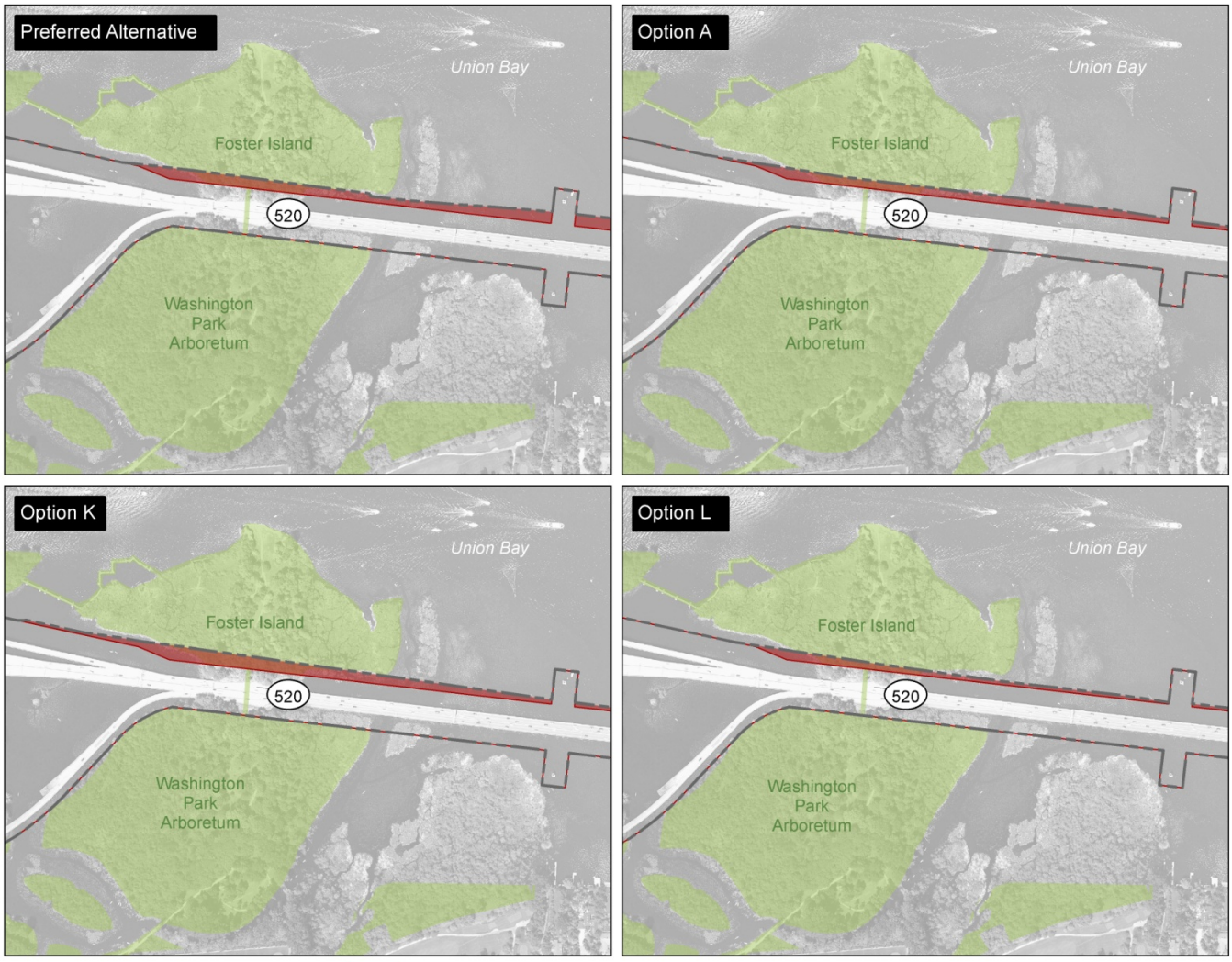
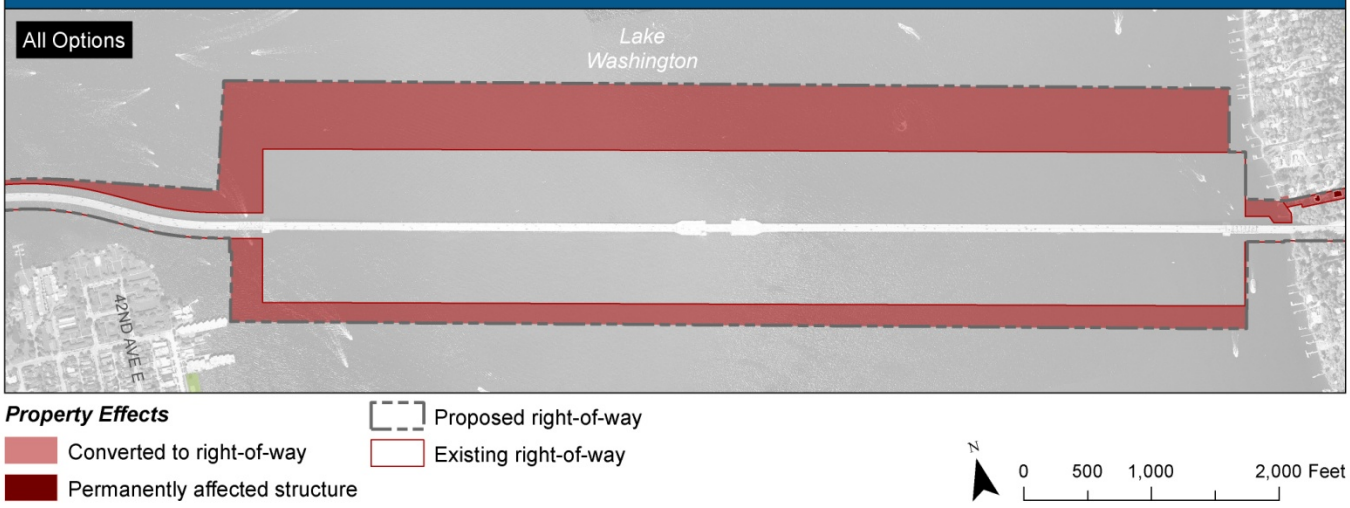


Exhibit 5.2-7. Right-of-way Acquisitions in the Lake Washington and Eastside Transition Areas



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).

Tolling of SR 520 was assumed under the Preferred Alternative and Options A, K, and L as a source of revenue to finance the project (see Chapter 1).

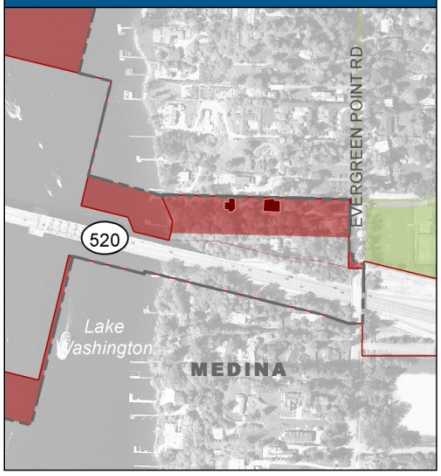
Tolling scenarios evaluated in the transportation model assumed variable tolling (different toll rates are charged depending on the time of day and whether the trip is during peak or off-peak traffic hours). For example, a trip during peak traffic hours would be more expensive than at other times of day. Results from the transportation model indicate that the new lanes, combined with the toll, would provide an incentive to use transit and high-occupancy vehicles (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 Preferred Alternative and Options A, K, and L. 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 Preferred Alternative and Options A, K, and L.

The total assessed value of the property acquired for right-of-way under the Preferred Alternative and Options A, K, and L would be between $9 million and $15 million. Of this additional right-of-way acquired, approximately $2.7 million to $4.4 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 $12,500. This represents less than 0.01 percent of the City's 2008 budgeted property tax revenues.

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

Exhibit 5.2-8. **Right-of-way Acquisitions on the Eastside**



Property Effects

- Converted to right-of-way
- Permanently affected structure
- Proposed right-of-way
- Existing right-of-way
- Park

N

0 250 500 Feet

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 the Preferred Alternative and Options A, K, and L.

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)
Preferred Alternative	$11,800,000	$3,100,000	$8,600	Less than 0.01
Option A	$14,700,000	$4,400,000	$12,100	Less than 0.01
Option K	$9,092,000	$2,692,000	$7,600	Less than 0.01
Option L[b]	$10,992,000	$2,692,000	$7,600	Less than 0.01

[a] The total initial property tax effect includes partial encroachments. The tax effect of the partial encroachments was calculated by multiplying the actual 2008 property tax collected for the entire parcel by an estimate of the percentage of the parcel that would be acquired.
[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.
Source: King County Assessor (2009).

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, except under Option L, 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.

The Preferred Alternative would displace fewer parking stalls than Options A, K, and L. Although the Preferred Alternative would not affect parking at the Hop-In-Market, it would result in permanent changes in access. The existing unconsolidated access into the Hop-In-Market from Montlake Boulevard, 22nd Avenue East and East Roanoke, would be consolidated into a single location on East Roanoke Street.

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; visitors and employees at the UW Medical Center might be required to find alternative parking around the stadium.

Effect of Suboptions

- Adding the suboptions to Option A, K, or L resulted 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 project's addition of new HOV lanes and a regional bicycle and pedestrian path is consistent with the Puget Sound Regional Council's (PSRC's) *Vision 2040* (PSRC 2008) and *Transportation 2040* (PSRC 2010a) 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 to improve linkages between urban centers. As noted in Chapter 4, *Transportation 2040* and the PSRC regional travel demand model assume a 6-lane SR 520 by 2040 to support planned population and employment growth in the region. *Transportation 2040* identifies the SR 520 floating bridge as a project necessary to support development of the centers identified in *Vision 2040* and to keep freight moving to support a strong economy. It also recommends relying directly on highway users to pay for improvements through tolling. The strategy starts with developing high-occupancy traffic (HOT) lanes and tolling individual highway and bridge projects in their entirety as they are implemented. The plan calls for full highway system tolls by approximately 2030, which would also have positive effects on reducing congestion and emissions of pollutants and greenhouse gases. Although planning for how to implement full regional tolling is still in its early stages, the SR 520, I-5 to Medina project is consistent with future regional tolling strategies.

The Preferred Alternative and Options A, K, and L 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 Preferred Alternative and Options A, K, and L 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 would cross the Montlake Cut and connected 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 conflicted with the area designated in the plan as a potential development site near the University of Washington's Waterfront Activities Center (WAC).

The *Washington Park Arboretum Master Plan* (City of Seattle et al. 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. The Preferred Alternative and Options A, K, and L would remove these ramps and would relocate MOHAI; thus, they would 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 project would be consistent with all other policies of the *Washington Park Arboretum Master Plan*. As discussed further in Section 5.4, WSDOT has worked extensively with Arboretum representatives since issuance of the SDEIS to develop mitigation for effects on the Arboretum in order to implement key recommendations of the 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 would all be located within the shoreline environment. Within Seattle, the project is anticipated to be permitted as an Essential Public Facility under the Conservancy Navigation (CN), Conservancy Recreation (CR), Conservancy Management (CM), and Conservancy Preservation (CP) designation. Bridges and streets are permitted outright in areas designated Urban Residential (UR).

The City of Seattle is in the process of updating its shoreline master program (SMP). The updated SMP is expected to be adopted in late 2011 or early 2012. Since the updated SMP has not yet been adopted, it is not possible to assess the consistency of the Preferred Alternative and Options A, K, and L with the new regulations. However, it is possible to generally use the current SMP as guidance on the relative degree of consistency. Based on this approach, the Preferred Alternative and 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.

Since the Preferred Alternative was identified, WSDOT has worked with the agencies with jurisdiction over shoreline resources—the City of Seattle, the City of Medina, and Ecology—to develop best management practices and other site-specific mitigation measures to protect shoreline areas and ensure compliance with the City of Seattle's Environmental Critical Areas

Ordinance (Seattle Municipal Code 25.09). This coordination has occurred through multiple individual pre-application meetings with local jurisdictions over the last 2 years, as well as through the Natural Resources Technical Working Group meeting with relevant regulatory agencies. WSDOT will continue to coordinate with these agencies to ensure that all required shoreline master program permits and approvals are obtained.

The No Build Alternative would be less consistent with local land use plans than the Preferred 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.

What are the indirect effects of the project on land use and economic activity?

Land Use

Transportation projects can have indirect effects on land use if the projects bring about changes in the rate and pattern of development. Anticipating and guiding growth patterns are the objective of Washington State's Growth Management Act, which is described briefly below. In cases where transportation projects facilitate growth—for example, if a new highway brings development to a rural area—this "induced growth" is considered an indirect effect of the transportation project. Induced growth is generally not a major concern in situations where the transportation facilities being improved are located in densely populated urban areas and are already over capacity.

The SR 520, I-5 to Medina project is not expected to have indirect effects on land use, including induced growth effects. As indicated by *Vision 2040*, the central Puget Sound region population is expected to increase by about 1 million people over the next 30 years (PSRC 2010c, WSDOT 2010g). To identify how the project could affect future land use, WSDOT requested that PSRC run their integrated transportation and land use model (called the DRAM-EMPAL model—see text box at right) to assess changes in growth patterns under the Preferred Alternative and No Build. This analysis was updated between the SDEIS and the Final EIS because the PSRC released updated population and employment estimates. The DRAM-EMPAL model results from PSRC show that the SR 520, I-5 to Medina project would have little to no impact on regional population and employment distribution (WSDOT 2010g). Additionally, the DRAM-EMPAL model showed that the project would not induce any changes in employment within the forecast analysis zones around Lake Washington. The maximum change in population as a result of the project was 2 percent, and that occurred in the Points Communities (near the eastside transition

PSRC's DRAM-EMPAL Model

The PSRC forecasts economic and demographic changes for the central Puget Sound area using DRAM-EMPAL Models. The forecasts show how many people will live and work in the region and accounts for shifts in jobs and population within a region or county by using Forecast Analysis Zones (FAZs).

WSDOT used the DRAM-EMPAL models to identify project level changes to the project area demographics.

area of the project). Instead, this and other regional transportation projects would improve efficiency and support a shift in travel from single occupancy vehicles towards transit and HOV options. Tolling will help facilitate this shift. The result is more people being moved by fewer vehicles on a transportation network that will accommodate planned increases in population growth but will not change the growth pattern or lead to unintended growth patterns. PSRC's integrated transportation and land use model indicates that "approximately 97% of growth occurs within designated urban growth areas, in a manner consistent with the Regional Growth Strategy" (Chapter 1, Page 10 of PSRC 2010a). Since *Vision 2040* assumes a 6-lane SR 520, the project supports containment of growth within the urban growth area.

Economic Activity

Operation of the Preferred Alternative would not affect the regional economy, except through beneficial effects of improved transportation efficiency along the SR 520 corridor. As noted above, because the proposed project would replace part of an existing transportation corridor through an urban area that has already been developed, it would not change land use or development patterns as demonstrated by the PSRC DRAM-EMPAL model. For more information on the long-term effects of the project on transportation efficiency, see the Final Transportation Discipline Report (Attachment 7). For more information on the direct effects of the project on land use and growth patterns, see the Land Use, Economics, and Relocations Discipline Report Addendum and Errata (Attachment 7).

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.

Residential Relocations

- WSDOT will work with owners and/or residents of relocated properties required by the Preferred Alternative. Residents displaced by the Preferred Alternative would be provided with relocation assistance in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.

- Relocated residents are eligible to receive relocation advisory services and certain monetary payments for moving and replacement housing costs. WSDOT would work with the affected property owners to identify specific needs and available replacement property in the vicinity. Relocation resources would be made available without discrimination. If WSDOT determined that insufficient housing existed, it would commit to Housing of Last Resort (WAC 468-100-404), which provides necessary housing in a number of ways and in a manner feasible for the individual situations.

Other Relocations

- WSDOT has acquired the MOHAI building from the City of Seattle, the Historical Society of Seattle, and King County. WSDOT is working with MOHAI to relocate the museum operation to a replacement facility. Relocation activities are anticipated to be complete by the end of 2012.

What has been done to avoid or minimize negative effects?

Throughout the design process, WSDOT has taken care to avoid and minimize any adverse land use, economic, and relocation effects. The Preferred Alternative has minimized potential relocations and land use effects as described below:

- The width of the new Portage Bay Bridge has been reduced and its alignment has been shifted. This change has resulted in the avoidance of the NOAA Northwest Fisheries Science Center buildings that would have been displaced by Option A.
- The Montlake interchange has been reconfigured and the lid extended east to beyond 24th Avenue East. This change has resulted in the avoidance of the Montlake 76 station that would have been displaced by Option A.

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.

How would the project affect neighborhoods?

Community Cohesion

The Preferred Alternative, like all the SDEIS design options, would result in several long-term benefits that would improve community cohesion for the neighborhoods in the study area. A primary benefit integral to the SR 520, I-5 to Medina project is the addition of landscaped lids in the project area. The lids would benefit community cohesion by reconnecting neighborhoods originally bisected by SR 520 and I-5. These lids would provide linkages between adjacent and nearby parks, improve views toward the highway from nearby residences, and provide safe passage across I-5 and SR 520 at these locations. Lids are discussed further below.

Lid Design

Two lids are included in the Preferred Alternative and all SDEIS design options. The first is the 10th Avenue East/Delmar Drive East lid, which would help reconnect the Portage Bay/Roanoke and north Capitol Hill neighborhoods, which were separated by SR 520's construction. This lid would be designed with involvement by the community to reflect the historic character of the Roanoke Park Historic District to the north, and it would include open space and pathways, as well as the relocated Bagley Viewpoint.

The second, a lid over SR 520 at Montlake Boulevard included with different configurations in the Preferred Alternative and the SDEIS options, would be an important neighborhood benefit. Exhibit 5.3-1 shows the conceptual lid configurations at the Montlake interchange for the Preferred Alternative and the SDEIS options. As shown in the exhibit, the Preferred Alternative's 1,400-foot lid—larger than the lids included in the SDEIS options—would extend from west of Montlake Boulevard to east of 24th Avenue NE and would terminate near the Union Bay shoreline.

KEY POINT

The Preferred Alternative, like the SDEIS design options, includes 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.

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.

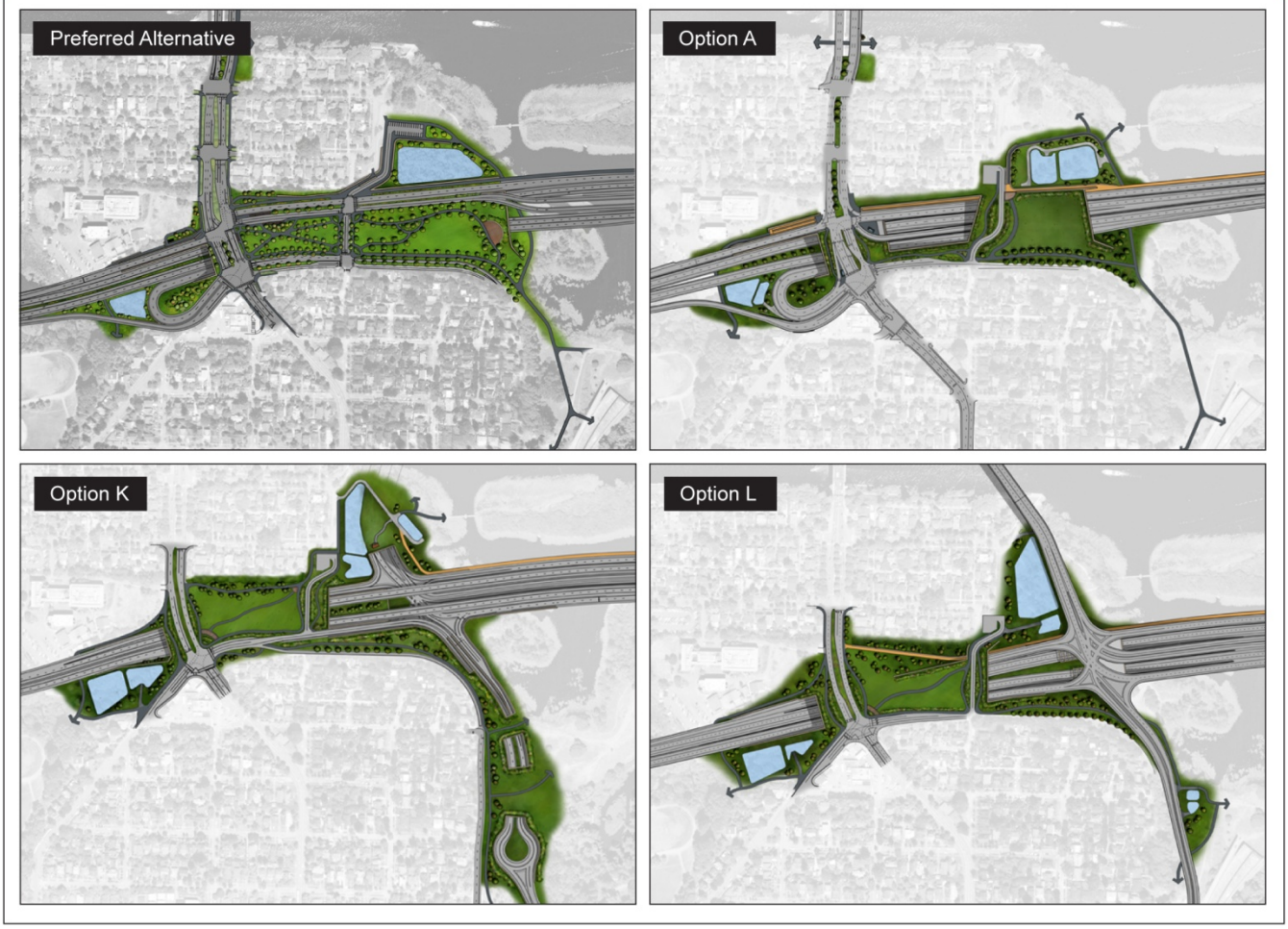
Landscaped lids across SR 520 would provide multiple health benefits by allowing people to connect in easily accessible and safe areas. Green space can enhance people's ability to cope with and recover from stress. The HIA describes how the green space on the lids can bring diverse groups together and 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.

In all options, the lid would function as a vehicle and pedestrian crossing, a landscaped area connecting the northern and southern portions of the Montlake community, and public open space.

Design and aesthetic treatment for the Montlake lid were developed through the Engrossed Substitute Senate Bill (ESSB) 6392 workgroup process (described in Chapter 2). The increased size of this lid under the Preferred Alternative would provide greater benefit to community cohesion with a larger landscaped area and more opportunities to make connections. New pathways on the lid would be designed such that they:

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



- Are in scale and style with the surrounding Montlake neighborhood, the Arboretum, and the Olmsted-designed boulevards.
- Are safe and easy to navigate without confusion (wayfinding).
- Accommodate diverse users and modes (such as cyclists, pedestrians, and elderly users).
- Buffer users from the street edge (e.g., with planting strips and other aesthetic physical buffers).

- Connect users to locations both on the lid (e.g., transit stops, bicycle lockers, comfort stations, view points, plazas) and to the existing network of local and regional open spaces and paths/trails, including the Arboretum Waterfront Trail, the Lake Washington Loop Trail, East Montlake Park, University of Washington (UW) Open Space, UW main campus, and Sound Transit's University Link light rail station.

As described in Chapter 2, several lids that were features of SDEIS design options are not included in the Preferred Alternative. They are as follows:

- I-5/East Roanoke Street. This lid would be included with Options A, K, and L. A bicycle pedestrian crossing over I-5 at the same location is still proposed as part of the Preferred Alternative.
- Montlake Boulevard NE and NE Pacific Street (Options K and L only). Because the Preferred Alternative would not affect this intersection, no lid is proposed.
- Foster Island "land bridge." This structure, similar to a lid, would be included in Option K only.

Aesthetics

Under the Preferred Alternative and the SDEIS options, widening the highway would bring some homes closer to the project footprint, which would create negative effects related to visual quality and aesthetics. Like lid design, overall aesthetic design for the SR 520 corridor is also being developed with consideration of community needs. Collaboration is ongoing among WSDOT, the Seattle Design Commission (SDC), City of Seattle, UW Architectural Commission, Arboretum and Botanical Garden Committee (ABGC), Seattle Bicycle Advisory Board, Seattle Pedestrian Advisory Board, and Seattle neighborhoods to expand and refine an aesthetic vision, establish goals, and suggest design treatments for urban design and streetscapes within the project area. This collaboration will ultimately result in a set of urban design guidelines that will inform and direct final design and construction of SR 520. Development of the urban design guidelines for SR 520 began in winter 2010/2011 and is expected to be complete in early 2012.

Noise

The Preferred Alternative and the SDEIS options would reduce noise levels throughout the corridor compared to both existing conditions and the No Build Alternative. Noise levels in the corridor would be further reduced if noise walls recommended for the Preferred Alternative and Options A, K, and L were approved by the affected communities and delivered as part of the project. With noise mitigation, Options A, K, and L would have fewer remaining noise effects than the Preferred Alternative. Public comments received on the SDEIS generally requested that noise in the corridor be reduced using methods other than noise walls. Section 5.7 describes the noise impacts for the Preferred Alternative and SDEIS options, and

discusses where and why noise walls are recommended along the corridor. Section 5.5 discusses visual quality issues that would be associated with use of the noise walls.

Relocations

For the Preferred Alternative and all SDEIS design options, relocations of residents associated with the project would be relatively few and would not be expected to cause an adverse effect on community cohesion (see Section 5.2, Land Use).

The Preferred Alternative and all options would displace the Museum of History and Industry (MOHAI) facility, which is a resource that serves the region's population and visitors to Seattle. 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.

Pedestrians, Bicyclists, and Transit

Under the Preferred Alternative and all SDEIS design options, the project would include a regional bicycle/pedestrian path extending from the Montlake interchange area across the Evergreen Point Bridge and connecting 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 the Portage Bay/Roanoke neighborhoods. The trail would improve connectivity between neighborhoods, their business districts, and community resources; the trail also would support non-motorized commutes.

KEY POINT

The Preferred Alternative and all options would close the Montlake Freeway Transit Station. Closure of the station would not affect social resources since alternate connection points and routes would be available.

Improved transit service and reliability afforded by the new high-occupancy vehicle (HOV) lanes of all options would benefit local communities. All SR 520 users would benefit from a safer bridge that is less vulnerable to catastrophic failure. In addition, all SR 520 users would benefit from a faster, more reliable trip across SR 520, which the project would provide.

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 for all options. Better regional connectivity would lead to potential for social interactions and integrations. No neighborhoods that are now connected via bus service would lose connections because of the project, although different routes and interconnections would be required for some trips. All options would close the Montlake Freeway Transit Station. Closure of the station would not affect social resources since alternate connection points and routes would be available.

As described in Section 5.1, during off-peak hours, the function of the freeway transit station would be replaced by new eastbound and westbound bus stops on the Montlake lid. These stops would continue to be accessible to pedestrians, bicyclists, and other transit riders, and would allow transit agencies to maintain SR 520 bus service to the Montlake interchange area via Eastside-downtown Seattle bus routes during off-peak periods. During morning and evening peak periods, when downtown Seattle-Eastside bus routes would not serve the Montlake lid stops, some bus riders traveling between the Eastside and University District would be required to transfer at the Evergreen Point Freeway Transit Station to reach their final destination, and some bus riders traveling between the University District and downtown Seattle would be required to change their transit route from SR 520 buses to light rail or other local bus routes.

Recreation

As discussed in Section 5.4 and Chapter 9, WSDOT has made every effort to avoid permanent effects on parks, and the Preferred Alternative has fewer effects than the SDEIS design options. The acreage of parkland to be permanently acquired would be 6.7 acres under the Preferred Alternative, 7.5 acres under Option A, 9.1 acres with Option K, and 7.6 acres with Option L.

All loss of park acreage would be mitigated. Public parks and recreation facilities in the project area would remain open and available for all. Section 5.4 provides more information on the recreation effects of the project. Chapters 9 and 10 discuss the mitigation measures proposed for the park losses.

Public Services and Utilities

The Preferred Alternative, like Options A, K, and L, 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 where provided, 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 (as indicated by the project's transportation modeling) 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.

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 the extent of relocation has not yet been determined.

Community Demographics

The project would not affect the overall housing or population characteristics of the project neighborhoods, nor would it displace affordable housing or community facilities. Acquisition of new right-of-way for SR 520 would not affect the ability of the cities and neighborhoods around the project to plan for changes in density that may occur as the region grows.

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 to 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 Addendum and Errata, 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. Both the U.S. Department of Transportation (USDOT) order (5610.2) and the FHWA order (6640.23) require 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 in Chapter 4 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 half-mile study area overall has household incomes at or below the federal poverty level. Concentrations of low-income residents

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.

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 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 (LEP). 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 Environmental Justice Discipline Report Addendum and Errata (in Attachment 7) contains additional detail and discussion on the results of the analysis.

Limited-English-Proficient Populations

Title VI of the Civil Rights Act of 1964 prohibits discrimination based on national origin. As a recipient of Federal financial assistance, WSDOT must ensure that persons who are limited-English proficient (LEP) are provided meaningful access to all of its programs and activities. The USDOT and FHWA implementing orders that address environmental justice do not address LEP populations, and effects to that segment of the general population are usually addressed in the social effects discussion. However, within this project's study area, due to the overlap between effects of tolling on low-income populations and LEP populations, both are addressed in this environmental justice discussion.

Exhibit 5.3-2. **Travelshed Study Area**

Potential Effects on Low-Income and Minority Populations

Community Cohesion

As described earlier in this section, 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 area would be quieter than it is today.

The Preferred Alternative would require relocation of the residents of two single-family houses in the project area, for whom relocation assistance would be provided. (WSDOT has already provided relocation assistance for residents of the two houses in Medina acquired for the project, and the houses that have been acquired south of Portage Bay are vacant.) No low-income, minority, or LEP households would be relocated because of the project. Option A would remove five residential structures. Options K and L would remove three residences.

Tolling

Enrolling in electronic tolling would be more challenging for LEP bridge users, who might have difficulty understanding how to use the system. To help alleviate some of those potential problems, WSDOT is conducting widespread outreach to social service agencies that serve LEP populations to explain how the tolling works. Based on the demographic profile of the study area, WSDOT is also translating information about electronic tolling

into multiple languages, as described in the Environmental Justice Discipline Report Addendum and Errata (in Attachment 7).

WSDOT found that tolls would affect the ability of social service agencies to provide services to low-income, minority, and LEP populations. Many of those agencies operate under very tight budgets, and the tolls would add to the cost of delivering services to their clients. Although public paratransit services such as King County Metro Access and Community Transit Dial-A-Ride-Transportation (DART) would be classified as transit and would not be charged a toll, private providers such as Hopelink would be charged the same as other private vehicles, which would increase the cost of service delivery.

All options, including the Preferred Alternative, would require electronic tolling for motorists who use the floating bridge. The toll would be the same amount for all users regardless of income, so low-income users would have to spend a higher proportion of their income on the toll. There would also be processes associated with tolling that might make it more difficult for low-income and minority populations.For drivers of personal vehicles, WSDOT investigated whether there would be any alternative to that mode of travel and paying the toll. The findings of surveys and focus groups conducted with low-income SR 520 users in 2008 were that transit would not provide a reasonable, affordable alternative to paying the toll. Low-income SR 520 users who participated in the study indicated that current transit service was too infrequent or too far from where they live or work. The study also found that low-income users do not use transit service on SR 520 at a higher rate than the general population.

Pre-paying for a transponder account would be more challenging for low-income bridge users, as they are more likely to lack a credit or debit card or to have enough money to make the initial deposit in a cash account. As described in the 2009 Environmental Justice Discipline Report, WSDOT found that recipients of public benefits might use their Electronic Benefits Transfer (EBT) card to pre-pay their transponder account. Evergreen Point Bridge users who do not have a credit or debit card could use the new Pay by Mail option; however, the Pay by Mail option costs an additional $1.50, which would present an additional burden to low-income users.

Following the analysis done for the SDEIS, WSDOT and FHWA evaluated new information that had become available on alternatives to paying a toll, as well as updated information regarding the project's overall transportation benefits. The following information was considered in the Final EIS analysis:

- One of the important concepts in evaluating the impacts of tolls on low-income populations is whether those populations have an affordable alternative to the toll. Since publication of the SDEIS, WSDOT and King County Metro have taken actions to provide

KEY POINT

Because there are affordable alternatives to paying the SR 520 toll, such as transit improvements, and the project would have benefits such as increased predictability and travel time savings, WSDOT concludes that there is no disproportionately high and adverse effect on low-income or LEP populations as a result of the toll.

affordable alternatives to paying the toll. These include expanding transit service and ridesharing service on a number of routes in and near the SR 520 corridor; working with community-based agencies that serve low-income users of the SR 520 travelshed to train them on helping their clients find affordable alternatives to paying a toll, including vanpools and ridesharing; and offering free crossing of the Evergreen Point Bridge between 11 p.m. and 5 a.m.

- FHWA has provided guidance that overall project benefits—including those that apply broadly to all users—should be considered in determining whether there is a disproportionately high and adverse effect on low-income or minority populations. According to research conducted for this project, many low-income drivers consider a faster, more reliable trip across Lake Washington to be worth the cost of a toll. The transportation analysis shows that commutes between Seattle and Bellevue could be shortened by as much as 33 minutes during the morning peak period and as much as 33 minutes during the evening peak period (see Exhibit 5.1-7). Furthermore, all SR 520 users would benefit from a safer facility that is less vulnerable to catastrophic failure.

After considering this information, WSDOT and FHWA determined that the actions taken to provide more affordable alternatives to paying the toll, coupled with the benefits of the project, would offset the adverse effects of the toll on low-income populations. The section below titled *What has been done to avoid or minimize negative social effects?* and the Environmental Justice Discipline Report Addendum and Errata in Attachment 7 include additional information on analysis that has been completed since the SDEIS.

Tribal Cultural Resources

As discussed in Section 4.6, Foster Island is significant to Native American 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 has documented the status of Foster Island as a Traditional Cultural Property (TCP) through work with the tribes under Section 106 of the National Historic Preservation Act.

The 6-lane section design of the new roadway would require acquisition of between 0.3 and 0.7 acres of land on Foster Island (depending on option), as well as expansion of the right-of-way around the existing alignment. The Preferred Alternative and SDEIS Option A would have very similar footprints – less than Options K or L. The Preferred Alternative would provide approximately 16 to 20 feet of clearance above Foster Island. This would minimize disturbance to the island and improve the walk along the Arboretum Waterfront Trail by opening views at ground level while still maintaining a relatively low profile. Option A would provide 12 to 18 feet

KEY POINT

The Preferred Alternative has been designed to minimize effects on Foster Island – a Traditional Cultural Property.

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.

of clearance, Option L would provide 10 to 12 feet of clearance, and Option K would be at grade or depressed across Foster Island.

The Preferred Alternative's area of acquisition and ground disturbance would be similar to that of Options A, K, and L, but Option K would have the greatest overall effects on Foster Island with the land bridge and fill around it. Options K, and L would also include stormwater treatment on Foster Island, further disrupting the area. See Chapter 2 for more information on the different design elements of each option on Foster Island.

WSDOT has coordinated closely with the tribes on avoidance and minimization of impacts on Foster Island through the Section 106 process (see Section 5.6, Cultural Resources). WSDOT has conducted archaeological investigation of the areas where ground disturbance would occur during construction of the project, and has found no archeological resources in these locations. If previously unidentified archaeological sites were discovered during construction, tribes would be consulted to determine the appropriate mitigation measures. 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.

Section 5.6 provides more information on cultural resources and Foster Island. WSDOT is continuing to coordinate with the affected tribes during project design to ensure that new facilities on Foster Island are respectful of its cultural status.

Tribal Fishing

Project effects on tribal fishing are of serious concern to the Muckleshoot Indian Tribe, which has treaty fishing rights in all of Lake Washington, the Ship Canal, and some of the other areas where pontoons may be outfitted and transported (see Section 6.15). WSDOT will continue to work through government-to-government consultation with the Muckleshoot Indian Tribe on an agreement to resolve fully and fairly issues associated with the impacts of the project on treaty rights. Therefore, there would not be a disproportionately high and adverse effect to tribal fishing because of the project, regardless of build option..

KEY POINT

WSDOT anticipates executing an agreement with the Muckleshoot Indian Tribe to mitigate for the project's adverse effects on tribal treaty rights. If the agreement is executed, WSDOT expects that there would not be a disproportionately high and adverse effect on tribal fishing as a result of the project. WSDOT will continue to work through government-to-government consultation with the Muckleshoot Indian Tribe to fully and fairly resolve issues associated with the impacts of the project on tribal treaty rights.

The issues that WSDOT investigated with regard to treaty fishing rights involved the effects of the different design options to the fishery and aquatic habitat, as well as the ability to access areas for fishing. The technical aspects involved with these issues are also addressed in Section 5.11 The following provides an overview of some of the issues.

Portage Bay Bridge

Under the Preferred Alternative and all SDEIS design options, the new Portage Bay Bridge would approximately double the amount of over-water and in-water shading compared to the existing bridge. However, the middle

and eastern sections of the Preferred Alternative would be more than twice as high as the existing bridge thereby off-setting the shading effects on fish habitat. The Preferred Alternative would be 5 feet narrower at the midpoint of the Portage Bay Bridge than Option A and 3 feet wider than Options K or L, which is a negligible difference between alternatives. The project-related changes to the Portage Bay Bridge are not expected to affect tribal fishing. The effects of any of the options would be essentially the same as the No Build Alternative.

West Approach Area

The Preferred Alternative and all SDEIS options would reduce fish habitat functions, primarily because of increased shading by the larger over-water structures. Compared to the existing structures, the proposed over-water structures are about twice as wide for all alternatives. The Preferred Alternative is within the range of over-water shading identified for the SDEIS options. The most likely area that increased shade could affect salmonids is in the west approach area, where the shadow of the bridge may delay, but not prohibit, outmigration of juvenile salmonids. The influence of in-water shading on fish behavior is complex and it varies by width and height of the structures, species, time of year, and other factors. The Ecosystems Discipline Report Addendum and Errata (WSDOT 2011j) provides a detailed analysis of the effects of the project on fish and their habitat.

Lake Washington and East Approach Area

Under the Preferred Alternative and all the SDEIS options, the new Evergreen Point Bridge would have a substantially wider footprint than the existing bridge. It would permanently limit access to usual and accustomed tribal fishing areas for the Muckleshoot Indian Tribe. The wider bridge deck, supplemental stability pontoons, and anchor cables would span from 450 to 600 feet wider than the existing Evergreen Point Bridge. In addition, the alignment of the new bridge would shift north.

The project would have some beneficial effects on the aquatic habitat that supports tribal fishing. These effects include:

- The Preferred Alternative, like all the SDEIS options, would result in overall water quality improvements because WSDOT will be treating stormwater for the project roadways to levels that comply with current water quality standards. In contrast, there is only limited stormwater treatment under existing conditions.
- Spacing of bridge columns in the west approach area under the Preferred Alternative would be increased compared to the existing structures and bridge spans would be longer, which would reduce the number of columns in fish habitats in tribal fishing areas.

The project would also have a number of potentially adverse effects on tribal fishing in Lake Washington. These effects can be summarized as follows:

- The project's footprint would be significantly larger than that of the existing bridge, resulting in a permanent loss of fishing area to the Muckleshoot Indian Tribe. Bridge structures and operations located in or near water could obstruct access for fishers. Because the bridge anchors would extend farther from the bridge than the existing anchors, tribal fishers may need to move farther away from the bridge to fish. This could bring their equipment into areas of heavier boat traffic, potentially exposing their gear to an increased risk of damage.
- The Ship Canal provides the only access to the Lake Washington system and is a critical route for all salmonids migrating between Puget Sound and Lake Washington. Salmon passing through this area, including out-migrating juveniles and returning adults, are already affected by vessel traffic and the existing bridge structure. As noted in Section 5.11, the project's wider footprint (and resultant shading or shadow effects) could worsen these effects. The influence of in-water shading on fish behavior is complex and it varies by width and height of the structures, species, time of year, and other factors. The Ecosystems Discipline Report Addendum and Errata (Attachment 7 and the Biological Assessment and Opinions [Attachment 18] provide a detailed analysis of the effects of the project on fish and their habitat).
- The Preferred Alternative and all SDEIS design options would include a bridge maintenance facility on the east end of the bridge in an area that may be used for sockeye spawning (see Section 4.11). This facility could have adverse effects on the sockeye spawning grounds. Design refinements to the east approach have resulted in more substrate displacement in the sockeye spawning areas than was reported in the SDEIS (see Section 5.11 for more information). The maintenance facility's new dock would create new shading and salmon predator habitat at this location, and would result in permanent loss of this specific location for tribal fishing.
- The proposed lighting on the Montlake Cut bascule bridge, west approach, and floating spans and lighting on the east approach span and maintenance facility have the potential to affect listed salmonids. Lighting associated with the Montlake Cut bascule bridge would be similar to lighting on the existing bridge; however, because there will be two new bridges, the area illuminated is shifted to the east by approximately 100 feet. Lighting in the west approach and east approach structures will be less than under existing condition due to shielding and increased structure heights. The project would also include a reduction of roadway lighting fixtures to the extent possible

on portions of the west approach, the entire floating span, and portions of the east approach.

What are the indirect effects of the project on social elements?

The project would not result in indirect effects on social elements and would not indirectly affect low income or minority populations. Operation of the Preferred Alternative, or Options A, K, or L would generally benefit community cohesion and would not change demographics or existing land use patterns. The project would not increase demand for public services or utility infrastructure within the project vicinity, as the project would not induce growth (see Section 5.2).

What has been done to avoid or minimize negative social effects?

The Preferred Alternative and all the SDEIS design options incorporate features intended to minimize negative effects on neighborhoods, including context-sensitive design, landscaped lids, a regional bicycle/pedestrian path, and transit improvements in the Montlake area. In addition, design of the roadway reflects community goals for the narrowest possible footprint while not precluding future light rail, and a lower floating bridge profile so as not to encroach on residential or park property more than necessary, and to prevent views from being obscured. The Preferred Alternative design reflects comments received on the SDEIS from project area neighborhoods, and incorporates the results of a collaborative design process for the Montlake area that will help to enhance community cohesiveness and provide improved pedestrian, bicycle, and transit facilities. The project also would enhance parks, particularly the Arboretum, as mitigation for the increased width and bulk of the highway in this area.

In evaluating effects to tribes in the project area, the project design has been refined to avoid effects to Foster Island (as discussed in Section 2.5) and to fish resources and habitat (as discussed in Section 5.11). The following section summarizes those project refinements in the context of tribal environmental justice effects.

Tolling

In 2009, the Washington State legislature authorized King County to raise property taxes to fund transit, a portion of which has been dedicated to enhancing service along the SR 520 corridor in anticipation of tolling. At the time of publication of the SDEIS, there were no specific plans for how the service dollars would be allocated. Since then, a plan for transit service improvements has been developed and adopted.

A comparison of the transit service improvements map with the demographic analysis of the SR 520 travelshed shows that although there

are pockets of low-income residents throughout the SR 520 travelshed, the highest concentrations of low-income SR 520 users are living in the following areas: neighborhoods along SR 522; the Totem Lake area in Kirkland; Bothell where I-405 intersects with SR 522; and the Seattle neighborhoods of Northgate, the University District, First Hill, and downtown Seattle. King County Metro Transit and Sound Transit have committed to making transit service improvements on routes that serve some of these neighborhoods. The new routes are described below.

These improvements address the issue of transit frequency for many people living in neighborhoods with low-income populations in the SR 520 travelshed. It should be noted that many of the improvements are on commuter routes rather than all-day routes; therefore, they do not expand travel options for low-income people who need to travel during non-peak hours (such as service or shift workers). However, tolls are lower or non-existent during non-peak hours, reducing the effect on low-income users crosing the bridge during those times. Because the transit service improvements include only one new route (Sound Transit route 542, described below), they do not help many low-income users for whom transit is too far from where they live or work to serve as a reasonable alternative to paying the toll on the Evergreen Point Bridge.

The new transit enhancements include improvements to the following routes:

- King County Metro Transit route 255: This is all day service from the Totem Lake area in Kirkland to downtown Seattle. Starting in October 2010, route 255 extended morning and afternoon weekday trips from Kirkland Transit Center to Totem Lake Transit Center. Starting in February 2011, Route 255 will improve weekday service frequencies by 10 to 30 minutes. Route 255 service from Totem Lake to downtown Seattle begins at approximately 4:30 a.m. and ends at 10:30 p.m. Return service begins at approximately 5:25 a.m. and ends at midnight. These improvements will provide better access and more frequent service for low-income people living in the Totem Lake area of Kirkland.
- King County Metro Transit route 265: This commuter route operates during peak periods from Redmond to Downtown Seattle. Starting in October 2010, route 265 extended from Downtown Seattle to First Hill. However, because route 265 provides only PM peak period service from First Hill, these improvements will have a negligible benefit to low-income residents in First Hill.
- King County Metro Transit route 271: This is all-day service from the Eastgate Park and Ride to the University District Ride via Bellevue Transit Center. Starting in October 2010, Eastgate-University District weekday service began running every 10-30 minutes until 6:00 p.m. Route 271 also extended its 30 minute headway service later into the evening on weekdays. Service from the University District to Eastgate

begins at approximately 5:30 a.m. and ends at 10:20 p.m., with return service beginning at 5:45 a.m and ending at 10 p.m. This improvement will provide more frequent cross-lake travel for low-income residents living in the University District.

- King Count Metro Transit route 311: This is a commuter route that operates during peak periods on weekdays. Starting in February 2011, route 311 will have three new morning and three new afternoon trips between Woodinville and Downtown Seattle, which will provide low-income people living in the Duvall area with service every 15 minutes during the peak periods. Service from Duvall to Downtown Seattle begins at 4:51 a.m. and ends at 7:17 a.m.. Return service begins at 3:15 p.m. and ends at 6:15 p.m.. There are six outbound trips from Duvall to Seattle and six return trips, so these route improvements have limited benefits for low-income people who work non-peak hours (such as service or shift workers).
- Sound Transit route 542: This new commuter route started in October 2010 and provides two-way weekday service with 15-minute frequency during peak periods from Redmond to the University District. Service begins from the University District to Redmond at approximately 6:30 a.m. and runs every 15 minutes until 10 a.m.. It starts up again at 2:30 and runs every 15 minutes until 6 p.m.. Return service begins at 5:30 a.m. and runs every 15 minutes until 9 a.m.. It starts up again at 3:30 p.m. and runs every 15 minutes until 7 p.m.. This improvement will provide more frequent cross-lake service for low-income people living in the University District. Because route 542 does not provide all day service, these route improvements have limited benefits for low-income people who work non-peak hours.
- Under the WSDOT Vanpool Investment Program (VIP), there will be a number of new vanpools in service. Vanpools are currently available on a first-come, first-served basis for a monthly rate that covers gas, maintenance, and insurance. Parking and tolls for vanpools are generally free. The rate varies, depending on the size of the van, number of trips per week, and distance traveled per trip. For example, the monthly rate for a 7-10 passenger van traveling up to 20 miles roundtrip five days a week would be $380 ($38-$54 per person/month). Individuals who wish to form a vanpool must do the following: assemble a group of four or more people, choose a driver, and complete an application. WSDOT has been promoting vanpools to community-based social service agencies as an affordable alternative to paying the toll for their staff and clients.

Although not related to implementation of early tolling on SR 520, King County Metro Transit will be launching RapidRide bus service to from Redmond to Bellevue via Crossroads and Overlake in fall 2011. RapidRide B Line will provide all day, high frequency service and improve connections to buses serving the Eastside, Seattle, south King County, Lynnwood,

Everett, and other places. This will help low-income residents of Bellevue's Crossroads neighborhood as well as low-income people traveling to Bellevue or Redmond for work.

In addition, WSDOT has been conducting extensive outreach to community-based social service agencies that serve low-income residents of the SR 520 travelshed to update them about the tolling and train them on how to help their staff and clients access affordable alternatives to paying the toll, including vanpools and ridesharing. Since May 2010, the WSDOT tolling team has been conducting the following outreach activities:

- Translated informational materials about tolling into Chinese, Korean, Japanese, Russian, Spanish, and Vietnamese – the same languages that the Washington State Department of Licensing translates.
- Translated the Good to Go! Website into Spanish.
- Distributed information about tolling to community-based social service agencies, churches, schools, and other organizations that serve low-income and minority populations throughout the travelshed.
- Facilitated two trainings for social workers to help them provide information about tolling to their clients and ensure that staff has the tools and materials to share accurate information with clients.
- Purchased advertising, pitched stories, and coordinated with editorial boards for ethnic newspapers and radio stations.
- Disseminated information about how to purchase transponders and establish and replenish prepaid transponder accounts using an EBT card. EBT cards function like a debit card for recipients of public benefits.

Tribal Cultural Resources and Fishing

The project design has resulted in the narrowest roadway width and the fewest columns practicable across Foster Island, minimizing effects on the TCP. The archaeological work that WSDOT conducted in 2010 also helped reduce the potential for effects by confirming that there were no archaeological resources in the areas planned for ground disturbance. Measures identified in the Programmatic Agreement for Section 106 (see Section 5.6 and the Final Cultural Resources Assessment and Discipline Report in Attachment 7) will ensure that work done on Foster Island respects the importance of this area to the tribes. Ongoing coordination with staff from the Muckleshoot Indian Tribe Fisheries Division has also resulted in design changes that will help reduce effects on tribal fishing. These changes include:

- Reducing in-water structures by minimizing the number and size of bridge support columns, increasing the space between columns, and using special footings for the structure foundation.

- Minimizing the effects of shading on open-water habitat by increasing the bridge height compared to existing conditions and SDEIS options and reducing the overall width of the over-water structures by minimizing the number of lanes and reducing shoulder widths.
- Improving water quality by treating stormwater runoff.
- Minimizing the effects of lighting on aquatic habitat by placing them on the center median whenever possible and using special fixtures on lights that are adjacent to the water.

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

Tolling

As described in this report, there are substantial new improvements to transit serving SR 520 and extensive outreach to community-based social service agencies conducted by WSDOT. Coupled with the abatement and minimization measures described above, WSDOT concludes that the effects of the toll on low-income populations have been greatly minimized. Therefore, no mitigation measures are recommended.

Tribal Cultural Resources and Fishing

WSDOT is actively consulting with the Muckleshoot Indian Tribe, Suquamish Tribe, Snoqualmie Tribe, and Tulalip Tribes in accordance with Section 106 of the National Historic Preservation Act and the 1989 Centennial Accord between the Federally Recognized Tribes in Washington State and the State of Washington, the New Millennium Agreement, the WSDOT Executive Order on Tribal Consultation, E 1025.01, and the Centennial Accord Plan of the Washington Department of Transportation. To date, two separate agreements have been developed for this project:

- To address cultural resources effects, tribes are signatories to a Section 106 Programmatic Agreement to satisfy the requirements of the National Historic Preservation Act. The agreement includes by reference a separate Foster Island Treatment Plan to mitigate for adverse effects on Foster Island. In addition, an archaeological treatment plan is also incorporated by reference into the Section 106 Programmatic Agreement to address further cultural resources analyses as project design and construction progress.
- As described in Chapter 1, WSDOT and FHWA are engaged in government-to-government consultation with the Muckleshoot Tribe to determine appropriate mitigation for the project's effects on tribal treaty fishing. The outcome of this consultation will be a Memorandum of Agreement that documents WSDOT's commitment to a set of specific mitigation measures. .

Section 5.6 and the Final Cultural Resources Assessment and Discipline Report (Attachment 7) contain more information about mitigation relating to Foster Island. With implementation of these measures, there would be no disproportionately high and adverse effects on tribes regarding the Foster Island TCP.

A draft version of the Memorandum of Agreement with the Muckleshoot Tribe is expected to be completed for review by summer 2011 and signed by the end of the year. Conditional upon execution of this agreement, WSDOT anticipates that effects on tribal treaty fishing will be fully mitigated and that there will be no disproportionately high and adverse effect on minority populations as a result of the project.

What is the Environmental Justice Determination for the project?

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, 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.

There would not be a disproportionately high and adverse effect to minority or low income populations as a result of tolling. This finding was reached considering the following:

- All SR 520 users would benefit from a safer bridge that is less vulnerable to catastrophic failure and that would provide a faster, more reliable trip across SR 520.
- Increased transit options (including more routes, improved headways, and vanpool and ride-sharing programs) are being implemented across Lake Washington to provide more affordable and convenient options for avoiding the toll.
- Tolls would be lower at non-peak hours.

There would not be a disproportionately high and adverse effect on minorities as a result of project construction or operation on Foster Island. In this case, the finding specifically refers to the tribal cultural resources of Foster Island.

This finding was reached considering:

- Measures in the current project design to minimize effects on the TCP
- The mitigation measures agreed upon as part of consultation under Section 106 of the NHPA

There would not be a disproportionately high and adverse effect to minorities as a result of project construction or operation in Lake Washington and associated waterbodies. In this case, the finding specifically refers to Muckleshoot Indian Tribe's treaty fishing rights.

This finding was reached considering:

- Measures in the project design to minimize effects on tribal fishing
- WSDOT's anticipated execution of an agreement with the Muckleshoot Indian Tribe to fully and fairly resolve issues associated with the impacts of the project on treaty rights.

5.4 Recreation

This section discloses potential effects on parks and recreation resources within the project area. The discussion presents information about acquisition of park land as well as changes in noise or visual quality or other elements of the environment that might affect the future use and enjoyment of the facilities. These resources are protected in part by two federal regulations. Section 4(f) (discussed in Chapter 9) requires an evaluation of the use of park and recreation resources in accordance with Section 4(f) of the Department of Transportation Act (49 USC 303). Section 6(f) (discussed in Chapter 10) requires an assessment of 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. Chapters 9 and 10 discuss the specific avoidance and mitigation requirements related to these laws and the project's effects in the context of those regulations. Chapter 9 presents all recreation mitigation measures that WSDOT proposes to undertake.

KEY POINT

The Preferred Alternative, like the SDEIS design options, would affect park land by acquiring all or a portion of six recreational properties. 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. The Preferred Alternative would acquire 6.7 acres of park land, compared to 7.5 acres for SDEIS Option A, 9.1 acres for SDEIS Option K, and 7.6 acres for SDEIS Option L.

How would the project affect parks and recreation resources?

Under the Preferred Alternative, as with Options A, K, and L, the project would result in a loss of park land through the acquisition of all or a portion of six recreational properties. Estimated permanent acquisition of park and recreation resources is shown in Table 5.4-1. As shown, the Preferred Alternative would acquire the least amount of park land. Each recreation resource that would experience an effect from operation of the project (whether property is acquired or not) is discussed below. See Section 4.4 for a description of the existing characteristics and uses of each recreation resource.

Table 5.4-1. Permanent Park Acquisition (acres)

Resource	Existing Size	Preferred Alternative	Option A	Option K	Option L
Bagley Viewpoint	0.1	0.1	0.1	0.1	0.1
Montlake Playfield	26	1.2[a]	2.0[a]	1.0[a]	0.8[a]
East Montlake Park	8.8	2.8	2.8	5.2	4.3
McCurdy Park	1.4	1.4	1.4	1.4	1.4
Washington Park Arboretum	230	0.5	0.4	0.7	0.3
UW Open Space	3	0.7	0.9	0.8	0.6
Total Acquisition		6.7	7.5	9.1	7.6

Notes: Adding the suboptions to Options A, K, and L would not change the park acquisitions listed in this table. Column totals do not add due to rounding.

[a] Acquisition includes the submerged lands north of Portage Bridge.

Bagley Viewpoint

The Preferred Alternative and all SDEIS options, would result in the complete acquisition of Bagley Viewpoint to provide right-of-way for the 10th Avenue East/Delmar Drive East lid (Exhibit 5.4-1). WSDOT proposes to replace the viewpoint functions of the existing site on that new lid. Section 5.5 provides more information on the views that would be provided from the lid.

Roanoke Park

Although no property would be acquired from Roanoke Park for the Preferred Alternative or any of the SDEIS options, the 10th Avenue East/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 neighborhoods. The 10th Avenue East/Delmar Drive East lid would include pathways to improve connectivity and to provide access across SR 520, improving safety for pedestrians and bicyclists.

Private Recreational Boating Facilities in Portage Bay

Queen City Yacht Club and Seattle Yacht Club

Operation of the Preferred Alternative or Options A, K, and L would not result in any negative effects on recreational activities at the yacht clubs. As a result of design changes made to reduce effects on the NOAA facility, the Preferred Alternative would reduce the physical space available for moorage at the Queen City Yacht Club by approximately one boat slip (see Section 5.2 for more information about property impacts and changes to right-of-way). Improvements to SR 520 and the Montlake interchange area would have a positive effect on traffic flow and access to the Seattle Yacht Club. The Preferred Alternative would reduce noise levels at the Queen City Yacht Club and Seattle Yacht Club compared to the No Build Alternative. Stormwater treatment would improve the quality of runoff entering Portage Bay in the vicinity of the yacht clubs (see Section 5.10 for more information on water resources and water quality). As noted for Montlake Playfield, context-sensitive design of the new Portage Bay Bridge is expected to provide a positive visual experience for boaters and seasonal boating event attendees.

Montlake Playfield

Preferred Alternative

The Preferred Alternative would acquire a portion of the Montlake Playfield (Exhibit 5.4-2). The new ramp at Montlake Boulevard would be on columns through approximately 0.2 acre at the east side of the Montlake Playfield property. Because this area is adjacent to WSDOT right-of-way

Exhibit 5.4-1. Permanent Park Acquisition at Bagley Viewpoint

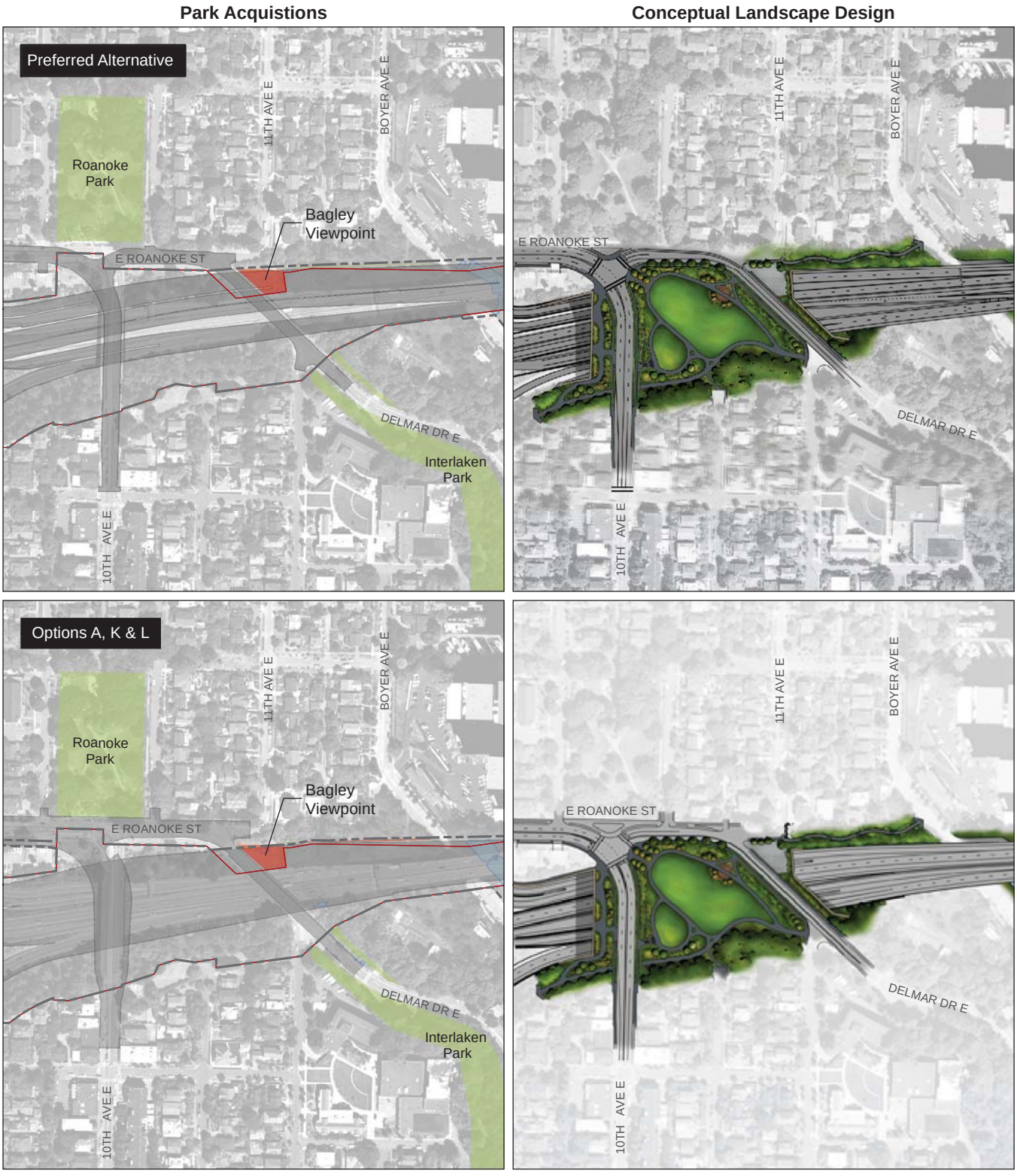
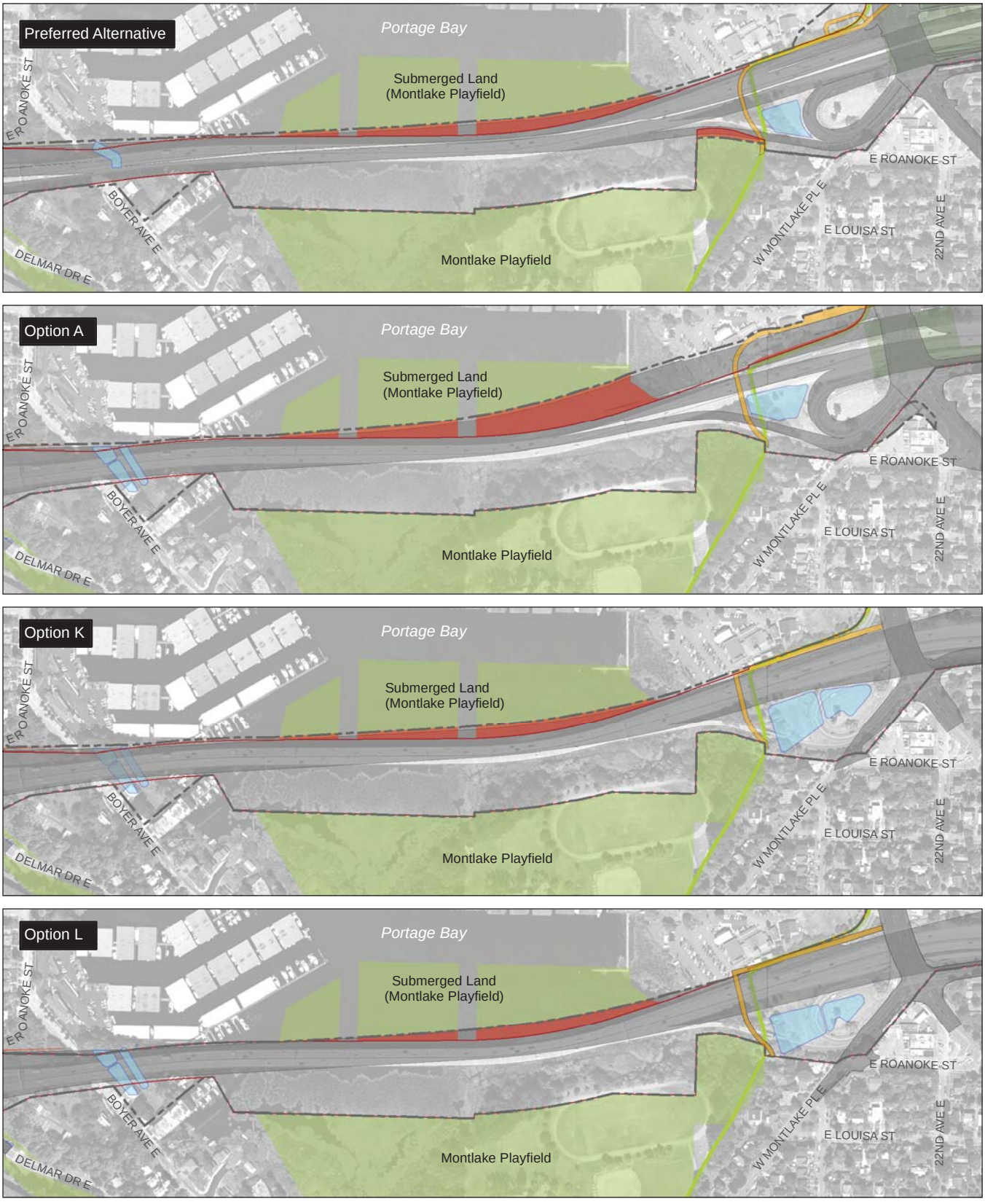


Exhibit 5.4-2. Permanent Park Acquisition at Montlake Playfield



and is somewhat removed from the main activities of the park, it is not used much. However, there would be no discernable difference to boating access around the bridge in this part of the park.

The southern edge of the Portage Bay Bridge would appear to be in the same location as today viewed from Montlake Playfield, with the alignment shifting over 10 feet farther away at the midspan of the bridge and 10 feet to 15 feet closer at the bridge ends. See Chapter 2 for a description of the new bridge location and the text box on page 5.2-3 for information on right-of-way boundaries in this area. As with existing conditions, the bridge would not be visible during the summer months from the playfield area of the park, screened by the existing deciduous trees between the playfield area and Portage Bay. Section 5.5 provides more information on the visual quality effects of the project.

There would be no change to shoreline access for launching and landing of small boats from Montlake Playfield. Views toward Portage Bay from the shoreline area would be similar to today. Noise from traffic on the Portage Bay Bridge would be less than under existing conditions or the No Build Alternative. Section 5.7 provides more information about noise effects in the Montlake Playfield area.

Options A, K, and L

The operational effects of Options A, K, and L would be similar to the Preferred Alternative except that none of these options would require the use of park property for a ramp to Montlake Boulevard. Options A, K, and L would reduce noise compared to the No Build Alternative, and noise walls recommended along the Portage Bay Bridge for options A and L would further reduce noise in the park.

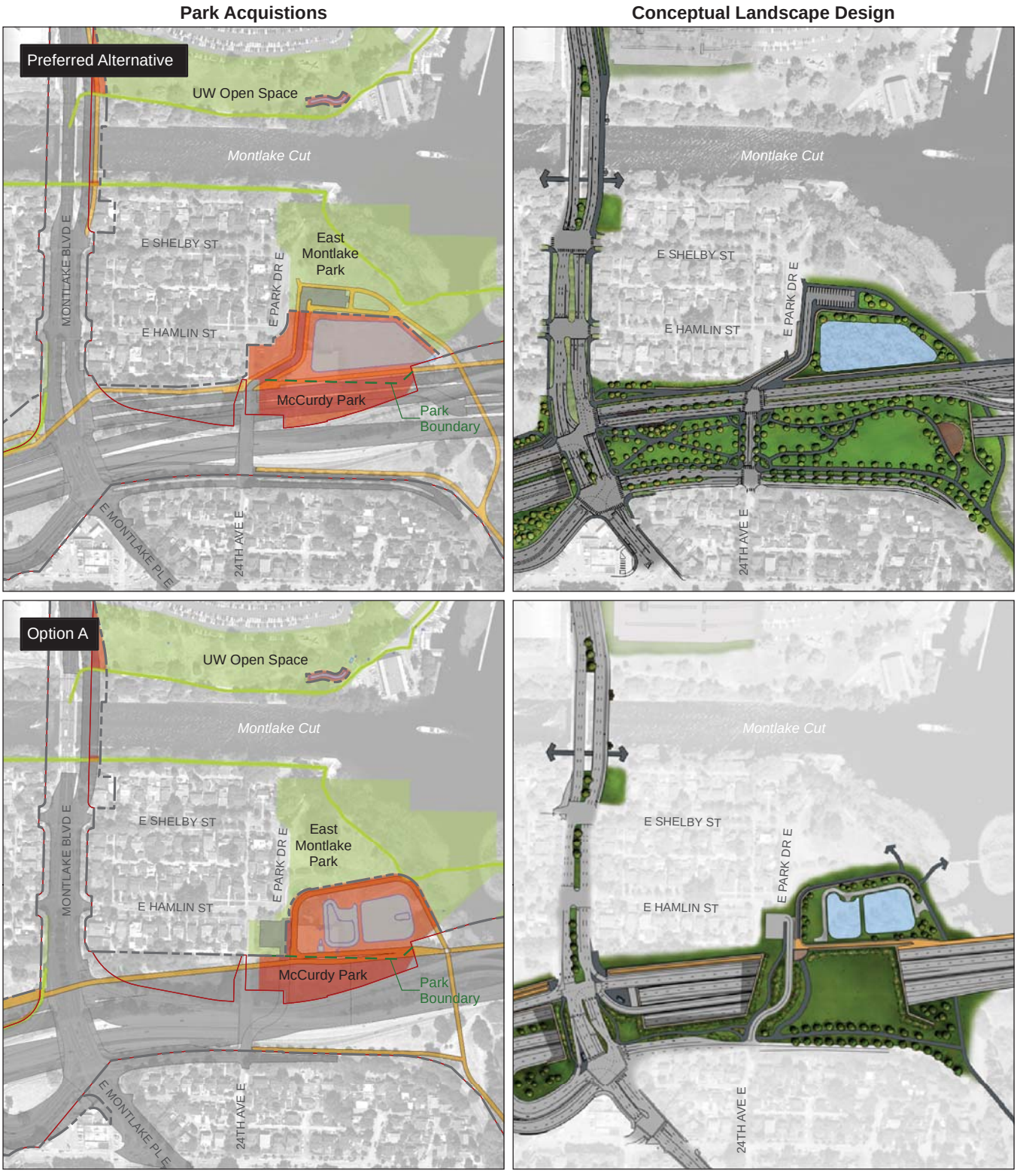
East Montlake and McCurdy Parks

The Preferred Alternative and all the SDEIS options would remove the MOHAI facility and change all of McCurdy Park from recreation to transportation use. All options would make the freeway more noticeable at East Montlake Park (Exhibit 5.4-3).

Preferred Alternative

Under the Preferred Alternative, about 4.2 acres of combined park area would be changed to a transportation use, including all of McCurdy Park where a stormwater pond would be placed. The often-used features of East Montlake Park (including the nonmotorized boat launch areas along Union Bay, the Ship Canal Waterside Trail, and the Arboretum Waterfront Trail) would remain in place. The open space area of East Montlake Park would be reduced with placement of a parking lot here to retain on-site parking once the existing large lot was removed. Access to the park would be from the relocated 24th Avenue East.

Exhibit 5.4-3. Permanent Park Acquisition at East Montlake and McCurdy Parks (Preferred Alternative and Option A)



The views of SR 520 would be different than today. Currently, SR 520 can be heard, but is generally not seen, from areas within East Montlake Park because the view to the south is blocked by the MOHAI facility and trees in McCurdy Park. With the Preferred Alternative, the top of the SR 520 Montlake lid would be taller than the ground surface at East Montlake Park and the north side wall of the lid would face the park area. The existing trees at McCurdy Park, which now buffer the existing freeway, would be gone and would be difficult to replace adjacent to the freeway due to space limitations.

The new stormwater facility (where McCurdy Park is now located) would be landscaped, which would contribute to screening of the freeway. A new pedestrian/bicycle trail would enter the park under SR 520, creating new north/south connectivity and a loop trail with the Arboretum Waterfront Trail (see Exhibit 5.4-3). Noise levels would not be perceptibly different than today or under the No Build Alternative.

Option A

The same acreage of park area would be acquired with Option A as with the Preferred Alternative (4.2 acres). The effects of Option A would be similar to those described above for the Preferred Alternative except that the Montlake lid would be smaller and the east lid portal and freeway ramps onto the lid would be more prominent visually at East Montlake Park.

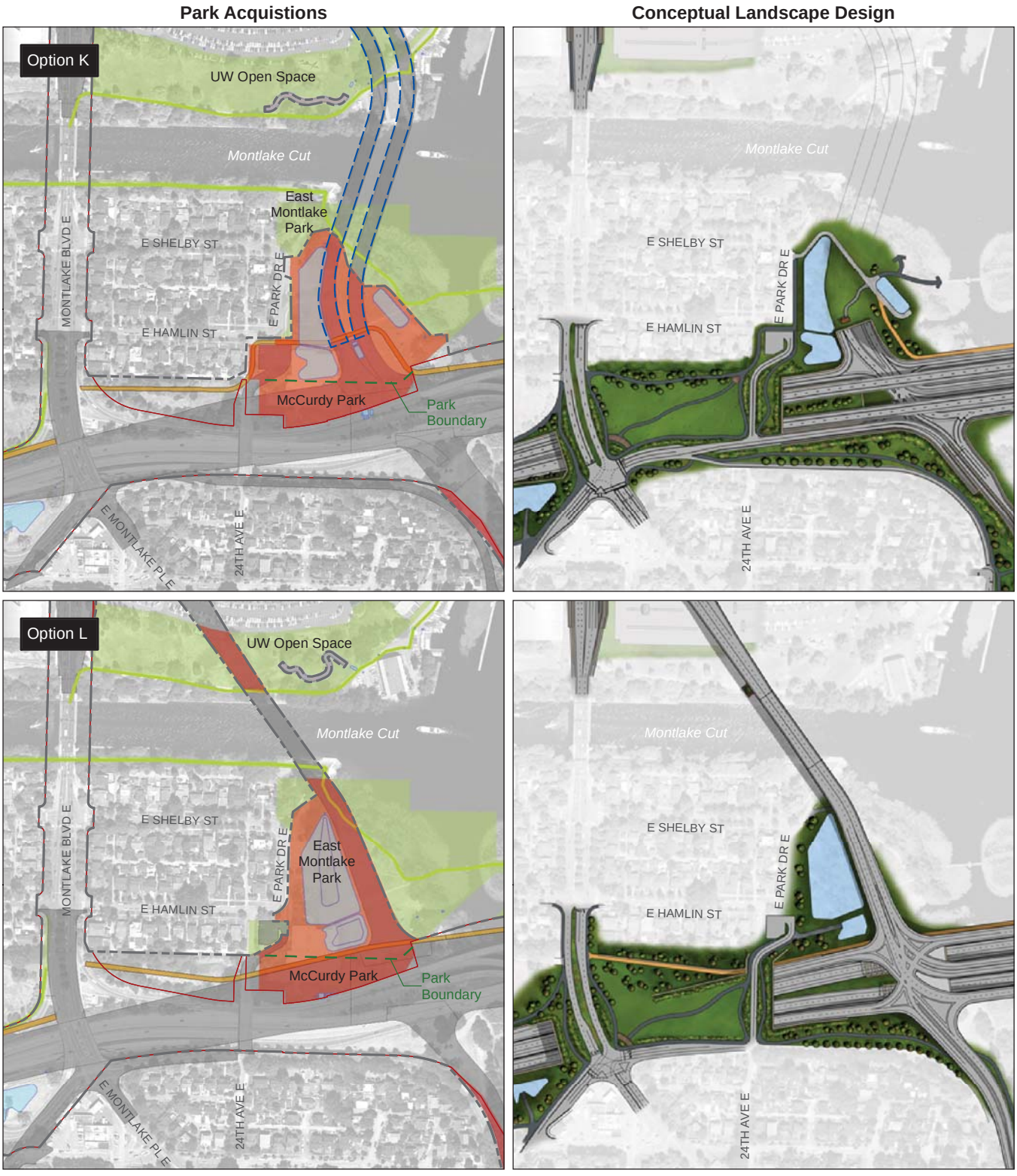
Option K

Option K would change 6.6 acres of the total park area to transportation use, the most of all the options. The atmosphere at the park would be different than the other options because of the below-grade SR 520/ Montlake Boulevard interchange. Although the roadway would be closer to the park area than under existing conditions or the Preferred Alternative or Option A, there would be no noticeable change in noise levels for most of the park and noise levels would be noticeably lower toward the west side of the park due to the below-grade SR 520 interchange. The SR 520 regional bicycle and pedestrian path would be routed through the park area. All of the existing park uses (open space, trails, and boat launch/landing areas) would remain in place as with the other options (including the Preferred Alternative).

Option L

Option L would change 5.7 acres of the total park area to transportation uses (Exhibit 5.4-4). However, regardless of acreage acquired, this option would have the greatest effects on the park area of all the options. The new roadway between SR 520 and the second bascule bridge would travel overhead through the heart of the park, bringing associated shade and change in character of the park area. Noise levels in the park would not be noticeably different due to the elevation of the roadway over the area. All of the existing park uses (open space, trails, and boat launch/landing areas)

Exhibit 5.4-4. Permanent Park Acquisition at East Montlake and McCurdy Parks (Options K and L)



would remain in place as with the other options, but the park experience would be considerably different with the location of the new overhead roadway.

University of Washington Open Space

All options, including the Preferred Alternative, would acquire a portion of the University of Washington Open Space site. Exhibit 5.4-5 shows the acquisition associated with each option.

Preferred Alternative

The Preferred Alternative would acquire 0.7 acre of land from the University of Washington Open Space for transportation uses. Approximately 0.2 acre of that would be the grassy open space area at the west side of the site. That area would be taken up by a wider Montlake Boulevard (where the second bascule bridge connects to land). Also, in the western portion of the site, noise would increase somewhat with the new roadway configuration. The remaining 0.7 acre acquired on-site would be used for a stormwater bioswale that would treat runoff from Montlake Boulevard (see section 5.10, Water Resources).

Changes in noise would not be noticeable toward the middle and eastern portions of the University of Washington Open Space. The remaining 0.5 acre to be acquired here would be in this portion of the site and would be used for a stormwater bioswale. The bioswale would not affect the functions of this portion of the site—grassy open space, the Waterfront Activities Center, the climbing rock, or the Canoe House (on property adjacent and to the east of this site). The bioswale would be installed through an area where park users can currently walk or play, but it would be an aesthetically pleasing new feature for the site.

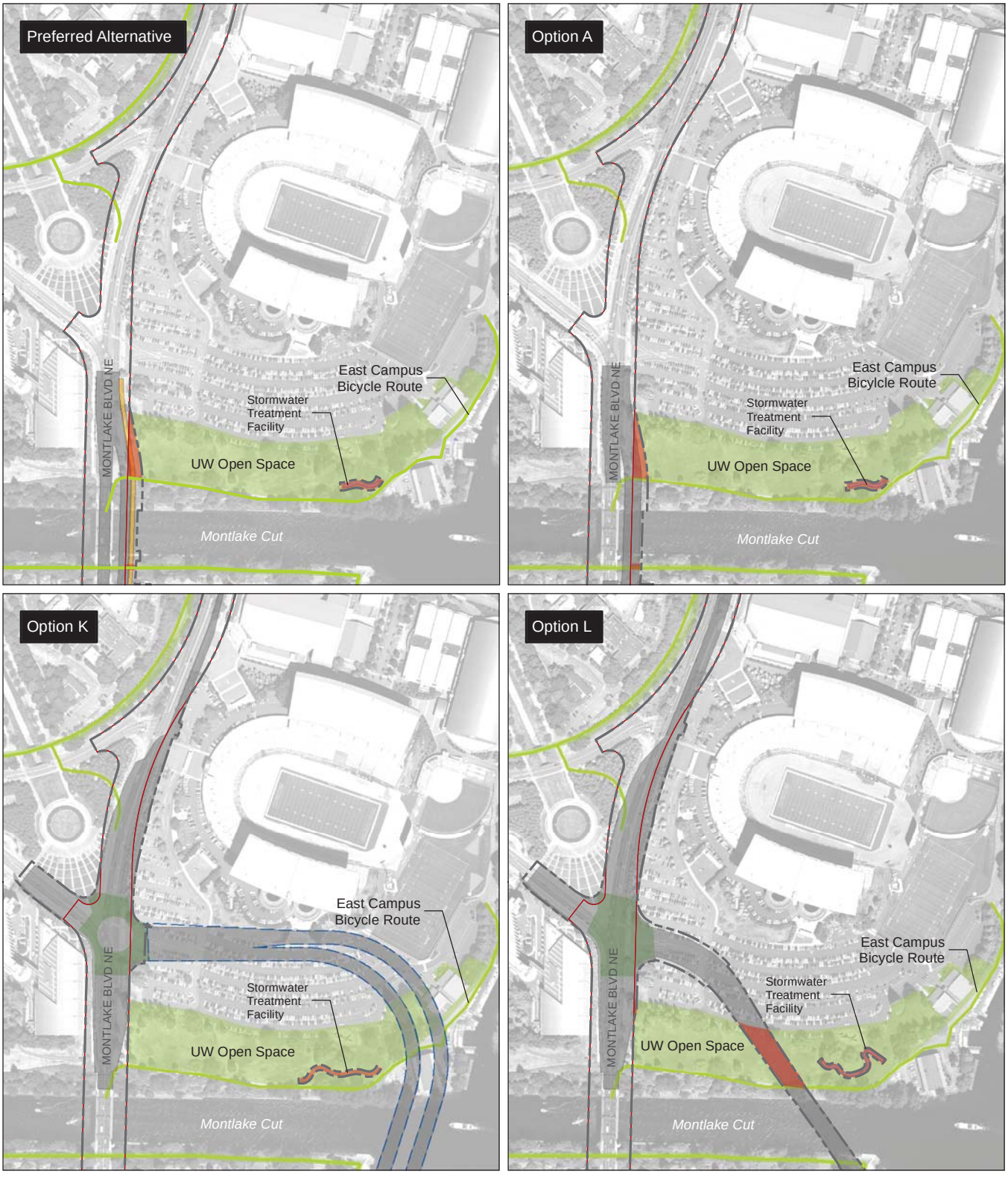
Option A

Option A would acquire 0.9 acre of land from the University of Washington Open Space for transportation uses. The overall effects would be the same as with the Preferred Alternative.

Option K

Option K would acquire 0.8 acre of the University of Washington Open Space for transportation functions, about the same as the Preferred Alternative and Option A. The new roadway between the SR 520/ Montlake Boulevard interchange and the Montlake area would tunnel under the Montlake Cut and the UW Open Space, and surface in the Husky Stadium Parking lot north of and adjacent to the UW Open Space, where it would connect to a reconstructed Pacific Street/Montlake Boulevard intersection. To accommodate the tunnel portal, the other three legs of the intersection would be lowered, including the segment of Montlake Boulevard along the UW Open Space site. A retaining wall would be

Exhibit 5.4-5. Permanent Park Acquisition in UW Open Space



installed along Montlake Boulevard to accommodate the lowered roadway. There would no perceptible change to noise levels at any portion of this site.

As with Option A and the Preferred Alternative, the bioswale would remove an area where park users can currently walk or play. All other existing functions and uses now available on the site would remain in place with this option.

Option L

Option L would acquire 0.6 acre of the UW open space for transportation uses and would have the greatest effect because it would place the north end of the new bascule bridge over the open space, making it visible to users of the Waterfront Activities Center, the climbing rock, and other areas. Noise levels in all areas of the park would increase noticeably. All existing functions and uses now available on the site would remain in place with this option, but the character of the site would have changed with the new overhead roadway through the site.

Washington Park Arboretum

The Preferred Alternative and all the SDEIS design options would convert land in the Washington Park Arboretum at Foster Island from recreation use to transportation use. Exhibits 5.4-6 and 5.4-7 show where land would be acquired. While all options, including the Preferred Alternative, would acquire a similar amount of right-of-way, Table 5.4-1 shows that Option K would require the largest area (0.7 acre) for its land bridge and related fill section. Effects of all options on the Washington Park Arboretum adjacent to the existing SR 520 would include filling of wetlands and removal of trees.

Arboretum Waterfront Trail under SR 520 on Foster Island

Preferred Alternative

The Preferred Alternative would cross Foster Island on a bridge. The wider footprint of the new roadway would require acquisition of 0.5 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 14 to 20 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.

Preferred Alternative – Arboretum Area

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 and kayaks can access

Exhibit 5.4-6. Permanent Acquisition in Washington Park Arboretum (Preferred Alternative and Option A)

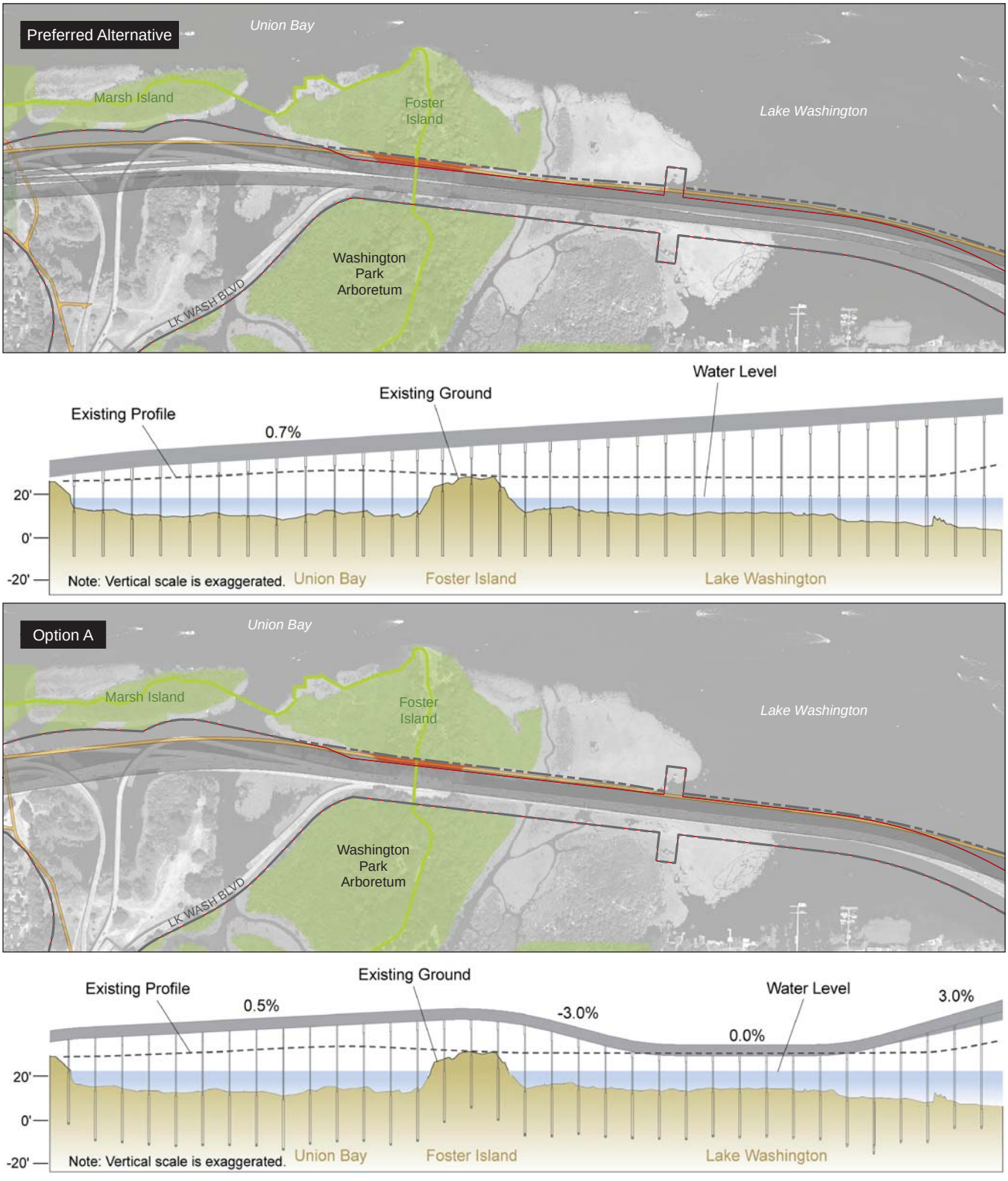
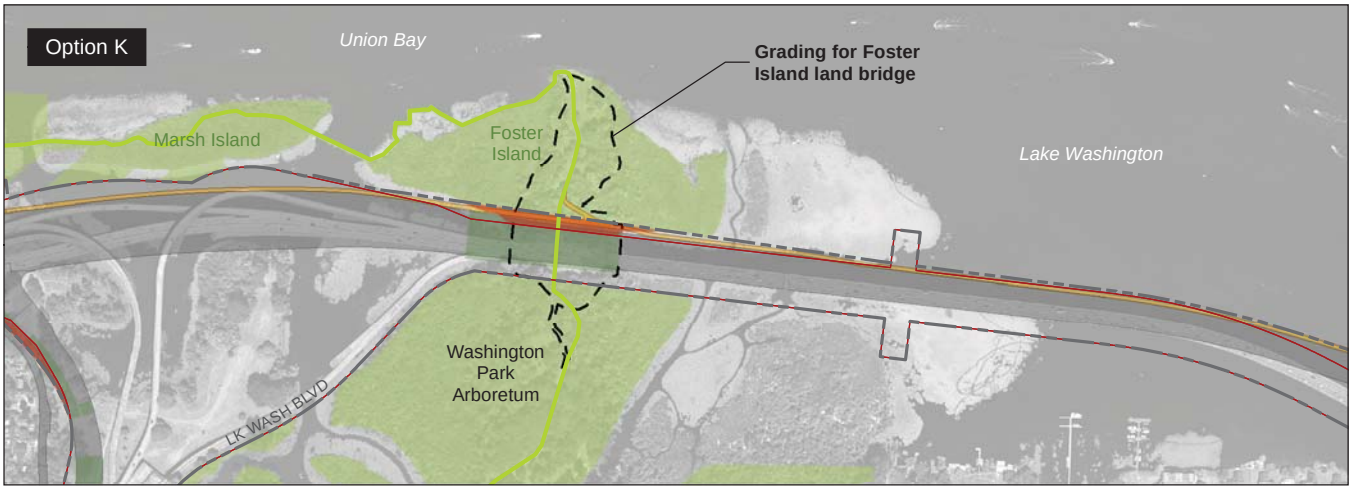
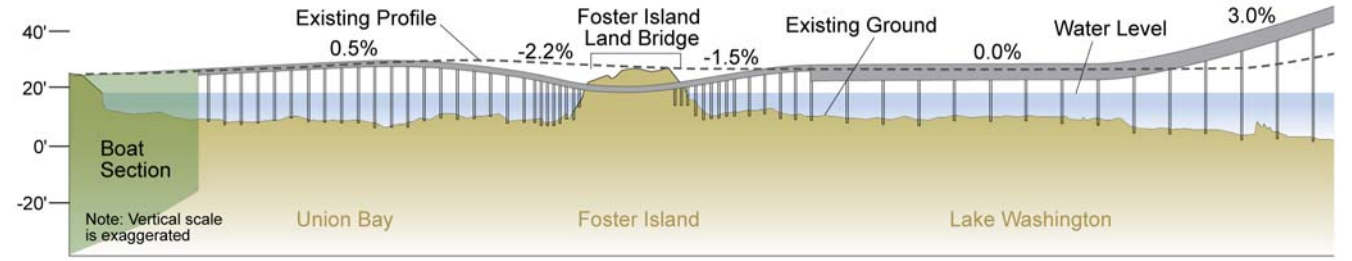
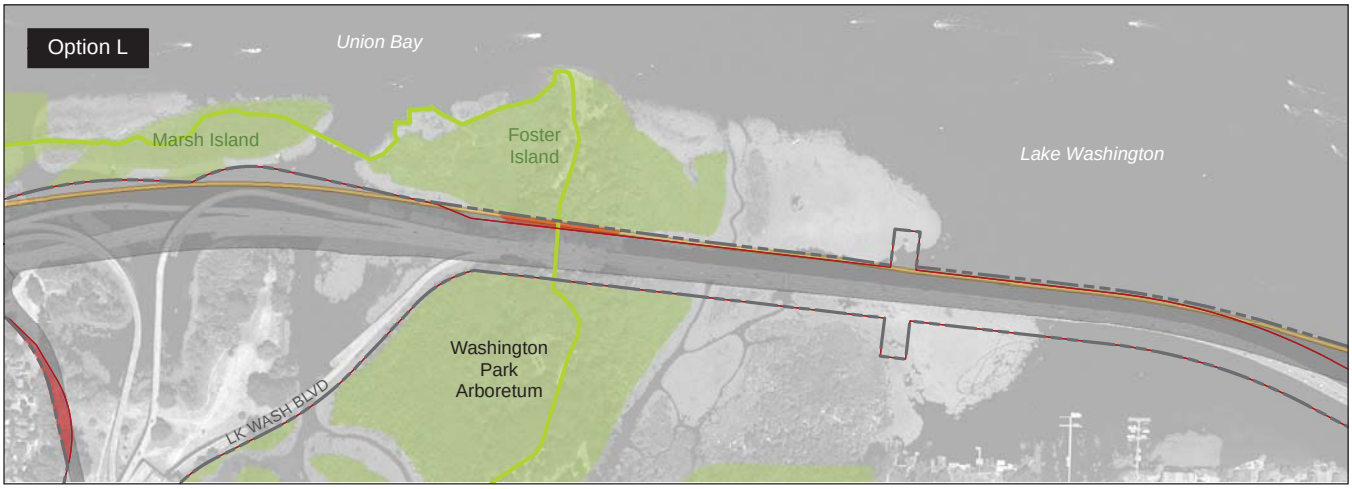
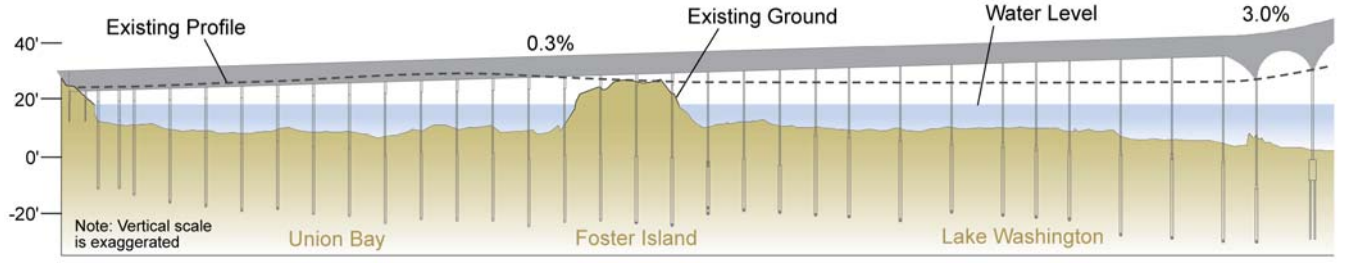


Exhibit 5.4-7. Permanent Acquisition in Washington Park Arboretum (Options K and L)









Park Acquisition

- Converted to right-of-way
- Proposed right-of-way
- Existing right-of-way
- Lid or landscape feature
- Pavement
- Park
- Existing trail/bicycle path
- Proposed bicycle/pedestrian path

N

0 250 500 Feet

the Arboretum area south of SR 520 by travelling underneath the existing freeway structure and ramps.

With the Preferred Alternative, canoes and kayaks would have improved passage as a result of the structure's higher profile and removal of the existing Lake Washington Boulevard and R.H. Thompson Expressway ramps. Because the highway main line would be wider and approximately 10 feet higher than the existing roadway, it would become a more noticeable feature on Foster Island for trail users. However, the higher profile and the 4-foot concrete traffic barrier included in the project design would substantially reduce noise levels in the areas close to the highway (see Section 5.7 for information on noise effects at the Washington Park Arboretum).

Option A

Like the Preferred Alternative, Option A would cross Foster Island on a bridge. It would require acquisition of 0.4 acre of land on the island (see Table 5.4-1). The highway main line would provide approximately 15 to 18 feet of clearance above the crossing of the Arboretum Waterfront Trail on Foster Island, which is higher than the current clearance of 8 feet. Other than the amount of land acquired, the effects of Option A would be similar to those of the Preferred Alternative. Noise levels under Option A would be higher than for the Preferred Alternative.

Option A Suboptions

- The Lake Washington Boulevard ramps proposed as an Option A suboption would be located within and adjacent to the SR 520 main line, considerably farther west than they are now. They would have little additional effect on 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

Under Option K, SR 520 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 would require acquisition of 0.7 acre 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 SR 520 regional bicycle/pedestrian path.

Option K Arboretum Area

The top of the land bridge would be landscaped, which would provide a more pleasant crossing of SR 520 than the current narrow underpass. Fill would be placed north and south of the land bridge to create a gentle slope from the bridge to the north end of Foster Island and into the Arboretum. This land bridge would provide enhanced views of the water for trail users, but would change the character of the Foster Island portion of the Arboretum Waterfront Trail from a wetland viewing opportunity to a more landscaped upland setting. Also, 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, nearshore access for small boats around Foster Island would be obstructed with the low roadway in this area. Boats would encounter a structural blockage requiring travel at least 200 feet away from Foster Island to cross underneath SR 520. The columns of the floating bridge approach spans would also be much more closely spaced than today, which would clutter the area for recreational navigation.

As with Option A, noise levels under Option K would be higher in the Arboretum than for the Preferred Alternative.

Option L

Option L would cross over Foster Island on a bridge. It would require acquisition of 0.3 acre of land on the island. The highway main line would provide approximately 10 to 12 feet of clearance above the crossing of the Arboretum Waterfront Trail on Foster Island, higher than today. Canoe and kayak access within the Arboretum area would be similar to the Preferred Alternative and Option A.

Option L Arboretum Area

Because the highway main line would be higher than the existing roadway, the highway would become a more noticeable feature within the park, and would affect the visual environment for trail users on Marsh and Foster Islands. The wider spacing of the new columns on the proposed bridge would be a positive visual change, opening views of Lake Washington. As with Options A and K, noise levels under Option L would be higher in the Arboretum than for the Preferred Alternative, but noise would be reduced compared to the No Build alternative. Addition of noise-reduction features included in the Preferred Alternative could reduce noise levels further.

How would the project affect bicycle and pedestrian connections?

The Preferred Alternative, like all the SDEIS design 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

KEY POINT

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 would provide new areas for passive recreation. Trails across these lids would further improve connectivity for bicyclists and pedestrians.

the Points Loop Trail in Medina. Bicyclists crossing SR 520 would have convenient access to the Burke-Gilman Trail and other portions of the regional recreational trail system.

The green open spaces, landscaping, and pathways planned for the lids of all options would provide new areas for passive recreation, although the lids would not be designated as parks. Trails across these lids would further improve connectivity for bicyclists and pedestrians.

What are the indirect effects of the project on parks and recreational resources?

Indirect effects on recreational resources can occur when there are changes in access, surrounding land use, noise levels, or visual intrusion that affect the value and integrity of the resource for park users. For the SR 520, I-5 to Medina project, most indirect effects on parks and recreational resources would be positive by encouraging greater use of these resources, improving connectivity and linkages between parks, and improving noise levels and visual quality in certain locations.

Replacement park property developed as part of the mitigation for direct effects (discussed below as a mitigation measure) would create additional recreational areas for park users. The regional bicycle/pedestrian path and lids would encourage increased pedestrian and bicycle use over the long term. Reduced noise in the corridor would also produce long-term benefits for park users. No adverse indirect effects on parks and recreational resources are expected to result from the project.

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. Section 4(f) regulations require that avoidance of impacts on protected resources be analyzed, and Section 6(f) requires that resources protected by that regulation, and that are proposed to be converted, must be replaced. The City of Seattle also has its own regulatory requirement to ensure that parks are protected (see text boxes at right). The Section 6(f) and 4(f) processes were conducted together for the most part. WSDOT worked with the Parks Technical Working Group (TWG), which consisted of WSDOT, Seattle Parks and Recreation, the University of Washington, the Recreation and Conservation Office, the National Park Service, and FHWA, to evaluate park effects. This coordination effort included effects as defined under both Sections 4(f) and 6(f).

During the Parks TWG coordination process, WSDOT considered various alternatives for the project that would avoid effects on parks altogether, as

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 Section 6(f) resources.

Replacement property is also needed for the affected recreation resources that were redeveloped with grants from the Aquatic Land Enhancement Act (ALEA) – the Ship Canal Waterside Trail and Arboretum Waterfront Trail). For this project, the Section 6(f) mitigation addresses both the LWCFA and ALEA resources.

Section 4(f)

Many 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.

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. The land replacement requirements of Section 6(f) will help the City in meeting its obligations under this ordinance.

well as design changes to avoid individual resources; none of these were found to be feasible and prudent under Section 4(f), and none would avoid all conversions of resources under Section 6(f). Chapter 9 contains more information on avoidance alternatives and measures to minimize harm to the Section 4(f) park resources. Chapter 10 summarizes the process that WSDOT undertook to avoid Section 6(f) conversions.

As noted previously in Section 5.4, the Preferred Alternative would acquire less park property than any of the SDEIS design options and the Preferred Alternative was designed to reduce effects on Section 6(f) resources to 4.8 acres. In comparison, Options A, K, and L would result in Section 6(f) conversions of approximately 5.6, 9.3, and 7.9 acres, respectively. The Preferred Alternative incorporates a number of design refinements to further address operational effects of the project on recreation. These include a reduced footprint across Foster Island, a higher bridge profile across Foster Island, and a larger Montlake lid to provide better open-space connectivity between the Montlake neighborhood and the Washington Park Arboretum. The higher roadway profile and 4-foot concrete barriers included in the Preferred Alternative redesign would benefit parks in the project vicinity by reducing noise, especially at the Arboretum where park users pass directly under SR 520. Taller concrete traffic barriers could also be applied to Options A, K, and L, though the level of noise reduction provided by those elements would vary depending upon the individual project designs.

Although freeway lids are not considered to be parks for purposes of park mitigation, the lids included in the Preferred Alternative and all SDEIS options would have beneficial effects in connecting existing parks, and some areas would provide additional passive open space for community use.

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

Both Section 4(f and Section 6(f) involve mitigation planning for recreation effects. In addition to measures to avoid recreation effects, mitigation measures were identified by WSDOT during its work with the Parks TWG.

Section 6(f) of the LWCFA requires that replacement property be acquired for conversion effects. Chapter 10 provides a description of the Section 6(f) resources affected at both East Montlake Park and Washington Park Arboretum. The Parks TWG identified the Bryant Building site on Union Bay as a suitable replacement property for the Preferred Alternative's Section 6(f) effects. WSDOT is proceeding with negotiations with the UW and City of Seattle on that site. If an option other than the Preferred Alternative is chosen for the project, WSDOT will continue work with the Parks TWG to define full and appropriate mitigation for Section 6(f) effects for that option. The Parks TWG developed full-scale mitigation measures

under the Section 4(f) evaluation process for effects on park resources. This mitigation includes enhancement of existing parks and recreational properties in a manner consistent with applicable planning documents. WSDOT worked with the Parks TWG to determine the least overall harm to Section 4(f) resources, including parks under Options A, K, L and the Preferred Alternative. This work involved balancing the ability of each option to mitigate adverse impacts, the relative severity of remaining harm to the resource after mitigation, the relative significance of each Section 4(f) property, the views of the officials with jurisdiction, and the degree to which each alternative would meet the purpose and need of the project. These aspects were considered along with differences in cost for the alternatives and the magnitude of any adverse impacts on non-Section 4(f) resources remaining after mitigation measures are applied.

Since Section 4(f) provides a solid framework for evaluating recreation effects and determining and coordinating appropriate mitigation, Chapter 9 includes this Final EIS's discussion of all recreation mitigation measures.

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 Addendum and Errata (Attachment 7).

How would the project affect visual quality?

Under the Preferred Alternative and all the SDEIS design options, the project would result in wider bridges and roadways that would be shifted from the existing alignment in some areas and raised or lowered. The views most affected would be in the vicinity of the Portage Bay Bridge, the Montlake area, and the wetlands in Washington Park Arboretum. The Preferred Alternative and the SDEIS options would provide lids over SR 520; these lids would result in lost views of the surroundings and open sky for motorists, but would improve visual quality looking toward the lids.

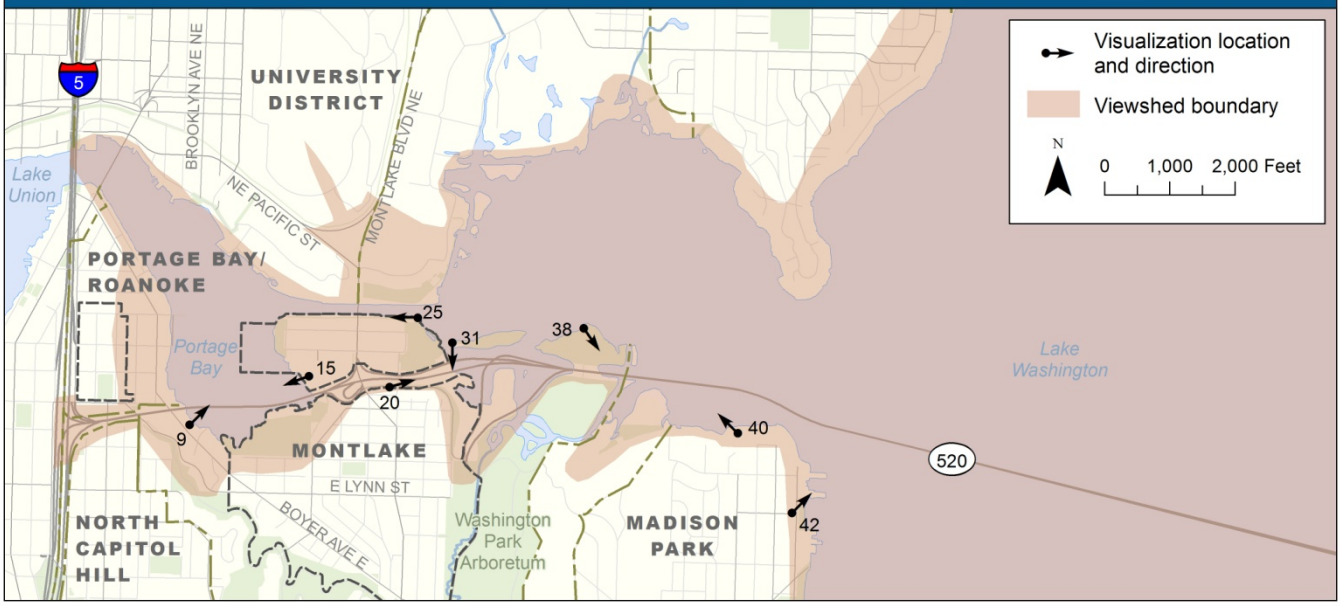
As part of the analysis, the project team selected views and corresponding viewpoints and took photographs for visualizations from these viewpoints. Exhibit 5.5-1 shows the location of the visualizations presented in this section. (The Visual Quality Discipline Report Addendum and Errata in Attachment 7 includes more visualizations than are presented here.) While the visualizations are purposefully 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 are described in the following sections.

DEFINITION

Visual quality ratings:

- Vividness:
  Low = mundane or nondescript landscape; Moderate = some features with striking or attractive attributes
  High = presence of dominant feature or collection of features that is distinctive or memorable
- Intactness:
  Low = built features placed without sensitivity to or in conflict with natural or existing setting
  Moderate = -built features somewhat response to natural or existing setting
  High = natural and built components in balance and harmony with each other and their relationship to the landscape
- Unity:
  Low = reduced integrity due loss of landscape from view or the prevalence of incompatible structures due to conflicting scales, colors, or purposes
  Moderate = presence of some features not compatible with the existing landscape, or a loss of part of the landscape from view

Exhibit 5.5-1. **Visualization Location and Direction**



Roanoke Landscape Unit

Preferred Alternative

Under the Preferred Alternative (and all SDEIS options), the overall character and quality of this landscape unit would improve as a result of the presence of the 10th Avenue East/Delmar Drive East lid (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.

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

	Vividness	Intactness	Unity
Existing	Moderate	Low	High in neighborhoods Low near I-5 and SR 520
Preferred Alternative and all SDEIS options	Moderate	Moderate	Moderate

The 10th Avenue East/Delmar Drive East lid would provide a continuous landscape between neighborhoods. The landscaped lid could also recreate a more substantial connection between Interlaken Park and the reconstructed Bagley Viewpoint. The new Bagley Viewpoint proposed to be on the lid would be different from the original park, but would 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 the street trees that were removed for construction.

The I-5 bike-pedestrian bridge and the 10th Ave. East/Delmar Dr. East lid under the Preferred Alternative

Options A, K, and L

Options A, K, and L would provide some additional improvement as a result of the I-5 lid, which is not included in the Preferred Alternative. The photos to the right show the bicycle-pedestrian bridge of the Preferred Alternative (upper) and the I-5 lid of Options A, K, and L.

The I-5 lid and the 10th Ave. East/Delmar Dr. East lid under Options A, K, and L

Portage Bay Landscape Unit

Under the Preferred Alternative, as with all the SDEIS options, the overall character and quality of this landscape unit would not change as a result of the new Portage Bay Bridge (Table 5.5-2).

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

	Vividness	Intactness	Unity
Existing	High	Moderate	High
Preferred Alternative and all SDEIS options	High	Moderate to high	High

The final span length and column spacing have yet to be determined. Columns of the bridge are now approximately 100 feet apart. As discussed in Chapter 2, pending final design, the span length for the Preferred Alternative would range from 116 feet to 300 feet. For purposes of the visualizations shown on Exhibits 5.5-2 and 5.5-3, the options show a variety of features and column widths to demonstrate possible combinations of features. Final design will include work with community members and the Seattle Design Commission to determine appropriate aesthetic treatment for the bridge.

Exhibit 5.5-2. **View of Portage Bay from NOAA Picnic Lawn (Visualization Location 15)**

Existing View

- 4-lane bridge
- Column spacing at 100 feet on center
- NOAA campus picnic lawn

Preferred Alternative

- 6-lane bridge with westbound managed shoulder
- Bridge design and aesthetic treatments to be determined

Option A

- 6-lane bridge with westbound auxiliary lane
- No noise walls
- Bridge design to be determined

Option K

- 6-lane bridge
- No noise walls
- False arches

Option L

- 6-lane bridge
- Noise walls
- False arches

Exhibit 5.5-3. **View of Portage Bay Bridge Columns (Visualization Location 9)**

Existing View

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

Preferred Alternative

- 6-lane bridge with eastbound off-ramp to Montlake
- Bridge re-aligned 40 feet north
- Bridge design and aesthetic treatments to be determined

Option A

- 6-lane bridge with westbound auxiliary lane
- No noise walls
- Bridge design to be determined

Option K

- 6-lane bridge
- No noise walls
- False arches

Option L

- 6-lane bridge
- Noise walls
- False arches

Preferred Alternative

Views around the bridge from low-lying land or from the water would either remain the same as today or be more open. Intactness of views would range from moderate to high depending on the location of the viewpoint.

Under the Preferred Alternative, the east end of the Portage Bay Bridge would remain at its current location on the north side, and views toward the bridge from the NOAA Northwest Fisheries Science Center would not change (see Exhibit 5.5-2). The south side of the new bridge would be closer to the Montlake Playfield than it is currently, but the structure would still be seasonally screened by the existing tree canopy. At the west side of

Portage Bay, the bridge would be wider to the north, which would affect views from the homes next to the north side of the bridge because the bridge would be more dominant in eastward views.

The wider new bridge and the addition of structures such as traffic barriers on top of the bridge structure or arch designs between columns would increase the physical bulk of the bridge (see Exhibit 5.5-3). This would make the bridge somewhat more dominant in north/south or eastward views, but the change would not affect overall visual quality since the bridge is already a dominant feature of the view in those directions. The areas under and around the west end of the bridge would be landscaped after construction and new views, primarily from the water, would open up along Boyer Avenue.

Under the Preferred Alternative, views for drivers on the new Portage Bay Bridge would be diminished from today's views due to the use of the 4-foot-tall traffic barriers and the addition of the planted median. Depending on their height, spacing, and density, small shrubs that would be planted in the median could also obscure side views of the Portage Bay area over the traffic barriers (across the oncoming traffic lanes). Eastward views of the Cascade Mountains and Lake Washington would still be panoramic, but the expansiveness of these views would be reduced by the traffic barriers and median plantings. If the same type and size of traffic barriers (4-foot) were applied to Options A, K, and L, the views from the bridge would be the same as for the Preferred Alternative.

Option A

The visual quality effects of Option A would be similar to the Preferred Alternative. However, under Option A, the east end of the new Portage Bridge near the NOAA facility would be farther north, which would change the character of that part of the campus and would encroach on views over Portage Bay to the west.

The driver's experience of the Portage Bay Bridge would change because of the greater width of the bridge compared to its current width. Both Option A and Option K would include standard traffic barriers (lower than the 4-foot barriers included in the Preferred Alternative). Views would be panoramic eastward as they are today; however the view of open water would decrease if the recommended noise walls were installed that would block lateral views and diminish the panorama.

Option K

Option K would result in effects identical to those of Option A, except that without the Option A auxiliary ramp, the eastern half of the bridge would be 35 feet narrower than under Option A. The decreased width from Option A would noticeably decrease the visual effects on the NOAA campus, but would not be discernible from most other viewpoints.

Option K Suboption

- The addition of an eastbound off-ramp to Montlake Boulevard would be similar to the existing eastbound off-ramp and would not affect any views.

Option L

Option L would result in effects similar to those of Option K except that the presence of noise walls at some locations would make the roadway appear more massive when seen from outside of the roadway. In addition, the recommended noise walls would block lateral views for motorists on the bridge. This would result in an overall reduction in the quality of the scenic views experienced while driving across or looking at the Portage Bay Bridge.

Montlake Landscape Unit

The Preferred Alternative and all of the SDEIS options would result in changes to visual character and quality in the Montlake area (Table 5.5-3).

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

	Vividness	Intactness	Unity
Existing	High	Low	Low
Preferred Alternative	High	Low to moderate	Low to moderate
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

The Preferred Alternative, like SDEIS Option A, would change views primarily by enlarging the existing Montlake interchange, while SDEIS Options K and L include additional structures in the McCurdy Park and East Montlake Park areas that would be highly visible to motorists and park users. Option K includes an interchange and tunnel configuration that would require tall retaining walls at the tunnel entrance and columns to support the SR 520 main line. Option L includes an elevated interchange over the main line and a new bridge through East Montlake Park and over the Montlake Cut.

Preferred Alternative

Effects on visual quality in the Montlake area under the Preferred Alternative would be comparable to those of SDEIS Option A in general, but with fewer effects at the NOAA campus. The character of the NOAA Northwest Fisheries Science Center would be changed by the addition of a ramp to the Bill Dawson Trail. This ramp would occupy a portion of the

landscaped east slope and reshape the slope. As with Options K and L, there would be little effect on the visual quality of views from the NOAA campus toward SR 520 because no buildings would be removed from the NOAA facility under the Preferred Alternative. The three-story research buildings would continue to act as a physical barrier and visual buffer against the roadway.

The Preferred Alternative, like all the SDEIS design options, would widen SR 520 to the north and remove mature roadside trees and shrubs that now provide a pleasant green edge along the roadway south of the Shelby-Hamlin neighborhood. The removal of these trees would change the view from several homes and from East Montlake Park.

The Preferred Alternative's 1,400-foot lid would fully cover SR 520, providing visual and spatial connectivity between north and south Montlake (Exhibit 5.5-4). The Montlake lid would hide the freeway, providing positive visual changes for pedestrians, cyclists, and motorists on Montlake Boulevard, Lake Washington Boulevard, and 24th Avenue East, as well as for residents of the homes on Lake Washington Boulevard that currently overlook SR 520. However, the east lid portal and the elevated ramps onto the lid would dramatically change the character and quality of views from East Montlake Park, the Arboretum Waterfront Trail at Marsh Island, and the Waterfront Activities Center at the University of Washington (Exhibit 5.5-5). From these sensitive locations, the structures would be prominent because of their size and because the existing tree buffers would be gone and difficult to replace due to space limitations. The lid walls and elevated ramp columns would also dominate motorists' views from the roadway as they approach or exit the lid.

Similar to the SDEIS design options, the Preferred Alternative would change McCurdy Park, the Museum of History and Industry (MOHAI) building and parking lot, and a portion of East Montlake Park into roadway and a stormwater treatment wetland. The result of this would be high levels of change to the visual character of the landscape from the viewpoint of motorists and adjacent residents. However, the stormwater treatment wetland would 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. Landscape treatment and a new, smaller parking lot to serve park users would restore East Montlake Park's functions and establish visual unity with the surrounding area.

In the MOHAI-East Montlake Park area, the east portal of the Montlake lid would be visible, which would reduce vividness, intactness, and unity for views toward SR 520. Vividness would remain high in the Montlake Cut area because the new bascule bridge would be designed as an appropriate architectural companion to the existing historic bridge. The new bascule

bridge would not be noticeable from Rainier Vista, nor would it affect the Montlake Boulevard NE/Pacific Street NE intersection.

Exhibit 5.5-4. **Looking Northeast from Lake Washington Boulevard toward MOHAI and McCurdy Park Trees (Visualization Location 20)**

Existing View

- 4-lane roadway with transit-only on ramp
- Unused R.H. Thomson Expressway ramps in distance
- 20-foot-high retaining wall on north side of corridor

Preferred Alternative

- Montlake Boulevard lid with westbound off-ramps (white barrier in middle distance)
- Transit stop on lid (green and yellow bus at far left)

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

Exhibit 5.5-5. **Looking South from Pedestrian Bridge between MOHAI and Marsh Island toward SR 520 (Visualization Location 31)**

Existing View

- Lake Washington Boulevard off-ramp in front
- Unused R.H. Thomson Expressway ramps behind
- Lake Washington Boulevard off-ramps at far left
- Mainline lanes at water level
- Shoreline and wetland vegetation

Preferred Alternative

- No ramps to Lake Washington Boulevard
- Westbound general purpose and HOV/transit off-ramps onto lid
- Regional bike and pedestrian path

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

Option A

Under Option A, the character of the NOAA Northwest Fisheries Science Center would be changed by the removal of buildings and the reduction in the size of the landscaped east slope, which in turn would result in a change in views from the central buildings. Under existing conditions, the research buildings on the south side of the campus act as a physical barrier and visual buffer against the roadway. The replacement of these service buildings with an auxiliary lane and a relocated Bill Dawson Trail would substantially alter the visual quality of views for people who work at the NOAA campus.

Under Option A, widening SR 520 to the north would remove mature roadside trees and shrubs, resulting in visual quality effects similar to those described for the Preferred Alternative. Because the Montlake lid would be smaller and would not extend completely across SR 520, the effects of roadway widening would be more noticeable than with the Preferred Alternative. Option A would also change McCurdy Park, the MOHAI building and parking lot, and a portion of East Montlake Park into roadway and a stormwater treatment wetland. As with the Preferred Alternative, the character of the pond would be consistent with the open space and shoreline context of the surrounding area.

Views of and from the new Montlake bascule bridge under Option A would be the same as those for the Preferred Alternative. Vividness would remain high in the Montlake Cut area because the new bascule bridge would be an appropriate architectural companion to the existing historic bridge.

Option A Suboptions

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

Option K

The below-ground interchange and tunnel configuration of Option K would be experienced as a walled canyon by motorists. The tall retaining walls of the tunnel entrance and the columns supporting the overhead main line would be visible to motorists and park users, with the highest level of visual effects on views from the Arboretum Waterfront Trail at Marsh Island and the Waterfront Activities Center. 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 change the view quality at the Montlake Cut because of the landform under the former MOHAI parking lot and the 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 the tunnel portal would be covered by a partial or full lid. From the motorists' viewpoint, this new configuration would create a complex, multi-layered channel that would block views of the university. However, pedestrians, bicyclists, and light rail users could have an improved visual experience

because they would be separated from vehicular traffic and would have unobstructed views. The project would not affect the view of Mount Rainier from Rainier Vista on the University of Washington campus.

Overall vividness for the Montlake area could remain high if the surface effects of the tunnel did not detract from the character of the Ship Canal, East Montlake Park, and the Waterfront Activities Center. Intactness and unity would decrease in the Montlake residential area because the massive, depressed interchange would not be in balance or consistent with the residential scale and the natural character of the parks and shorelines around it. In the southeast campus area of the university, intactness and unity could increase if the depressed intersection resulted in the removal of overhanging wires, lamps, and signage and created better pedestrian and vehicle orientation and circulation.

Option K Suboption

- Adding the westbound Montlake Boulevard ramp to Option K would result in no measurable differences in the visual impacts described above.

KEY POINT

The Preferred Alternative and all the SDEIS design 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

Under Option L, the elevated interchange over the main line and the new bridge through East Montlake Park would be dramatic changes to the Montlake area. As with Option K, the retaining walls and columns would be visible to motorists and park users, with the highest level of visual effects on views from the Arboretum Waterfront Trail at Marsh Island and the Waterfront Activities Center. 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 Waterfront Activities Center area (Exhibit 5.5-6). 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. Option L would also result in very high levels of change to visual character and quality in the southeast campus of the University of Washington. The new bascule bridge would pass west of the Canoe House, and part of the University of Washington (UW) Open Space and would be highly visible from these areas. The lowered Montlake Boulevard/NE Pacific Street intersection and bridge landfall would have a similar appearance to Option K.

Exhibit 5.5-6. Looking West from Northeast Corner of East Montlake Park toward Montlake Bridge (Visualization Location 25)

Existing View

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

Preferred Alternative

- New bascule drawbridge parallel to existing Montlake Bridge
- Design and aesthetic treatments to be determined

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 Suboption

- Adding northbound capacity on Montlake Boulevard to Option L would result in no measurable differences in the visual effects 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 the Preferred Alternative and the three SDEIS design options, the west approach bridge through Union Bay and east to Lake Washington would be much wider than the existing structures, which could change boaters' and park users' experience in this area. The west approach would be shifted northward approximately 190 feet farther than the existing structure. Views would change for north Madison Park residences; views of the Laurelhurst hills could possibly be blocked, although more open water in Union Bay would be revealed. Overall, however, visual quality would not change from its existing high level, except with Option K (Table 5.5-4).

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

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

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 5.5-7).

Preferred Alternative

The primary effect from the Preferred Alternative would be the noticeably greater width and height of the west approach as compared to the existing bridge. The profile of the west approach would be raised from its existing height and would provide a constant grade, increasing from 12 feet above the water surface at the Montlake shoreline up to 48 feet at the west transition span of the floating bridge. The increased height would make the bridge slightly more visible from distant viewpoints, such as Husky Stadium or Laurelhurst. The new Arboretum Waterfront Trail under the bridge would provide a more comfortable and pleasant experience than the narrow underpass that exists today because of the increased height and openness afforded by the widely spaced columns. However, the greater height and

Exhibit 5.5-7. **Looking South from Foster Island's North Shoreline toward SR 520 (Visualization Location 38)**

Existing View

- North Foster Island picnic area at shoreline
- Mature woods

Preferred Alternative

- 6-lane bridge at 13 to 15 feet above ground
- No change to North Foster Island

Options A and L

- No change to north Foster Island

Option K

- Land bridge at Foster Island with pedestrian/bicycle pathway

width of the structures would make them a more visually dominant element in this area, especially in the areas directly north and south of the highway. Near the northern shoreline of Foster Island, the effects on visual quality would be less.

In the near to medium term, overall visual quality ratings for the Preferred Alternative in the areas close to the new highway would be lower than those for existing conditions. This is due to the combination of larger structures and the removal of vegetation during construction. The ratings in this area for vividness, intactness, and unity would be diminished until trees and shrubs grew taller and filled in. In 10 to 20 years, after the vegetation had matured, 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.

As with all SDEIS options, the Preferred Alternative would remove the R.H. Thomson Expressway ramps, opening views of park landscapes and water bodies and providing a more natural-appearing character than now exists.

The Preferred Alternative's west approach structures would be higher than they are now, making them slightly more visible to north Madison Park residences and other distant viewpoints. For motorists and transit riders, the west approach would continue to provide panoramic or scenic views to Lake Washington and the Cascades when traveling east, and to the Arboretum when traveling west.

Option A

Like the Preferred Alternative, the primary effect from Option A would be due to the greater width and height of the west approach structures. These changes would result in similar visual quality effects as those described above for the Preferred Alternative.

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, they 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; overall effects would be similar to those of the Preferred Alternative.

Option K

The main effect on visual quality and character from Option K in this area 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. Motorists would experience a much wider, relatively exposed roadway for several years, until replanted shoreline vegetation matured on and around Foster Island.

Of the Preferred Alternative and the SDEIS design 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 existing tunnel. However, 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 grew 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. From distant viewpoints, vividness, intactness, and unity of this landscape unit would not change substantially. However, intactness and unity 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 (Exhibit 5.5-7).

Option L

Option L's effects on visual quality and character would be similar to those of Option A. However, the physical presence of the highway would be somewhat more noticeable in the Arboretum because of its greater width (approximately 60 feet wider across Foster Island and approximately 80 feet wider south of Marsh Island. The west approach bridge through Union Bay would be more comparable in height to the existing bridge than the Preferred Alternative or Option A. A minimum of 10 feet of clearance above the Arboretum Waterfront Trail would be provided for park maintenance vehicles and to avoid a confining experience for pedestrians.

Option L Suboption

- 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). The reduction in the height of the floating bridge for the Preferred Alternative would make views of this structure more similar to existing views than would SDEIS Options A, K, or L (Exhibit 5.5-9). For houses near the bridge in Medina, the northward shift of the alignment 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 high quality of those views would not change because the bridge is already a large part of those views (Table 5.5-5).

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

	Vividness	Intactness	Unity
Existing	High	High	High
Preferred Alternative and all SDEIS options	High	High	High

Exhibit 5.5-8. **Looking Northwest from Edgewater Apartments toward SR 520 West Approach and Husky Stadium (Visualization Location 40)**

Existing View

- 4-lane bridge
- View of south Union Bay
- Column spacing at 100 feet on center
- Husky Stadium in distance (left of center)
- Boat traffic

Preferred Alternative

- Wider and higher 6-lane bridge
- More open view into north Union Bay
- Column spacing at 250 feet on center
- ITS gantry (visable in front of Husky Stadium roof line)
- Transit bus on bridge (center)

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

Exhibit 5.5-9. **Looking Northeast across Lake Washington at Evergreen Point Bridge (Visualization Location 42)**

Existing View

- Shoreline park in Madison Park
- Evergreen Point Bridge and East Approach
- Medina shoreline in distance
- Cascade Mountains far in distance

Preferred Alternative

- Evergreen Point Bridge and East Approach
- Bridge height at mid-span approximately 20 feet above water

Options A, K, and L

- Evergreen Point Bridge and East Approach
- Bridge height at mid-span approximately 30 feet above water

Sweeping views from the Evergreen Point Bridge of the Cascade and Olympic mountains and Mount Rainier, which currently exist only for motorists, would be available to users of the new bicycle/pedestrian path. 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 visual 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. As noted above, the change from existing conditions would be least with the Preferred Alternative because of the lower height of the floating structure compared with the SDEIS design options.

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

For all options, a swath of mature trees and understory nearly 150 feet wide would be removed on the north side of SR 520 as a result of the northward shift in alignment west of Evergreen Point Road. This would create a more dramatic view westward of Lake Washington and the Olympic Mountains. East of Evergreen Point Road, roadway would replace the grassy slope within WSDOT right-of-way 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 in the Eastside Landscape Unit

	Vividness	Intactness	Unity
Existing	High	Low	Low to moderate
Preferred Alternative and all SDEIS options	Moderate to high	Low	Low to moderate

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

Similar to the current roadway configuration, the Preferred Alternative and all SDEIS design options would have continuous lighting along the corridor from I-5 to Foster Island and on bridges across the Montlake Cut. Light levels along the corridor would be similar to existing levels. New lighting would use fixtures that shield sideways glare. 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.

No roadway lighting is proposed on the fixed portions of the bridge east of Foster Island. To minimize effects on the aquatic environment, 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 itself would increase relative to existing conditions because of the wider and higher roadway.

Based upon current lighting studies, the east approach would be illuminated to meet safety requirements for the transit ramps. 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 proposed noise walls would block most of the light from the east approach 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.

Effect of Suboptions

Option A Suboptions

- 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.
- 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 are the indirect effects of the project on visual quality?

The proposed project would not produce indirect effects on visual quality and aesthetics because all changes to structures, landforms, and vegetation would be confined to direct impacts within the project area along the SR 520 corridor.

What has been done to avoid or minimize negative effects?

During 2010, WSDOT sponsored several technical workgroups with resource agencies, with the intention of refining the Preferred Alternative to further avoid or minimize negative effects. The Parks and Natural Resource technical working groups collaborated on mitigating for impacts on parks, shorelines, wetlands, aquatic habitat, and other natural resources. These discussions have established minimization and mitigation concepts that will be further developed as the design progresses. These concepts, in turn, have influenced planning for the project's landscape and urban design.

In addition to the technical working groups, the workgroup established under Engrossed Substitute Senate Bill (ESSB) 6392 (discussed in Chapters 1 and 2) refined specific areas and elements of the SR 520, I-5 to Medina project Preferred Alternative through a multi-agency process. Based on legislative direction, WSDOT and the Mayor and City Council of the City of Seattle established a workgroup that brought together King County Metro, University of Washington, Sound Transit, and other designees to consider design refinements and transit connections within the Preferred Alternative. These refinements have been included in the landscape and urban design concepts of the Preferred Alternative and could be added to the other options.

The Preferred Alternative incorporates many features that address concerns from communities regarding visual quality or otherwise provide aesthetic benefits. These include the following:

- A narrowed footprint, compared to Option A, across the Portage Bay Bridge and Foster Island, which would reduce visual presence and would minimize clearing of vegetation
- A lower floating bridge profile than the SDEIS options in response to community concerns
- A larger, full-width lid across Montlake Boulevard, providing more area for landscaping as well as increased community open space and visual benefits for nearby residents
- A landscaped median on Portage Bay Bridge to create a boulevard experience

Many of the project's 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 in East Montlake Park 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 the Preferred Alternative and all options, the following mitigation measures would be performed by WSDOT:

- 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.

DEFINITION

Green Over Gray

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

- Revegetate areas where natural habitat, vegetation, or neighborhood tree screens were removed during construction. These areas would be under Portage Bay Bridge in Roanoke Park; along the roadway in the Eastside study area; and in the Montlake and West Approach Landscape Units, in particular at the NOAA Northwest Fisheries Science Center, East Montlake Park, and the Arboretum. 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 would generally be used to revegetate parks and re-establish tree screens in these areas in consultation with local jurisdictions and agencies. Revegetation plans would 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.
- 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 lid landscapes 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. (An example of this type of effort would be a transitional seating wall and stairs on the north side of the Evergreen Point Road lid, to 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 and the original Bagley Viewpoint Park marker and stone would be included at that site.
- Redesign the remaining portion of East Montlake Park in cooperation with the Seattle Parks and Recreation Department. Grass and trees in the south Shelby-Hamlin area would be replaced with trees and screening vegetation to soften the appearance of the new lid wall. Mature and/or larger size trees, shrubs, vines, and groundcovers for

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; WSDOT 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

replacement or enhancement would be selected as appropriate in consultation with Seattle Parks and Recreation. Plantings would be irrigated and monitored until established.

- Design the Canal Reserve (the area between the new regional bicycle/pedestrian path and adjacent residences in the Shelby-Hamlin neighborhood) to be compatible with the location and consistent with corridor visual standards for unity. The treatment would be a fence or vegetation or a combination of both, depending on available space.
- After construction, restore Foster Island, including shoreline and buffer restoration and roadside planting. Development of revegetation plans will require coordination with the Seattle Parks and Recreation Department, the University of Washington, the Muckleshoot Indian Tribe, and the Arboretum Foundation, as identified in the Arboretum Mitigation Plan (Attachment 9). Plans will require mature and/or larger trees, shrubs, plants, and adequate irrigation and monitoring until vegetation is established. Revegetation for the areas where the Lake Washington Boulevard and R.H. Thomson Expressway ramps are to be removed will also be coordinated with these entities.

The mitigation measures recommended by the ESSB 6392 Workgroup and the Arboretum Mitigation Plan that address visual quality and aesthetics are presented below.

Urban Design and Streetscape Options

WSDOT will collaborate with the Seattle Design Commission (SDC), City of Seattle, UW Architectural Commission, Arboretum and Botanical Garden Committee (ABGC), Seattle Bicycle Advisory Board, Seattle Pedestrian Advisory Board, and Seattle neighborhoods to expand and refine an aesthetic vision, establish goals, and suggest design treatments for urban design and streetscapes within the project area. This collaboration will include identifying the existing urban amenities that will remain after construction of SR 520, and co-developing a community engagement process for refining the goals and principles. It will ultimately result in a set of urban design guidelines to inform and direct final design and construction of SR 520.

The following options were developed as part of the ESSB 6392: Design Refinements and Transit Connections Workgroup (see Attachment 16):

"Provide paths at the E. Roanoke Street enhanced I-5 overcrossing and the 10th and Delmar lid which:

- Are in scale and style with surrounding neighborhoods and parks.
- Accommodate diverse users.
- Connect users to north Capitol Hill, downtown Seattle and the University District.

"Provide opportunities for viewing visual resources at:

- Montlake Bascule Bridge – 18-foot wide bicycle and pedestrian path with viewing space mid-span.
- E. Roanoke Street enhanced crossing – improved bicycle and pedestrian access with possible belvedere/viewing areas to downtown Seattle.
- 10th and Delmar lid – incorporation and preservation of the Bagley Viewpoint with raised viewing plaza at east edge of lid.
- Montlake lid – raised viewing area to Washington Park Arboretum and Lake Washington at east edge of lid.

"Provide paths at the Montlake lid which:

- Are in scale and style with the surrounding Montlake neighborhood, Arboretum and Olmsted boulevards.
- Accommodate diverse users and modes (e.g., cyclists, pedestrians, and elderly users).
- Buffer users from the street edge (e.g., planting strips and other aesthetic physical buffers).
- Connect users to locations both on the lid (e.g., transit stops, bicycle lockers, comfort stations, view points, plazas) and to the existing network of local and regional open spaces and paths/trails, including the Arboretum Waterfront Trail, the Lake Washington Loop Trail, East Montlake Park, UW open space, UW main campus, and Sound Transit's University Link UW station.
- Are safe and legible (wayfinding).

"Ensure durability, relevance, beauty, context and maintenance of landscapes by:

- Selecting native vegetation (low maintenance, climate-appropriate) and/or vegetation in keeping with City of Seattle standards and historic context.
- Not placing vegetation in areas where maintenance is difficult or impossible (e.g., Portage Bay Bridge).
- Preserving mature tree canopy at 10th and Delmar lid where possible.
- Replanting the Canal Reserve site.
- Connecting or augmenting Olmsted boulevard aesthetic and Arboretum collections/aesthetic through planting plans that respect Arboretum Master Plan, Olmsted precedents and City of Seattle standards."

Arboretum Mitigation Plan

Based on consultation with the ABGC and the Muckleshoot Indian Tribe, along with WSDOT's technical evaluation, WSDOT has also identified a

suite of projects including aesthetic and landscape enhancements and other design features that could occur within future WSDOT right-of-way areas. WSDOT will continue to work with applicable and interested tribes and the ABGC to fully define and implement appropriate aesthetic treatments for the new crossing of Foster Island. The Arboretum Mitigation Plan is included in Attachment 9 of this Final EIS. Chapter 9 also discusses ABGC coordination efforts and this mitigation plan.

5.6 Cultural Resources

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 properties from damage or loss from the project. FHWA and WSDOT have worked with agencies, affected 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 strategies to assure that Washington's cultural heritage is protected.

The National Environmental Policy Act (NEPA) required federal agencies to conduct an environmental impact assessment for proposed action, and agencies must consider cultural resources as part of that assessment. For transportation-related projects, Section 4(f) of the Department of Transportation Act of 1966 (49 United States Code [USC] 303) and its implementing regulations (23 Code of Federal Regulations [CFR] 774) is another federal regulation that protects historic properties, along with publicly-owned park and recreation areas, and wildlife and waterfowl refuges. Section 4(f) applies to all projects that require approval by an agency of the U.S. Department of Transportation (USDOT), including FHWA. (For more information on Section 4(f), see Chapter 9.)

Other environmental laws, such as the National Historic Preservation Act (NHPA), also require that effects on significant cultural resources be considered during the public environmental review process. Section 106 of the 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, agencies must consult with the State Historic Preservation Officer (SHPO) to assure that significant cultural resources are identified, and to obtain the SHPO's formal opinion on each property's significance and the impact of the agency's proposed action upon the property. In Washington State, the SHPO is housed in the Department of Archaeology and Historic Preservation (DAHP). To evaluate the proposed project's potential effects on cultural resources, WSDOT, in partnership with the DAHP, established the project's area of potential effects (APE), which is the geographic area within which an undertaking may directly and indirectly cause alterations in the character or use of historic properties (36 CFR 800.16). WSDOT then conducted research and completed field work to identify historic properties. WSDOT cultural resources specialists analyzed the proposed designs and operations of the build alternatives to determine their effects on the identified historic properties in the APE. WSDOT also consulted with Native American tribes that have historical ties to the study area and could be affected by the proposed action.

Coordination with the SHPO and consulting parties has substantially increased since the Preferred Alternative was identified. Establishing the

KEY POINT

Cultural and Historic Resources

The Preferred Alternative and 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 and from the introduction of increased green space and beneficial visual effects from landscaped lids. Negative effects would result either from the acquisition of land or buildings, or from visual intrusion caused by more prominent roadway and bridge structures.

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 State Historic Preservation Officer (SHPO), Advisory Council on Historic Preservation (ACHP), affected Indian tribes, and other consulting parties. As lead federal agency, FHWA conducts government-to-government consultations with the tribes. Under The *First Amended Programmatic Agreement Implementing Section 106 of the National Historic Preservation Act for the Federal-aid Highway Program in Washington State Administered by the Federal Highway Administration* (2007), signed by FHWA, WSDOT, SHPO, and the ACHP, FHWA delegates certain authorizes relating to Section 106 of the NHPA to WSDOT for Federal-aid highway projects in Washington state. with specific details, including processes, staff qualifications, definitions of roles and responsibilities, conditions for consultations with agencies and tribes, and documentation standards. This agreement allows WSDOT to take on many functions that would ordinarily be federal-level responsibilities for compliance with Section 106 of the NHPA. In compliance with the 2007 agreement, 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.

design of the Preferred Alternative allowed WSDOT and FHWA to better assess the potential effects on cultural resources. Since the SDEIS was published, the APE has been revised, new consulting parties have been added, and additional information has been submitted to the DAHP and consulting parties for comment and review (see the Final Cultural Resources Assessment and Discipline Report in Attachment 7). Section 106 consultations culminated with the signing of the Programmatic Agreement, which includes by reference a Foster Island Treatment Plan to resolve adverse effects on the Foster Island traditional cultural property (TCP).

How would the project affect historic properties during operation?

WSDOT and FHWA evaluated the project's potential effects on historic properties using the Criteria of Adverse Effect (36 CFR 800.5) outlined in Section 106 of the National Historic Preservation Act NHPA. This legislation states that a project would have an adverse effect on a historic property if it results in changes to the property's characteristics that qualify it for inclusion in the NRHP. Examples of potential adverse effects include the physical destruction of an entire historic property; damaging, altering, or removing a portion of a historic property; and introducing environmental factors that are out of character with the historic property and diminish its setting and integrity (for example, visual intrusions).

The SHPO represents the interests of the state and its citizens in the preservation of their cultural heritage. To ensure consideration of historic properties at all levels of planning and development, WSDOT and FHWA have actively consulted with the SHPO throughout the SR 520, I-5 to Medina project. WSDOT analyzed the potential effects on historic properties from Options A, K, and L and presented these findings in the Draft Cultural Resources Discipline Report (Attachment 7 to the SDEIS). Following identification of the Preferred Alternative, WSDOT, on behalf of FHWA, evaluated each historic property within the APE and assessed the Preferred Alternative's effects on each property's seven aspects of integrity in accordance with 36 CFR 800. The assessment resulted in one of four findings:

- **Does Not Alter Integrity:** Either no historic properties are present, or there is no effect of any kind, neither harmful nor beneficial, on historic properties.
- **Alters Integrity:** The undertaking affects historic properties, but does not diminish the characteristics that qualify the properties for listing in the NRHP.
- **Diminishes Integrity:** There is an effect from the undertaking which alters the characteristics that qualify the property for listing in the NRHP in a way that diminishes the integrity of the historic property.

Programmatic Agreement

Adverse effects on historic properties from construction and/or operation of the SR, 520: I-5 to Medina project will be mitigated in accordance with Section 106 through a project-specific Programmatic Agreement. WSDOT has engaged in consultation with the ACHP, DAHP, affected tribes, and other consulting parties to negotiate the terms and conditions of the Programmatic Agreement. The project's Programmatic Agreement memorializes the stipulations agreed upon to avoid, minimize, and mitigate adverse effects to historic properties located within the APE. Adverse effects on the Foster Island TCP will be resolved through stipulations provided in the Foster Island Treatment Plan, which is included in the Programmatic Agreement by reference.

See Attachment 9 for a copy of the Programmatic Agreement developed for the SR 520, I-5 to Medina project.

This includes diminishing the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

- **Temporarily Diminishes Integrity:** There is an effect from the undertaking, and that effect temporarily (during construction of the project) alters the characteristics that qualify the property for listing in the NRHP in a way that diminishes the integrity of the historic property. This includes diminishing the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

Subsequent to this analysis, FHWA and WSDOT determined that the project would have an adverse effect on historic properties. FHWA and WSDOT continued consultation with the SHPO and the other Section 106 consulting parties to seek resolution of the adverse effect from the project. The project's Programmatic Agreement memorializes the stipulations agreed upon to avoid, minimize, and mitigate adverse effects to historic properties located within the Area of Potential Effects. See Attachment 9 for a copy of the Programmatic Agreement.

The Preferred Alternative and all the SDEIS options would result in an "adverse effect" determination for the project as a whole (referred to in Section 106 as "the undertaking"). The findings under Section 106 for the Preferred Alternative were submitted to SHPO on January 26, 2011, and concurrence was received on February 28, 2011.

Potential effects on historic properties from construction and operation of the Preferred Alternative and Options A, K, and L are described in more detail in the following sections. The text is organized by property location roughly from west to east.

I-5 and Portage Bay Areas

Individually Eligible Historic Properties in the Portage Bay/Roanoke Park Area (Outside of the Roanoke Park Historic District)

The proposed landscaped lid at 10th and Delmar would have an effect on historic properties in this section of the APE. This lid would have beneficial effects on some properties because it would provide a pedestrian passageway between the North Capitol Hill and Portage Bay/Roanoke neighborhoods (currently separated by SR 520), increase landscaped green space in the area, and reduce noise levels. The lid would serve to shield 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.

Under the Preferred Alternative, an enhanced bicycle/pedestrian path would be added to the south side of the existing East Roanoke Street Bridge over I-5. No historic properties would be affected by operation of the enhanced bicycle/pedestrian path. Under Options A, K, and L, the proposed I-5 lid would stretch across much of the front of the Seward

School property, introducing a new green space between Eastlake and the Portage Bay/Roanoke neighborhood (Exhibit 5.6-1).

The Preferred Alternative and all SDEIS options include an HOV ramp over I-5. The ramp would be the same for all except with the Preferred Alternative it would be 2 feet lower than the SDEIS options. The Preferred Alternative's HOV ramp over I-5 would be roughly 30 feet wide and at approximately the same height as the existing ramp on the east end. It would be approximately 15 feet higher than the existing ramp at the west end as the ramp turns and heads south. The new HOV ramp would be adjacent to the existing ramp and would appear similar to the existing interchange, consistent with the visual quality of the existing conditions. The new ramp would be visible from a number of historic properties, but would not be a significant change from the existing viewshed of these properties, all of which are eligible for listing in the NRHP for their architectural qualities. The visual effect would not diminish the characteristics of these historic properties (Exhibit 5.6-2).

Roanoke Park Historic District (ID 37)[1]

The entire Roanoke Park Historic District is included in the APE and was listed in the NRHP in July 2009. There are 101 properties in the district, 80 of which are contributing elements, including Roanoke Park itself and the individually listed William H. Parsons House. The Roanoke Park Historic District is significant under Criterion A because of its direct association with events that made a significant contribution to the broad patterns of local and national history. The district is also significant under Criterion C for its collection of early twentieth century residential architecture designed by many notable Seattle architects (O'Connor et al. 2009).

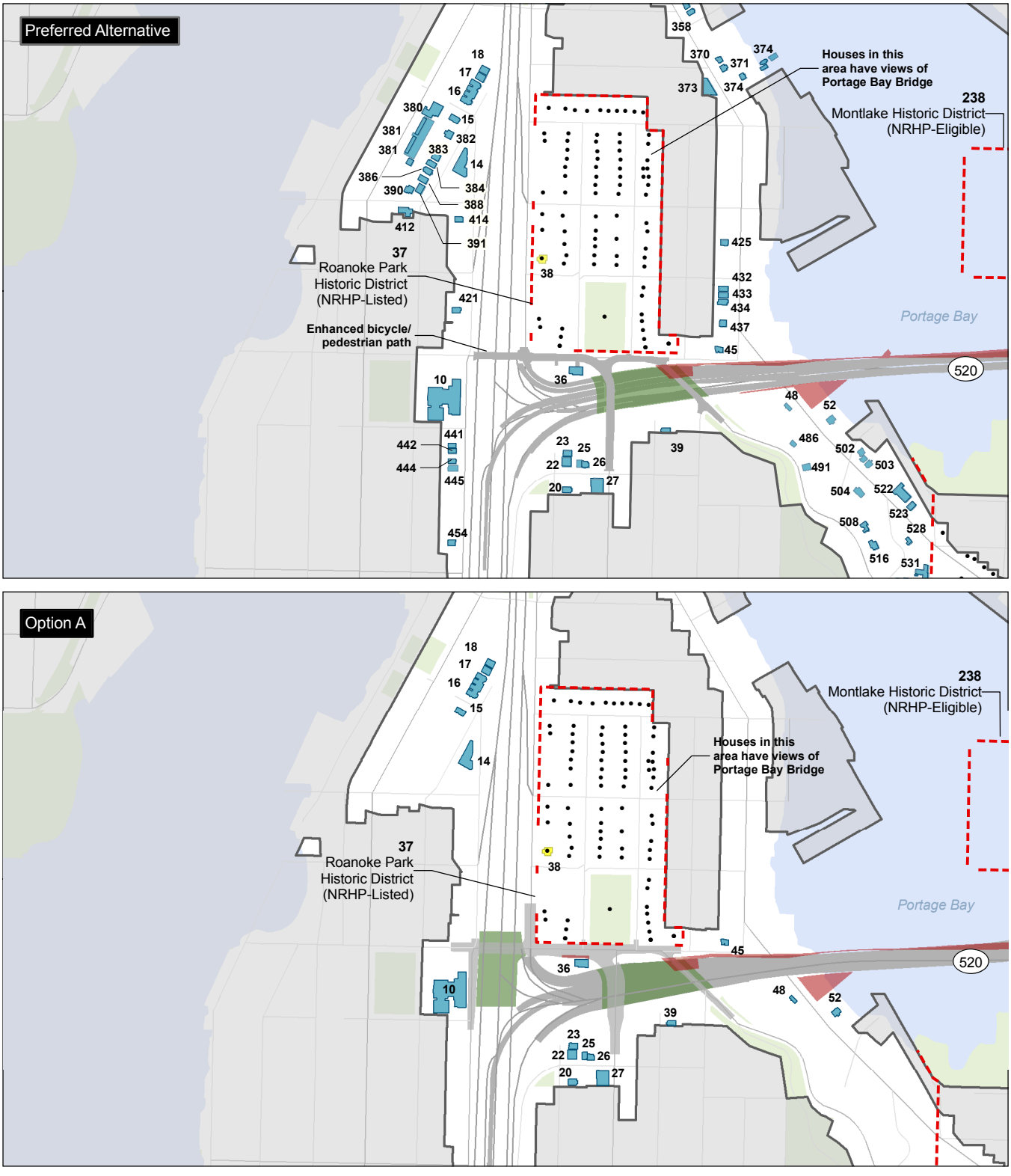
Preferred Alternative

The Preferred Alternative and all the SDEIS design options would include a lid south of the Roanoke Park Historic District. As discussed above, the 10th Avenue East and Delmar Drive East lid would be beneficial to the historic district as it would increase landscaped green space in the area, reduce noise levels for some properties, and provide visual continuity by shielding a portion of the SR 520 roadway.

Under the Preferred Alternative and all the SDEIS design options, the new Portage Bay Bridge would have a visual effect on portions of the Roanoke Park Historic District. The visual effect from the new bridge would be most pronounced for houses on the east side of 10th Avenue East between East Roanoke Street and East Shelby Street. Those houses currently have direct views of the existing Portage Bay Bridge (see Exhibit 5.6-1).

[1] The location of each property is shown by identification (ID) number on the exhibits in Sections 4.6 and 5.6. A list of properties by ID number is presented in Table 4.6-1.

Exhibit 5.6-1. **Effects on Historic Properties within the I-5 and Portage Bay Area**



NRHP Eligibility of Surveyed Resources

- Contributing
- LListed
- Eligible

Property Effects

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

Note: All resources are mapped and described in detail in the Final Cultural Resources Assessment and Discipline Report. See Table 4.6-1 for a list of properties that correspond to the ID numbers shown above.

N

0 250 500 1,000 Feet

Exhibit 5.6-2. **Visualization Showing the HOV Ramp over I-5 Facing West**

Existing View

- I-5 and existing on-ramp
- View toward Lake Union, Queen Anne and Aurora Bridge

Preferred Alternative

- New HOV on-ramp to SR 520
- View toward Lake Union, Queen Anne and Aurora Bridge

The bridge's wider footprint and increased height on the western end would have a visual effect on the setting and feeling of the Roanoke Park Historic District and the contributing elements that have a view of the bridge and the bay. If noise walls on the bridge were included for Options A, K, and L, they would result in a greater visual impact. Noise walls are not recommended along the Portage Bay Bridge for the Preferred Alternative because the noise analysis concluded that they would not be reasonable or feasible, as discussed in Section 5.7.

The Preferred Alternative and Option A would include a new bascule bridge across the Montlake Cut parallel to and on the east side of the historic bridge. The new bascule bridge would be visible primarily from the rear of houses on 10th Avenue East between East Hamlin and East Shelby streets. The new bascule bridge would not obscure the view of the original Montlake Bridge from these houses, and would be only slightly visible beyond the historic bridge from this vantage point. Although it could affect the setting and feeling of some contributing properties, this effect would be minor because of the distance of the historic bridge from the district.

Option L would include a new bascule bridge at the eastern end of the Montlake Cut. Because of the location of the new bascule bridge, it would only be visible from the Roanoke Park Historic District as part of the distant viewshed. This bridge would have a lesser effect on the historic district compared with the bascule bridge under the Preferred Alternative and Option A.

Seattle Yacht Club (ID 55)

As described in Chapter 4, the Seattle Yacht Club is a recreational and cultural institution that is significant under Criterion A for its direct association with the social and maritime history of Seattle. The new Portage

Bay Bridge would be approximately 110 feet farther to the north than the current bridge, bringing the bridge closer to the Seattle Yacht Club. The larger, closer bridge would alter the setting of the Seattle Yacht Club, but the property would retain integrity of feeling, location, association, design, workmanship, and materials. The visual effect of the bridge on the Seattle Yacht Club would not be substantial despite its closer location (Exhibit 5.6-3).

Exhibit 5.6-3. **Seattle Yacht Club Lawn Looking Southwest toward Portage Bay Bridge**

Existing View

- 4-lane Portage Bay bridge in distance
- Seattle Yacht Club marina (middle ground) and lawn

Preferred Alternative

- 6-lane bridge with westbound managed shoulder
- 4-foot-high traffic barriers
- ITS gantries
- Bridge design and aesthetic treatments to be determined

Montlake Area

NOAA Northwest Fisheries Science Center (ID 56)

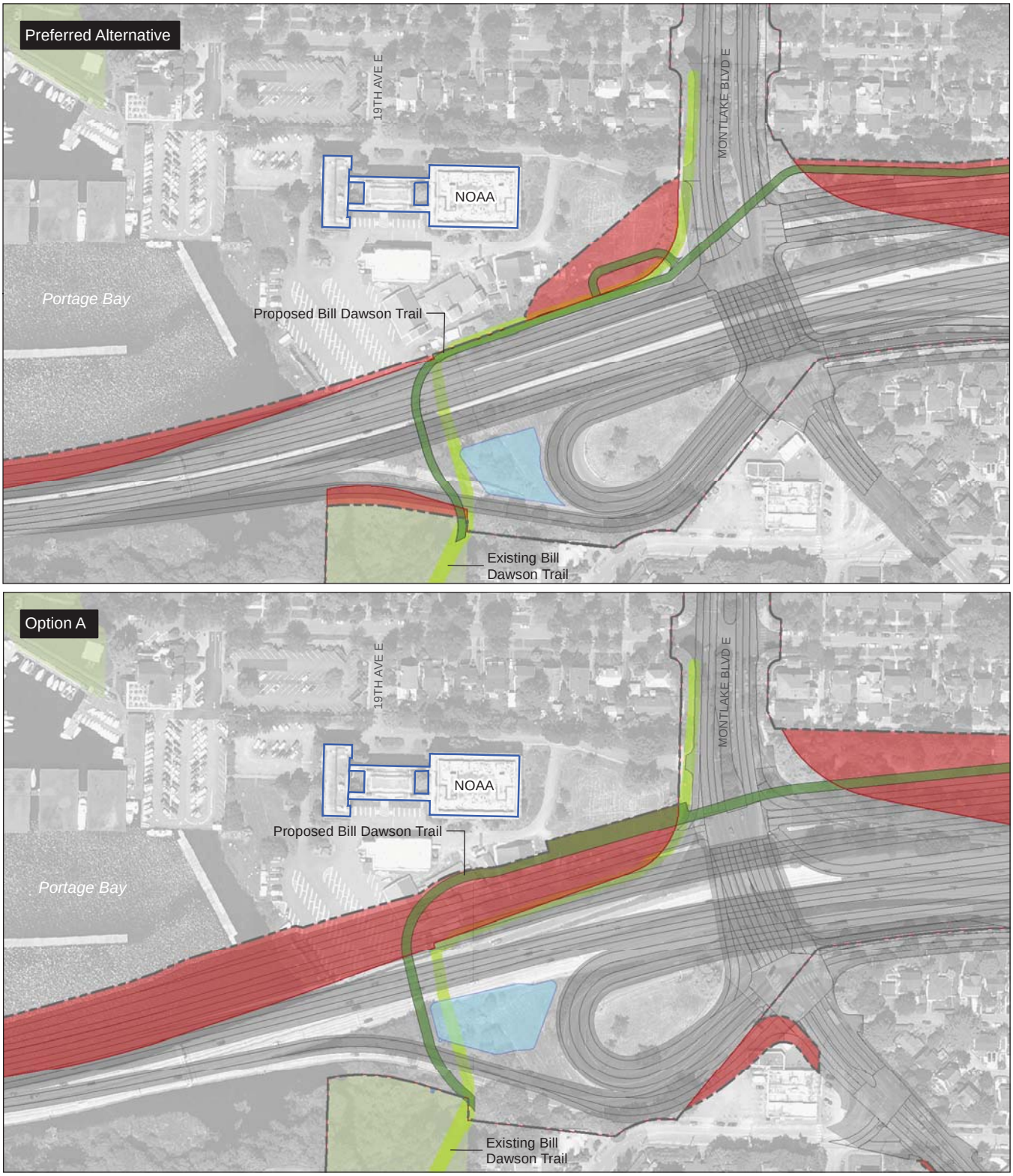
Three buildings on the NOAA Northwest Fisheries Science Center North Campus are eligible for the NRHP under Criterion A for their association with important research that is significant locally, regionally, and nationally. The oldest North Campus building, dating from 1931, is also eligible under Criterion C for its distinctive architecture that incorporates marine motifs to visually demonstrate its association with marine research, and its design by major architect John Graham, Sr.

Northwest Fisheries Science Center, Montlake Historic District

Preferred Alternative

Under the Preferred Alternative, the new Portage Bay Bridge would be about 110 feet closer to the historic NOAA North Campus buildings than the current bridge (Exhibit 5.6-4). Although there would be a visual effect on the setting and feeling of the historic NOAA buildings, it would not be a significant change from the existing condition. There would be no anticipated increase in vibration from operation of the new bridge;

Exhibit 5.6-4. Effects on NOAA Northwest Fisheries Science Center



vibration levels would be substantially the same as the current levels from traffic on the existing bridge and should not interfere with scientific activities at the center. The 1931 building would maintain its view north to Portage Bay, the property would retain its shoreline on the bay, and all property immediately surrounding the historic buildings would be retained.

Option A

Based on discussions with NOAA, removing part of the land and nine buildings on the South Campus under Option A (see Exhibit 5.6-4) could result in the remaining NOAA Northwest Fisheries Science Center site, including the historic buildings, being vacated if the loss of the buildings prevented the facility from carrying out its mission in this location. This would result in a change in the property's use, which contributes to its historic significance as a site that supports important fisheries research that has local, regional, and national 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.

Options K and L

Options K and L would have similar effects on the NOAA facility as the Preferred Alternative.

Montlake Bridge (ID 54)

The Montlake Bridge is listed in the NRHP under Criterion C for its design and engineering qualities. Currently, there is a clear view of the historic bridge from many vantage points east and west of the bridge on the north and south sides of the Montlake Cut, as well as from the cut itself and from Lake Washington. The bridge is a primary part of the viewshed of the University of Washington, the Canoe House, the Montlake Historic District, and the Montlake Cut, but is also visible as far away as the Roanoke Park Historic District. This is an iconic bridge that is a part of the community's viewscape.

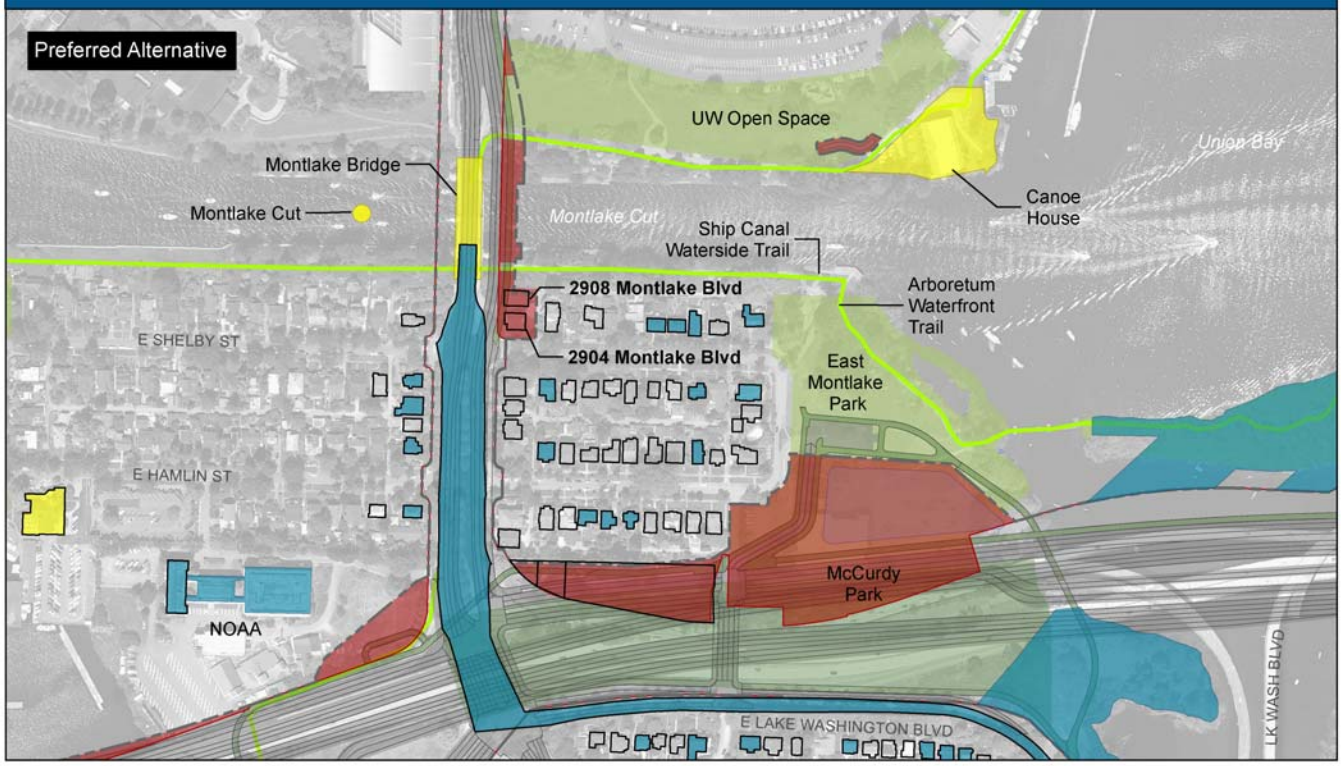
Preferred Alternative

The new bascule bridge immediately adjacent to the historic Montlake Bridge would diminish the integrity of the setting and feeling of the historic bridge (Exhibit 5.6-5). A context-sensitive design for the new bridge would help to lessen effects on the historic bridge by allowing the historic structure to remain visually prominent. Mitigation measures to ensure a context-sensitive design that follows the Secretary of the Interior's Standards are stipulated in the Programmatic Agreement.

Option A

The effects of Option A on the Montlake Bridge would be similar to those of the Preferred Alternative.

Exhibit 5.6-5. **Effects on Historic Properties from a New Bascule Bridge, Preferred Alternative**



NRHP Eligibility of Surveyed Resources

- Contributing
- Listed
- Eligible
- Converted to right-of-way
- Proposed right-of-way
- Existing right-of-way
- Travel lane
- Stormwater facility
- Existing trail/bicycle path
- Proposed bicycle/pedestrian path
- Lid or landscape feature
- Pavement
- Park

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

N 0 150 300 600 Feet

Options K and L

The tunnel and the new bascule bridge at the east end of the Montlake Cut under Options K and L, respectively, would not diminish the historic Montlake Bridge because of the distance between these design elements and the historic bridge. Although the new bridge would be visible from the historic bridge, this change to the setting would not diminish the qualities that make the bridge eligible for listing in the NRHP.

Canoe House (ID 203)

The Canoe House was originally designed and built in 1918 for use as a naval military hangar. It was never used by the Aviation Training Corps and was subsequently donated to the University of Washington. It is listed in the NRHP under Criterion C for its architectural significance, as follows:

> rare … example of an architectural type developed in the early years of aviation….. No other examples of the hangar type dating from the period of the First World War are known in Washington.… Moreover, no other early hangars are known to

have survived in the vicinity of Seattle, which has figured prominently in aviation history since the founding of the Boeing Company in 1916 (Potter 1975).

Preferred Alternative

The Canoe House currently has a clear, unobstructed view of the historic Montlake Bridge (see Exhibit 5.6-5). The new bridge would be constructed on the east side of the historic bridge, so the view of the historic bridge from the Canoe House would be obstructed by the new bridge. The Canoe House would have an open view of the west approach to the floating bridge and the floating bridge itself. Although these structures would be up to 20 feet higher than they are currently, it would not be a significant change from the existing condition.

The Preferred Alternative, through the introduction of the second bascule bridge, would diminish the integrity of the Canoe House by significantly impacting its setting and feeling. To mitigate this effect, the Programmatic Agreement stipulates a context-sensitive design for the new bascule bridge.

Option A

The effects of Option A on the Canoe House would be similar to those of the Preferred Alternative.

Option K

The south tunnel portal would change the landform at the former Museum of History and Industry (MOHAI) parking lot and would require ventilation towers and stormwater pump stations in East Montlake Park. These structures would be visible from the Canoe House, but the tunnel itself would be below ground and not visible.

Option L

The new bascule bridge near the east end of the Montlake Cut would diminish the setting and feeling of the Canoe House and partially block the view of the historic Montlake Bridge (Exhibit 5.6-6).

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 introduce shadows to the property and nighttime glare from lighting on the bridge and headlights of nighttime traffic.

Montlake Cut (ID 53)

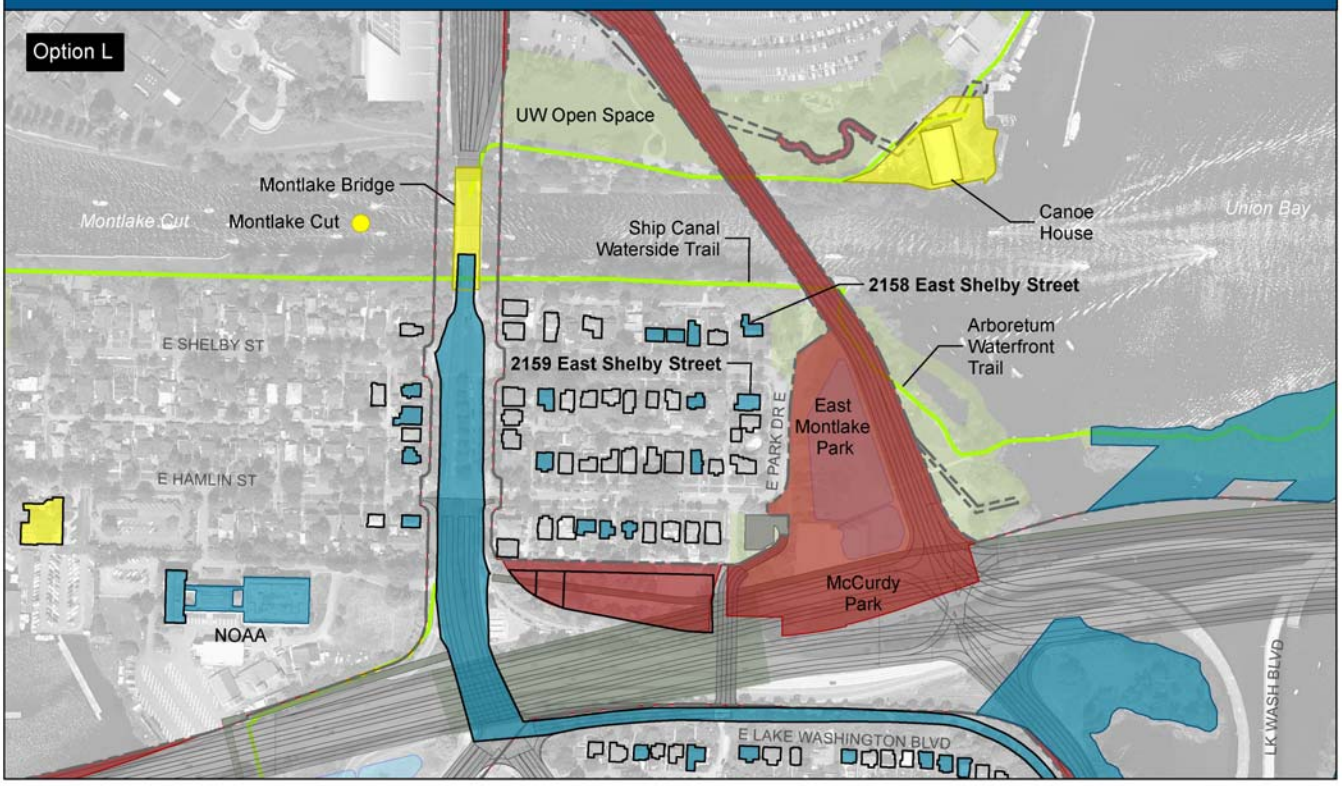
The Montlake Cut, listed in the NRHP under Criterion C for its engineering significance, is a navigable waterway with an existing bascule bridge crossing.

Preferred Alternative

The addition of a new bascule bridge of similar size adjacent to the existing bridge would affect the setting and feeling of the Montlake Cut. The greatest effect would be the partial blocking of the view of the historic

bridge from the east end of the cut (Exhibit 5.6-7). The cut would continue to operate as a navigable waterway and would not be impeded in any way by operation of the SR 520, I-5 to Medina project. The integrity of design, materials, location, workmanship, and association would remain intact. The Montlake Cut would continue to be used as a navigational channel as designed, and the additional bridge would not diminish the qualities that make it significant.

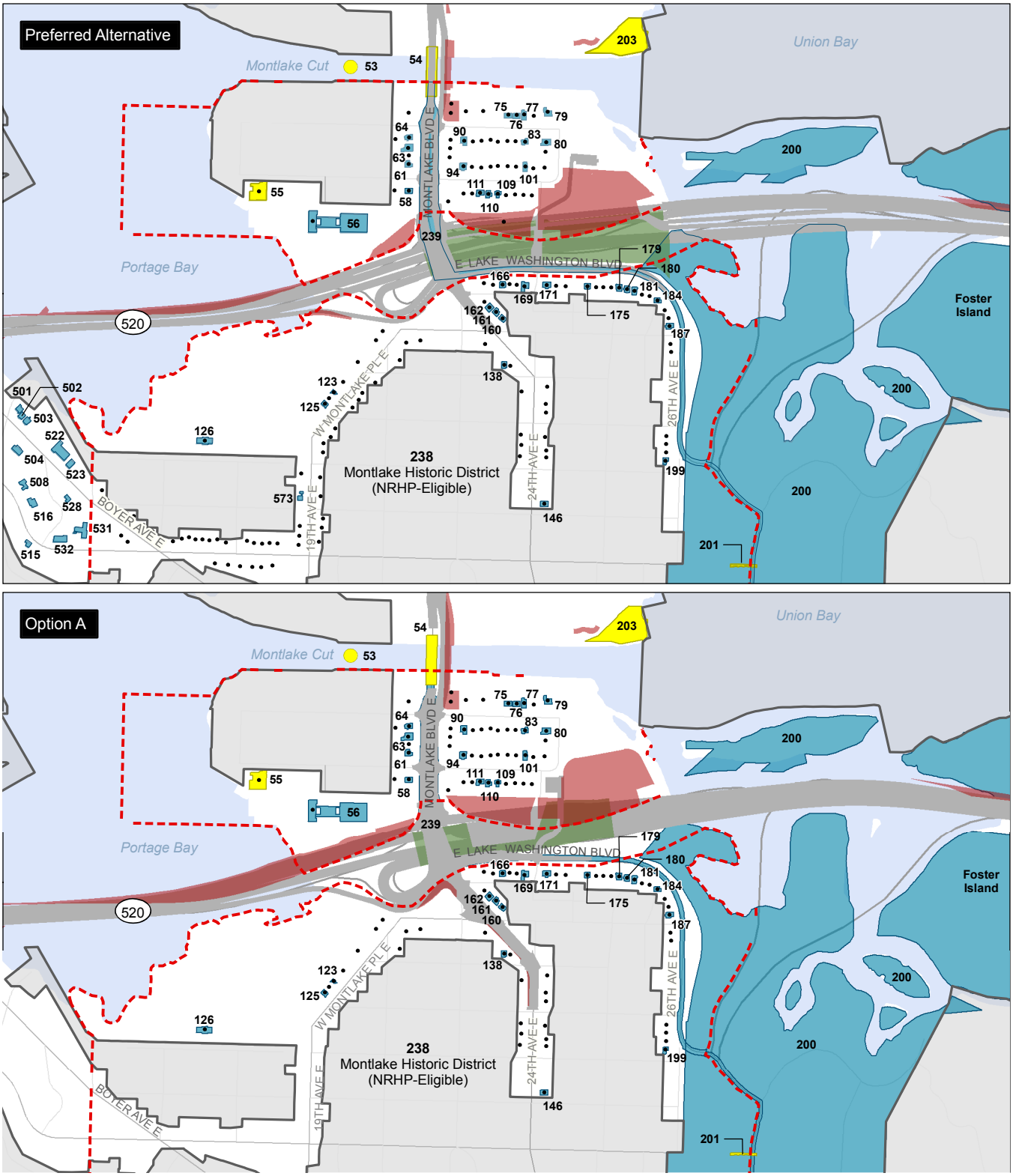
Exhibit 5.6-6. **Effects on Historic Properties from a New Bascule Bridge, Option L**



Options A and L

Options A and L would have similar effects on the Montlake Cut as the Preferred Alternative.

Exhibit 5.6-7. Effects on Historic Properties within the Montlake Area, Preferred Alternative and Option A



NRHP Eligibility of Surveyed Resources

- Contributing
- Listed
- Eligible

Property Effects

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

Note: All resources are mapped and described in detail in the Final Cultural Resources Assessment and Discipline Report. See Table 4.6-1 for a list of properties that correspond to the ID numbers shown above.

N

0 250 500 1,000 Feet

Option K

The south tunnel portal would change the landform at the former MOHAI parking lot and would require ventilation towers and stormwater pump stations in East Montlake Park. These structures would be visible from the Montlake Cut, but the tunnel itself would be below ground and not visible. The view of the structures would not diminish the qualities that make the cut significant.

Montlake Community Center (ID 126)

The Montlake Community Center is individually eligible for listing in the NRHP under Criterion A for its association with the development of the Montlake neighborhood and the City of Seattle parks system. It is also eligible for listing under Criterion C for its distinctive characteristics as an early field house and recreation center, and as a good example of Tudor Revival style architecture. It is also eligible as a contributing element to the Montlake Historic District.

Under the Preferred Alternative and Options A, K, and L, the new Portage Bay Bridge would be visible from the Montlake Community Center, but it would be a minor change from the existing view (see Exhibit 5.6-3). The Portage Bay Bridge is partially screened from the Montlake Community Center by the adjacent gymnasium building and existing park vegetation. Noise levels would be reduced under the Preferred Alternative and all SDEIS options. The significant characteristics of the Montlake Community Center would not be diminished by the Preferred Alternative or any of the SDEIS options.

Lake Washington Boulevard (ID 239)

Lake Washington Boulevard is individually eligible for listing in the NRHP under Criterion A for its association with the citywide Olmsted Brothers parks and parkways plan. It is significant as the first boulevard constructed as a part of the plan and was the standard by which the other boulevards were designed. The boulevard also is eligible for listing in the NRHP under Criterion C as a noted work of the master landscape architects John Charles Olmsted and Frederick Law Olmsted, Jr. The segment of this linear resource surveyed for the SR 520, I-5 to Medina project extends from East Madison Street to the edge of the University of Washington campus at NE Pacific Avenue.

Preferred Alternative

A portion of Lake Washington Boulevard East would be affected by the addition of a central planted median and the widening of the roadway to the north between Montlake Boulevard and where Lake Washington Boulevard curves to the south. The addition of the planted median would visually improve the roadway, creating an enhanced park boulevard that would incorporate visual screening in keeping with the Olmsted Brothers' philosophy of blending pragmatic and picturesque design and of providing

visually appealing parkway transportation corridors (Exhibit 5.6-8). To accommodate the median, the westbound lane would be moved north, closer to the new landscaped lid.

The Preferred Alternative would remove the Montlake Boulevard median between East Hamlin Street and SR 520, which would alter the setting and feeling of this segment of historic Lake Washington Boulevard. Because it was designed as a park boulevard with planted medians, the loss of this vegetation would alter the integrity of design of this segment. The Programmatic Agreement contains stipulations to ensure that new medians constructed on the park boulevard would have a context-sensitive design and would be compatible with the original Olmsted medians.

The boulevard would operate directly adjacent to the new landscaped lid rather than running alongside SR 520, which would enhance the setting, reduce noise, and be more in keeping with the original conditions of the park boulevard. Removal of the SR 520 Lake Washington Boulevard ramps and the R.H. Thomson Expressway ramps would benefit Lake Washington Boulevard because it would eliminate a large intersection that was not part of the original boulevard plan, and it would reduce daily traffic on the park boulevard in the Arboretum. Removal of these ramps would also improve the view from Lake Washington Boulevard.

Option A

Option A would affect Lake Washington Boulevard similarly to the Preferred Alternative.

Option K

Under Option K, the segment of Lake Washington Boulevard between Montlake Boulevard and the Arboretum would be used for local traffic only. The new ramps and traffic turnaround would be east of and completely separated from Lake Washington Boulevard East and 26th Avenue East. Historic properties at the east end of Lake Washington Boulevard East and along 26th Avenue East would experience some visual effects from these new features, 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 resembling a full lid would cover the entire ramp near the southern end, just before the turnaround (Exhibit 5.6-9).

These landscape features would greatly reduce the visual effects 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. This portion of Lake Washington Boulevard would be altered and would no longer connect to the Arboretum.

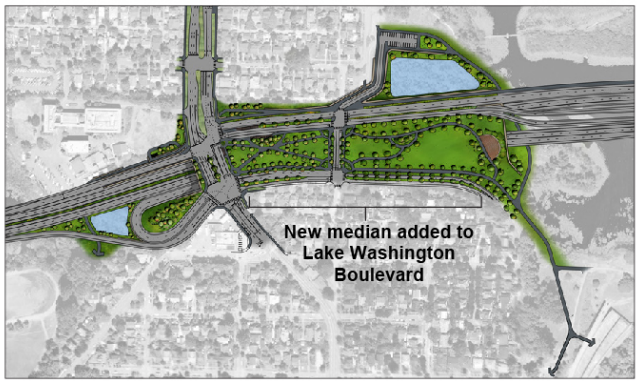
Exhibit 5.6-8. **Lake Washington Boulevard Planted Median**

Existing View

- West terminus of Lake Washington Boulevard at Montlake Boulevard
- Planted median along the north side of Lake Washington Boulevard

Preferred Alternative

- Restored and context-sensitive planted median along Lake Washington Boulevard
- Montlake lid in background



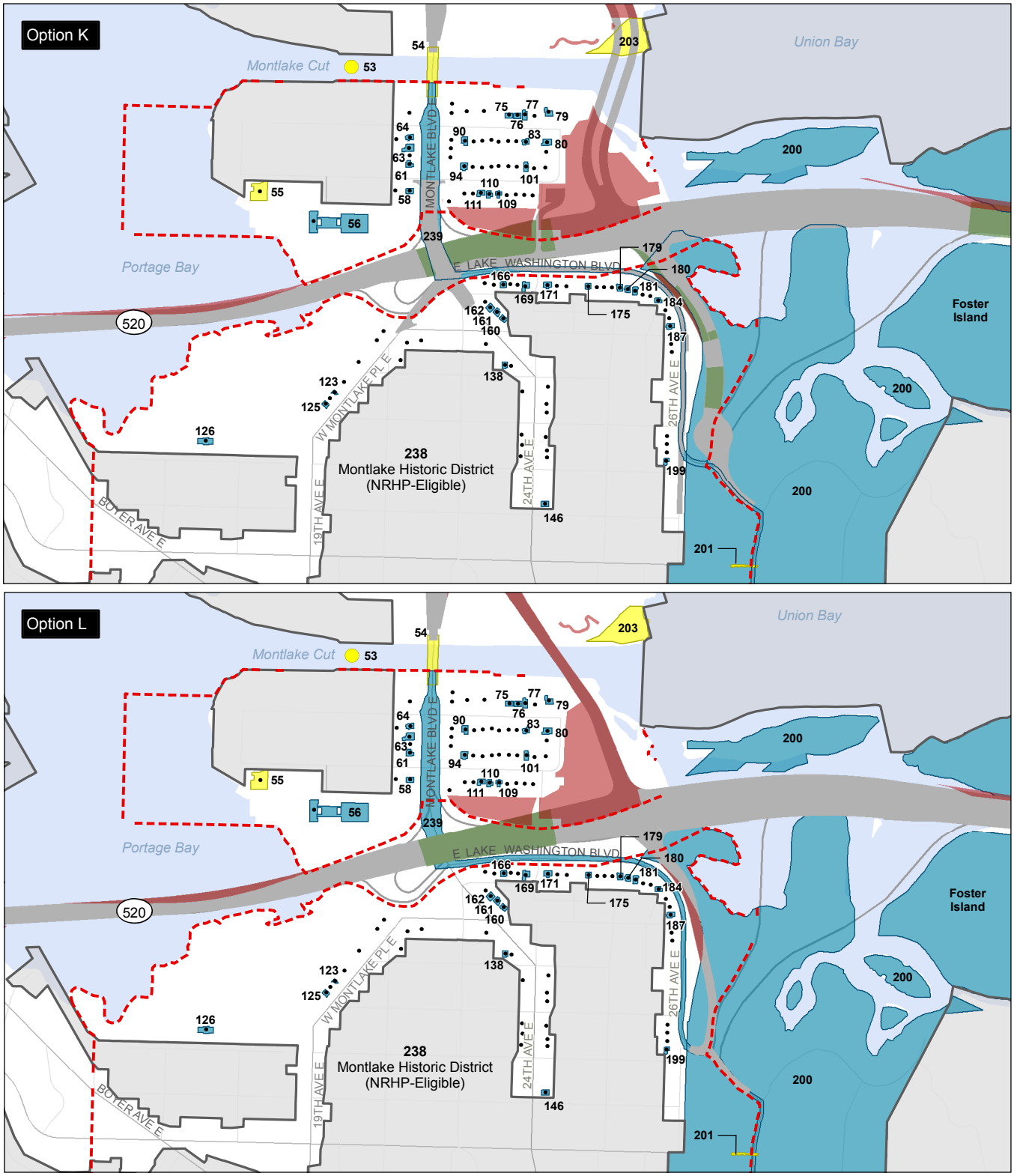
Rendering of Montlake Lid

Lake Washington Boulevard would operate with a new alignment between East Roanoke Street and where the boulevard currently connects with the Arboretum. A new traffic turnaround would be constructed at the existing connection between the boulevard and the Arboretum. This change would sever the original Lake Washington Boulevard route, which ran from the Arboretum across the Old Canal Reserve land and connected to the University of Washington Campus, as planned by the 1903 and 1909 Olmsted Park and Boulevard Plan.

Option L

Under Option L, the new SR 520 on- and off-ramps would be located to the east of Lake Washington Boulevard East. 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 the same height as, or perhaps slightly higher than, the existing Lake Washington Boulevard East. The new ramps could block direct access into the Arboretum from the Montlake Historic District between SR 520 and East Calhoun Street (see Exhibit 5.6-9).

Exhibit 5.6-9. **Effects on Historic Properties within the Montlake Area, Options K and L**



NRHP Eligibility of Surveyed Resources

- Contributing
- Listed
- Eligible

Property Effects

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

Note: All resources are mapped and described in detail in the Final Cultural Resources Assessment and Discipline Report. See Table 4.6-1 for a list of properties that correspond to the ID numbers shown above.

N 0 250 500 1,000 Feet

Montlake Historic District (ID 238)

The Montlake Historic District is NRHP-eligible under Criterion C because of its significant, cohesive collection of residential architecture typical of early twentieth century Seattle, with a combination of distinctive builder's houses, high-style, architect-designed residences, and impressive nonresidential structures.

Preferred Alternative

Operation of the Preferred Alternative would affect the setting of the northern portion of the Montlake Historic District near the historic Montlake Bridge. The new bascule bridge would displace the two houses immediately south and east of the existing bridge, exposing the remaining elements of the district in this area to a more open view of Montlake Boulevard with associated traffic and loss of privacy compared to existing conditions. The historic Montlake Bridge and the new bascule bridge would both become visible from properties that currently are shielded from that view by the existing houses on Montlake Boulevard, leaving some houses in this part of the district more exposed to the roadway and the bridge approach.

2111 East Shelby Street, a contributing resource to the Montlake Historic District

The Programmatic Agreement contains stipulations to minimize the change of setting due to the removal of two contributing properties and introduction of a new bascule bridge. The Programmatic Agreement includes commitments to a context-sensitive bridge design and installation of buffering or screening.

Another area in the northern portion of the historic district that would be particularly affected by the project is East Hamlin Street east of Montlake Boulevard. Buildings located on the south side of East Hamlin Street would lose the landscaped buffer currently provided by the Canal Reserve land south of the alleyway behind them. Under the Preferred Alternative, the SR 520 westbound exit ramp would be closer to the rear of these properties. The new bicycle and pedestrian path would be north of the ramp, below grade, with retaining walls on each side. An approximately 45- to 100-foot buffer would remain between the rear yards of the houses and the north retaining wall of the new bicycle and pedestrian path. Although the Canal Reserve land and the mature specimen trees there would be lost, the land would become part of the landscaped lid, so open green space would remain in the area. Adding the lid would benefit the Montlake Historic District by reducing visual intrusion and noise from SR 520. In addition, the lid would partially reunite the two sides of the historic district currently separated by SR 520 and would increase the connectivity between them.

Although the Preferred Alternative would cause some visual effects on the Montlake Historic District that would affect the setting and feeling of the

district, these effects would not diminish the overall levels of integrity of association, location, design, materials, and workmanship of the district.

Measures to avoid and minimize impacts on setting and feeling of the historic district are stipulated in the Programmatic Agreement.

Option A

In addition to the effects described above for the Preferred Alternative, Option A would widen East Montlake Place East and 24th Avenue East, as shown in Exhibit 5.6-7. The widening would affect the settings of four contributing elements in the Montlake Historic District, including the individually eligible property at 2220 East Louisa Street. Option A's smaller partial lid over SR 520 would provide fewer benefits to the district than the Montlake lid included in the Preferred Alternative.

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.
- Adding the Lake Washington Boulevard ramps to Option A would result in additional effects on the Montlake Historic District. Most of the length of the new on- and off-ramps would run along the north and south sides of the main line. Because of their more westward location, these ramps would have an increased visual effect on the Montlake Historic District, affecting contributing properties along Lake Washington Boulevard East and 26th Avenue East. 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.
- 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 could require stormwater pump stations and ventilation towers in East Montlake Park. These structures would be visible from the surrounding areas of the Montlake Historic District. The tunnel itself would be below ground and not visible from any historic properties.

Similar to the Preferred Alternative and Option A, the buildings located on the south side of East Hamlin Street would lose the landscaped buffer

provided by the Canal Reserve land south of the alleyway behind them. Although the Canal Reserve land and the mature specimen trees would be lost, the land would become part of the landscaped lid, so open green space would remain in the area.

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.

Option L

Under Option L, the existing Montlake interchange would be replaced with an elevated SPUI near the current location of MOHAI. This interchange 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. It is likely that the structures would be visible from some residential areas of the Montlake Historic District. The interchange could be a visual barrier to views north and northwest from historic properties on Lake Washington Boulevard East (see Exhibit 5.6-9).

The new bascule bridge near the east mouth of the Montlake Cut would affect the setting of the northeast section of the Montlake Historic District. 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 bridge would degrade the integrity of the setting and feeling of this section of the Montlake Historic District. Properties at the east end of East Shelby Street would experience the most severe visual effects because the new bridge would be constructed immediately to the northeast of these properties, and would be a minimum of 131 feet from the closest house (see Exhibit 5.6-9).

2158 East Shelby Street, Montlake Historic District

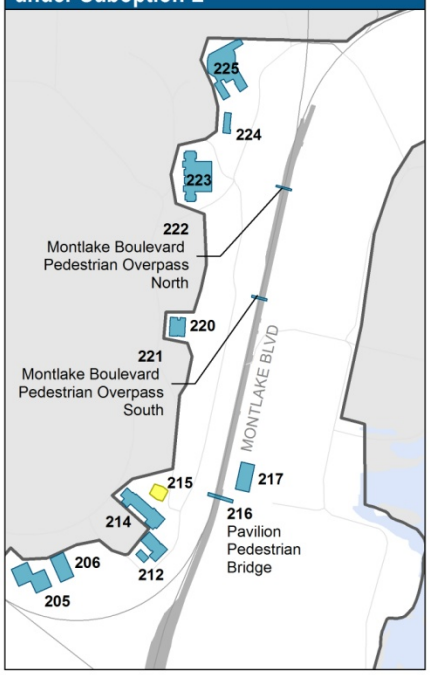
2159 East Shelby Street, Mary Houlahan House, Montlake Historic District

Similar to the Preferred Alternative and Option A, the buildings located on the south side of East Hamlin Street would lose the landscaped buffer provided by the Canal Reserve land south of the alleyway behind them. Although the Canal Reserve land and the mature specimen trees would be lost, the land would become part of the landscaped lid, so open green space would remain in the area.

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 5.6-10). All three bridges are eligible for the NRHP. It would move the roadway closer to Graves Hall, also eligible for the NRHP. The wider roadway with new pedestrian bridges would be visible from the University of Washington Club and McMahon Hall, both eligible for the NRHP. However, the effect on the setting and feeling of these buildings would be minimal. No additional effects on historic properties at the University of Washington are expected from this suboption.
- Adding left-turn access from Lake Washington Boulevard onto the SPUI south ramp of the new interchange would result in no measurable difference in the effects on historic properties described above because it would not require additional right-of-way.

Exhibit 5.6-10. **Location of Pedestrian Bridge Overcrossings to be Removed under Suboption L**



West Approach Area

Washington Park Arboretum (ID 200)

The Arboretum is a public facility that was developed as part of the Olmsted Plan for Seattle Parks and Boulevards. The park stretches across approximately 230 acres, all of which is located within the APE. The Washington Park Arboretum is eligible for listing in the NRHP under Criterion A (for its association with events that have made a significant contribution to the broad patterns of our history, including the A-Y-P Exposition, the development of the University of Washington, and the development of the parks system in Seattle) and under Criterion C (as the work of a master for its design by the noted Olmsted Brothers firm, as well as the many talented designers and architects who contributed to its designed features).

The Arboretum contains one NRHP-listed property, the Arboretum Aqueduct, which is also a designated Seattle Landmark, and the Seattle Japanese Garden, another designated Seattle Landmark.

Under the Preferred Alternative and all options, WSDOT would remove the Lake Washington Boulevard and R.H. Thomson Expressway ramps in the Arboretum. Removing these ramps would benefit the Arboretum, opening views for park users and improving the recreational experience of the land and water in this area. The new west approach would originate from the shoreline near East Montlake Park and would maintain a constant

slope through the Arboretum. The height of SR 520 at the west transition span would be similar to the existing west transition span.

Traffic to and from SR 520 would no longer exit and enter directly to and from the portion of Lake Washington Boulevard located in the Arboretum, which would benefit the park. Some of the drivers who currently use this segment of the park boulevard would choose another route to reach the Montlake interchange, which would reduce the amount of traffic on Lake Washington Boulevard in the Arboretum.

As part of the Arboretum Mitigation Plan, developed through the ESSB 6392 workgroup process, WSDOT has committed to working with the Seattle Department of Transportation to identify traffic-calming measures along Lake Washington Boulevard and to fund traffic management in the Arboretum. In addition to support for traffic calming, the Arboretum Mitigation Plan contains additional mitigation measures to reduce project effects on the Arboretum, including stipulations such as coordination on aesthetic enhancements, consultation on noise minimization measures, and WSDOT peninsula restoration following ramp removal.

WSDOT developed a memorandum of understanding (MOU) with the Arboretum and Botanical Garden Committee (ABGC) that describes the roles and responsibilities of each party involved in the various mitigation projects (see Attachment 9 for a copy of the MOU). Following execution of the MOU, which was signed in March 2011, WSDOT and the ABGC will develop scopes, cost estimates, and implementation plans for each mitigation project by late 2011. Project-specific implementation agreements are anticipated for development in late 2011 or early 2012. The traffic calming and traffic management projects were scoped and implemented by WSDOT in spring 2011.

Foster Island (ID 201)

Foster Island is currently part of the Washington Park Arboretum. The North Island is approximately 13 acres and the South Island approximately 23 acres. Although the islands were formerly separate, they are now connected as a single island, and SR 520 occupies the space between the islands as well as part of the north margin of the South Island.

Foster Island was historically and continues to be a sacred place to some local tribes (Waterman 1922, Hilbert et al. 2001). WSDOT and FHWA, in consultation with the tribes, has determined that Foster Island is a TCP eligible for listing in the NRHP.

Preferred Alternative

Under the Preferred Alternative, the highway main line would be elevated in the Washington Park Arboretum, rising from its existing clearance of approximately 8 feet over the Arboretum Waterfront Trail on Foster Island

to a clearance of approximately 16 to 20 feet at this location. Because the main line would be higher than the existing roadway, the highway would become a more dominant and noticeable feature, causing a visual effect in the northern portion of the Arboretum. However, the new SR 520 structure would produce a beneficial effect by allowing the trail to pass between columns of an elevated structure, replacing the current low and narrow pedestrian underpass, and improving the user experience by opening views at ground level. The wider column spacing (to support the elevated structure) on the proposed bridge would also contribute to the positive visual change for the area under the elevated roadway.

The Preferred Alternative and all the SDEIS design options would affect Foster Island to varying degrees, as described below (Exhibit 5.6-11). As discussed in Chapter 4, Foster Island is eligible for the NRHP as a traditional cultural property due to its cultural significance.

The Preferred Alternative would cross Foster Island with a pier and span bridge that would require acquisition of 0.5 acre of land on Foster Island north of the existing alignment. (This compares to 0.4 acre for Option A, 0.7 acres for Option K, and 0.3 acre for Option L.) There would be no right-of-way expansion south of the existing roadway.

The Preferred Alternative minimizes impacts on the Foster Island TCP. As a result of WSDOT's coordination with the affected area tribes, WSDOT limited the additional width required for design refinements, and also committed to using low-impact construction techniques by using work bridges to reduce further ground disturbance. The project would still permanently acquire 0.5 acre of land and expand a use on the island that is inconsistent with its traditional cultural use. This would diminish the integrity of the setting and feeling of Foster Island.

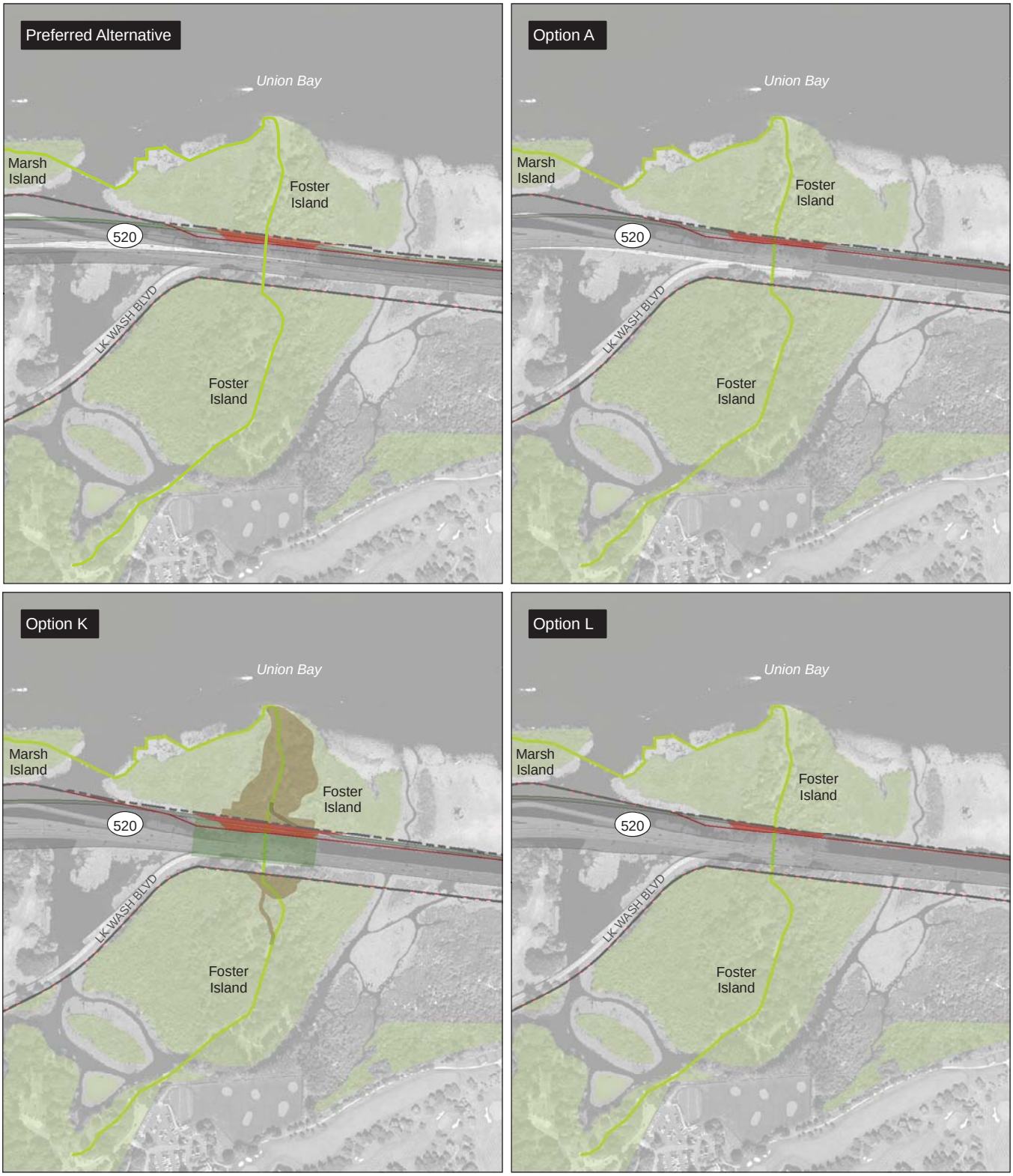
Option A

Option A would also cross Foster Island with a pier-and-span bridge that would require acquisition of 0.4 acre of land north of the existing alignment. As with the Preferred Alternative, there would be no right-of-way expansion to the south of the existing roadway (see Exhibit 5.6-11). The highway main line would be elevated, resulting in approximately 16 to 20 feet of clearance between the bottom of the bridge and 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, causing a visual effect similar to the Preferred Alternative in this area of the Arboretum. Effects on Foster Island would also be similar to those of the Preferred Alternative.

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 option.

Exhibit 5.6-11. Permanent Effects on Foster Island



The added ramps would be located considerably farther west than they are currently, resulting in a positive visual change.

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

Option K

Option K's proposed land bridge would require acquisition of 0.7 acre of land on Foster Island (see Exhibit 5.6-11). 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.

The right-of-way expansion for the land bridge on Foster Island would occur north of the existing alignment. There would be no right-of-way expansion in the more culturally sensitive area south of the existing roadway. 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.

Option L

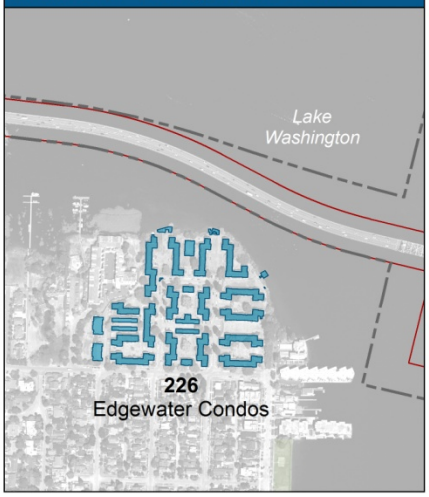
In the Arboretum, Option L would cross over Foster Island with a bridge similar to Option A, requiring acquisition of 0.3 acre of land. The highway main line would be elevated, providing approximately 10 to 12 feet of clearance above the Arboretum Waterfront Trail on Foster Island. Because the main line would be higher than the existing roadway, the highway would become a more dominant and noticeable feature

As with the Preferred Alternative and the other design options, permanent acquisition for Option L would occur on the north section of the island; there would be no right-of-way expansion in the more culturally sensitive area south of the existing roadway.

Edgewater Condominiums (ID 226)

The Edgewater Condominiums (Exhibit 5.6-12) are eligible for listing in the NRHP under Criterion C as part of the multiple property nomination for Seattle apartment buildings. They are recognized as a distinctive architectural type and as the work of master architect John Graham Jr.

Exhibit 5.6-12. **Edgewater Condos**



NRHP Eligible of Surveyed Resources

Eligible

Existing right-of-way

Proposed right-of-way

N

0 500 1,000 Feet

Preferred Alternative

The Edgewater Condominiums would experience a slight benefit from the new west approach of the Preferred Alternative. The west highrise would shift westward from its existing location and would be a few feet higher; it also would lie approximately 70 feet farther north than the existing structures. This would reveal more open water views in Union Bay from these condominiums. The height of the floating bridge would increase to an elevation of approximately 20 feet above the water surface. This change to the viewshed would affect the integrity of setting and feeling of the property, but it would not be a significant change from existing conditions, and would increase less than Options A, K, and L. No defining characteristics of the Edgewater Condominiums would be diminished by the Preferred Alternative.

Options A, K, and L

The Edgewater Condominiums would experience an effect similar to that described for the Preferred Alternative, although the floating bridge would be approximately 30 feet above the water surface rather than 20 feet. No defining characteristics of the Edgewater Condominiums would be diminished by the SDEIS options.

Lake Washington Area

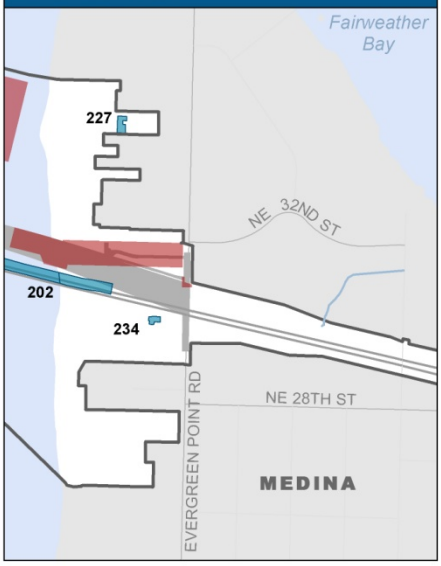
The Preferred Alternative and all the SDEIS options would demolish the existing Evergreen Point Bridge and construct a new Evergreen Point Bridge. No historic properties in the Lake Washington study area would be affected by operation of the Preferred Alternative or any SDEIS options because the only historic property present, the Evergreen Point floating bridge, would be removed during construction of the new bridge.

Eastside Transition Area

There would be no adverse effects on the historic built environment in the Eastside Transition Area from operation of the Preferred Alternative. 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 (Exhibit 5.6-13). 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.

The Dixon House is located approximately 1,000 feet north of the existing east approach to the Evergreen Point Bridge. The new bridge and the approach would be about 160 feet closer to the Dixon House, but still far enough away that operation of SR 520 would not diminish the setting and

Exhibit 5.6-13. **Effects on Historic Properties within the Eastside Transition Area**



NRHP Eligibility of Surveyed Resources

Eligible

Property Effects

Converted to right-of-way

Area of potential effects

Pavement

Note: All resources are mapped and described in detail in the Final Cultural Resources Assessment and Discipline Report. See Table 4.6-1 for a list of properties that correspond to the ID numbers shown above.

N

0 500 1,000 Feet

feeling of this property. The intersection of SR 520 and Evergreen Point Road, near the Arntson House, would be several lanes wider than the existing intersection. This could raise the traffic noise level at this property, but the house would retain the vegetative buffer between it and the roadway. The new floating portion of the bridge would be slightly higher than the existing floating portion, but this greater height would be a minimal visual change to the setting of historic properties in the Eastside transition area.

What indirect effects would the project likely have on cultural resources?

WSDOT did not identify any indirect effects on cultural resources likely to result from operation of the SR 520 project. This is because all project-related effects on cultural resources would be within or close to the project construction footprint and would occur at the time of project construction.

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

Throughout the design and planning process, WSDOT has taken care to avoid and minimize the adverse effect on historic properties. General measures taken through planning and design to avoid and minimize the adverse effect on historic properties include the following:

- Reducing the footprint and/or shifting the alignment of SR 520 to avoid or minimize effects on historic properties, including the Montlake Historic District, the NOAA Northwest Fisheries Science Center, the Washington Park Arboretum, and Foster Island
- Incorporating a landscaped lid at Montlake Boulevard that helps physically reunite the Montlake Historic District while improving views and reducing noise
- Incorporating a landscaped lid at 10th and Delmar that helps reduce noise in the Roanoke Park Historic District and provides an opportunity to develop an adjacent open space that is compatible with the historic district
- Reducing noise levels in the two historic districts, at the Seattle Yacht Club, the NOAA Northwest Fisheries Science Center, Lake Washington Boulevard, the Washington Park Arboretum, and Foster Island by incorporating noise reduction strategies.
- Adjusting construction haul and detour routes to avoid or minimize construction impacts on the Montlake and Roanoke Park historic districts as much as possible
- Involving the affected communities in context-sensitive design of the new lids as part of SR 520 design development and under existing processes of the City of Seattle and the SDC, which will help preserve

the setting and feeling of the Roanoke Park and Montlake Historic districts as well as individually NRHP-eligible and listed properties within and adjacent to those districts.

The following specific design measures were incorporated into the Preferred Alternative to avoid or minimize effects:

- Changes to the project alignment to avoid direct physical effects on the Roanoke Park Historic District. These changes avoid direct impacts on the sidewalk, the street, and the planted median within the district.
- Changes to the Portage Bay Bridge width and alignment to avoid demolition of buildings at the NOAA Northwest Fisheries Science Center that would have occurred under previously studied designs. As described in the SDEIS, these demolitions could have had the potential to result in permanent displacement of the property's historic use.
- Posting a reduced speed limit between I-5 and the Montlake lid (45 mph) and incorporating a taller than standard traffic barrier between the Portage Bay Bridge and I-5 to help reduce noise levels at nearby properties, including the Roanoke Park Historic District, the Seattle Yacht Club, and the NOAA Northwest Fisheries Science Center.
- Developing context-sensitive designs for the Portage Bay Bridge, the new Montlake bascule bridge, and the west approach bridge that will maintain or enhance the historic setting and feeling of the Roanoke Park and Montlake historic districts, the Seattle Yacht Club, NOAA Northwest Fisheries Science Center, the Montlake Bridge, the Canoe House, and the Washington Park Arboretum.
- Designing the Preferred Alternative to minimize the width and number of columns across Foster Island to reduce effects on Foster Island and the Washington Park Arboretum.
- Enhancing the historic setting of the Washington Park Arboretum by removing the existing ramps, incorporating noise reduction strategies, and providing improved pedestrian and bicyclist connections under the highway.

No NRHP-eligible archaeological sites have been identified within the APE. To date, WSDOT has conducted archaeological investigations of the areas planned for ground-disturbing activities in high-probability areas within the limits of construction, including Foster Island. Two factors have prohibited WSDOT from investigating all locations within the APE for the presence of archaeological sites. In some cases, WSDOT has yet to identify the locations that will be needed, and in others, WSDOT does not yet have permission from property owners to perform archaeological investigations. Thus, some ground-disturbance areas, such as the natural resources and Section 6(f) mitigation sites, will not be inventoried for archaeological resources until after the Programmatic Agreement has been signed.

Therefore, the commitment to identify and evaluate these sites is memorialized through a stipulation in the Programmatic Agreement, (Attachment 9).

Improvements to the design of the west approach have reduced the number of columns that would be placed across Foster Island, an NRHP-eligible TCP. As noted previously, right-of-way expansion in this area would be restricted to the area north of the existing alignment.

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

The adverse effect on historic properties would be mitigated through the stipulations provided in the Programmatic Agreement among WSDOT, FHWA, ACHP, SHPO, affected tribes, and other consulting parties. Measures to be taken to mitigate the adverse effects of the SR 520, I-5 to Medina project were developed through consultation among these participants and are detailed in the Programmatic Agreement (Attachment 9). In accordance with 36 CFR 800.6, Resolution of Adverse Effects, WSDOT, FHWA, DAHP, and the tribes have developed a Foster Island Treatment Plan that stipulates the measures to be taken to mitigate the adverse effect on the Foster Island TCP.

5.7 Noise

The noise analysis for the project 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 Addendum and Errata (Attachment 7).

KEY POINTS

Noise

The Preferred Alternative and 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.

The potential effects of the Preferred Alternative were evaluated using the same methods used to evaluate the potential effects of the No Build Alternative and Options A, K, and L. As discussed in Section 5.1, however, the No Build Alternative and the Preferred Alternative traffic analysis was updated for this Final EIS to include the most current assumptions about future population and employment levels, road improvements, and transit services that will be in place by 2030. Since noise analysis is based on traffic data, this updated transportation information (traffic volumes, mixture, speed projections, etc.) was then used to evaluate the noise effects of the Preferred Alternative and the updated No Build Alternative. Section 5.1 provides more information on the updated transportation analysis. In addition, the Medina area was re-evaluated for the Final EIS to account for the removal of several homes occurring prior to project construction, which reduced the total number of residences in the project corridor.

The design files used in the model included a full three-dimensional plan and profile of the proposed highway, ramps, retaining walls, and other design elements that could affect the transmission of noise. WSDOT also used updated topographical maps for the surrounding areas and reviewed and verified all noise modeling locations.

Noise Modeling

In the FEIS, noise levels were modeled at 230 locations (representing 838 residences) for the Preferred Alternative.

In the SDEIS, 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.

Under FHWA and WSDOT policy, all alternatives and design options are initially modeled without noise mitigation, and an analysis is then performed to determine whether consideration of noise abatement measures (typically noise walls) is warranted. If so, abatement measures are modeled to determine their feasibility and cost-effectiveness. Thus, initial results without mitigation are described for the Preferred Alternative and the SDEIS options, followed by a discussion of whether further mitigation is warranted. The traffic noise models for the Preferred Alternative and Options A, K, and L without noise mitigation do not include the noise-reducing effects of a traffic barrier.

How would the project affect noise levels without mitigation?

The noise analysis was performed for 230 receptors along the project corridor. The 230 receptors represent 617 single and multi-family

residences and residential equivalents and 220.8 residential equivalents, which are used to represent noise sensitive non-residential areas, such as parks and schools. As shown in Table 5.7-1 the Preferred Alternative, would result in 206.6 residences exceeding the noise abatement criteria (NAC) without noise mitigation as compared to 287.2 under the updated No Build Alternative. The primary reasons for this reduction are the modifications in the horizontal and vertical alignment, construction of new retaining walls, and expanded Montlake lid design. Within the corridor along the Portage Bay Bridge between I-5 and the Montlake lid, the posted speeds would be reduced to 45 mph, which also aids in lowering the traffic noise levels within this area. Modifying speed limits is an approved abatement measure that can be considered under WSDOT policy. Typically a speed reduction of 10 mph can result in a reduction in traffic noise of up to 3 A-weighted decibels (dBA). The Montlake lid design for the Preferred Alternative would cover a larger portion of SR 520 and would also result in lower traffic noise level projections near the lid compared to lid designs developed for Options A, K, and L.

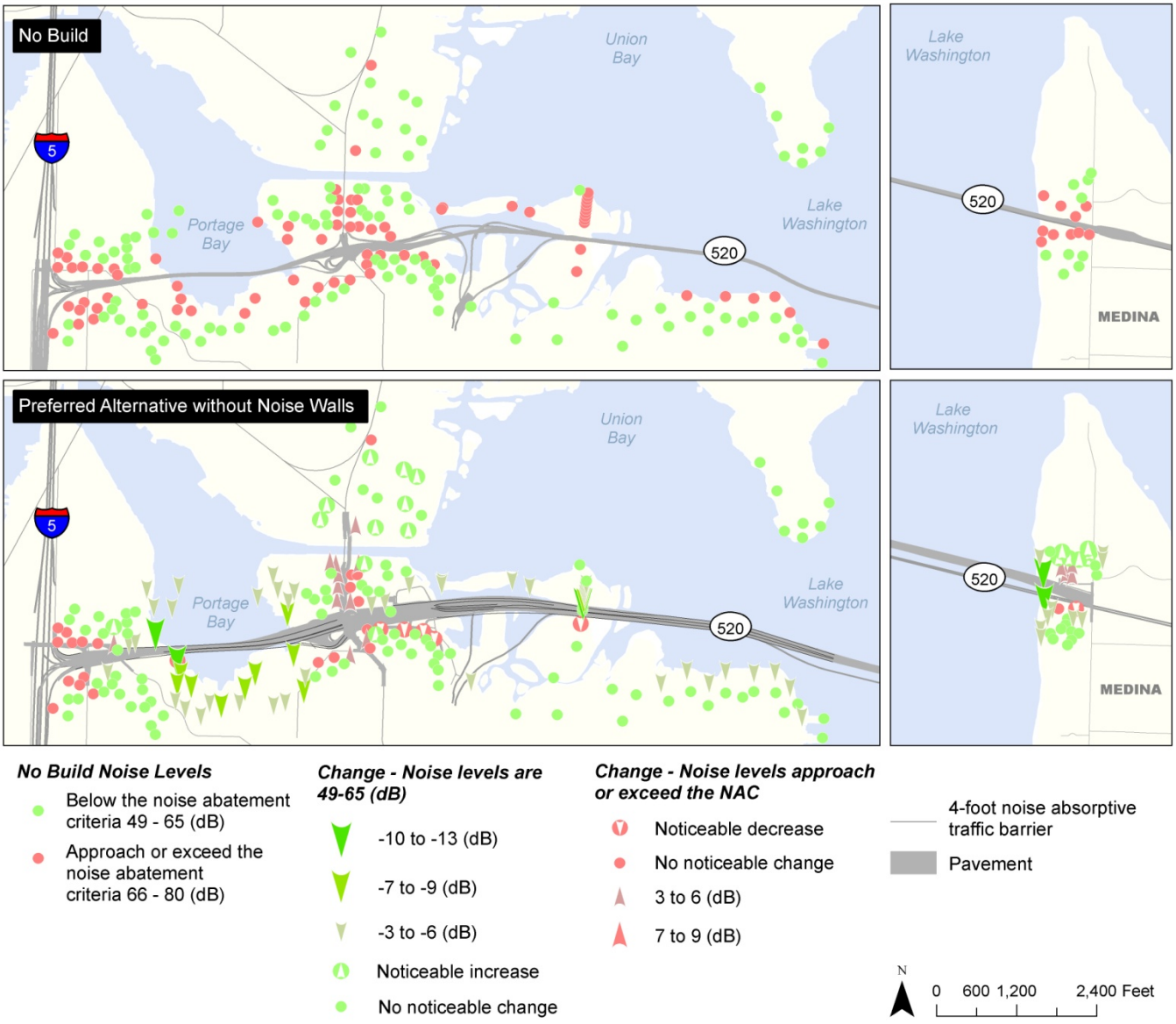
Table 5.7-1. Residences where Noise Levels Would Approach or Exceed the NAC in 2030 for the Preferred Alternative without Mitigation

	Total Residences	2004 Existing	2030 Updated No Build	2030 without Noise Walls- Preferred Alternative	2030 with Traffic Barriers and Noise Walls- Preferred Alternative
Project Corridor	837.8	270.3	287.2	206.6	142.8
Portage Bay/Roanoke[a]	83	24	24	22	22
North Capitol Hill	219	99	101	53	44
Montlake North of SR 520[a]	106.4	37	41.6	34.3	28
Montlake South of SR 520	141.6	63	66.6	48.2	39
University of Washington [a]	82.7	2	4.4	7.1	4.4
Washington Park Arboretum [a]	54	22	21.6	27	5.4
Madison Park	99.4	16	16	7	0
Laurelhurst	15	0	0	0	0
Medina	37	8	12	8	0

[a] This area also includes residential equivalents.

Exhibit 5.7-1 shows the locations where modeling occurred and the results for the updated No Build Alternative and Preferred Alternative without mitigation. The map shows the noise modeling sites, notes which receivers

Exhibit 5.7-1. **Noise Modeling Results for Receivers without Noise Walls (2030) - Preferred Alternative**



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 dBA. Noise levels at locations shown as having no noticeable change would remain within 2 dBA of current levels.

As shown in Table 5.7-2 and Exhibit 5.7-2, Options A, K, and L would also decrease the number of residences where noise levels exceed the NAC, although the decrease would be less than with the Preferred Alternative. Under Option A, the number of residences exceeding the NAC would decrease to 249. Under Options K and L, the number of residences exceeding the NAC would decrease 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.

Table 5.7-2. Residences where Noise Levels Would Approach or Exceed the NAC for SDEIS Options in 2030 for Options A, K, and L

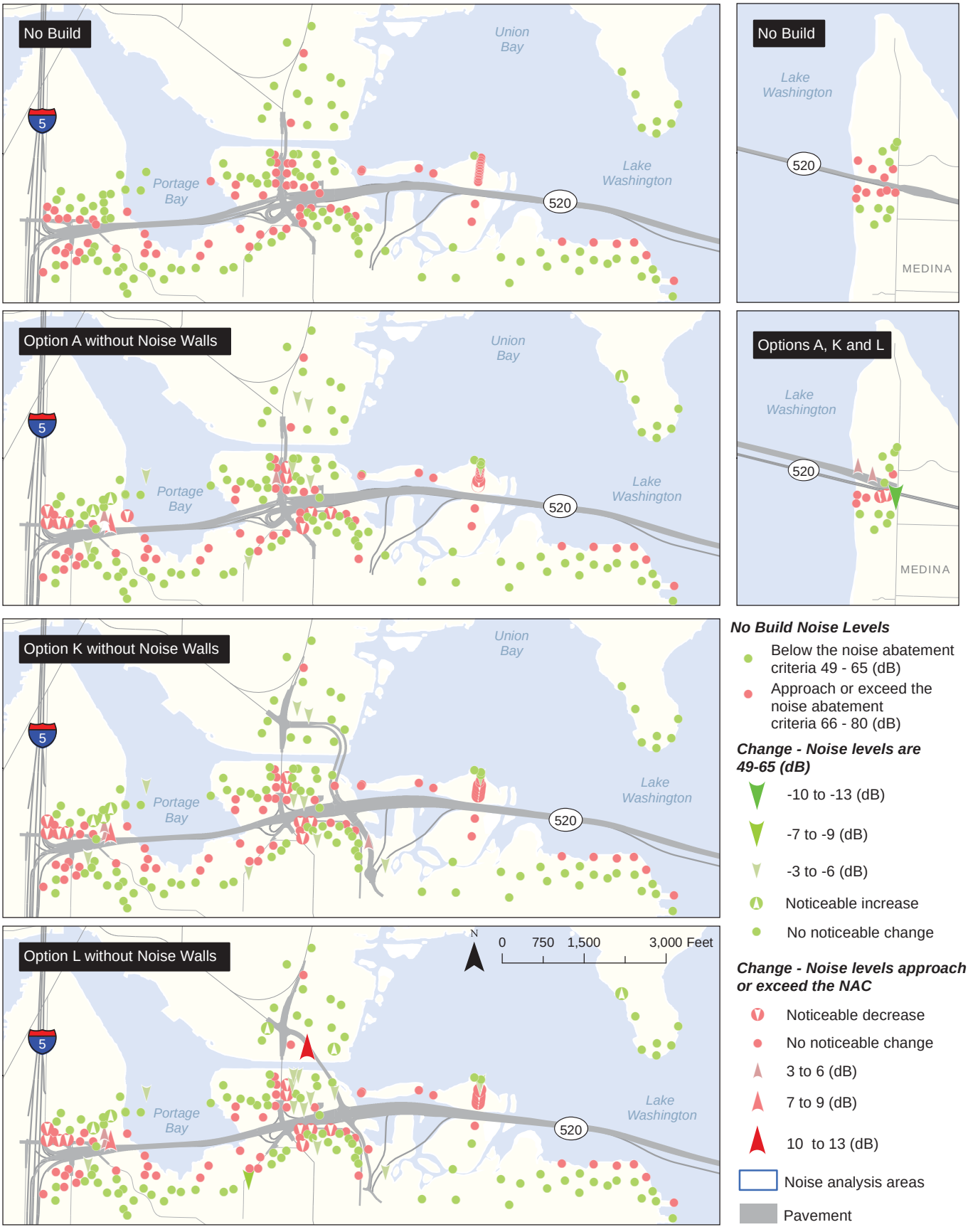
	Total Residences	2004 Existing	2030 No Build	2030 without Noise Walls			2030 w/ Noise Walls		
				Option A	Option K	Option L	Option A	Option K	Option L
Project Corridor	862	288	327	249	256	235	94	123	119
Portage Bay/Roanoke[a]	83	24	24	26	27	27	13	16	16
North Capitol Hill	219	99	109	89	89	83	35	35	35
Montlake North of SR 520[a]	106	37	47	27	28	28	0	19	18
Montlake South of SR 520	142	63	70	57	52	45	28	24	24
University of Washington[a]	83	2	4	2	2	4	2	2	4
Washington Park Arboretum[a]	54	22	27	16	27	22	16	27	22
Madison Park	99	16	16	10	10	5	0	0	0
Laurelhurst	15	0	0	0	0	0	0	0	0
Medina	61	26	30	21	21	21	0	0	0

[a] This area also includes residential equivalents.
Note: Adding the suboptions to Option A, K, or L would not change the noise effects listed in this table.

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

Under FHWA regulations (23 Code of Federal Regulations [CFR] Part 772), noise abatement must be considered when highway noise levels approach or exceed the thresholds set in FHWA's noise abatement criteria, as they currently 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.) Abatement 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 works with these property owners during detailed project design to determine some of the mitigation measures planned for the project.

Exhibit 5.7-2. Noise Modeling Results for Receivers without Noise Walls (2030) - Options A, K, and L



What has been done to avoid or minimize negative effects from noise?

Several design elements and general corridor improvements that were added to the Preferred Alternative as a result of the SR 520 Noise Expert Review Panel and in response to community input. In particular, many comments on the SDEIS and in other public forums expressed concern about the aesthetic impacts of noise walls, coupled with requests that WSDOT explore different and more innovative noise reduction measures. As a result, the Preferred Alternative design includes 4-foot noise-absorptive concrete traffic barriers along both sides of the SR 520 project alignment. The median planter on the Portage Bay Bridge will also be constructed using the barriers. These noise reduction measures could also be added to Options A, K, and L if one of these options became the preferred alternative.

The noise analysis for the Preferred Alternative includes the results of modeling standard concrete-type traffic barrier, but does not include any benefits from the acoustically absorptive material on the surface of the barriers. The noise-reducing effects of the 4-foot concrete traffic barriers were added to the traffic noise model as a corridor design element, and it was concluded that these barriers would reduce the number of traffic noise impacts along the project alignment by approximately 57 residences and residential equivalents compared to the model without traffic barriers. A WSDOT report on special noise barrier applications suggests that single-wall absorptive barriers may provide an additional 2-dBA decrease in noise levels compared to standard concrete barriers.

Additionally, within the corridor along the Portage Bay Bridge, between I-5 and the Montlake lid, the posted speeds would be reduced to 45 mph, which also aids in lowering the traffic noise levels within this area. Modifying speed limits is one of the abatement measures that can be considered under WSDOT policy and, typically, a reduction in traffic noise of up to 3 dBA can be expected with a speed reduction of 10 mph.

The final design element, which includes expanding the Montlake lid to cover a larger portion of SR 520, would also result in lower traffic noise levels near the lid compared to lid designs considered in previous analyses.

The combined effect of the design elements discussed above would result in overall lower noise levels along the project alignment. However, there would continue to be project-related noise effects and, therefore, additional mitigation measures must be considered under WSDOT policy. As described in the 2009 Noise Discipline Report section "What has been done to avoid or minimize negative effects from noise?" (see page 107), noise walls were determined to be the only viable mitigation option for the remaining noise-affected residences.

Alternative Noise-Reducing Design Measures

In addition to the 4-foot noise-absorptive traffic barriers and lower speed limits, the project team is currently evaluating quieter concrete pavement. The FHWA noise program policy related to tire/pavement noise (USDOT 1995) reads as follows:

> Pavement is sometimes mentioned as a factor in traffic noise. While it is true that noise levels do vary with changes in pavements and tires, it is not clear that these variations are substantial when compared to the noise from exhausts and engines, especially when there are a large number of trucks on the highway. Additional research is needed to determine to what extent different types of pavements and tires contribute to traffic noise.
>
> It is very difficult to forecast pavement surface condition into the future. Unless definite knowledge is available on the pavement type and condition and its noise generating characteristics, no adjustments should be made for pavement type in the prediction of highway traffic noise levels. Studies have shown open-graded asphalt pavement can initially produce a benefit of 2–4 dBA reduction in noise levels. However, within a short time period (approximately 6-12 months), any noise reduction benefit is lost when the voids fill up and the aggregate becomes polished. The use of specific pavement types or surface textures must not be considered as a noise abatement measure.

Sound measurements have increased over time for the three different types of quieter asphalt pavement installed along the SR 520 corridor. In general, the asphalt testing did not produce a pavement type that meets all WSDOT criteria; however, WSDOT is committed to continuing to test other types of pavements and is also committed to using a pavement type that will meet overall pavement standards for state highways while potentially providing some level of noise reduction when compared to most standard pavement types.

What noise walls were modeled and recommended for the project area?

The mediation group recommended different traffic noise mitigation and design elements intended to reduce noise for Options A, K, and L. 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. 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 and the community, they do not affect FHWA's and WSDOT's responsibility to identify and consider effective and allowable noise

abatement measures under existing laws. For this reason, as noted above, the Preferred Alternative and all of the SDEIS options were modeled both with and without noise walls.

In accordance with FHWA and WSDOT guidance, WSDOT evaluated 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 recommended noise walls only where modeling indicated that they would meet the guidelines for reasonableness and feasibility.

Preferred Alternative

Because design features such as reduced speeds, expanded lids, and 4-foot concrete traffic barriers were incorporated into the Preferred Alternative at many locations in the Seattle portion of the SR 520 corridor, noise walls would not provide enough additional reduction to be considered cost-effective. Therefore, the Preferred Alternative includes only two recommended noise walls: noise walls along both sides of SR 520 from just east of the floating span to Evergreen Point Road. If the recommended noise walls are included in the Preferred Alternative, the overall length would be 1,713 feet with height varying between 10 and 20 feet.

Noise abatement along I-5 in the North Capitol Hill area was also considered in the analysis for the Preferred Alternative. A noise wall along WSDOT right-of-way between I-5 and Harvard Avenue East and along a small spur of Broadway East near 10th Avenue East and SR 520 was evaluated for cost-effectiveness. However, further structural review is required to conclude if including the wall is reasonable and feasible before recommending it to the communities. This review will take place during final design.

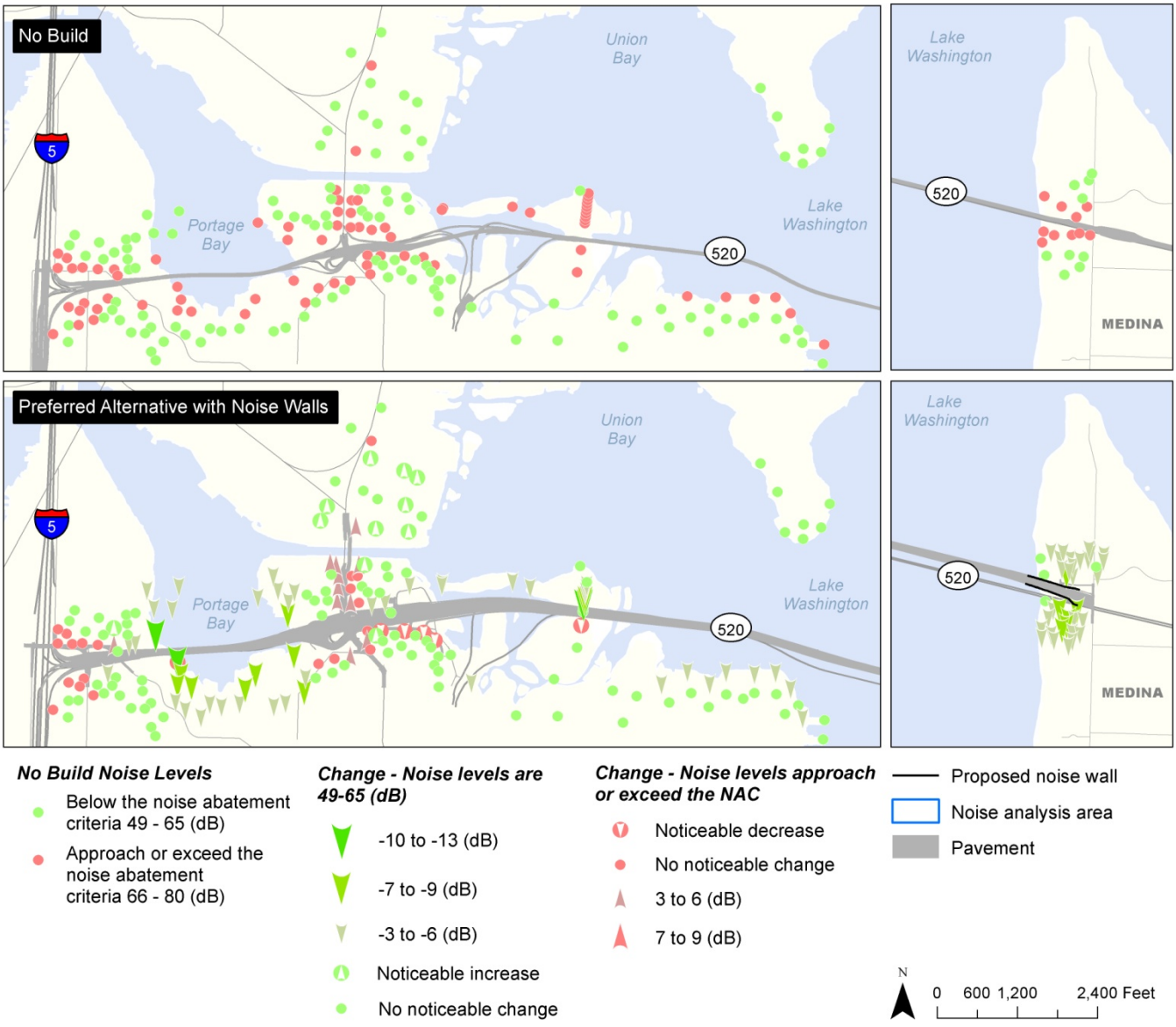
Exhibit 5.7-3 shows the locations of the recommended noise walls and identifies those receivers that would benefit. With the noise walls recommended for the Preferred Alternative, the number of residences that exceed the NAC would be reduced to 143 (Table 5.7-2) and a total of approximately 8 residences would benefit. The walls would meet WSDOT cost criteria.

Options A, K, and L

Options A, K, and L included the following recommended noise walls (Exhibit 5.7-4):

- 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

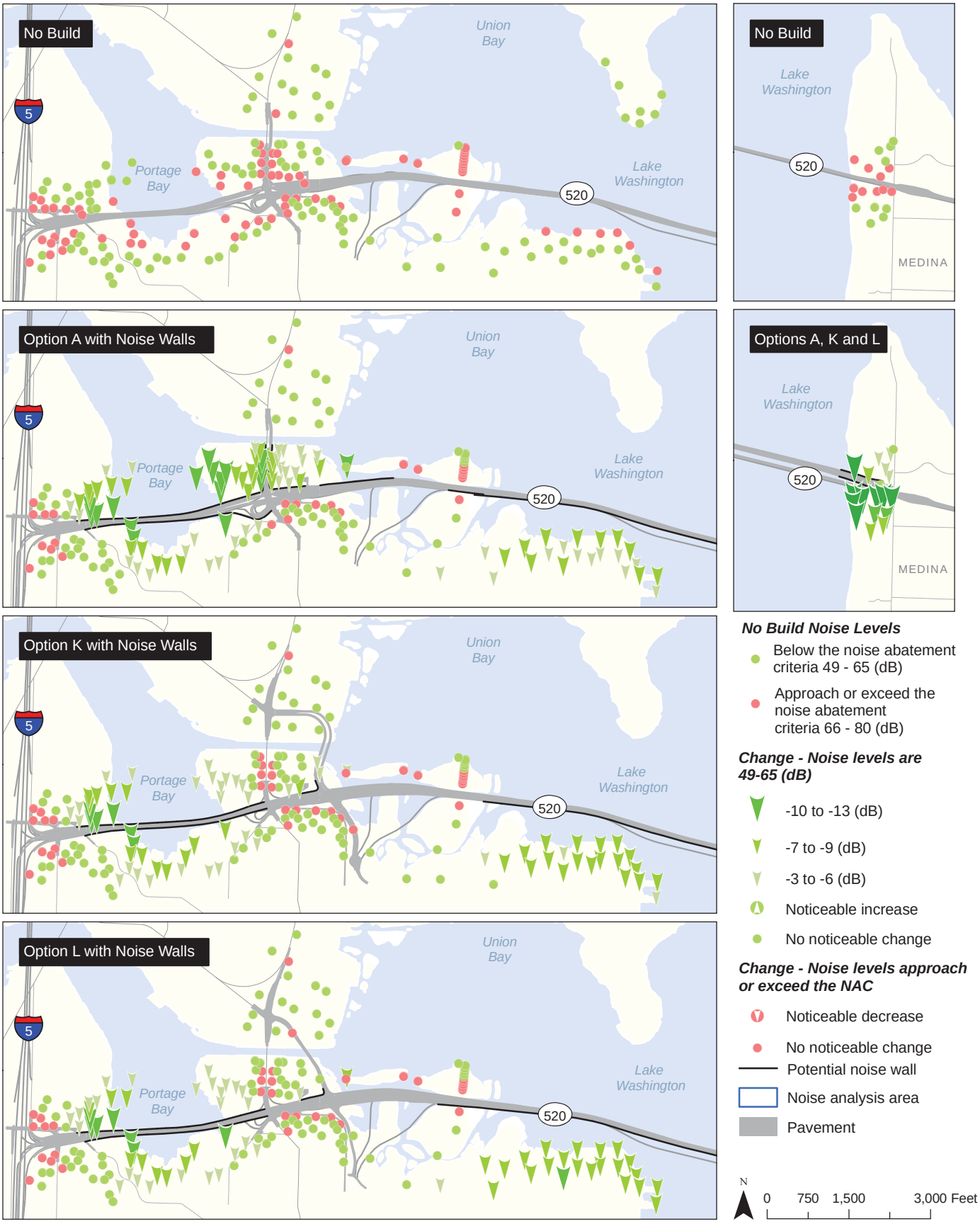
Exhibit 5.7-3. **Noise Modeling Results for Receivers with Noise Walls (2030) - Preferred Alternative**



- 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 did not meet the WSDOT reasonableness and/or feasibility criteria (for example, between Montlake Boulevard NE and the Arboretum), noise walls were not recommended. Exhibit 5.7-4 shows the receiver locations where noise walls would be located and the changes in noise levels.

Exhibit 5.7-4. Noise Modeling Results for Receivers - Noise Walls (2030)



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.

Option A

If the recommended 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. Exhibit5.7-4 shows the locations of the recommended noise walls.

With the noise walls recommended for Option A the number of residences that would exceed the NAC would be reduced to 94 (Table 5.7-2) and a total of 468 residences would benefit. Each wall would meet WSDOT cost criteria.

Option K

If the recommended noise walls were included in Option K, overall length would be 16,528 feet, with heights varying from 8 to 16 feet. Exhibit 5.7-4 shows the locations of the recommended noise walls.

With the noise walls recommended for Option K the number of residences that would exceed the NAC would be reduced to 123 (Table 5.7-2) and a total of 409 residences would benefit. 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

If the recommended noise walls were included in Option L, overall length would be 16,738 feet, with heights varying from 8 to 16 feet. Exhibit5.7-4 shows the locations of the recommended noise walls with Option L.

With the noise walls recommended for Option L the number of residences that would exceed the NAC would be reduced to 119 (Table 5.7-2) and a total of 400 residences (8 with noise levels of 70 dBA or higher) would benefit. Each wall would meet WSDOT cost criteria.

What indirect effects would the project likely have on noise?

WSDOT considered all noise-related effects of project operation to be direct. This is because project-related noise would be detected by people only while they were in or close to the SR 520 corridor and at the same time the noise was being generated. No indirect noise effects were identified from operation.

What has been done to avoid or minimize negative effects?

The Preferred Alternative includes WSDOT approved noise abatement such as reduced speed limits and increased roadway heights, expanded lids, as well as noise-reducing design elements including absorptive treatments on 4-foot traffic barriers. By reducing noise levels, the Preferred Alternative design results in fewer recommended noise walls compared to those recommended under the SDEIS options. In areas where the number of affected residences is higher with the Preferred Alternative compared to the SDEIS options, the difference is primarily due to the fact that only two noise walls (in Medina) are recommended under the Preferred Alternative.

The Preferred Alternative and Options A, K, and L include up to five landscaped lids (depending on the design option) over depressed sections of the roadway. Although these lids are included as community enhancements rather than noise mitigation, they would also help prevent noise from reaching noise-sensitive receiver locations near the lidded areas. The Noise Discipline Report Addendum and Errata (Attachment 7) provides a detailed explanation of where the lids will reduce noise levels.

Changes in the horizontal or vertical alignment of a roadway can reduce noise levels depending on the modification and surrounding conditions. These types of changes can qualify as noise mitigation. A depressed (lowered) roadway can provide substantial noise reduction, depending on the amount of depression. Under the Preferred Alternative and all design options, 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 negative effects would remain after mitigation?

Overall, with the Preferred Alternative, 143 residences or residential equivalents would continue to have noise levels that meet or exceed the NAC. With SDEIS Options A, K, and L, the residual noise effects totaled 94, 123, and 119 residences, respectively. With the Updated No Build Alternative, there would be 287 traffic noise effects within the project area. Currently, there are 270 residences that have noise levels exceeding the NAC.

There would be no negative effects remaining in Laurelhurst or Madison Park under the Preferred Alternative. Also, with the recommended mitigation measures in Medina, no negative effects would remain in Medina under the Preferred Alternative.

Within the Arboretum, five residential equivalents would have noise levels that exceed the NAC with the Preferred Alternative compared to 22 under the No Build Alternative. Similarly, within the North Capitol Hill neighborhood, 44 residences would have noise levels exceeding the NAC with the Preferred Alternative with recommended mitigation compared to 101 under the No Build Alternative.

Compared to the No Build Alternative, the numbers of affected residences within the Montlake neighborhoods north and south of SR 520 are reduced from 42 to 28 and 67 to 39, respectively. Within the University of Washington, the number of affected residences remains the same as the No Build Alternative.

Within the Portage Bay/Roanoke neighborhood, there would be 22 affected residences with the Preferred Alternative, which is less than the 24 predicted under the No Build Alternative.

Overall, the number of affected residences under the Preferred Alternative without the recommended noise walls or the 4-foot concrete traffic barrier would be lower than the number under either the No Build Alternative or under any of the SDEIS options without mitigation. However, the number of affected residences under the Preferred Alternative with the 4-foot traffic barrier in Seattle is somewhat higher than any of the SDEIS options with mitigation. This is primarily because the project design elements and the barrier reduce noise to levels where other noise abatement, such as noise walls, is no longer feasible and reasonable. Design elements that could not be modeled, such as absorptive treatment on traffic barriers, lid portals, and bridge joints may further reduce noise levels below the values reported in this analysis.

5.8 Air Quality

KEY POINTS

Air Quality

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

This section is based on the Air Quality Discipline Report Addendum and Errata (Attachment 7) and discusses how the project would affect local and regional air quality, including criteria pollutants and mobile source air toxics.

As discussed in Chapter 4, Washington is subject to air quality regulations issued by EPA, Ecology, and local air quality agencies. EPA's National Ambient Air Quality Standards (NAAQS) set limits on levels of criteria pollutants. Concentrations of the criteria pollutants must not exceed the NAAQS over specified time periods. Ecology and the Puget Sound Clean Air Agency (PSCAA) monitor air quality in the Puget Sound region to compare the levels of criteria pollutants found in the atmosphere with the NAAQS.

Mobile source air toxics (MSATs) are hazardous air pollutants found in motor vehicle exhaust. EPA has identified seven "priority MSATs" as having the greatest influence on health. Currently, no standards establish allowable concentrations of mobile source air toxics emissions. 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).

The air quality effects of the Preferred Alternative were evaluated using the same methods used to evaluate the effects of the No Build Alternative and Options A, K, and L. The local air quality effects of the Preferred Alternative and the Updated No Build Alternative are compared to Options A, K, and L in this chapter. As discussed in Section 5.1, the No Build Alternative was updated for this Final EIS to include the most up-to-date assumptions about the future population and employment levels, road improvements, and transit services that will be in place by 2030. This updated transportation information (traffic volumes, mixture, speed projections, etc.) was then used for analysis of regional air quality effects of the Preferred Alternative and the updated No Build Alternative. Section 5.1 provides more information on the updated transportation analysis. Options A, K, and L are qualitatively compared to the updated No Build Alternative and Preferred Alternative, as described later in this chapter.

How would the project affect air quality?

The Preferred Alternative as well as all the SDEIS options would meet air quality standards. The modeled concentrations of air pollutants are below the 1-hour and 8-hour NAAQS for all design option in all future years. MSAT emissions are expected to decrease between existing conditions and future years, regardless of the design option.

Local Air Quality

The Puget Sound area has a history of not meeting the NAAQS for carbon monoxide (CO). Although ambient concentrations have been below the NAAQS for many years, the area is still designated by EPA as a CO maintenance area. Because the project is in a CO maintenance area, 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 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. This is called a "conformity analysis" because it is intended to demonstrate whether projects conform with the State Implementation Plan (SIP) for maintaining air quality standards.

Preferred Alternative

For the final EIS, the transportation model was updated for the Preferred Alternative and No Build Alternative, and a new conformity analysis was performed. The following five intersections were analyzed for the Preferred Alternative:

- Montlake Boulevard and Lake Washington Boulevard/SR 520 Eastbound Ramps
- Montlake Boulevard and East Shelby Street
- Montlake Boulevard and Pacific Street
- Montlake Boulevard and Pacific Place
- Pacific Street and 15th Avenue NE

The intersections of Boylston Avenue/East Lynn Street and Boylston Avenue/East Roanoke Street were included in the SDEIS analysis but were not analyzed under the Preferred Alternative. This is because the updated traffic operations analysis indicated that these intersections would operate similarly under both the Preferred Alternative and the No Build Alternative and would therefore have similar CO concentrations.

To meet conformity requirements, the local air quality analysis for the Preferred Alternative was also conducted for the year 2040. The regional transportation plan, *Transportation 2040*, was adopted by the Puget Sound Regional Council in May 2010. Because *Transportation 2040*, which calculated regional emissions for the same year, is now in effect, the project is required to show conformity to air quality standards in 2040.

As shown in Table 5.8-1, the modeled concentrations for the Preferred Alternative are well below the 1-hour and 8-hour NAAQS.

Table 5.8-1. Preferred Alternative - Maximum 1-Hour and 8 Hour Carbon Monoxide Concentrations (parts per million [ppm])

Intersection Name		NAAQS	2008 Existing	2030 No Build	2030 Preferred Alternative	2040 No Build Alternative	2040 Preferred Alternative
Montlake Blvd/Lake Washington Blvd/ SR 520 Eastbound ramps	1-hour	35	11.9	9	9.6	9.0	10.3
	8-hour	9	9.8	7.8	8.2	7.8	8.7
Montlake Boulevard/ East Shelby Street	1-hour	35	11.5	9	9.0	9.2	9.1
	8-hour	9	9.5	7.8	7.8	7.9	7.9
Montlake Boulevard/ Pacific Place	1-hour	35	9.7	7.8	7.8	7.8	7.9
	8-hour	9	8.3	7.0	7.0	7.0	7.0
Pacific Street/ 15th Avenue NE	1-hour	35	9.4	7.5	7.4	7.5	7.5
	8-hour	9	8.1	6.8	6.7	6.8	6.8
Montlake Boulevard/ Pacific Street	1-hour	35	10.2	8.3	8.4	8.3	8.5
	8-hour	9	8.6	7.3	7.4	7.3	7.4

Note: All concentrations include a background concentration of 5 ppm.

Options A, K, and L

For the SDEIS options, the following five intersections were analyzed (Exhibit 5.8-1):

- Boylston Avenue/East Lynn Street
- Boylston Avenue/East Roanoke Street
- Montlake Boulevard/Pacific Place
- Pacific Street/15th Avenue NE
- Montlake Boulevard/Pacific Street

As shown in Table 5.8-1 and Table 5.8-2, the modeled concentrations are well below the 1-hour and 8-hour NAAQS for the Preferred Alternative and the SDEIS options.

Regional Air Quality

WSDOT performed an emissions burden analysis to evaluate how the project would contribute to regional emissions of criteria pollutants. This was done by calculating the emissions from vehicles in the region with the Preferred Alternative and Options A, K, and L and comparing them to the regional "emissions budget" as calculated by the Puget Sound Regional Council (PSRC). This budget, established and approved as a part of the SIP, sets a limit on allowed pollutant emissions for motor vehicles within the

KEY POINT

There is no measurable difference in regional air quality related to traffic emissions between build and no build conditions when the project is evaluated in the context of the study area as required.

region. Emission factors are stated in terms of grams of pollutants per vehicle mile traveled. WSDOT also performed a Mobile Source Air Toxics MSAT analysis as described below. Note that there are no standards established for project-specific emissions burdens or MSAT emissions. The section below describes how the information on those two factors is used to identify the project's contribution to air emissions in the region.

Emissions Burden Analysis

Preferred Alternative

In 2030, the Preferred Alternative would result in lower vehicle emissions than current conditions, primarily because of more stringent vehicle emission standards, and lower emissions that for Options A, K, and L (Table 5.8-3). The Preferred Alternative findings relative to Options A, K, and L are due primarily to the updated tolling and light rail assumptions in the transportation network.

There is no measurable difference in model results for regional emissions with and without the project on the scale of the study area, although differences would exist on local roads. The very slight differences in volatile organic compounds (VOCs) and nitrogen oxide (NOx) among all options in future years (Table 5.8-3) would occur because of the small differences in average speed throughout the study area. The average speed for the Preferred Alternative would be slightly faster than the average speed for the Updated No Build Alternative, which equates to slightly lower VOC and NOx emissions. CO emissions would also be lower than existing conditions, but this is not reflected in the table because of rounding. There would be no difference in particulate matter (PM) in future years due to likely age of vehicles on the road. .

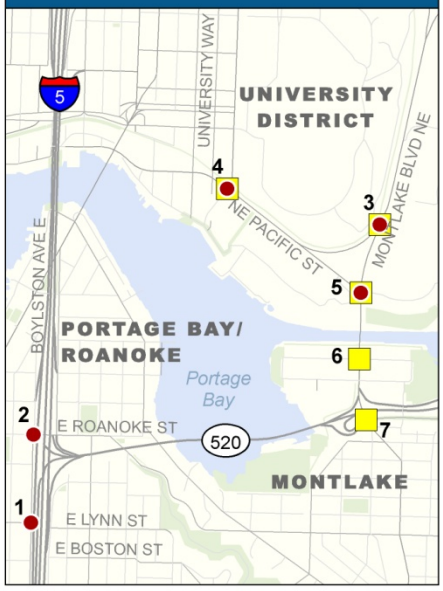
Options A, K, and L

Table 5.8-3 shows that emissions are almost identical for Options A, K, L and the No Build Alternative. Based on the SDEIS analysis, the predicted vehicle miles traveled (VMT) in the study area would slightly decrease for Option A and increase for Options K and L over the No Build Alternative, but the differences are so small as to be insignificant. 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. Adding the suboptions to Option A, K, or L would result in no measurable differences in effects.

MSAT Analysis

FHWA bases its recommendation for MSAT analysis on a project's average daily traffic volume. According to FHWA's guidelines, projects with an annual average daily traffic volume (AADT) of 140,000 or more should be analyzed quantitatively. Because the highest AADT among the design options was 133,750 (Options K and L), the effects in the SDEIS were

Exhibit 5.8-1 Intersections Evaluated for CO



Study Intersection (SDEIS Options)

Study Intersection (Preferred Alternative)

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

6 - Montlake Blvd/Lake Washington Blvd/SR 520 EB ramps

7 - Montlake Blvd/E Shelby St

N

0 1,000 2,000 4,000 Feet

Table 5.8-2. SDEIS Options - Maximum 1-Hour and 8-Hour Carbon Monoxide Concentrations (ppm)

Intersection Name		NAAQS	2008 Existing	2030 No Build	2030 Option A	2030 Option K	2030 Option L
Boylston Avenue/East Lynn Street	1-hour	35	7.6	6.6	6.6	6.6	6.6
	8-hour	9	6.8	6.1	6.1	6.1	6.1
Boylston Avenue/East Roanoke Street	1-hour	35	7.5	6.4	6.4	6.4	6.4
	8-hour	9	6.8	6.0	6.0	6.0	6.0
Montlake Boulevard/ Pacific Place	1-hour	35	9.6	7.8	7.8	8.5	8.5
	8-hour	9	8.2	7.0	7.0	7.4	7.4
Pacific Street/ 15th Avenue NE	1-hour	35	9.6	7.8	7.8	7.8	7.8
	8-hour	9	8.2	7.0	7.0	7.0	7.0
Montlake Boulevard/ Pacific Street	1-hour	35	10.4	8.1	8.0[a]	9.2	9.5
	8-hour	9	8.8	7.2	7.1a	7.9	8.1

[a] Adding the suboptions to Option A would result in an additional 0.2 ppm.
Notes:
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 5.8-3. Burden Emissions Analysis: Daily Project Emissions of Criteria Pollutants (tons per day)

Alternative	VMT	CO	CO % of SIP Budget	VOCs	NOx	PM_{10}	$PM_{2.5}$
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
2008 Revised Existing	11,200,000	226	9%	15.1	23.5	0.6	0.4
2030 Revised No Build	13,100,000	166	7%	7.3	7.2	0.4	0.2
2030 Preferred Alternative	13,100,000	166	7%	7.2	7.1	0.4	0.2
SIP Budget	N/A	2,510	N/A	N/A	N/A	N/A	N/A

Notes:
Emissions were calculated using the MOBILE6.2 emission factor for 30 miles per hour and the daily VMT from the 2009 Transportation Discipline Report (Attachment 7).
State Implementation Plan (SIP) inventory data are from 61 Federal Register (FR) 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.
PM_{10} = particulate matter smaller than 10 microns
$PM_{2.5}$ = particulate matter smaller than 2.5 microns

evaluated qualitatively. However, comments received on the SDEIS from the public and the EPA requested that a quantitative analysis be conducted for the Preferred Alternative, WSDOT performed that analysis as requested.

Emissions for each of the seven priority MSATs were estimated for the SR 520 corridor. The MOBILE6.2 mobile source emissions model was used to estimate an emission factor in grams per mile for all vehicle speeds. Model inputs included vehicle volume and average speed data for a series of segments representing eastbound and westbound traffic on SR 520. The emissions for each segment were determined by multiplying the emission factor by the segment length and the segment volume. Emissions from each segment were added together for a total emission value in tons per year for SR 520. Emissions were calculated for existing conditions (2008) and for the Preferred Alternative and No Build in 2030.

As seen in Table 5.8-4, MSAT emissions are slightly lower for the Preferred Alternative than emissions for the Updated No Build Alternative in 2030. The lower emissions are due to the general reduction in traffic congestion. The emissions in 2030 are significantly lower than the emissions in 2008, which is consistent with FHWA projections and is due to technological advancements in vehicles and fuel, as discussed in the Air Quality Discipline Report Addendum and Errata (Attachment 7). The Preferred Alternative would not cause an adverse effect due to MSAT emissions.

Average Daily Vehicle Miles Travelled

The Washington State Department of Transportation (WSDOT) has estimated vehicle miles traveled as part of the Highway Performance Monitoring System since 1980.

In 2009, the average daily vehicle miles traveled in the central Puget Sound region was 80,875,000. As the most dense population and employment area in the state, the four-county region experiences 52% of the statewide VMT while containing only 24% of the lane-miles.

Exhibit 5.9-3 in the next section illustrates the study area used in the Emissions Burden Analysis. The average daily vehicle miles traveled in this study area was 10,996,900 in 2008.

Table 5.8-4. MSATs Emissions Analysis: Daily Project Emissions of Criteria Pollutants (tons/day)

Alternative	Acrolein	Benzene	1,3-Butadiene	Formaldehyde	Naphthalene	POM	DPM
2008 Existing	0.52	35.03	2.74	8.71	0.53	0.0050	102.49
2030 No Build	0.26	19.80	1.41	4.47	0.37	0.0027	26.94
2030 Preferred Alternative	0.24	18.68	1.32	4.04	0.36	0.0027	26.40

Notes:
POM = polycyclic organic matter
DPM = diesel particulate matter

Air toxics is an emerging field and current scientific techniques, tools, and data are not sufficient to accurately estimate human health effects that would result from a transportation project in a way that would be useful to decision-makers in a National Environmental Policy Act (NEPA) context. Because of the limitations in the methodologies for forecasting health effects, any predicted difference among alternatives would likely be much smaller than the margin of error in the prediction methods. The results would also not account for other public health benefits of the project, such as reducing such as reducing criteria

pollutants emissions, accident rates, and fatalities as well as improved access for emergency response.

Does the project meet project-level conformity requirements?

Because the project is not anticipated to create any new violations, nor increase the frequency of an existing violation of the CO standard, it conforms with the purpose of the current SIP and the requirements of the federal Clean Air Act and the Washington Clean Air Act. The proposed project is included in the regional transportation plan (RTP), *Transportation 2040* (PSRC 2010a), and in the 2010-2013 Transportation Improvements Program, also known as the Transportation Improvement Program (TIP) (PSRC 2010b). The RTP and the TIP meet the conformity requirements identified by federal and state regulations for CO.

What indirect effects would the project likely have on air quality?

The project has the potential to provide indirect benefits to air quality in the form of reduced single-occupancy-vehicle use resulting from expected increases in transit ridership on SR 520. (See Section 5.1 and the Final Transportation Discipline Report for more information on transit.)

What has been done to avoid, minimize, and/or mitigate for negative effects?

Even without the project (the No Build Alternative), air quality in 2030 is expected to improve compared to current conditions, primarily because of the introduction of cleaner fuels and more efficient vehicle engines. Slight improvements in air quality would also result from increased mobility resulting from the SR 520 project. The project would comply with all applicable air quality standards, conform with the State Implementation Plan, and reduce emissions of MSATs. Therefore, no mitigation would be necessary for project operations.

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, since transportation agencies are typically required by law to provide facilities and services that will meet planned travel demand. However, in support of policies and legislation related to energy efficiency and greenhouse gas (GHG) emissions, WSDOT evaluates energy usage and GHGs for all its major transportation infrastructure projects. This section provides the results of these evaluations.

The information in this section is based on the Energy Discipline Report Addendum and Errata (Attachment 7). The potential effects of the Preferred Alternative were evaluated using the same methods used to evaluate the potential effects of Options A, K, and L. However, since publication of the SDEIS, the No Build Alternative and the Preferred Alternative traffic models and findings have been updated as described in Section 5.1, and that updated information was used for the energy analysis as well to ensure the most accurate analysis of the projected effects on energy and greenhouse gases.

How would the project affect energy use?

The analysis of energy effects is based on projected 2030 traffic volumes within the SR 520 corridor and the resultant annual vehicles miles traveled (VMT). The findings for the Preferred Alternative and Options A, K, and L are similar. Options A, K, and L have the same relative change compared to their SDEIS No Build Alternative as the Preferred Alternative has to the Updated No Build Alternative. The Preferred Alternative and all the SDEIS options would reduce annual consumption of fuel by motor vehicles (the major source of energy usage on a roadway) between 5 and 10 percent.

KEY POINT

Energy Savings

The Preferred Alternative and all options would reduce annual fuel consumption between 5 and 10 percent on SR 520 between Seattle and Medina as compared to the No Build Alternative.

Preferred Alternative

In 2030, the annual VMT on the SR 520 corridor under the updated No Build Alternative would be approximately 609 million miles. Like Options A, K, and L, the VMT for the Preferred Alternative is expected to be lower than the Updated No Build Alternative because no tolls would in place on SR 520 under No Build conditions in 2030. As discussed in Section 5.1, tolls can affect travel demand in the corridor by causing drivers to take alternate modes (such as transit or carpooling) or alternate routes.

Average Daily Vehicle Miles Traveled

In 2009, the average daily VMT in King County was 44,299,000 (PSRC 2010a).

In 2006, the average daily VMT on the project corridor was 1,600,000.

Vehicles operating in the study area under the updated No Build Alternative would consume about 4.1 million MBtu (million British thermal units) of energy, which is equivalent to 32.8 million gallons of fuel per year (see Table 5.9-1). The Preferred Alternative is estimated to consume about 4 percent less energy (the equivalent of 1.3 million gallons of fuel) than the

updated No Build Alternative in 2030. The reduction in energy use under the Preferred Alternative is attributable to two factors:

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

Table 5.9-1. Annual Fuel Consumption during Operation (2030)

Alternative/Option	Annual VMT (millions)	MBtu	Gallons of Fuel[a] (millions)	% Change from 2030 No Build Alternative
Existing Conditions (2006) SDEIS [b]	562	3,818,000	30.3	NA
2030 No Build Alternative SDEIS	806	5,474,000	43.4	NA
2030 Option A SDEIS	738	5,012,000	39.8	-8%
2030 Option K/L SDEIS	756	5,134,000	40.7	-6%
Existing Conditions (2006) [b]	546	3,707,000	29.4	NA
2030 No Build Alternative	609	4,132,000	32.8	NA
2030 Preferred Alternative	584	3,967,000	31.5	-4 %

[a] Fuel includes both diesel and gasoline.

[b] "Existing Conditions (2006) SDEIS" refers to the original existing conditions from the Puget Sound Regional Council travel demand model that were used in the traffic modeling efforts for Options A, K, and L and the No Build Alternative. "Existing Conditions (2006)" refers to the findings from the updated travel demand model used for the Preferred Alternative and updated No Build Alternative. See Section 5.1 for more information on these two modeling results.

NA = not applicable

Sources: WSDOT 2009e, U.S. 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 to result with the project, nor did it account for changes in fuel efficiency standards for future vehicles. Therefore, the conclusions are conservative (i.e., they are likely to overstate actual energy consumption). 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 the Preferred Alternative and Options A, K, and L would likely lead to a greater decrease in fuel consumed than what is presented in Table 5.9-1. That decrease would be consistent across the Preferred Alternative and the SDEIS options.

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.

Options A, K, and L

In the SDEIS analysis, the annual VMT across SR 520 under the 2030 No Build Alternative was 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 Options A, K, and L, the VMT across SR 520 is expected to be lower than under the No Build Alternative because of the same factors as the Preferred Alternative (reduction in VMT and addition of HOV lanes).

Effect of Suboptions

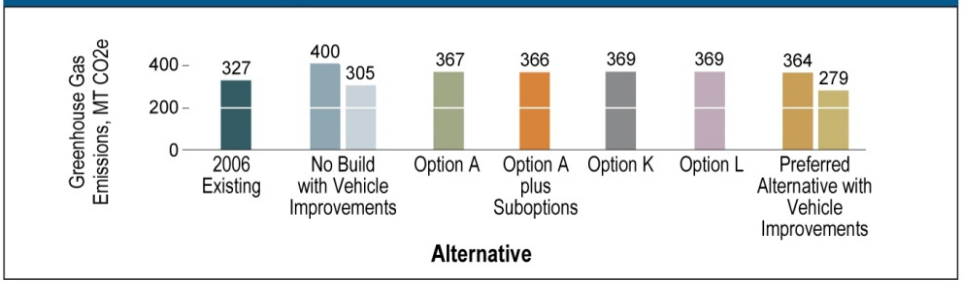
- Adding the potential suboptions to SDEIS Option A, K, or L could result in minor changes to the energy effects described above, based on estimated vehicle miles traveled, traffic operations, and the expected mix of vehicles. However, the relative effects of the three options would still be similar.

What effect would the project have on greenhouse gas emissions?

Corridor Analysis

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. The peak periods were used for comparison because they are the most congested times of day. The Preferred Alternative's operational emissions are comparable to the emissions from Options A, K, and L. In fact, the Preferred Alternative and all of the build options have essentially equal operational GHG emissions (the differences in the findings fall within a statistical margin of error and are negligibly different).

Exhibit 5.9-1. Weekday Peak Period Greenhouse Gas Emissions



Since the SDEIS was prepared, modeling tools have been updated to include the Corporate Average Fuel Economy (CAFE) standards currently in law (light duty fuel economy improvements between 2011 and 2016). To better understand the emissions associated with this project, the updated No Build Alternative and the Preferred Alternative were analyzed both with and without the updated CAFE standards as seen in Exhibit 5.9-1. In all

cases, regardless of option, the project would reduce emissions of GHG in the SR 520 corridor by almost 10 percent.

Effect of Suboptions

- Adding the potential suboptions to SDEIS Option A, K, or L would likely result in only minor changes to the GHG emissions effects described above since construction methods, materials, and costs would not be substantially altered. So adding the suboptions would yield approximately the same relative effects for the three options.

Sub-regional Analysis

In order to better understand the effects of the project on the greenhouse gas emissions, a sub-regional analysis was done for the Preferred Alternative and Updated No Build Alternative in addition to the corridor analysis. This additional analysis was not conducted for Options A, K, and L and their No Build Alternative since the findings from the corridor analysis above for all options including the Preferred Alternative were so similar.

A sub-regional analysis was also conducted for the Preferred Alternative in order to capture the potential for vehicle trip diversions away from SR 520 due to tolling. As shown in Exhibit 5.9-2, the study area included roads north and south of the SR 520 corridor. The sub-regional study area is based on daily average travel data from the PSRC travel demand model. Specific emission factors were generated using EPA's MOVES10a model.

As Exhibit 5.9-3 shows, the 2030 No Build Alternative and Preferred Alternative would both produce about 20 percent more emissions than the existing conditions. The vehicle miles traveled in this area would increase correspondingly. The difference between the Preferred Alternative and No Build Alternative is not discernible for either emissions or VMT.

How does the project relate to statewide greenhouse gas reduction goals?

In 2008, Washington State established statewide greenhouse gas reduction goals to reduce emissions to:

- 1990 levels by 2020
- 25% below 1990 levels in 2035
- 50% below 1990 levels in 2050

Exhibit 5.9-2. **Sub-regional Study Area Map for Greenhouse Gas Emissions**

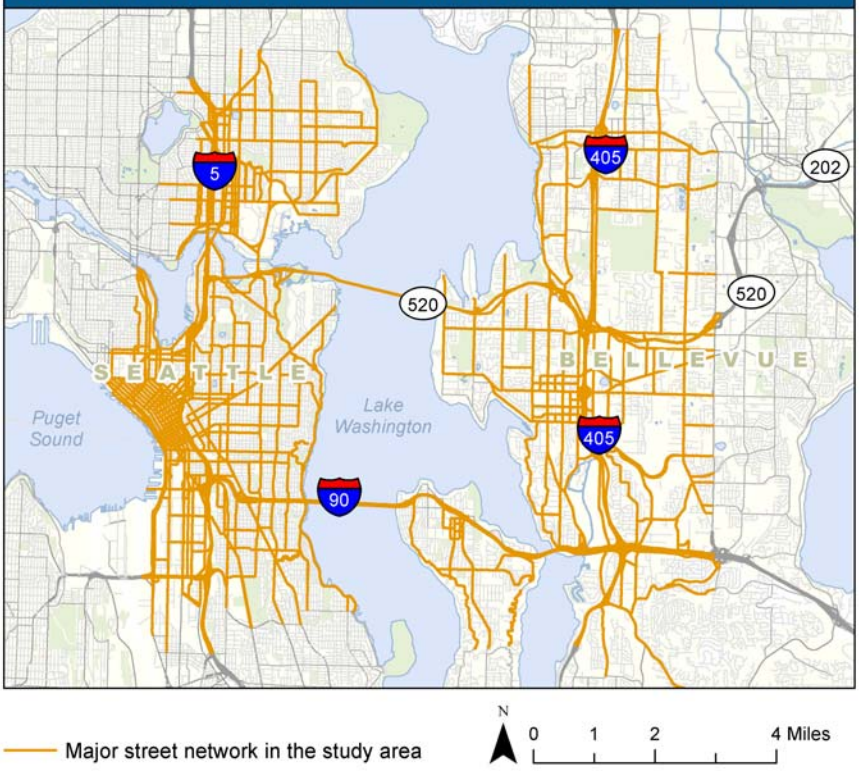
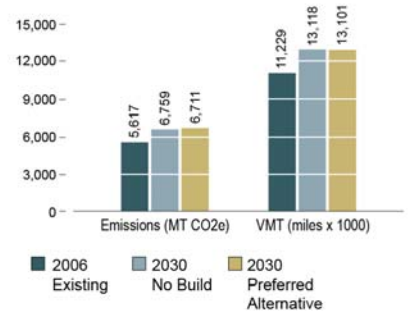


Exhibit 5.9-3. **Sub-regional Daily Emissions and VMT**



The state has not apportioned the goals to specific sectors such as transportation, electricity use and generation, or industrial sources. Achieving statewide greenhouse gas emissions targets will require reducing emissions from all sources.

Reducing transportation sector greenhouse gas emissions requires a systems approach to reduce inefficient movement of people, goods, and services over a variety of travel modes, geographic areas, and economic and social activities. WSDOT is working with regional and local jurisdictions and other interested parties to develop and implement strategies to reduce emissions throughout the state. For more information about recent work on statewide transportation greenhouse gas emissions, please see the WSDOT 2010 Sustainable Transportation report (available at: http://www.wsdot.wa.gov/SustainableTransportation/report.htm).

What indirect effects would the project likely have on energy consumption and greenhouse gas emissions?

In general, operation of the project would reduce energy consumption and GHG emissions over the No Build Alternative within the SR 520 corridor, Within the subregion, however, the alternative chosen for SR 520, would not affect greenhouse gas emissions. The addition of HOV lanes as part of the corridor system and a regional bike path would be consistent with the Governor's Executive Order 09-05, which includes direction to WSDOT to

continue developing GHG reduction strategies for the transportation sector. Therefore, no negative indirect effects are expected.

What has been done to avoid or minimize negative effects?

Because energy use and GHG emissions depend on the number of vehicles traveling on the roadway and their fuel efficiency, steps to improve travel efficiency on SR 520 would reduce GHG emissions within 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 (see Section 5.1).

WSDOT and its transportation partners will continue to work to reduce GHG emissions from the transportation sector throughout the state, including the SR 520 corridor. Examples of measures to reduce GHG emissions include providing alternatives to driving alone (such as carpooling, vanpooling, and transit); developing transportation facilities that encourage transit, HOV, bike, and pedestrian modes; supporting land use planning and development that encourage such travel modes (such as concentrating growth within urban growth areas); and optimizing system efficiency through variable speeds and tolling.

5.10 Water Resources

This section examines the potential effects of the project operation 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 2009 Water Resources Discipline Report and the Water Resources Discipline Report Addendum and Errata 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 best management practices (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 for the Preferred Alternative and the SDEIS options 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 to be treated is a function of the design storm, and the area of impervious surface on which rain falls.

Highway stormwater management 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

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?

The Preferred Alternative and the SDEIS options would increase pollutant-generating impervious surface (PGIS) areas compared to the No Build Alternative because of their wider roadways and bridges. The Preferred Alternative and the SDEIS options have different road profiles that require different designs to convey the stormwater to the treatment facilities. The facilities were located to meet those conveyance needs. The treatment facilities were sized to meet the Highway Runoff Manual (HRM) requirements for the Preferred Alternative and the SDEIS options, with individual variations for each design.

The pollutant-loading analysis conducted for the Preferred Alternative includes a refinement to address the effect of highway lids. The analysis of Options A, K, and L in the SDEIS did not account for any rainfall slanting onto the roadways under each highway lid. The Preferred Alternative analysis evaluated both the original assumption (referred to herein as Lid Scenario 1) that rain would fall straight down around the outside of the lid, and an alternative assumption (Lid Scenario 2) that rainfall could fall at an angle and wash pollutants off a greater roadway surface underneath the lid. Lid Scenario 1 includes the entire SR 520 roadway, but does not include the areas above SR 520 associated with the landscaped lids at 10th Avenue East and Delmar Drive East and in the Montlake area. Lid Scenario 2 includes both the SR 520 roadway areas and the areas under these two lids, to the extent that rain falling at an angle of 30 degrees would be able to wash pollutants off these surfaces and into the stormwater conveyance and treatment system. The amount of existing untreated PGIS is the same for Lid Scenario 1 and Lid Scenario 2, but less than the future treated PGIS. Overall, both lid scenarios result in a lower total amount of future treated PGIS for the Preferred Alternative than for any of the SDEIS options (Table 5.10-1).

DEFINITION

Pollutant-generating impervious surface (PGIS) is impervious surface that is a source of pollutants in stormwater runoff. Study area PGIS includes roadways that receive direct rainfall, or the run-on or the blow-in of rainfall.

KEY POINTS

The Preferred Alternative and all options evaluated in the SDEIS would increase the amount of pollutant-generating impervious surfaces in the project area (Preferred Alternative – 37 percent increase, Option A – 35 percent increase, Option K – 45 percent increase, and Option L – 44 percent increase).

Changes to some of the treatment facility types for the Preferred Alternative compared to the SDEIS options would not change the pollutant-loading estimates or the environmental effects described in the SDEIS.

The pollutant-loading analysis was refined for the Preferred Alternative to look at the effects of PGIS at the portals of the proposed lids.

By including stormwater treatment in the Preferred Alternative design, the project 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* in several areas of this project.

Table 5.10-1. Pollutant-Generating Impervious Surface

	Preferred Alternative[a]				
	Lid Scenario 1	Lid Scenario 2	Option A	Option K	Option L
Existing Untreated	66.4	66.4	57.5	64.2	60.4
Total Future Treated[b]	73.4	68.5	77.5	93.3	87.0
% Total Future Treated	100%	100%	100%	100%	100%

[a] See text for explanation of lid scenarios.
[b] See the Water Resources Discipline Report and Errata in Attachment 7.

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.

Table 5.10-2. Comparison of Stormwater Treatment by Threshold Discharge Area

		Preferred Alternative		SDEIS Options	
	TDA	Proposed Facility	Level of Treatment	Proposed Facility	Level of Treatment
Lake Washington	7	Biofiltration swale	Basic	Biofiltration swale, media filter vault	Basic
	8	Emerging technology best management practice (AKART)[a]	Basic	Emerging technology best management practice	Basic
	9	Constructed stormwater treatment wetland	Enhanced	Constructed stormwater treatment wetland, media filter vaults	Enhanced
Union Bay	10	Constructed stormwater treatment wetland, biofiltration swale	Enhanced/ basic	Constructed stormwater treatment wetland	Enhanced
Portage Bay	11	Constructed stormwater treatment wetland	Enhanced	Constructed stormwater treatment wetland	Enhanced
	12	Constructed stormwater treatment wetland	Enhanced	Constructed stormwater treatment wetland	Enhanced
	13	Biofiltration swale	Basic	Constructed stormwater treatment wetland	Enhanced
Lake Union	14	Biofiltration swale	Basic	Constructed stormwater treatment wetland, media filter vaults	Enhanced

[a]AKART = all known, available, and reasonable technologies

Lake Union

For the Preferred Alternative, a single biofiltration swale (basic treatment BMP, facility P) would convey treated stormwater from TDA 14 to Lake Union via an existing stormwater outfall located at Allison Street (Table 5.10-2 and Exhibit 5.10-1).

For the SDEIS options, 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 be a treatment wetland (an enhanced treatment BMP), while facilities Q and T would use media treatment vaults (a basic treatment BMP).

Portage Bay

For the Preferred Alternative and the SDEIS options, the stormwater design would discharge treated stormwater from three TDAs (11, 12, and 13) to Portage Bay through two existing outfalls—one on the eastern shoreline of Portage Bay and the other on the western shoreline (Table 5.10-2 and Exhibit 5.10-1). For the Preferred Alternative, however,

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

stormwater from TDA 13 would be treated with a biofiltration swale (facility O, basic treatment BMP) prior to discharge at the western shoreline. This is in contrast to the stormwater treatment wetland identified for the SDEIS options. This change is a result of the Preferred Alternative's smaller project footprint, which would yield less space for stormwater treatment in this area, and from site constraints such as steep slopes and proximity to Lake Washington. For the Preferred Alternative and the SDEIS options, stormwater from TDAs 11 and 12 would be treated by means of individual constructed stormwater treatment wetlands and then discharged to Portage Bay on the eastern shoreline (Table 5.10-2 and Exhibit 5.10-1).

Union Bay

In TDA 10, stormwater facilities for the Preferred Alternative (M and U) would be a constructed stormwater treatment wetland and a biofiltration swale, respectively. The Preferred Alternative would not include the media filter vaults described for the SDEIS options (see Table 5.10-2 and Exhibit 5.10-1). The SDEIS options would discharge treated stormwater to Union Bay by improving or replacing an existing City of Seattle outfall in TDA 10 (see Exhibit 5.10-1). The Preferred Alternative would add a new discharge location south of the existing outfall that was not previously described for the SDEIS options.

The proposed treatment for TDA 9 under the Preferred Alternative is most similar to SDEIS Option L, where stormwater along the west approach would be conveyed to a stormwater treatment wetland (facility M) and then discharged to Union Bay.

Lake Washington and the Floating Bridge

Stormwater on the floating bridge, which makes up TDA 8, would be treated in the same manner for the Preferred Alternative and all the SDEIS options, as detailed in two AKART ("all known, available, and reasonable technologies") studies (WSDOT 2009k, 2009l).

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 the AKART analyses to evaluate the technologies that could be applied in the bridge setting (WSDOT 2009k, 2009l).

After application of a set of screening criteria, the AKART analyses determined that the most effective stormwater treatment technology would be high-efficiency sweeping of the paved roadway in conjunction with

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 described in the SDEIS for Options A and K would create low points along the roadway that would make stormwater movement more difficult and potentially more costly.

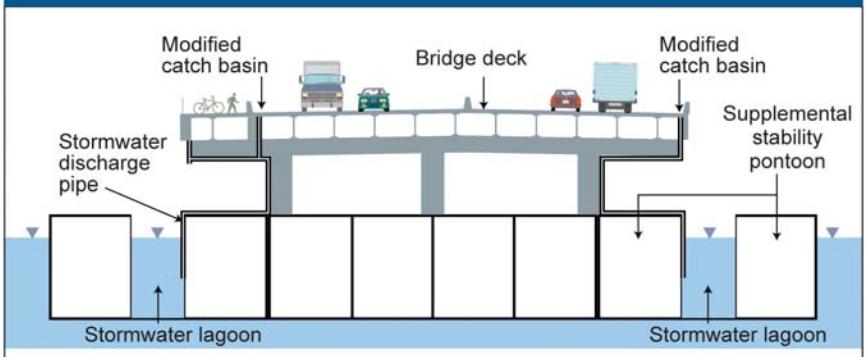
The profile identified for the Preferred Alternative provides for enhanced water quality treatment by working with gravity to move stormwater to the Montlake treatment facility. No pumping would be required, and the current design would enhance water quality runoff discharged to the fish migratory corridor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

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.

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 proposed 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 remaining pollutants prior to mixing with lake waters beneath the bridge. Ecology has reviewed and has conditionally approved the AKART studies (Fitzpatrick 2010). As part of the approval conditions, WSDOT will develop and implement a Department of Ecology approved monitoring program to verify the effectiveness of the treatment technologies.

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



Note: Stormwater discharges into the lagoon through an 8-inch or larger pipe.

Eastside

Under the SDEIS options, stormwater treatment for TDA 7 (Eastside transition area in Medina) would use a biofiltration swale and a media filter vault to treat stormwater before discharging to Lake Washington (Exhibit 5.10-3). Under the Preferred Alternative, stormwater in TDA 7 would be treated only with a biofiltration swale (basic treatment BMP, facility K). This treatment facility would not require flow control because it would discharge to Lake Washington.

Under the SDEIS options, stormwater also would discharge to Fairweather Bay and would be treated using a constructed wetland to enhance water quality. Under the Preferred Alternative, this stormwater also would be routed for treatment by an existing constructed wetland to achieve basic water quality treatment.

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.

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.

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.

How would the project stormwater treatment system affect water quality?

The Preferred Alternative and the SDEIS options 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.

Stormwater discharges by the Preferred Alternative to 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.

The patterns of net changes in pollutant loads would be generally the same for the Preferred Alternative as for the three SDEIS options. For the entire study area, the Preferred Alternative and the SDEIS options show a predicted net reduction for all five stormwater pollutants—total suspended solids (TSS), total zinc, dissolved zinc, total copper, and dissolved copper—compared with the No Build Alternative (Table 5.10-3). The differences in net reduction between the Preferred Alternative and the SDEIS options are slight, with either Option A, K, or L showing the greatest reduction in pollutant load for each evaluated pollutant. Overall, the Preferred Alternative would have a somewhat lower net reduction in pollutant load for TSS, total and dissolved zinc, and total copper than any of the three SDEIS options. This is because the Preferred Alternative would treat less existing PGIS than Options A, K, and L due to the smaller footprint and lesser amounts of existing PGIS to be disturbed in the Preferred Alternative. Project-wide, the net reduction in dissolved copper was essentially the same for the Preferred Alternative and the SDEIS options, with Lid Scenario 2 having the greatest reduction in dissolved copper of all the alternatives evaluated.

How would the project affect groundwater?

The increased impervious surface associated with the Preferred Alternative and the SDEIS options 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 Preferred Alternative and the SDEIS options 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.

Exhibit 5.10-3 **Proposed Stormwater Management Facilities in Eastside**

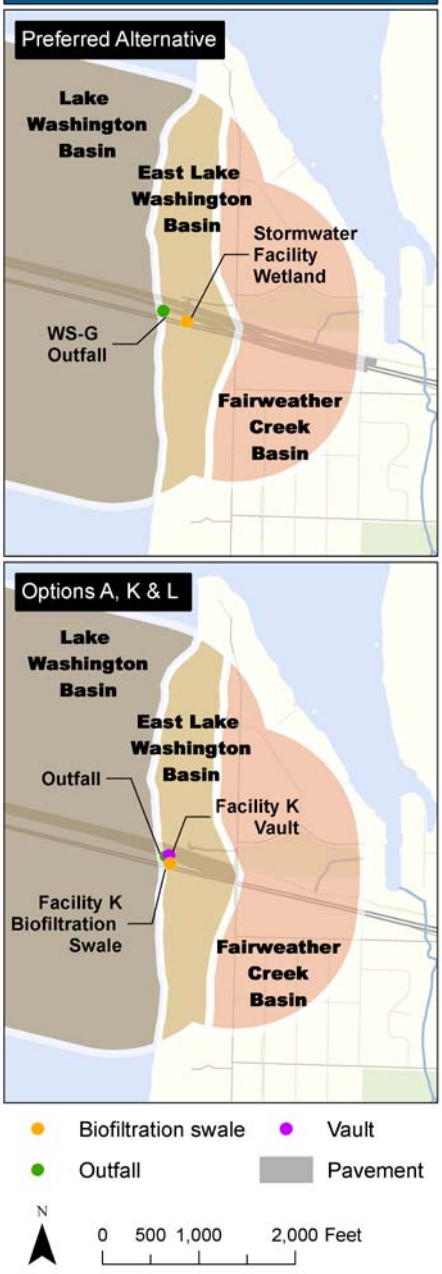


Table 5.10-3. Net Changes in Pollutant Loads between Pre- and Post-project Conditions (pounds)

	TSS	Total Zinc	Dissolved Zinc	Total Copper	Dissolved Copper
Preferred Alternative – Lid Scenario 1	-24,611.5	-34.8	-5.94	-5.4	-0.2
Preferred Alternative – Lid Scenario 2	-24,848.0	-36.0	-6.78	-5.6	-0.4
Option A	-29,013.0	-41.6	-7.5	-6.5	-0.3
Option K	-32,074.0	-44.5	-7.0	-6.8	-0.1
Option L	-30,204.0	-42.1	-6.8	-6.4	-0.2

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 the Preferred Alternative and the SDEIS options.

The bridge maintenance facility under the east approach would be constructed and operated in an area of high groundwater pressure. A long-term dewatering program could be used to maintain reduced pressures in the vicinity of the facility. The amount of water that might be removed as a result of the dewatering program would be small compared to the overall groundwater in the area.

What indirect effects would the project likely have on water resources?

WSDOT expects that the project would not violate state water quality standards during its long-term operation. The improved highway infrastructure, including improved stormwater treatment facilities, would reduce pollutant amounts in stormwater runoff relative to the paved surfaces that exist on SR 520 now. The improved stormwater treatment associated with the project could have slight direct or indirect beneficial effects on water quality. There would be no adverse indirect effects associated with the operation of stormwater quality treatment facilities as part of the project action.

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

Permanent negative effects of the Preferred Alternative and the SDEIS options would be avoided by including stormwater treatment facilities as part of the project. Overall, the facilities provided by the Preferred Alternative would achieve a net reduction of pollutant-loading levels to receiving water bodies in the study area. In addition, the overall footprint of the Preferred Alternative is smaller than any of the SDEIS options, and as

such, disturbs a smaller amount of existing PGIS. Only the amount of disturbed existing PGIS is treated in the Preferred Alternative, so that accounts for the lesser amount of existing PGIS to be treated.

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

Although the Preferred Alternative and the SDEIS options would increase the amount of land covered by impervious surface in the study area, WSDOT would offset this by treating a comparable amount of existing untreated impervious area. Because the size of the treatment facilities are based on the volume of water being discharged from the TDA acreage would be greater for LID Scenario 1, the capacities of the treatment facilities was based on this scenario In addition, the Preferred Alternative would meet all applicable water quality standards and effects on groundwater are negligible. Therefore, no unavoidable negative effects are expected to result from the project.

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 2009 Ecosystems Discipline Report and the Ecosystems Discipline Report Addendum and Errata (Attachment 7) provide a detailed technical discussion on the potential effects of the project.

How would the project affect wetlands?

KEY POINT

The Preferred Alternative and the SDEIS 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. The Preferred Alternative would shade the most wetland and Option L would shade the most wetland buffer.

Filling a wetland or altering its vegetation by shading 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 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 in the project area. Some of the shoreline habitat functions provided by wetlands would be lost.

The Preferred Alternative and the SDEIS options would reduce the availability and quality of wetland and wetland buffer habitat. Most effects would occur in 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 Washington Department of Ecology's (Ecology's) wetland rating system (Hruby 2004).

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 coordinated 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. 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 occurred in early 2011.

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 reflected in the table, the Preferred Alternative and Option A 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, with some fill resulting from stormwater facilities. The fill footprint for Option K would be larger due to the depressed single-point urban interchange (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 among the Preferred Alternative and the SDEIS 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. These shade effects were a concern to regulatory agencies and the Muckleshoot Indian Tribe because they would result in wetlands that would function less effectively than undisturbed wetlands. This loss of function was determined by these agencies and the tribe to require mitigation, as described in the section entitled *What mitigation is proposed for effects that are not avoidable?*.

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

	Portage Bay Area		Montlake Area		West Approach Area		Total Effects	
Option	**Fill**	**Shading**	**Fill**	**Shading**	**Fill**	**Shading**	**Fill**	**Shading**
Preferred Alternative								
Wetland	<0.1	0.4	<0.1	0.1	0.1	4.3	0.1	4.8
Buffer	-	0.1	0.2	0.1	0.4	0.9	0.7	1.1
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 fill less than 0.1 additional acre of wetland and 0.1 acre of buffer. 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 less than 0.1 additional acre of wetland in the Portage Bay area and west approach area, and less than 0.1 additional acre of buffer in the Portage Bay area.
[c] 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 in the Montlake area. It would shade less than 0.1 additional 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 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 increase the shaded area. Additional discussion of shading effects is presented in the 2009 Ecosystems Discipline Report (Attachment 7) and in the Conceptual Wetland Mitigation Plan (Attachment 9).

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

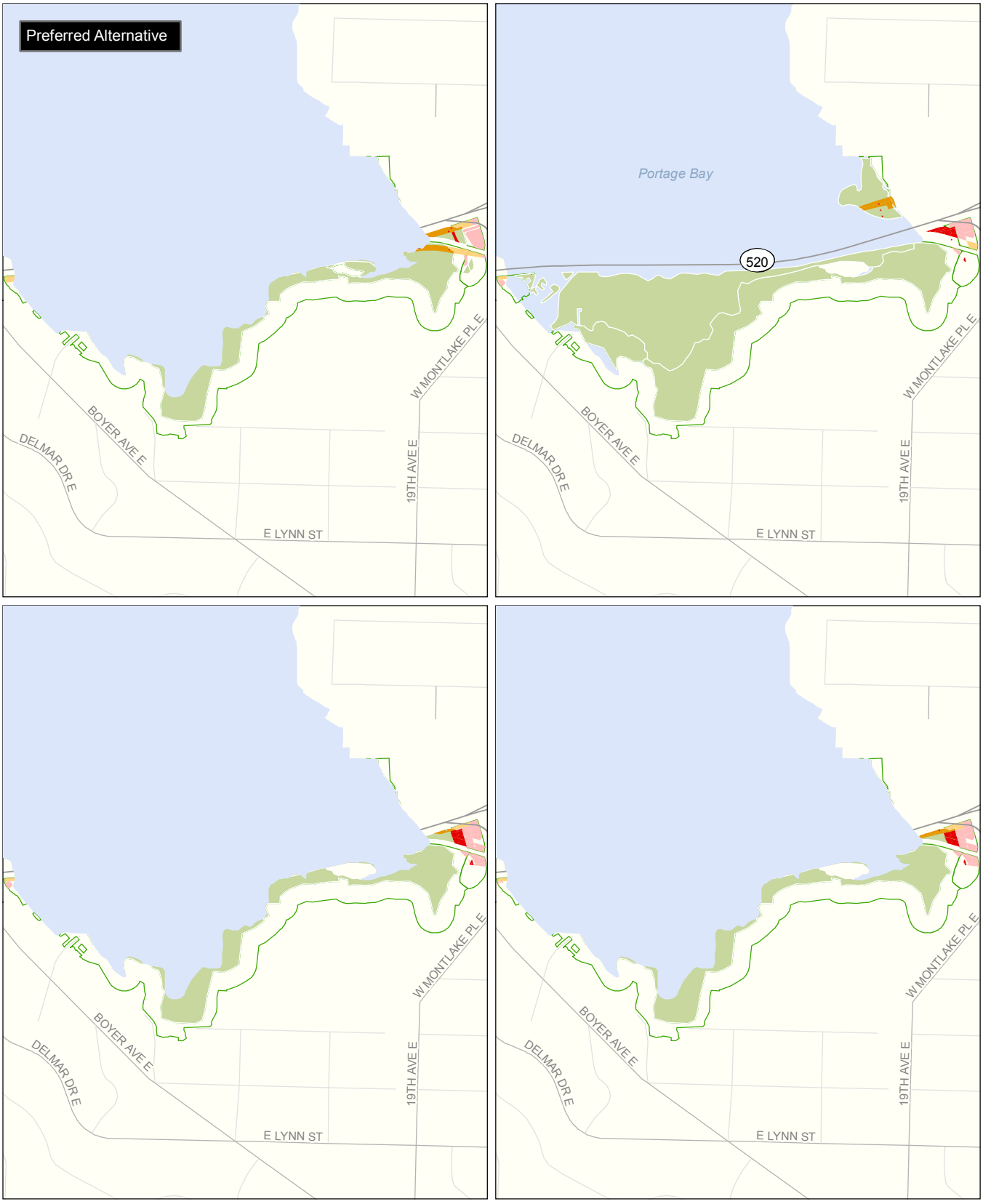
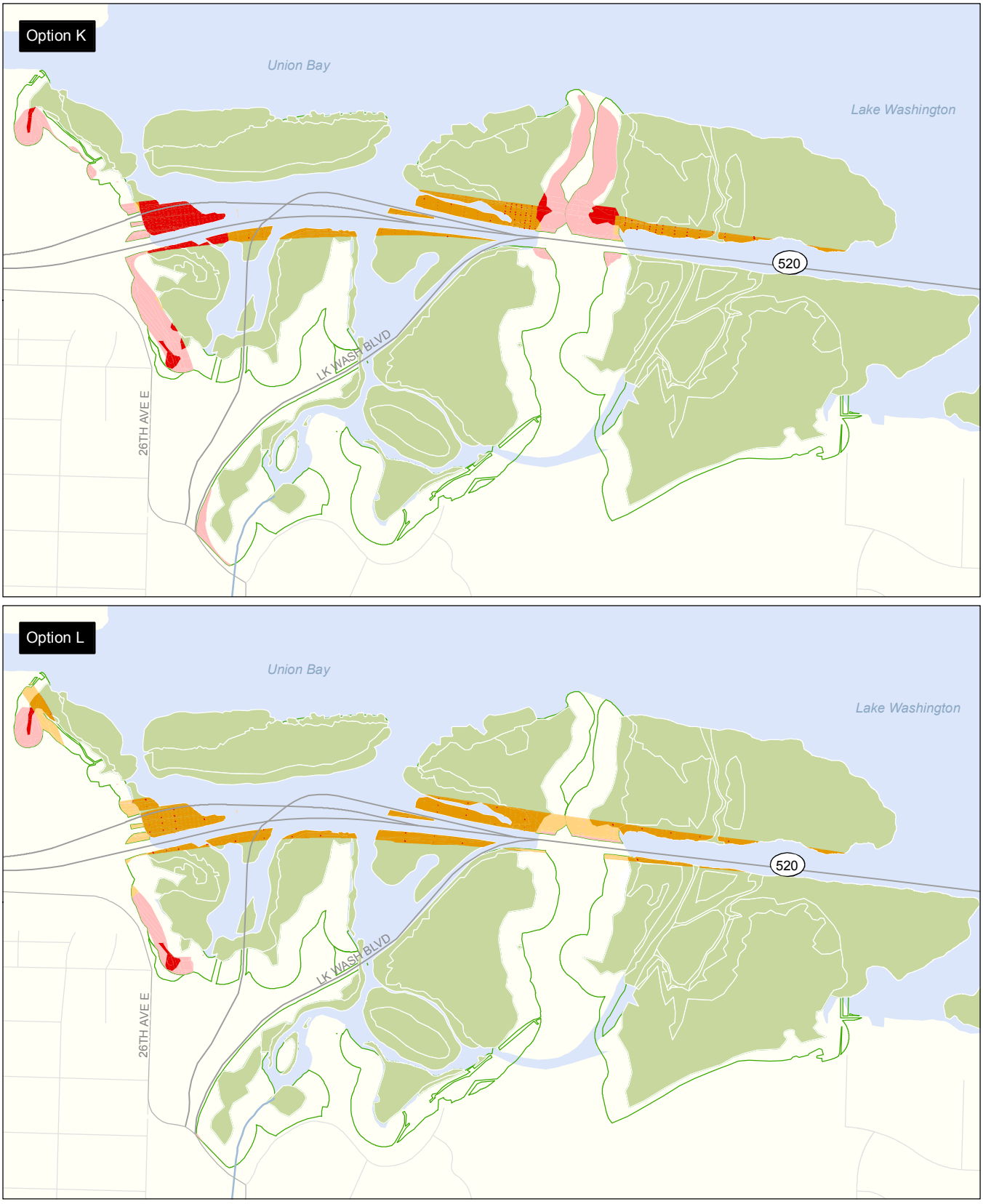


Exhibit 5.11-2. **Permanent Effects on Wetlands and Buffers in Lake Washington (Preferred Alternative and Option A)**

Exhibit 5.11-3. **Permanent Effects on Wetlands and Buffers in Lake Washington (Option K and Option L)**



In general, the operational effects from the Preferred Alternative are similar to those described for Option A. Table 5.11-1 and Exhibits 5.11-1, 5.11-2, and 5.11-3 show the permanent effects of the Preferred Alternative and SDEIS options on wetlands and buffers by geographic area.

Wetland effects in the Portage Bay Bridge area differ among the Preferred Alternative and the SDEIS options (see Table 5.11-1). While the effects of the Preferred Alternative are most similar to those of Option A, the design for the Preferred Alternative shifted the alignment to the south, and adjusted the overall width of the bridge in the middle and at the ends. This shifted the shading effects to a different wetland area within Portage Bay, but did not change the overall quantity of shading effect compared to Option A.

In the west approach area, the Preferred Alternative generally would be similar in design to Option A, but would be higher over land and water. The profile would be similar to but steeper than that of Option L, increasing at a constant slope from 12 feet above the water surface at the Montlake shoreline up to 48 feet at the west transition span of the floating bridge. The bottom of the bridge would be about 12 to 24 feet above the water through the Arboretum. The bridge would remain elevated over Foster Island, and would be 24 feet above ground on the west shoreline and 28 feet on the east shoreline.

The intensity of the shade cast by the structures would vary based on the height of the bridge. The intensity of shading of wetlands is expected to decrease as the structure increases in height. Where the bridge height is 24 feet or more, shaded areas would likely experience minimal changes in total vegetation cover except near the middle of the bridges (WSDOT 2009e). On the south side of the bridge, full sun and partial shade would extend northward under the bridge. Under the higher portions of the bridge, reflective and diffuse light would be sufficient to support plant growth. However, a change in vegetation composition could occur in some locations because of the reduced light. These effects on habitat functions have been qualitatively described; however, the entire area under the bridge was counted as shaded for the quantitative comparison of the Preferred Alternative to the SDEIS options.

Under the Preferred Alternative and all SDEIS options, the bridge structure through Union Bay would be wider than today (Exhibits 5.11-2 and 5.11-3). The gap between the eastbound and westbound structures would be wider than for Option A and the bridge structure for the Preferred Alternative would be farther south, resulting in more shading of wetlands for the Preferred Alternative than the SDEIS options. However, if any of the SDEIS options were identified as the Preferred Alternative, design refinements to better accommodate light rail would likely result in a similar increased effect.

How would the project affect fish resources?

The Preferred Alternative and the SDEIS options would create larger areas of reduced habitat function compared to existing conditions, primarily due to increased shading by the larger overwater structures. The Preferred Alternative and 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 the Preferred Alternative and the SDEIS options. About half of the overwater structures (25.9 acres) are associated with deep-water habitat (more than 30 feet deep) under the floating portion of the Evergreen Point Bridge (Table 5.11-2).

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
Existing Bridge and No Build	3.1	0.2	11.0	11.6	0.4	26.3
Preferred Alternative	5.3	0.3	17.1	25.9	1.3	49.9[a]
Option A	5.7	0.2	15.9	25.9	1.3	49.0[a]
Option K	4.6	0.0	16.8	25.9	1.3	48.6[a]
Option L	4.8	1.8	18.3	25.9	1.3	52.1[a]

[a] Includes between 2.3 and 3.7 acres of shading of aquatic bed wetlands within the aquatic environment. Effects on these resources and associated mitigation action are discussed in the Wetlands section of the Ecosystems Discipline Report Addendum and Errata in Attachment 7.

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 (WSDOT 2009c). 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 Preferred Alternative and the SDEIS 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, the depressed interchange included in Option K would lie below the high water elevation of the lake,

resulting in an aquatic fill rather than overwater shading (see the Ecosystems Discipline Report Addendum and Errata in Attachment 7 for more information).

The overwater structures would create differing intensities of shade, based on structure width and the height above the water surface. Table 5.11-3 compares the heights of the No Build Alternative, Preferred Alternative, and SDEIS options structures. Option K has the lowest profile along the alignment and a relatively wider overwater footprint, so it would have the highest intensity of shading effects on fish resources (even though the area of shading is less than other options). 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.

Table 5.11-3. Approximate Structure Height (feet) Above High-water Level

Location	Existing (No Build)	Preferred Alternative	Option A	Option K	Option L
Portage Bay					
West shoreline	50	55	58	58	58
Mid-point	10	30	27	27	27
East shoreline	8	18	17	17	17
Montlake					
Montlake Cut	35-46	35-46	35-46	0[a]	43-57
Union Bay					
West Arboretum shoreline	2.5	12	17	<0[b]	8
West Foster Island shoreline	6	24	25	<0[b]	13
West Approach					
East Foster Island shoreline	4	29	23[d]	<1	15
Mid-point[c]	4	36	8[d]	5	19
West highrise	44	45	50[d]	50	47
East Approach					
East highrise	55-64	70	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 the 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.

The Preferred Alternative and the SDEIS options all include support piers for permanent bridge structures. These piers would occupy a small amount of substrate and result in a loss of salmonid habitat, and at the same time may correspondingly increase habitat for predators. Table 5.11-4 shows the number of columns or other structures and the resulting habitat loss for the No Build Alternative, the Preferred Alternative, and the SDEIS options. Effects range from approximately 0.7 acre for Option A to 2.8 acres for Option K. The Preferred Alternative would result in approximately 0.9 acre of habitat loss from columns.

Table 5.11-4. Estimated Numbers of In-Water Concrete Columns for Portions of the Proposed Bridges and Area of Substrate Occupied

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
Preferred Alternative	50 15,200 sq/ft [a]	228 12,800 sq/ft	5 7,800 sq/ft [a]	283 41,000 sq/ft [a]
Option A	47 18,020 sq/ft [a]	187 5,290 sq/ft	5 7,800 sq/ft [a]	239 31,110 sq/ft [a]
Option K	42 17,850 sq/ft [a]	928 [b] 97,890 sq/ft [c]	5 7,800 sq/ft [a]	975 [b] 123,540 sq/ft [c]
Option L	48 18,160 sq/ft [a]	185 9,150 sq/ft	5 7,800 sq/ft [a]	238 35,110 sq/ft

[a] Area includes footings or shaft caps at the mud line supporting the columns.
[b] Columns range from 2 to 7 feet in diameter in Option K, while the other options range from 6 to 10 feet.
[c] 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.

Effects on tribal fishing could result from loss of access, from effects on fish habitat, and from potential effects on fish populations. These effects are discussed below under the West Approach Area and Lake Washington Area sections.

Portage Bay Area

Through Portage Bay, the Preferred Alternative would result in slightly less shading than Option A but more than Options K and L (see Table 5.11-2). Approximately 800 linear feet of structure on the west side of the new Portage Bay Bridge would be slightly higher than the existing structure; the remaining 1,200 linear-feet of bridge structure at the east end would be more than twice the height above water level of the existing bridge (see Table 5.11-3).

Montlake Area

The Preferred Alternative and Options A and L would involve construction of a new bascule bridge across the Montlake Cut. Because the Preferred Alternative and Option A bridges 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 Preferred Alternative and Option A bridge design would be about 7 feet narrower (53 feet wide) than the Option L bridge (60 feet wide). However, the Option L bascule bridge would be approximately 10 feet higher than the Preferred Alternative and Option A bridge designs. The bridges would not 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.

West Approach Area

In the west approach area, Option L would result in the largest area of overwater shading (see Table 5.11-2). As discussed earlier, shading effects are also dependent on the bridge height. For the Preferred Alternative, the proposed bridge would be higher above the water throughout much of the west approach than the existing bridge and the SDEIS options. Combined with the fewer (but larger) in-water columns, the higher bridge would allow greater amounts of light under the structure, effectively reducing the intensity of the overall shaded area and the shade edge. These reductions in shade intensity would minimize the effects of shade on fish and other aquatic species compared to the SDEIS options and existing conditions. The new bridge would be up to 32 feet higher than the existing bridge, with the greatest height difference in the area east of Foster Island, which is a primary migration route of juvenile salmonids.

Union Bay shoreline at Foster Island

The increased height and reduced shade of the Preferred Alternative, the reduced number of in-water structures compared to existing conditions, and the increased spacing between in-water structures would reduce overall habitat complexity. Because predator species use shade and structures to conceal themselves from their prey, these changes in the west approach bridge configuration would likely decrease the predation rates along the migratory corridor.

For Option K, the below-ground interchange configuration would result in filling a wedge of nearshore aquatic area, resulting in a permanent loss of approximately 2.7 acres of aquatic habitat. This is a substantially larger amount of aquatic fill than would be needed for support piles in the Preferred Alternative and Options A and L. Because wetlands are supported by Lake Washington rather than by groundwater, hydraulic conditions at the wetlands in Union Bay would not change. Under Section

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.

404(b)(1) of the Clean Water Act, which requires selection of the least environmentally damaging practicable alternative, the large in-water fill could result in difficulties in permitting Option K.

The increased bridge width and aquatic fill by in-water structures in this area would affect tribal fishing under the Preferred Alternative and the SDEIS options. Although less fishing takes place in nearshore areas, shading and loss of habitat could reduce fish use in the west approach area.

Results of SR 520 Fish Tracking Study

Fish react to the presence of overwater and in-water structures. Celedonia et al. (2008, 2009) 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. 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.

Lake Washington

The floating portion of the Evergreen Point Bridge would be the same for the Preferred Alternative and all the SDEIS options. It would be built over deep open-water habitat where bridge columns are not feasible. The Preferred Alternative bridge road surface would be approximately 10 feet higher than the existing bridge, and about 20 feet above the lake surface. The Preferred Alternative roadway height is about 10 feet lower than the SDEIS options, but this reduction is not expected to substantially affect

fish because only the superstructure would be different. The area of the floating bridge would be about 25.9 acres, which is the same as the SDEIS options (see Table 5.11-2).

As discussed above, fish react to the presence of overwater and in-water structures. Fish are expected to react similarly to the proposed bridge as to the existing bridge. However, the increased draft of the pontoons and the areas between the supplemental stability pontoons, as well as the greater overall width of the bridge, could affect fish use of the area near the bridge.

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 (175 feet versus 60 feet) when the supplemental stability pontoons are included (see Exhibit 2-23). The new floating portion of the bridge would be about 40 feet longer than the existing floating bridge (equivalent to less than 0.6 percent of the existing bridge). In addition, the pontoons would have a deeper draft (22 to 28 feet) below the surface of the water than the existing pontoons (8 to 14 feet). However, based on the relatively small magnitude of the increase and considering the overall lake volume, the increased size of the new pontoons would not be expected to substantially decrease the flow of wind-driven water past the floating bridge from the existing condition. The increased draft, in combination with the variable spacing of the supplemental stability pontoons along the longitudinal pontoons, could result in localized changes in water circulation patterns. The variable spacing between supplemental stability pontoons would produce 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 deepwater forage habitat for fish using the edge of the pontoons as cover.

The existing Evergreen Point Bridge impedes the movement of wind-driven Lake Washington surface water. The force of northerly or southerly winds tends to increase the height of the water slightly on the upwind side of the floating bridge, thus forcing a small movement of water under and around the ends of the bridge. 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 (WSDOT 2009f).

As discussed in Section 5.3, 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 develop appropriate mitigation measures. These measures will be documented in a separate agreement with the Muckleshoot Indian Tribe, which is expected to be completed in late 2011. See the Tribal Fishing section in Section 5.3 for information about this agreement.

Lake Washington Limnology and Fisheries

Users of the Evergreen Point Floating Bridge have noted that it acts as a floating breakwater, reducing or eliminating surface waves on the downwind side of the bridge. These observations created an interest in understanding how the proposed floating bridge might affect mixing of warmer surface waters with cooler subsurface waters in Lake Washington.

In response to these concerns, WSDOT conducted a follow-up study on this topic with regional experts on Lake Washington limnology and fisheries. This study provided more information on the potential effects on lake circulation from the deeper, longer, and wider floating bridge.

The study found that predicted effects on mixing of the surface and subsurface water layers are small compared to other natural processes, especially upwelling, and would not change existing Lake Washington conditions. These effects are not expected to change water temperatures in the surface layers nor influence salmonid temperature-dependent processes, including juvenile growth rates, adult energy depletion, or juvenile competition with other plankton-eating fish. A final report will be produced in 2011.

East Approach Area

Additional geotechnical studies in the area since the publication of the SDEIS found unsuitable lake bed substrate and upwelling along the shoreline, which resulted in a design change of the east approach bridge footings (see Geology and Soils Discipline Report Addendum and Errata in Attachment 7). The five in-water columns in this area would be supported by two mud-line footings, rather than each of the bridge columns being supported by individual drilled-shaft foundations. This design would displace about 7,800 square feet of substrate, compared to 450 square feet described in the SDEIS, and would likely increase the loss of potential sockeye spawning habitat in this area.

The new east approach for the Preferred Alternative and the SDEIS options would be higher than the existing structure by approximately 13 feet along most of its length. However, since the SDEIS was published, the structure design has been refined so that the eastbound and westbound lanes would be on separate structures with a gap between them. While this gap would increase the overall width of the east approach, it would allow increased light penetration, potentially decreasing the shading effects. It is not expected that the 70-foot-high bridge structure would create strong enough shade to affect the spawning of sockeye salmon, even if appropriate spawning conditions were present. This design would result in 1.3 acres of overwater shade for the east approach. This design refinement would apply both to the Preferred Alternative and to the SDEIS options (as reflected in Table 5.11-3) if one of those designs were ultimately selected.

Bridge Maintenance Facility

The design of the bridge maintenance facility and the dock would be the same for the Preferred Alternative and all the SDEIS options. The bridge maintenance facility could require dewatering to lower the local water table, or other structural features to maintain its proper operation. The draw down would be expected to be minor, however and not preclude or substantially degrade the quality of sockeye spawning habitat offshore. Located under the east approach, the bridge maintenance facility would consist of an upland facility and a dock extending approximately 100 feet offshore. The maintenance facility dock would add an overwater structure in the shallow nearshore environment, which could affect the migration and rearing behavior of juvenile salmonids in the area. It could also create habitat for smallmouth bass and other predators of juvenile salmonids. A small loss of bottom habitat would result from the dock support columns. To compensate for some of the potential effects on the nearshore habitat, the project would remove two existing residential docks nearby.

The dock design has been refined since publication of the SDEIS and would eliminate the wave barrier and all but two luminaires (overhead light stanchions). The wave barrier had been expected to cause some

redistribution of substrate material, which may have affected the spawning habitat. Reducing the number of luminaires minimizes the amount of incidental light reaching the water surface.

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 Endangered Species Act (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, the project is not expected to adversely affect overall salmonid populations or evolutionarily significant units in the watershed, as reported in the 2010 Biological Assessment (included in Attachment 18) and described in the following sections.

Of the state-listed and priority species of fish, only state candidate species occur in the project vicinity. All the state candidate species in the project vicinity also have federal designation and are discussed above.

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 salmon, steelhead, and other marine species) and the U.S. Fish and Wildlife Service (USFWS) (responsible for protecting bull trout). WSDOT has done extensive coordination with NOAA and USFWS on this project, including biweekly meetings and opportunities for review of analyses. WSDOT has prepared a Biological Assessment (Attachment 18) that evaluates effects on ESA-listed species in detail (Table 5.11-5). The Biological Assessment incorporates specific design information for the Preferred Alternative, along with descriptions of the potential effects of proposed construction techniques. The Biological Assessment was submitted to NOAA and USFWS in November 2010.

After reviewing the Biological Assessment, USFWS issued its Biological Opinion on April 15, 2011 (Attachment 18). It concluded that "the action, as proposed, is not likely to jeopardize the continued existence of the bull trout in its coterminous (or connected populations) range" and that "the

May Affect, Likely to Adversely Affect

May affect, likely to adversely affect (MALAA) represents an effects determination made under ESA. Where this designation is noted, the project may have direct or indirect adverse effects on a listed species, which are not discountable, insignificant, or entirely beneficial.

This beaver lodge near Foster Island is within the footprint of the project.

action, as proposed, will not destroy or adversely modify bull trout critical habitat." The biological opinion also contained mandatory terms and conditions intended to minimize certain adverse effects. The conclusions, take analysis, reasonable and prudent measures, and mandatory terms and conditions are included in the Biological Opinion.

The Biological Opinion from NOAA was issued in May 2011. The conclusions of the Biological Opinion are presented in Attachment 18.

Table 5.11-5. Potential Effects of the Project on Federally ESA-Listed Fish Species in the Study Area

Species	Federal Status	Suitable Habitat Existence	ESA Effects Determination[a]	Rationale for ESA Effects Determination
Bull trout (*Salvelinus confluentus*)	Threatened	Suitable habitat for foraging and migrating bull trout in Lake Washington and Puget Sound	MALAA[b]	Individual bull trout might be injured or harmed by habitat or water quality changes.
Chinook Salmon (*Oncorhynchus tshawytscha)*	Threatened	Suitable habitat for foraging, rearing and migrating Chinook in Lake Washington and Puget Sound	MALAA	Individual Chinook might be injured or harmed by habitat or water quality changes.
Steelhead (*Oncorhynchus mykiss)*	Threatened	Suitable habitat for foraging, rearing and migrating steelhead in Lake Washington and Puget Sound	MALAA	Individual steelhead might be injured or harmed by habitat or water quality changes.

[a] This determination is supported and documented in the November 2010 Biological Assessment for the SR 520 I-5 to Medina Bridge Replacement and HOV Project (Attachment 18).
[b] May Affect, Likely to Adversely Affect (MALAA)

How would the project affect wildlife and habitat?

The Preferred Alternative and the SDEIS options would affect wildlife by permanently removing vegetation and wildlife habitat, increasing shading, and decreasing noise disturbance from increased highway operations.

The new roadway would displace some high quality wildlife habitat, principally wetlands and forested uplands, in 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 5.11-6). Removing vegetation would reduce cover for urban-adapted species such as black-capped chickadees, American robins, and eastern gray squirrels. Option K would result in the greatest loss

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.

of wildlife habitat, mostly within the Urban Matrix and Parks and Other Potential Areas cover types (see Table 5.11-6). The Preferred Alternative would remove the least amount of vegetation, primarily in the Urban Matrix cover type (see Table 5.11-6). 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.

Table 5.11-6. Permanent Vegetation Removal by Cover and Habitat Type (acres)

	I-5 Area	Portage Bay Area	Montlake Area	West Approach Area	Floating Bridge Area[a]	Total
Preferred Alternative						
Parks and Other Protected Areas	0.1	<0.1	0.1	1.7	-	2.0
Open Water	-	<0.1	-	<0.1	-	<0.1
Urban Matrix	1.0	0.5	2.1	0.9	1.6	6.0
Total	**1.1**	**0.5**	**2.2**	**2.6**	**1.6**	**8.1**
Option A						
Parks and Other Protected Areas	0.1	0.2	0.1	1.7	-	2.1
Open Water	-	<0.1	-	<0.1	-	<0.1
Urban Matrix	1.4	1.8	2.5	0.8	2.7	9.2
Total	**1.6**	**2.0**	**2.6**	**2.5**	**2.7**	**11.4**
Option K						
Parks and Other Protected Areas	0.1	0.2	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
Total	**1.6**	**2.7**	**5.5**	**7.0**	**2.7**	**19.5**
Option L						
Parks and Other Protected Areas	0.1	0.2	1.4	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
Total	**1.6**	**2.7**	**2.5**	**1.3**	**2.7**	**10.8**

[a] Floating bridge area includes the east approach and Eastside transition areas for this analysis of wildlife habitat.
Parks and Other Protected Areas includes deciduous and/or coniferous trees, shrub/grass, and wetland.
Open Water includes wetland.
Urban Matrix includes deciduous and/or coniferous trees, shrub/grass, and wetland.

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 the Preferred Alternative or the SDEIS options would have minimal effects on bald eagles and peregrine falcons, since those that forage in the area are accustomed to the presence of traffic. The Preferred Alternative would remove a narrow swath of wetland and shoreline vegetation in the west approach area where these birds forage for prey. The effect on prey availability would be minimal, however, because this affected foraging area is small relative to the total foraging area for these species.

Typical habitat in the Urban Matrix cover type in the study area.

Vegetation would be shaded where the roadway (bridges and approaches) would be elevated, including through the Washington Park Arboretum. Under the Preferred Alternative, approximately 6.5 acres of vegetation would be shaded by new bridge structures, with about half of this area over wetlands (Table 5.11-7). Shading effects on wetlands are discussed in the *How would the project affect wetlands?* section above. The elevated roadway would also shade open water, but shading in open-water areas would likely have only a minor effect on wildlife. The effects of shading on open-water habitat are discussed in the *How would the project affect fish resources?* section above. Actual shading effects in individual areas would depend on roadway height in the area and existing vegetation cover.

Table 5.11-7. Shading from Operation by Cover and Habitat Type for Each Option (acres)

Area, Cover Type, and Habitat Type	Preferred Alternative	Option A	Option K	Option L
Parks and Other Protected Areas	1.1	0.2	0.3	2.0
Open Water	3.5	2.9	2.5	3.8
Urban Matrix	1.8	0.1	1.4	1.3
Total	**6.5**	**3.2**	**4.2**	**7.1**

Also of potential concern is shading of wetland habitat in the Parks and Other Protected Areas habitat cover type. Wetland habitat supports a high diversity of wildlife species. The increased height of the elevated roadway through the Washington Park Arboretum area for the Preferred Alternative and Options A and L would allow more incoming light beneath the structures and could stimulate more growth of shrubs and some trees than existing conditions.

KEY POINT

The Preferred Alternative and all SDEIS 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 from removal. Option L would have the largest habitat loss from shading.

Preferred Alternative

The Preferred Alternative would permanently remove approximately 8.1 acres of vegetation, mostly within the Urban Matrix cover type. The west approach area would have the most vegetation removed, followed by the Montlake area, floating bridge (bridge maintenance facility) area, and I-5

area, with Portage Bay area having the least vegetation removed. Less than 0.1 acre of this area filled would be wetland. In addition, approximately 6.5 acres of vegetation would be shaded, with 4.8 acres of this area over wetlands.

Option A

Option A would permanently remove approximately 11.4 acres of vegetation, mostly within the Urban Matrix cover type, spread relatively evenly among all areas—less than 0.1 acre of this area filled would be wetland. In addition, approximately 3.2 acres of vegetation would be shaded, with most of this area over wetlands.

Option K

Option K would permanently remove approximately 19.5 acres of vegetation, mostly within the Urban Matrix cover type, followed closely by Parks and Other Protected Areas, with most in the west approach area followed by the Montlake area. Of the 19.5 acres removed, 1.8 acres would be wetland. In addition, approximately 4.2 acres of vegetation would be shaded; of this area, 2.8 acres would be wetlands.

Option L

Option L would permanently remove approximately 10.8 acres of vegetation, primarily within the Urban Matrix cover type, spread somewhat evenly among the geographic areas. Of the 10.8 acres, less than 0.3 acre of wetland would be filled. In addition, 7.1 acres of vegetation would be shaded; of this area, 4.3 acres would be wetlands.

Lake Washington and Eastside Transition Areas

Since publication of the SDEIS, new information has resulted in design refinements to the bridge maintenance facility area. These refinements result in approximately 1.6 acres of vegetation removed for the bridge maintenance facility; this effect would apply to the Preferred Alternative as well as to SDEIS Options A, K, and L.

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 described above.

What indirect effects would the project likely have on wetlands, fish resources, wildlife, and habitat?

The wetlands assessment did not identify any expected indirect effects of the proposed project on wetlands. In addition, because of the project location, project effects on habitat would generally be limited to the lake and estuarine environments in the study area, not farther removed in distance, and would be consistent with those occurring from existing uses and activities. WSDOT did not identify any potential effect of the project on fish and aquatic habitat that would occur later in time than the project activity causing the effect. Therefore, the project is not expected to result in measurable indirect effects on fish and aquatic habitat.

What has been done to avoid or minimize adverse effects on wetlands, fish resources, wildlife, and habitat?

Consistent with regulatory guidance, WSDOT has designed the project to avoid and minimize the effects of the Preferred Alternative and the SDEIS options. Specific aspects of the design that have been incorporated to avoid and minimize effects on ecosystems are as follows:

- As discussed in Section 5.10, 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 roadway footprint has been minimized to the greatest extent possible over the course of project design to reduce impacts. For example, the cross-section of the floating bridge is 115 feet, compared with a 133-foot cross-section for the 6-Lane Alternative in the Draft EIS.
- The Preferred Alternative and Options A and L would include fewer bridge columns, spaced farther apart than the existing columns, to reduce impacts on wetlands, wetland buffers, and open waters. Fewer columns also help reduce potential habitat for salmonid predators.
- The existing Lake Washington Boulevard ramps and R.H. Thomson Expressway ramps would be removed, which would expose previously shaded areas. These ramps are mainly over upland or open water areas, as opposed to vegetated wetlands, but their removal would expose approximately 0.6 acre of previously shaded aquatic bed wetlands. In addition, 18 support columns (less than 0.1 acre of fill) would be removed.
- Although the elevated structures would be wider than existing structures, in many areas the bridges would be higher than they are today, 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. The Preferred Alternative has higher overwater structures than the SDEIS options, reflecting resource agency and tribal comments on the SDEIS and during the regulatory coordination process.

- The wave barrier for the maintenance facility dock was eliminated as part of design refinements for the Preferred Alternative in order to reduce potential effects on spawning habitat.

What mitigation is proposed for effects that are not avoidable?

Wetlands

Compensatory mitigation would for effects to wetlands be required for the Preferred Alternative and the SDEIS options. The information presented in this section is from the conceptual wetland and aquatic habitat mitigation plans, which are included as Attachment 9 to this Final EIS.

As described in Chapter 1, WSDOT engaged the regulatory agencies with jurisdiction over wetlands and aquatic habitat as well as the Muckleshoot Indian Tribe in the Natural Resources Technical Working Group (NRTWG) 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. The SR 520, I-5 to Medina project will provide compensatory wetland mitigation in five locations for the project's wetland effects. Four of the locations are onsite or close to the project, and one is located several miles from the project but in the same watershed. The five sites are as follows (see the Conceptual Wetland Mitigation Plan in Attachment 9 for details):

- Washington Park Arboretum Mitigation Site - Four individual potential mitigation areas were identified along Arboretum Creek south of East Foster Island Road.
- WSDOT Peninsula - This site consists of a large, WSDOT-owned peninsula extending northward from the Arboretum area into Union Bay. The area currently contains the Lake Washington Boulevard and R.H. Thomson Expressway ramps.
- Union Bay Natural Area - The Union Bay Natural Area is owned and managed by the University of Washington. It is directly north across Union Bay from the SR 520, I-5 to Medina project.
- Magnuson Park – Magnuson Park is owned by the City of Seattle and managed by the Seattle Parks and Recreation. The site is approximately 2.5 miles north of SR 520 near the Lake Washington shoreline.
- Cedar River Elliott Bridge Reach (offsite) - WSDOT would develop a floodplain restoration site along the Cedar River on land owned by King County.

The compensatory mitigation for the project is a comprehensive package designed to follow Ecology and U.S. Army Corps of Engineers' 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 was also designed to meet the mitigation sequencing, compensation, reporting, and monitoring requirements typically used in WSDOT projects.

The acreages of effect reported below are those developed for the Preferred Alternative during the NRTWG, reported in the Draft Conceptual Wetland Mitigation Plan, February 2011 (Attachment 9). All mitigation estimates are based on these quantities. These quantities were calculated using methods different from those used for the effects analysis conducted to compare NEPA alternatives and options as reported in Table 5.11-1. The reasons for this difference are:

- Since the SDEIS was published, WSDOT has developed more detail on project construction methods, resulting in more precise quantification of effects and required mitigation for the Preferred Alternative.
- Mitigation ratios for shade effects had not been concurred with by resource agencies and tribes at the time of the SDEIS, but were established in the NRTWG.

Table 5.11-8 summarizes the area of wetland effects 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 the five sites above. WSDOT will also add appropriate buffers to wetlands in the mitigation areas. If one of the SDEIS options is ultimately selected as the project proposal, a similar process would be followed to calculate the necessary mitigation.

Table 5.11-8. Wetland Effects and Required Mitigation for the Preferred Alternative of the I-5 to Medina: Bridge Replacement and HOV Project (acres)

Wetland Effect Category	Affected Area[a]	Mitigation Area[b]
Permanent Fill	0.3	1.7
Permanent Shading	4.3	7.8
Permanent Effect Subtotal	4.6	9.5

Note: Totals may not add up due to rounding.
[a] Wetland effect areas are based on the Draft Conceptual Wetland Mitigation Plan, February 2011.
[b] Mitigation areas are based on applying a modified standard ratio for rehabilitation (Ecology et al. 2006a). Mitigation using creation would be at approximately ½ of the area shown in this table, and mitigation using enhancement ratios would require twice the areas shown. Modified mitigation ratios were developed in consultation with and with the approval of the NRTWG at the NRTWG meeting 9/30/10.

Fish and Aquatic Resources

In cooperation with resource agencies and the Muckleshoot Indian Tribe through the NRTWG, WSDOT has developed 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. The Conceptual Aquatic Habitat Mitigation Plan is included in Attachment 9 to the Final EIS.

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.

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 will conduct specific mitigation activities at more than one location within the Water Resource Inventory Area (WRIA) 8 watershed. Several mitigation projects would be developed, including habitat restoration projects in Lake Washington, the Cedar River, and Bear Creek. The primary mitigation goal is 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 are proposed to include the following:

- Floodplain acquisition, levee setbacks, and off-channel habitat creation in a reach of the lower Cedar River (Cedar River/Elliott Bridge Reach) would improve channel, riparian, and floodplain functions, benefitting spawning, rearing, and migratory habitat for multiple species of salmonids.
- Restoring 3,000 linear feet of lower Bear Creek would benefit migratory and rearing habitat for multiple salmonid species. Construction of a new channel would increase stream complexity, habitat, and channel sinuosity. The new channel would include substantial increases in pool habitat, large woody debris density, and off-channel habitat. Substantial riparian and wetland restoration in the study area would also provide habitat value for multiple salmonid species and life history stages.
- Restoring the lower reaches and associated delta of a fish-bearing stream (Taylor Creek) in south Lake Washington would increase foraging and rearing opportunities for juvenile salmonids (e.g., Chinook) during their early life history, while also serving as shallow-water refugia from predation.
- Restoring a portion of currently bulkheaded shoreline habitat to a natural grade and enhancement of offshore substrates. These actions would occur within the project alignment (East Approach site) and would improve the quality of sockeye spawning habitat in the area, as well as enhancing nearshore and riparian conditions that support juvenile salmonids. In addition, two existing residential docks would be

removed to provide in-kind and onsite mitigation for effects associated with the proposed maintenance facility dock.

- Enhancing the Lake Washington shoreline at four discrete sites within Seward Park and three sites within Magnuson Park. The enhancements would occur through grading and beach resloping, nearshore bulkhead and debris removal, and substrate augmentation, as well as riparian habitat creation and enhancement. These actions would improve the quality of sockeye spawning habitat in the area, as well as enhancing nearshore and riparian conditions that support out-migrating juvenile salmonids.
- Enhancing the shoreline at the south end of Lake Washington (South Lake Washington Shoreline Restoration site), including grading and beach resloping, removal of an existing flume and rubble, restoration of riparian areas, and removal of existing mooring dolphins. These enhancements would directly benefit juvenile Chinook salmon exiting the Cedar River by providing rearing and feeding opportunities prior to continued out-migration through Lake Washington.

Wildlife and Habitat

WSDOT has coordinated with the City of Seattle, the University of Washington, Seattle Parks and Recreation, and the Arboretum Foundation in developing a planting strategy to offset the project's effects on regulated shoreline habitat under the City's shoreline management regulations. Many shoreline areas of Union Bay and the Montlake Playfield are not fully vegetated and/or contain invasive species. Some of these areas could be replanted with native trees and shrubs and the invasive species removed.

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 Addendum and Errata (Attachment 7).

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. The new structures proposed by the Preferred Alternative and Options A, K, and L would be far better able to withstand earthquakes than the existing structures. WSDOT has included 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 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.

KEY POINT

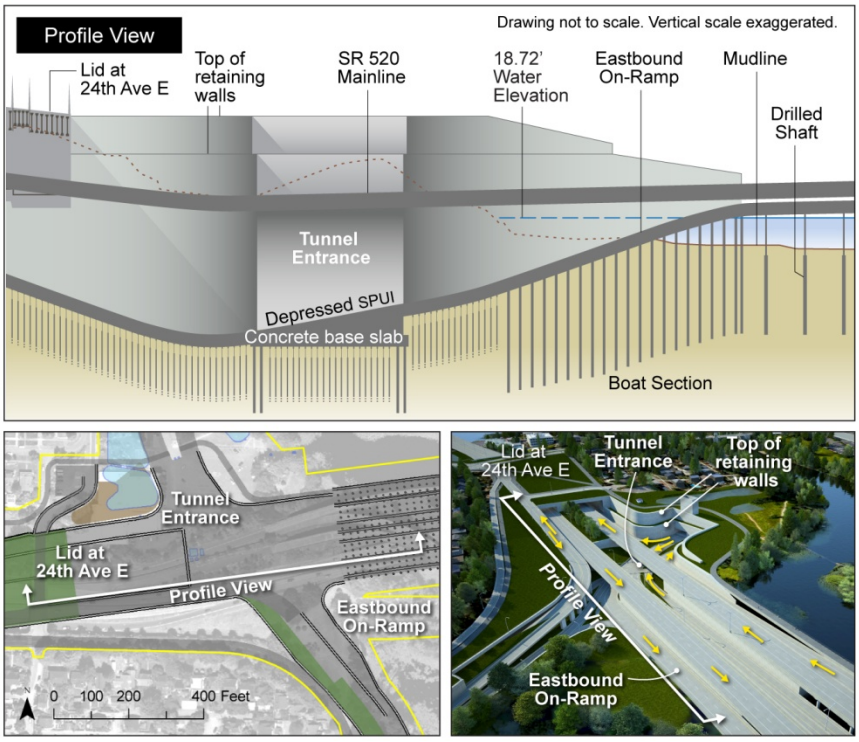
Geologic Hazards

As described in Chapter 4, the project area includes geologic hazards including steep slopes and soils that are prone to erosion and/or liquefaction. The project design would address these hazards by 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.

The Preferred Alternative and Options A, K, and L all have similar risks except in the Montlake and west approach areas where the depressed single-point urban interchange (SPUI) structures constructed under Option K would have some unique geologic considerations because portions of the roadway would be below the lake level (Exhibit 5.12-1). To prevent the roadway from floating, piles or tie-down anchors would be required to resist the buoyancy forces that would tend to cause the large structural slabs 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.

Although the below-water structures, including the tunnels, would be designed to be watertight, some leakage would likely occur, and an active

Exhibit 5.12-1. **Option K SPUI**



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 high-occupancy vehicle (HOV) direct-access ramp to Option A would result in no measurable differences in the geology and soils considerations and effects described above.
- 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 SDEIS 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 under that option 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 are the indirect effects of the project on geology and soils?

The geology and soils assessment did not identify any expected indirect effects of the proposed project on geology and soils in the study area.

What has been done to avoid or minimize negative effects?

The project 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 result in primarily beneficial effects related to the identification and remediation of sites that would occur during construction. In addition, the new stormwater facilities would operate to collect the currently untreated stormwater runoff. The information presented in this section is based on the Hazardous Materials Discipline Report Addendum and Errata (Attachment 7).

How could the project affect hazardous materials?

Transporting hazardous materials carries with it some risk to the driver and occupants of vehicles and others on the road. Spilled chemicals on a public roadway can also lead to expensive cleanups and traffic delays. The Washington Department of Ecology (Ecology) serves as the state's Incident Command for emergency spills and, as such, responds to spills within highway rights-of-way. The risk of spills is inherent in all transportation facilities, but can be minimized by designing these facilities to meet safety standards that reduce the risk of accidents. Operation of the SR 520, I-5 to Medina project is generally expected to reduce the potential for hazardous material spills through improved traffic flow and increased safety. The risk of spills would not vary substantially between the Preferred Alternative and Options A, K, and L.

KEY POINT

Hazardous Materials

Project operations would result in primarily beneficial effects tied to the identification and remediation of sites that would occur during construction. In addition, the new stormwater facilities would operate to collect the currently untreated stormwater runoff.

All transportation facilities pose the risk of vehicular fluid spills by the travelling public. The risk of spills would not vary substantially between the Preferred Alternative and Options A, K, and L.

During project operation, stormwater facilities would collect polluted runoff from traffic. This runoff may include fuels, lubricants, heavy-metal compounds from tires and brakes, and automobile-engine coolants (such as ethylene glycol). Currently untreated, this runoff would be treated using Ecology-approved best management practices (BMPs) during project operation. Section 5.10, Water Resources, includes more information on water quality treatment methods proposed for the project.

The bridge maintenance facility would store hazardous materials such as fuels, adhesives, cleaners, epoxies, propane, grease, lubricants, paints, and solvents. These materials would be used in the study area during maintenance activities. The risk of potential releases to the environment is considered low, because the amounts of each of these materials onsite would be small, in most cases a few gallons each, and spill prevention control, and countermeasures 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. WSDOT would comply with all applicable regulations regarding storage and spill containment for diesel fuels. Again, the risks of potential releases

to the environment would be low because spill pollution prevention measures would be implemented during the tank's design and operation.

Effects of Suboptions

- None of the suboptions for Options A, K, and L would result in any measurable differences in hazardous material effects compared to the options themselves.

What are the indirect effects of the project on hazardous materials?

The hazardous materials assessment did not identify any expected indirect effects of the proposed project on hazardous materials.

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. No negative effects are expected to occur as a result of project operation.

5.14 Navigation

When proposing changes to structures that cross Lake Washington, WSDOT 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 Addendum and Errata (Attachment 7).

How would the project affect navigation channels?

The project 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 the Preferred Alternative and 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.

KEY POINT

Navigation

Under the Preferred Alternative, the west transition span would be the same as under existing conditions, the draw span would be removed, and the east transition span would be 15 feet higher. Under Options A, K, and L, 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 44 feet would only be able to pass under the east transition span. The new bascule bridge under the Preferred Alternative and Options A and L would coordinate openings with the existing bridge and would not impose height restrictions.

Table 5.14-1. Changes in Navigational Restrictions in Lake Washington

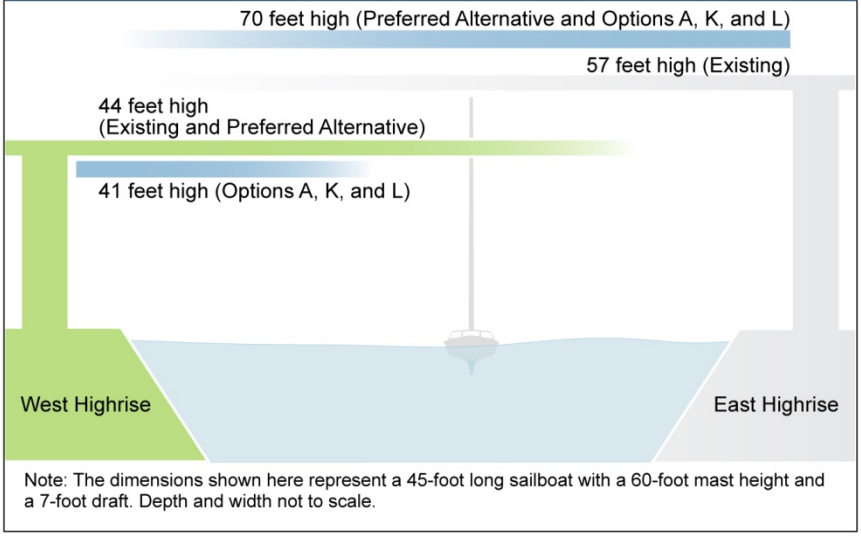
	Existing		Preferred Alternative		Options A, K, and L	
Bridge	**Width (ft)**	**Height (ft)**	**Width (ft)**	**Height (ft)**	**Width (ft)**	**Height (ft)**
New Montlake Bascule Bridge[a]	100	Drawspan	100	Drawspan	100	Drawspan
Evergreen Point Bridge						
West transition span	206	44	130	44	130	41
Mid span	200	Drawspan	Removed	Removed	Removed	Removed
East transition span	207	55 to 64	190	70	210	70

[a]Preferred Alternative and Options A and L only

The Preferred Alternative, like all the SDEIS options, would change the navigational channels under the Evergreen Point Bridge (see Table 5.14-1 and Exhibit 5.14-1). Under the Preferred Alternative, the west navigation channel would remain at its existing height. Under Options A, K, and L, the west navigation channel of the new Evergreen Point Bridge would be 3 feet lower. The only effect from the lower height under Options A, K, and L would be on boats with an overhead clearance of more than 41 feet and less than 44 feet, which 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.

Under the Preferred Alternative and Options A, K, and L, 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.

Exhibit 5.14-1. **Navigational Clearance with the Project**



Note: The dimensions shown here represent a 45-foot long sailboat with a 60-foot mast height and a 7-foot draft. Depth and width not to scale.

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 are the indirect effects of the project on navigation channels?

WSDOT did not identify any expected indirect effects of the proposed project on navigation in the study area.

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 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 Construction Phase 1: Floating Bridge and Landings

As previously discussed in Chapter 2, currently committed funding is sufficient to construct the Evergreen Point floating bridge and landings; a Request for Proposals has been issued for construction of this portion of the project, with proposals due in June 2011. Accordingly, this Final EIS discusses the potential for the floating bridge and landings to be built as the first phase of the SR 520, I-5 to Medina project. This portion of the project is referred to in the Final EIS as Construction Phase 1, or simply Phase 1. Construction Phase 1 differs from the SDEIS Phased Implementation scenario, which included the west approach and the Portage Bay bridge in the first construction phase.

To address the effects of Construction Phase 1, this section of the Final EIS summarizes the operational effects of the floating bridge and landings separately as a subset of the "full build" analysis. The evaluation is qualitative in nature, and assumes that the floating bridge and landings would be the only project components in operation until the rest of the project has been funded and built. Since all improvements needed for Phase 1 are within the overall footprint of the facilities to be provided by full buildout, the discussion on differences in effects focuses on the timing of construction rather than the extent of impacts.

The time frame for which only the Phase 1 improvements would be in place depends upon WSDOT's ability to fund full construction of the SR 520, I-5 to Medina project. This funding will be based on future revenues and economic conditions. For analysis purposes, in disciplines where a design year is used (e.g. transportation), Construction Phase 1 is evaluated based upon a design year of 2030, the same as for full buildout. This does not mean that Phase 1 is expected to be the only part of the project built by 2030; it simply provides a way to look at the effects of Phase 1 consistently with the effects of the full project, and also to compare it with the No Build Alternative.

Transportation

For the SDEIS Phased Implementation Scenario, WSDOT modeled traffic operations for 2030 using the following assumptions:

- Completion of the SR 520, Medina to SR 202 project
- A new 6-lane floating bridge (two general-purpose lanes and one inside high-occupancy vehicle (HOV) lane in each direction) Evergreen Point Road and the west transition span of the Evergreen Point Bridge
- Use of the existing four general-purpose lanes from the west transition span to I-5

Construction Phase 1 for the Final EIS assumes the same physical configuration for SR 520 as described above. As described in Section 5.1, the traffic modeling for the Final EIS has been updated to reflect new assumptions about regional population and employment growth and about the future transportation network. However, the traffic results from Final EIS Construction Phase 1 would be similar to those of the SDEIS Phased Implementation Scenario. In fact, traffic is likely to operate slightly better under Construction Phase 1 than under the SDEIS Phased Implementation Scenario, because the predicted travel demand for SR 520 is lower. Therefore, model results for the SDEIS Phased Implementation Scenario are presented in this section as a conservative estimate of the transportation performance of Construction Phase 1. To maintain consistency, these results are compared against the SDEIS No Build Alternative.

Morning Commute

Westbound

Volumes and Mode Share

Table 5.15-1 summarizes demand and throughput for the vehicles per hour and persons per hour for the westbound morning peak period. As noted above, the results for Construction Phase 1 would be similar to (although slightly less than) those shown for the SDEIS Phased Implementation Scenario.

Table 5.15-1. Westbound AM Peak Period Cross-Lake Vehicle and Person Trips

	Vehicles per Hour	Persons per Hour
2030 SDEIS No Build Alternative		
Demand	4,400	8,200
Throughput	3,900	7,600
2030 SDEIS 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 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 Construction Phase 1, 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. Because the new bridge would provide better sight distance and a longer taper than the existing merge point, it is likely that congestion would be somewhat less severe than under the No Build Alternative.

Travel Time

Under the SDEIS Phased Implementation Scenario, general-purpose travel times between I-5 and SR 202 were estimated to 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 assumed that the Medina to SR 202 project would be operational in 2030. 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. As noted above, the results for Construction Phase 1 would be similar to those shown for the SDEIS Phased Implementation Scenario.

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 SDEIS 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 Construction Phase 1 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

In general, the afternoon commute under Construction Phase 1 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

Table 5.15-3 summarizes the person and vehicle demand and throughput for the SDEIS No Build Alternative and the SDEIS Phased Implementation Scenario. As noted above, the results for Construction Phase 1 would be similar to (although slightly lower than) those shown for the SDEIS Phased Implementation Scenario, with traffic volumes remaining similar between Construction Phase 1 and the No Build Alternative.

Table 5.15-3. Westbound PM Peak Period Cross-Lake Vehicle and Person Trips

Alternative	Vehicles per Hour	Persons per Hour
2030 SDEIS No Build Alternative		
Demand	4,600	8,200
Throughput	3,800	6,700
2030 SDEIS 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 would occur with or without the project. 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 Construction Phase 1, the congestion point would move to the west end of the floating bridge where the HOV lanes merge into the 4-lane roadway. Although the congestion point would remain, the lane taper would be longer and sight distances would be better, allowing for improved traffic operations at the merge location compared to conditions at the current merge point.

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 SDEIS 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. As noted above, the results for Construction Phase 1 would be similar to those shown for the SDEIS Phased Implementation Scenario.

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 SDEIS 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

Table 5.15-5 summarizes the person and vehicle demand and throughput for the SDEIS No Build Alternative and the SDEIS Phased Implementation Scenario. As noted above, the results for Construction Phase 1 would be similar to (although slightly lower than) those shown for the SDEIS Phased Implementation Scenario.

Congestion Points

As described above, I-405 would be severely congested on both northbound and southbound lanes during the afternoon commute, with or without the project. 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 SDEIS No Build Alternative		
Demand	4,100	8,200
Throughput	3,600	7,000
2030 SDEIS 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.

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) under Construction Phase 1. Overall travel times for general-purpose and HOV lanes between I-5 and SR 202 would be similar t those for the No Build Alternative.

Land Use and Economic Activity

Construction Phase 1 would require an aquatic lands easement from the Washington State Department of Natural Resources for construction and right-of-way for the new Evergreen Point Bridge and new anchors placed in Lake Washington. It would also require the acquisition of two parcels on the Eastside totaling 1.2 acres (see Section 5.2). No structures would be removed during this first phase of construction. All other land use effects from right-of-way acquisitions in the I-5, Portage Bay, Montlake, and west approach areas would occur later in time as a result of full buildout.

In general, the benefits to businesses that would occur 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 with phased construction than if the entire project were built at one time.

Social Elements

Neighborhoods

Because Construction Phase 1 includes only the floating bridge and landings, the operational effects on community cohesion that benefit the Eastlake, North Capitol Hill, Portage Bay/Roanoke, University District, Montlake, and Madison Park neighborhoods would be delayed until full buildout. These benefits, along with improved transit service reliability from a continuous HOV lane on SR 520, would therefore be realized over a longer overall time period than if the project were built all at once (see Section 5.3).

Effects on Low-income, Minority, and Limited-English-Proficient (LEP) Residents

Construction Phase 1 would affect the usual and accustomed tribal fishing areas of the Muckleshoot Indian Tribe through replacement of the Evergreen Point Bridge. The new bridge would have a substantially wider footprint than the existing Evergreen Point Bridge and the alignment would be shifted north, permanently reducing access to existing tribal fishing areas

(see Section 5.3). Effects on tribal fishing for replacement of the Portage Bay Bridge would occur later in time as a result of full buildout; however, the bulk of tribal fishing in the project area occurs in Lake Washington, so the majority of the project effects would take place during Phase 1.

Tolling would also be implemented during Construction Phase 1. As described in Section 5.3, tolls would affect low-income bridge users more than the general population because the tolls would constitute a larger percentage of their income. Low-income people and those with limited English proficiency are also likely to face greater difficulties in participating in electronic tolling. In addition, social service providers that cross the bridge may also be affected in their ability to provide services. However, proposed transit enhancements in the SR 520 travelshed, along with extensive outreach to low-income and minority populations and service agencies, are expected to minimize the adverse effects of tolling to the extent that they are not disproportionately high and adverse.

Recreation

Construction Phase 1 would require no acquisition of park land. Acquisition of land from Bagley Viewpoint, Montlake Playfield, McCurdy Park, East Montlake Park, and the Arboretum would occur later in time, as would improved connectivity between and within park areas from pathways and landscaping on lids in the I-5 and Montlake interchange areas as a result of full buildout (see Section 5.4).

Visual Quality

Construction Phase 1 would result in operational effects on visual quality from changes in the scale and appearance of the replaced Evergreen Point Bridge in the Lake Washington Landscape Unit (see Section 5.5). Changes in the Roanoke, Portage Bay, Montlake, and west approach landscape units would occur later in time as a result of full buildout. The interim connection bridge would be visible to boaters and from more distant vantage points such as Laurelhurst, but would have a similar appearance to the existing west approach structures.

Cultural Resources

Construction Phase 1 would result in the demolition of the National Register of Historic Places- (NRHP) eligible floating bridge, as described in section 5.6. 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 occur later in time as a result of full buildout (see Section 5.6).

Noise

Construction Phase 1 would provide noise reduction benefits in the Medina neighborhood as a result of the noise walls included in the east approach area. The noise reductions predicted in the Portage Bay/Roanoke, North Capitol Hill, and Montlake neighborhoods and in the Washington Park Arboretum would occur later in time as a result of full buildout (see Section 5.7).

Air Quality

Air emissions under Construction Phase 1 would be similar to those under the No Build Alternative. Because of the introduction of cleaner fuels and new emissions standards requiring more efficient vehicle engines, air quality will improve in the future with or without the project. Slight improvements in air quality would occur later in time as a result of increased mobility under full project buildout (see Section 5.8).

Energy and Greenhouse Gases

Energy consumption and greenhouse gas emissions from Construction Phase 1 would be similar to the No Build Alternative. As with air quality, the introduction of cleaner fuels and new emissions standards requiring more efficient vehicle engines will reduce energy consumption and greenhouse gas emissions in the future, with or without the project. Slight reductions in energy consumption and greenhouse gas emissions would occur later in time as a result of increased mobility under full project buildout (see Section 5.9).

Water Resources

Construction Phase 1 includes building stormwater management facilities to treat the runoff in the Lake Washington, East Lake Washington, and Fairweather Creek basins, as described in Section 5.10. These facilities will reduce pollutant loading to Lake Washington and Fairweather Creek basins. The stormwater facilities in the Lake Union, Portage Bay, and Union Bay basins would be constructed as part of full buildout (see Section 5.10); hence, there would be a delay in achieving the water quality benefits provided by the project in these basins.

Ecosystems

Wetlands

Construction Phase 1 would result in no permanent effects on wetlands because there are no wetlands in the Lake Washington area or Eastside transition area (see Section 5.11). The majority of wetlands and buffers are in the Portage Bay and west approach areas and would be affected at the

time of full buildout. There are no wetlands in the I-5 area, and only small portions of wetlands extend into the Montlake area.

Fish

Operation of the floating bridge and landings under Construction Phase 1 could affect fish in the Lake Washington area. As described in Section 5.11, the larger floating span and pontoons could affect fish use of the area near the bridge. The variable spacing between supplemental stability pontoons would produce recesses along the face of the pontoons which would increase the migration distance (if fish followed the face of the pontoons) and provide additional deepwater forage habitat for fish using the edge of pontoons for cover. The increased width of the bridge may also have minor effects on circulation and temperature in Lake Washington, as discussed in Section 5.11.

Construction Phase 1 would also include completion of the bridge maintenance facility and dock. The finish floor elevation of the bridge maintenance facility could result in localized water table lowering, or drawdown, that could result in upwelling in the sockeye spawning habitat near the east approach. However, as described in Section 5.11, this effect is expected to be relatively minor, and would not preclude sockeye spawning or substantially degrade the quality of spawning habitat. There are no indications that the presence of an overwater structure in the east approach area would affect the spawning of sockeye salmon.

Effects on fish resources in the Portage Bay and west approach areas would occur at the time of full buildout.

Wildlife

Operation of the floating bridge and landings would result in the loss of mostly open water habitat in the Lake Washington and Eastside transition areas. This type of habitat is most notable for its prevalence of waterfowl. 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 and would be not affected until full buildout. See Section 5.11 for additional information.

Geology and Soils

Effects of the floating bridge and landings on geology and soils would be limited to those related to construction of the east approach and Eastside transition area (see Section 5.12). The effects related to operation of the west approach and Portage Bay bridge would occur at the time of full buildout.

Hazardous Materials

Construction Phase 1 includes stormwater management facilities to treat the runoff from the new Evergreen Point Bridge and the stormwater facilities in the Lake Washington, East Lake Washington, and Fairweather Creek basins (see Section 5.13).). The new stormwater facilities would operate to collect currently untreated stormwater runoff. All transportation facilities pose the risk of vehicular fluid spills by the traveling public. Operation of the project is generally expected to reduce the potential for hazardous materials spills through improved traffic flow and increased safety.

The bridge maintenance facility in Medina would store small amounts of hazardous materials such as fuels, adhesives, cleaners, epoxies, propane, grease, lubricants, paints, and solvents. These materials would be used during maintenance activities. The risk of potential releases to the environment is considered low because the amounts of each of these materials onsite would be minimal, in most cases a few gallons each, and spill prevention, control, and countermeasures would be implemented during the facility's operation.

Navigable Waterways

Construction Phase 1 would affect the navigation channels under the Evergreen Point Bridge. The west transition span would remain at its current height of 44 feet, the drawspan would be removed, and the east transition span would be raised to 70 feet (see Section 5.14). These changes are not expected to affect commercial or recreational navigation in the project area.

5.16 Summary of Project Operation and Permanent Effects

Table 5.16-1 summarizes the project operation and permanent effects of the Preferred Alternative and SDEIS options on each element of the environment. 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 Preferred Alternative and SDEIS Options

Transportation	
The Preferred Alternative and all SDEIS options include high-occupancy vehicles (HOV) lanes in both directions, an HOV direct-access ramp to I-5 express lanes, and HOV bypass lanes on all on-ramps. The Preferred Alternative and all SDEIS 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 Highway Operations	
The Preferred Alternative and SDEIS options would allow SR 520 to serve more traffic than the No Build Alternative during the peak period. The Preferred Alternative and SDEIS options would improve travel times between I-5 and SR 202 for both HOV and general-purpose traffic.	
Preferred Alternative	The Preferred Alternative would allow SR 520 to serve more vehicles and people per hour: ▪ AM Peak Period - 8,300 vehicles per hour (9% more than No Build) with Preferred Alternative; 14,600 people per hour (17% more than No Build) with Preferred Alternative ▪ PM Peak Period - 7,900 vehicles per hour (4% more than No Build) with Preferred Alternative; 14,400 people per hour (14% more than No Build) with Preferred Alternative
Option A	Option A would allow SR 520 to serve more vehicles and people per hour: ▪ AM Peak Period - 8,100 vehicles per hour (7% more than No Build) with Option A; 16,500 people per hour (14% more than No Build) with Option A ▪ PM Peak Period - 7,800 vehicles per hour (5% more than No Build) with Option A; 15,900 people per hour (16% more than No Build) with Option A.
Options K and L	Options K and L would allow SR 520 to serve more vehicles and people per hour: ▪ AM Peak Period - 8,600 vehicles per hour (13% more than No Build) with Option A; 17,500 people per hour (20% more than No Build) with Option A ▪ PM Peak Period - 8,400 vehicles per hour (14% more than No Build) with Option A; 17,400 people per hour (27% more than No Build) with Option A.
Local Traffic Volumes and Operations	
The greatest effect on traffic volumes would occur in the Montlake Boulevard interchange area.	
Preferred Alternative	Under the Preferred Alternative, travel patterns on local streets in the area would change due to the direct-access HOV ramp from SR 520, the removal of the Lake Washington Boulevard ramps, and the addition of a new bascule bridge adjacent to the existing bridge on Montlake Boulevard. From the north, more trips from the University District to I-5 would travel along Montlake Boulevard southbound and across the Portage Bay Bridge westbound than under the No Build

Table 5.16-1. Summary Comparison of Operation Effects of the Preferred Alternative and SDEIS Options

	Alternative. This is because travel along Montlake Boulevard would be improved by the additional bridge across the Montlake Cut, and congestion spilling back from westbound SR 520 would be reduced, leading to greater use of the highway. The Preferred Alternative 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. The Preferred Alternative would add 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.
Option A	Option A would have similar effects as described for the Preferred Alternative.
Options K and L	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.
Parking	
The Preferred Alternative would have fewer parking effects than SDEIS options A, K, and L. Option L would have the greatest overall effect on parking due to construction of the northern interchange ramps across the Montlake Cut, which would pass through the Husky Stadium's south parking lot. The Preferred Alternative and Options A, K, and L would require removal of the existing lot at Bagley Viewpoint Park due to construction of the 10th and Delmar lid. WSDOT is considering replacement of part or all of this parking. At the NOAA property, only the portion of the facility parking lot located on WSDOT right-of-way under the Evergreen Point Bridge structure would be removed under the Preferred Alternative. Under Option A, roughly 12 spaces could be removed from the portion of the parking lot that is not under the existing structure due to column placement. Options K and L would not affect parking at this location.	
Preferred Alternative	The Preferred Alternative would remove approximately 172 parking spaces in the project area.
Option A	Option A would remove approximately 196 parking spaces in the project area.
Option K	Option A would remove approximately 211 parking spaces in the project area.
Option L	Option A would remove approximately 337 parking spaces in the project area.
Transit	
The Preferred Alternative and SDEIS options with an inside HOV lane across the Evergreen Point floating bridge, would substantially increase the demand for bus service across SR 520, allowing SR 520 to carry more people with greater efficiency, and allowing buses and carpools to move faster and more reliably than under No Build conditions. 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 the Preferred Alternative and SDEIS options would improve local traffic operations and allow transit to move faster and more reliably than the No Build Alternative.	
Preferred Alternative	In addition to the HOV facilities listed above, the Preferred Alternative would add HOV direct-access ramps at the Montlake Boulevard interchange area, connecting Montlake Boulevard with SR 520 to and from the east. The Preferred Alternative would also add HOV lanes to Montlake Boulevard NE from SR 520 across the Montlake bascule bridges.
Montlake Freeway Station	
The Preferred Alternative and SDEIS options would remove the Montlake Freeway Transit Station. 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.	

Table 5.16-1. Summary Comparison of Operation Effects of the Preferred Alternative and SDEIS Options

Preferred Alternative	Under the Preferred Alternative, new westbound and eastbound bus stops would be provided on the new Montlake lid. This configuration would allow the transit agencies to maintain SR 520 bus service to the Montlake interchange area during off-peak periods. SR 520 transit travel patterns would not be substantially affected by this change. During the morning and evening peak periods, downtown Seattle-Eastside bus routes would have one less stop on their route, resulting in travel time savings. Because downtown Seattle-Eastside bus routes would not serve the Montlake lid bus stops during the a.m. and p.m. peak periods, riders would lose access to approximately 220 bus trips between Montlake Boulevard and Evergreen Point or Yarrow Point freeway transit stations compared to the No Build Alternative.
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 project. The Preferred Alternative and all SDEIS options would permanently remove two residences on the west end of the Portage Bay Bridge and the Museum of History and Industry (MOHAI) building. Estimated property tax effects would be similar across for the Preferred Alternative and SDEIS options, and result in a less than 0.01 percent decrease in tax revenue.	
Preferred Alternative	The Preferred Alternative would require the least amount of new right of way (10.6 acres). This alternative would result in 9 full parcel acquisitions, and would remove 6 residential structures.
Option A	Option A would require 11.5 acres of new right-of-way. 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 National Oceanographic and Atmospheric Administration's (NOAA's) Northwest Fisheries Science Center.
Option K	Option K would require the most new right-of-way (15.5 acres). This option would result in 6 full parcel acquisitions, and the University of Washington's Waterfront Activities Center (WAC) would be relocated for a multiple-year period.
Option L	Option L would require 12.4 acres of new right-of-way. This option would result in 5 full parcel acquisitions.
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	
The Preferred Alternative and the SDEIS options include lids that would benefit community cohesion by reconnecting neighborhoods originally bisected by SR 520 and/or 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. The Preferred Alternative includes an enhanced bicycle/pedestrian path over I-5 instead of the I-5 lid designed for the SDEIS options. 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. WSDOT concludes that there is no disproportionately high and adverse effect to low-income or LEP populations as a result of the toll. WSDOT has determined that there would not be a disproportionately high and adverse effect on tribal fishing because of the project, regardless of build option. This is because WSDOT will continue to work through government-to-government consultation with the Muckleshoot Indian Tribe on an agreement to resolve fully and fairly issues associated with the impacts of the project on treaty rights.	
Recreation	
WSDOT would acquire some parkland adjacent to the existing corridor for new permanent right-of-way in order to accommodate alignment and interchange improvements. The number of acres that would be converted to right-of-way would differ between the Preferred Alternative and Options A, K, and L. All or part of up to six recreational properties (depending on the alternative) would be acquired. The largest acquisitions would occur at McCurdy and East Montlake Parks.	

Table 5.16-1. Summary Comparison of Operation Effects of the Preferred Alternative and SDEIS Options

The Preferred Alternative and all SDEIS options would also acquire Bagley Viewpoint in its entirety. For the Preferred Alternative and all SDEIS options the west approach bridge width and profile through the Arboretum could change boaters and park users' experience in this area.

The landscaped lids at 10th Avenue East and Delmar Drive East, 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.

Preferred Alternative	The Preferred Alternative would acquire the least amount of park land (6.7 acres).
Option A	Option A would acquire 7.5 acres of park land.
Option K	Option K would acquire 9.1 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
Option L	Option L would acquire 7.6 acres of park land.
Mitigation	Both Section 4(f and Section 6(f) involve mitigation planning for recreation effects. The Section 6(f) and 4(f) processes were conducted together for the most part. WSDOT worked with the Parks Technical Working Group (TWG), which consisted of WSDOT, Seattle Parks and Recreation, the University of Washington, the Recreation and Conservation Office, the National Park Service, and FHWA, to evaluate park effects. This coordination effort included effects as defined under both Sections 4(f) and 6(f). Chapter 9 of the Final EIS provides a solid framework for evaluating recreation effects and determining and coordinating appropriate mitigation under Section 4(f). Section 6(f) of the LWCFA requires that replacement property be acquired for conversion effects. Chapter 10 of the Final EIS provides a complete description of the Section 6(f) resources affected at both East Montlake Park and Washington Park Arboretum.
Visual Quality	

The Preferred Alternative and SDEIS 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.

The Preferred Alternative and SDEIS options would improve the visual quality of the Roanoke landscape unit with the addition of the 10th Avenue East and Delmar Drive East lid.

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.

The Preferred Alternative and SDEIS 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.

Preferred Alternative	The smaller bicycle/pedestrian crossing over I-5 near Roanoke Street would improve the visual character for the Roanoke area, compared to the No Build alternative. The Preferred Alternative would include a planted median along Portage Bay Bridge and could potentially change the view for drivers. The path beneath SR 520 on Foster Island would offer a more open and potentially pleasant experience than the SDEIS options or the No Build Alternative.
Option A	Under Option A, the SR 520 bridge over Foster Island would be higher than the existing bridge and the bridge proposed for Option L.
Option K	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. Under Option K, the land bridge at Foster Island would remove naturalized woodlands on both sides of SR 520.

Table 5.16-1. Summary Comparison of Operation Effects of the Preferred Alternative and SDEIS Options	
Option L	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 L, the bridge on Foster Island would be wider than the existing bridge and 2 to 4 feet higher at the Arboretum Water Trail.
Mitigation	WSDOT has reinitiated discussions with the Seattle Design Commission to develop 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	
WSDOT and FHWA evaluated the project's potential effects on historic properties within the project area using the Criteria of Adverse Effect (36 CFR 800.5) outlined in Section 106 of the NHPA. This legislation states that a project would have an adverse effect on a historic property if it results in changes to the property's characteristics that qualify it for inclusion in the National Historic Preservation Act (NRHP). Subsequent to the Final EIS analysis, FHWA and WSDOT determined that the project would have an adverse effect on historic properties. FHWA and WSDOT continued consultation with the State Historic Preservation Office (SHPO) and the other Section 106 consulting parties to seek resolution of the adverse effect from the project. The project's Programmatic Agreement memorializes the stipulations agreed upon to avoid, minimize, and mitigate adverse effects to historic properties located within the Area of Potential Effects. The Preferred Alternative and all the SDEIS options would result in an "adverse effect" determination for the project as a whole (referred to in Section 106 as "the undertaking"). The findings under Section 106 for the Preferred Alternative were submitted to SHPO on January 26, 2011, and concurrence was received on February 28, 2011.	
Noise	
Without noise mitigation, the Preferred Alternative and all SDEIS options would have 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 other landscape features over the highway would be the primary reasons for the reduction in noise levels.	
Preferred Alternative	The Preferred Alternative would have the least number of residences exceeding the NAC (207). With noise walls, 143 residences would exceed the NAC.
Option A	Under Option A, 249 residences would exceed the NAC. With noise walls, 94 residences would exceed the NAC.
Option K	Under Option K, 256 residences would exceed the NAC. With noise walls, 123 residences would exceed the NAC.
Option L	Under Option L, 235 residences would exceed the NAC. With noise walls, 119 residences would exceed the NAC.
Mitigation	Because design features such as reduced speeds, expanded lids, and 4-foot concrete traffic barriers were incorporated into the Preferred Alternative at many locations in the Seattle portion of the SR 520 corridor, noise walls would not provide enough additional reduction to be considered cost-effective. Therefore, the Preferred Alternative includes only two recommended noise walls: noise walls along both sides of SR 520 from just east of the floating span to Evergreen Point Road. If the recommended noise walls are included in the Preferred Alternative, the overall length would be 1,713 feet with height varying between 10 and 20 feet. For Options A, K, and L, noise walls would be warranted for consideration along I-5 near the Capitol Hill neighborhood, and 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. For SR 520 between 10th Avenue East to Montlake Boulevard NE and out through the Arboretum, the analysis indicated that noise walls would not meet WSDOT reasonableness or feasibility criteria. Designs 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 analysis (with the exception of the south Arboretum wall under Option K) would meet WSDOT criteria for feasibility and cost-effectiveness.

Table 5.16-1. Summary Comparison of Operation Effects of the Preferred Alternative and SDEIS Options

Air Quality	
The Preferred Alternative and all SDEIS options would not cause a violation of the National Ambient Air Quality Standards (NAAQs). The modeled concentrations of air pollutants are well below the 1-hour and 8-hour NAAQS for the Preferred Alternative and all SDEIS options.	
Energy and Greenhouse Gases	
The Preferred Alternative and all SDEIS options would reduce annual energy consumption between 4 and 10 percent on SR 520 between Seattle and Medina. The Preferred Alternative and all SDEIS options would reduce greenhouse gas emissions by approximately 10 percent in the project area.	
Water Resources	
The Preferred Alternative and all SDEIS options would increase the amount of land covered by pollutant-generating impervious surfaces in the project area (Preferred Alternative – 37 percent increase, 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.	
Ecosystems	
The Preferred Alternative and all of the SDEIS 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. The Preferred Alternative and all of the SDEIS options would reduce fish habitat functions, primarily due to increased shading by the larger overwater structures, and in-water structures. Compared to the existing structures, the proposed overwater structures are about twice as wide for all designs. The Preferred Alternative 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. The Preferred Alternative and all of the SDEIS 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	
Preferred Alternative	The Preferred Alternative would fill 0.1 acre of wetland, and 0.7 acre of wetland buffer. The Preferred Alternative would shade 4.8 acres of wetland, and 1.1 acres of wetland buffer.
Option A	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	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	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.
Mitigation	The SR 520, I-5 to Medina Project would provide compensatory wetland mitigation in five locations for the project's wetland effects. Four of the locations are onsite or close to the project, and one is located several miles from the project but in the same watershed. See the Conceptual Wetland Mitigation Plan in Attachment 9 for details.
Fish Resources	
Preferred Alternative	The Preferred Alternative would result in approximately 49.9 acres of shaded aquatic habitat, and approximately 41,000 square feet of in-water concrete bridge structure. This option has the highest bridge profile through Union Bay and Lake Washington, further minimizing the effects to fish and aquatic resources.

Table 5.16-1. Summary Comparison of Operation Effects of the Preferred Alternative and SDEIS Options	
Option A	Option A would result in approximately 49.0 acres of shaded aquatic habitat, and approximately 31,000 square feet of in-water concrete bridge structure.
Option K	Option K would result in the least shading overall shading—48.6 acres. Option K would be below the high-water elevation east of the Montlake shoreline, and would be the lowest profile design through Union Bay and east of Foster Island. This option would result in filling approximately 123,500 square feet of aquatic habitat.
Option L	Option L would result in the most overall shading through the corridor- 52.1 acres and approximately 35,000 square feet of in-water concrete bridge structure.
Mitigation	WSDOT has developed a comprehensive conceptual mitigation plan for aquatic restoration and habitat improvements at seven locations within the Water Resource Inventory Area (WRIA) 8 watershed, including restoration projects in Lake Washington, the Cedar River, and Bear Creek. The primary mitigation goal is to compensate for the SR 520, I-5 to Medina project's physical and biological effects while enhancing the production and survival of fish species to the maximum extent practicable. See the Conceptual Aquatic Mitigation Plan (Attachment 9) for further detail.
Wildlife and Habitat	
The Preferred Alternative and the SDEIS options would affect wildlife habitat by permanently removing vegetation and habitat, and increasing shading.	
Preferred Alternative	The Preferred Alternative would remove the least amount of habitat; approximately 8.1 acres of mostly the Urban matrix cover type across the entire project area.
Option A	Option A would remove 11.4 acres of mostly the Urban Matrix cover type, evenly spread among all areas.
Option K	Option K would remove 19.5 acres of mostly the Urban Matrix cover type, with most in the Montlake area.
Option L	Option L would remove 10.8 acres of mostly the Urban Matrix cover type, with effects evenly distributed among the geographic areas.
Mitigation	WSDOT will continue to work with City of Seattle, University of Washington, and the Arboretum Foundation to develop mitigation planting strategies to offset operational effects on shoreline habitat in Portage Bay and Union Bay.
Geology and Soils	
The Preferred Alternative and all SDEIS options include designing bridge columns to withstand seismic motion, and/or excavating areas of vulnerable soils and replacing them with stronger material. The Preferred Alternative and 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 a single-point urban interchange (SPUI) located at the Montlake shoreline.	
Option K	The risk of damage to the below-water facilities for Option K would be greater than if the interchange were constructed above water.
Mitigation	The proposed project 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. These risks are approximately the same for the Preferred Alternative and the SDEIS options.	
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 Preferred Alternative and SDEIS Options

Navigation	
For the Preferred Alternative and all SDEIS options, the draw span on the floating bridge would be removed, and the east transition span would be 15 feet higher than existing. The changes would impose a height restriction of 70 feet for vessels passing under the new Evergreen Point Bridge.	
Preferred Alternative	For the Preferred Alternative, the new bascule bridge would coordinate openings with the existing bridge and would not pose height restrictions over the Montlake Cut. Boats with an overhead clearance of more than 44 feet would only be able to pass under the east transition span.
Option A	Under Option A, the new bascule bridge would coordinate openings with the existing bridge and would not pose height restrictions over the Montlake Cut. Boats with an overhead clearance of more than 41 feet would only be able to pass under the east transition span.
Option K	Boats with an overhead clearance of more than 41 feet would only be able to pass under the east transition span.
Option L	Under Option L, the new bascule bridge would coordinate openings with the existing bridge and would not pose height restrictions over the Montlake Cut. Boats with an overhead clearance of more than 41 feet would only be able to pass under the east transition span.
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 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 Effects Summary

Element	Type of Effect	Operation Effects			
		Preferred Alternative	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)	10.6	11.5	15.5	12.4 (1.4)
	Full parcel acquisitions	9	7	6	5
5.3 Social Elements		Please see qualitative effects summary in Table 5.16-1.			
5.4 Recreation	Parks effects (acres)	6.7	7.5	9.1	7.6
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	207	249	256	235
5.8 Air Quality	Local NAAQS violations	0	0	0	0
5.9 Energy and Greenhouse Gases	Estimated gallons of fuel (millions) consumed annually during operation (2030)	31.5	39.8	40.7	40.7
	Percent change in GHG emissions as compared to No Build Alternative	-10%	-10%	-9%	-9%
5.10 Water Resources	Total pollutant generating impervious surface area (acres)	73.4 [a] 68.5 [b]	77.5[a]	93.3[a]	87.0[a]
5.11 Ecosystems	Wetland fill (acres)	0.1	0.1	1.8	0.3
	Wetland buffer fill (acres)	0.7	0.7	5.4	1.5
	Wetland shading (acres)	4.8	3.2	2.8	4.3
	Wetland buffer shading (acres)	1.1	0.9	0.1	1.3
	Aquatic habitat filled (acres)	0.9	0.5	2.7	0.6
	Overwater structures (acres)	49.9	49.0	48.6	52.1
	Vegetation removal (acres)	8.1	11.4	19.5	10.8
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] Lid Scenario 1
[b] Lid Scenario 2