Tunnel Alternative

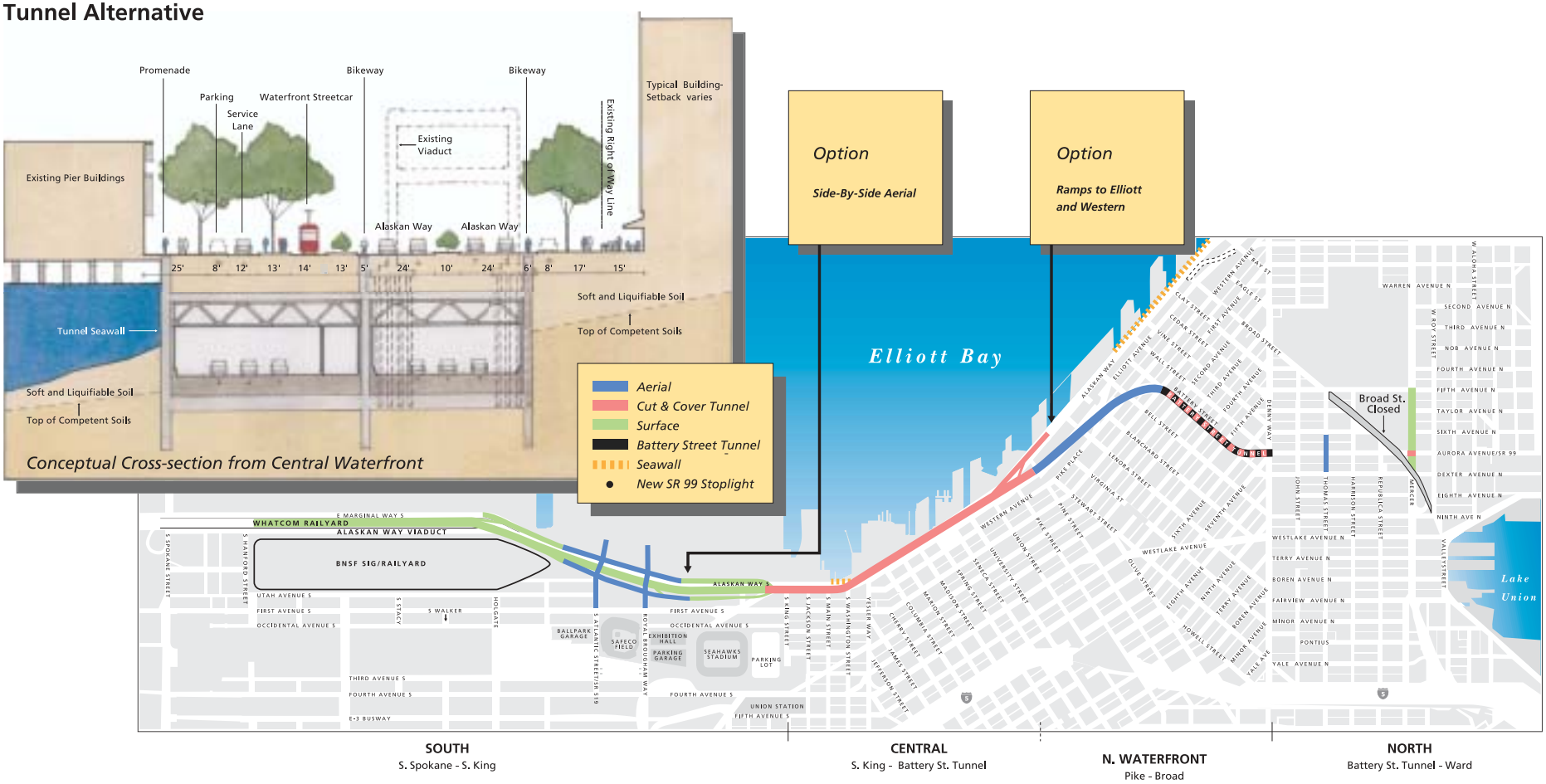


Exhibit 7-1

CHAPTER 7 - TUNNEL ALTERNATIVE

1 What is the Tunnel Alternative?

How would it replace SR 99 and the viaduct?

The Tunnel Alternative includes replacing SR 99 with the following elements as shown in Exhibit 7-1:

- South - Replace the existing viaduct with an at-grade roadway. Replace ramps at First Avenue S. with an elevated interchange connecting SR 99 to SR 519 at S. Atlantic Street and S. Royal Brougham Way. Also, provide a northbound off-ramp and southbound on-ramp at S. King Street.
- Central - Replace the viaduct with a six-lane tunnel (three lanes in each direction) from S. King Street to Pike Street. The tunnel would have emergency exits, a fire suppression system, and a ventilation system. Construct northbound and southbound ramps to connect the tunnel to the Alaskan Way surface street near Stewart Street. Build a new aerial connection between Pike Street and the Battery Street Tunnel with two lanes in each direction. The connection would be wider than the existing facility and it would not have ramps to Elliott and Western Avenues. Existing ramps at Battery Street would be maintained for only emergency vehicle use.
- North Waterfront - Reconstruct the Alaskan Way surface street with four lanes (two lanes in each direction). The Alaskan Way surface street would provide access to Ballard / Interbay.
- North - Improve the Battery Street Tunnel for fire and life safety by adding emergency exits, upgrading electrical systems, adding ventilation, and upgrading the fire suppression system. Widen the Mercer underpass by expanding Mercer Street from four eastbound lanes to a seven-lane, two-way roadway with three lanes in each direction and a center turn lane. Build a new two-lane bridge over Aurora / SR 99 at Thomas Street, and close Broad Street from Fifth Avenue to Ninth Avenue.

In addition, there are two possible options for the Tunnel Alternative.

- South - Replace the viaduct with a side-by-side aerial structure. Build an interchange to connect SR 99 to SR 519 at S. Atlantic Street and S. Royal Brougham Way. The connections to SR 519 would be provided via ramps that would touch down at the street level.
- Central - Construct the aerial connection to the Battery Street Tunnel with ramps to Elliott and Western Avenues in place of ramps to Alaskan Way surface street near Stewart Street.

How would it replace the seawall?

The Tunnel Alternative would replace the seawall with the outer wall of the tunnel from S. Washington Street up to Pike Street. In areas where there is no tunnel, the seawall would be replaced as described for the Rebuild Alternative. The seawall would be replaced with drilled shafts and improved soils from S. Washington Street up to Bay Street as shown in Exhibit 7-1.[1] The liquefiable soils behind the seawall and under the relieving platform would be improved by strengthening them with cement grout. Similarly, a small section of existing sheet pile wall from near S. King Street to S. Washington Street would be removed and replaced with improved soils and drilled shafts. In some areas along the seawall, drilled shafts may not be needed and the soils would only be improved.

2 How would the Tunnel Alternative be built?

The construction steps described below are preliminary and they may change based on additional project design.

Construction of this alternative would begin by relocating utilities. Next, the seawall would be replaced in areas where the tunnel would not be built. Construction of the southbound tunnel and the west half of the SR 519 overpass would begin. Improvements associated with the Widened Mercer Underpass would be built and detours on Broad Street would be established.

Next, the southbound section of the viaduct between Pike Street and the Battery Street Tunnel would be torn down and a new aerial structure would be built. The southbound half of the Battery Street Tunnel would be improved with new exits, electrical systems, ventilation, and an improved fire suppression system. In addition, the southbound tunnel and west half of the SR 519 overpass would be completed.

The existing viaduct from S. Holgate Street to Pike Street would be removed. The northbound section of the viaduct connecting Pike Street to the Battery Street Tunnel would be torn down and a new aerial structure would be built. The northbound half of the Battery Street Tunnel would be improved with new exits, electrical systems, ventilation, and an improved fire suppression system. In addition, the northbound tunnel and east half of the SR 519 overpass would be built.

Finally, utilities would be placed in their final locations, the Alaskan Way surface street would be

Additional information is provided in Appendix B describing the Tunnel Alternative.

Preliminary engineering drawings of this alternative are contained in Appendix W.

How can soils be improved or strengthened?

Soil can be strengthened by mixing it with cement grout. Construction methods that may be used to strengthen soil for this project are described in more detail in Chapter 10.

[1] No seawall work is required for any of the alternatives between Blanchard and Battery Streets adjacent to the Bell Harbor International Conference Center.

rebuilt, and traffic would be routed to its permanent locations. Additional information about construction is provided in Chapter 10.

3 How would the Tunnel Alternative change access?

How would it change vehicle access in the south?

Currently in the south end, SR 99 has a southbound off-ramp and a northbound on-ramp connecting at First Avenue S. near Railroad Way S. The Tunnel Alternative would replace the First Avenue S. ramps with an elevated interchange over SR 99. The interchange would connect SR 99 to SR 519 at S. Atlantic Street and S. Royal Brougham Way. It would improve access in the south end by adding ramps that would provide connections to the stadiums and SR 519, which connects to I-90. The SR 519 interchange would also separate vehicles and rail operations. Currently these operations are not completely separated, and there are times when trains block roadway connections at S. Atlantic Street.

In addition, new ramps would be provided to connect near S. King Street. The S. King Street ramps would provide drivers access into and out of downtown. Traffic movements provided by the new ramps would include:

- Northbound off from SR 99 near S. Holgate Street to S. Atlantic Street and S. Royal Brougham Way.
- Northbound off from SR 99 near S. Royal Brougham Way to S. King Street.
- Northbound on from S. Royal Brougham Way to SR 99.
- Southbound on from E. Marginal Way near S. Holgate Street to SR 99.
- Southbound on from the Alaskan Way surface street to SR 99 near S. Dearborn Street.
- Southbound off from SR 99 near S. King Street to the Alaskan Way surface street.

If the side-by-side aerial option were constructed in the south end, ramp connections would include the following:

- Northbound off from SR 99 to S. Atlantic Street and S. Royal Brougham Way.
- Northbound off from SR 99 near S. Royal Brougham Way to the Alaskan Way surface street.
- Northbound on from S. Royal Brougham Way to SR 99.
- Southbound on from E. Marginal Way near S. Holgate Street to SR 99.
- Southbound off from SR 99 near Railroad Way to the Alaskan Way surface street.
- Southbound on from the Alaskan Way surface street to SR 99 near S. Dearborn Street.

How would it change railroad access?

Changes to railroad access in the south end would be similar to those discussed for the Rebuild Alternative. The new at-grade SR 99 would be built west of the existing viaduct where the Whatcom Rail Yard is currently located. As a result, the Whatcom Rail Yard would be removed and the Burlington Northern Santa Fe (BNSF) Seattle International Gateway (SIG) Rail Yard, located to the west of SR 99, would be expanded and reconfigured to include the relocated Whatcom Rail Yard tracks.

In addition, the tail track would need to be moved from west of SR 99 to the east side of SR 99. The tail track would extend from the reconfigured BNSF SIG Rail Yard to just south of Railroad Way S.

If the side-by-side aerial option were constructed in the south end, the Whatcom Rail Yard would be removed and incorporated into the BNSF SIG Rail Yard as described above. The tail track could continue to be located west of SR 99.

How would it change vehicle access for ferries?

People driving to the ferry get there via the Alaskan Way surface street, often by taking a left at Yesler Way. When Colman Dock is full, drivers wait for the ferry under the viaduct south of Railroad Way S. Drivers leaving Colman Dock use Marion Street or Alaskan Way.

The Tunnel Alternative would change where drivers wait for the ferry when Colman Dock is full. It would also change the way drivers get to Colman Dock, and it would add a new way for drivers to exit Colman Dock.

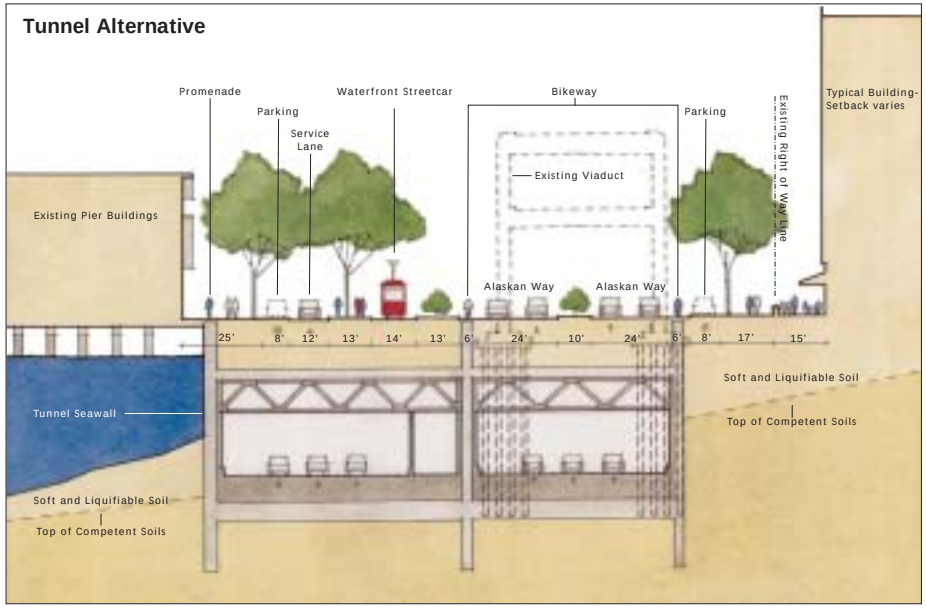


Exhibit 7-2

With this alternative, the viaduct would be removed and replaced with an at-grade roadway south of Yesler Way. Therefore, the existing ferry holding area under the viaduct would need to be relocated. Ferry holding could be provided east of SR 99 near S. Royal Brougham Way or west of SR 99 on part of Terminal 46, just south of S. King Street. With either of these ferry holding locations, traffic flow would be improved for both Alaskan Way surface street traffic and ferry traffic by building a separate roadway connecting the holding area to Colman Dock. Improved traffic flow at Colman Dock could also make ferry loading and unloading operations more efficient.

The separate ferry access roadway would be built on a new over-water pier between S. Washington Street

Appendix C contains additional details about transportation.

What is the tail track?

The tail track is a single railroad track that connects the Burlington Northern Santa Fe (BNSF) Seattle International Gateway (SIG) Rail Yard on the east side of SR 99 to the Whatcom Rail Yard located west of SR 99..

The tail track is used to assemble and sort railcars for both the Whatcom and BNSF SIG Rail Yards.

and Yesler Way. Drivers would get to Colman Dock using S. King Street and the new ferry access roadway. Drivers leaving Colman Dock would be able to exit where they do now at Marion Street or Alaskan Way, or they could exit using the roadway to S. King Street.

The new ferry access roadway and over-water pier is needed for some additional reasons. The new pier would provide space to relocate the historic Washington Street Boat Landing, and it could provide new shoreline access to pedestrians and bicyclists. During construction, the roadway and pier are needed to maintain ferry access and egress. They could also accommodate construction staging activities.

If SR 99 were replaced by the side-by-side aerial structure, changes to ferry access would be similar to what was described above.

How would it change vehicle access into or out of downtown?

With the Tunnel Alternative, the specific locations where drivers get into and out of downtown would change, but several access locations would continue to be provided. This alternative would replace the viaduct with a tunnel with three lanes in each direction from S. King Street to Pike Street. The existing ramps to Columbia and Seneca Streets would be replaced with new ramps at S. King Street that would connect to the Alaskan Way surface street. Drivers could also reach the south end of downtown using the new SR 519 interchange at S. Atlantic Street and S. Royal Brougham Way. In addition, there are several ways drivers could get to and from downtown using connections from the Alaskan Way surface street.

From Pike Street, the tunnel would provide ramps that would connect to the Alaskan Way surface street near Stewart Street. These ramps would replace the existing Elliott/Western ramps. Traffic traveling to and from the Ballard/Interbay and Belltown areas would use these ramps and travel on the Alaskan Way surface street.

From Pike Street, the tunnel would transition to a side-by-side aerial structure connecting into the Battery Street Tunnel. The existing ramps to Battery Street would be closed to general traffic, but maintained for emergency access.

If the ramp option is built, ramps to the Alaskan Way surface street near Stewart Street would not be constructed. Instead, access to Ballard/Interbay and Belltown would be provided by ramps to Elliott and Western Avenues, similar to existing conditions.

How would it change the Alaskan Way surface street for vehicles?

The viaduct would be removed, which would open up the large area of land between the waterfront and downtown. There are several ways in which this area could be used. One possible surface street design is shown in Exhibit 7-2. Regardless of the design selected, the Alaskan Way surface street would be rebuilt with four lanes (two lanes in each direction) north of Yesler Way. Between S. King Street and Yesler Way, Alaskan Way would have six lanes. Turn pockets could be provided in some locations. The surface street would have expanded pedestrian promenades, one or two trolley tracks, on-street parking, and service roadways for piers and adjacent buildings.

How would the Battery Street Tunnel change?

Fire and life safety conditions in the Battery Street Tunnel would be improved by adding emergency exits, upgrading electrical systems, adding ventilation, and upgrading the fire suppression system.

How would it change vehicle access north of the Battery Street Tunnel?

Connections north of the Battery Street Tunnel are important for traffic detours during construction. For the Tunnel Alternative, the Battery Street Tunnel would be upgraded and a new aerial connection between Pike Street and the Battery Street Tunnel would be built. During construction of these improvements, traffic along this section of SR 99 would need to be detoured. Improvements to Mercer Street and other streets north of the Battery Street Tunnel would allow these streets to handle the additional traffic. After construction, these north end improvements would provide long-term benefits that are described below.

In the north end, Mercer Street would be widened from four eastbound lanes to a two-way, seven lane street. Mercer would have three lanes in each direction and a center turn lane between Fifth and Dexter Avenues. In addition, a two-lane bridge would be built over Aurora/SR 99 at Thomas Street. During construction, the Mercer Street and Thomas Street improvements would change traffic flow in the north end to allow southbound SR 99 traffic to be detoured onto Broad Street. Once construction was completed, existing ramps to Mercer and Broad Streets would be removed. After construction, the Mercer and Thomas Street upgrades would improve east-west circulation in the South Lake Union and Uptown neighborhoods. East-west connections for vehicles, bicyclists, and pedestrians are constrained by Aurora/SR 99 because it cuts off the street grid. Once construction was completed, Broad Street could be closed between Fifth and Ninth Avenues, allowing for more streets to be reconnected.

How would it change bicycle access?

The Tunnel Alternative would change bicycle access by modifying the location of the Waterfront Trail. The existing Waterfront Trail begins at S. Royal Brougham Way and runs along the east of side of E. Marginal Way/ Alaskan Way to Bell Street. It is separated from the Alaskan Way surface street and is shared by both bicyclists and pedestrians. The separated, shared path would be extended south from S. Royal Brougham Way to just south of S. Atlantic Street. From S. Atlantic Street to Yesler Way, the Waterfront Trail would be moved from the east side of E. Marginal Way/Alaskan Way to the west side. Additionally, it may be possible to develop a spur shared use trail that would lead diagonally from the north side of Seahawks Stadium (midway between S. Atlantic Street and S. Royal Brougham Way) to the southwest corner of the intersection of Alaskan Way and S. King Street. Between Yesler Way and Union

Other possible surface street design variations are shown in Appendix X, Design Variations for Surface Street Improvements.

Street, the Waterfront Trail would be replaced with bicycle lanes along each side of the Alaskan Way surface street. North of Union Street, cyclists would be routed back to the Waterfront Trail, which would be located in its present location on the east side of Alaskan Way.

How would it change pedestrian access?

As with bicycle access, the Tunnel Alternative would change pedestrian access by modifying the location of the Waterfront Trail. The separated, shared path would be extended south from S. Royal Brougham Way to just south of S. Atlantic Street. From S. Atlantic Street to Yesler Way, the Waterfront Trail would be moved from the east side of E. Marginal Way / Alaskan Way to the west side.

Between S. King Street and Yesler Way, the Waterfront Trail would be replaced with a sidewalk along each side of the Alaskan Way surface street. Additionally, it may be possible to develop a separated shared use trail that would lead diagonally from the north side of Seahawks Stadium (midway between S. Atlantic Street and S. Royal Brougham Way) to the southwest corner of the intersection of Alaskan Way and S. King Street. North of Yesler Way pedestrians could walk on sidewalks on the east side of Alaskan Way or the waterfront promenade located on the west side of Alaskan Way. North of Union Street, pedestrians could walk on either the waterfront promenade on the west side of Alaskan Way or the Waterfront Trail on the east side of Alaskan Way.

In the SR 519 area, pedestrian access would be maintained by continuing the sidewalks on Alaskan Way and associated local streets on the SR 519 interchange. Connections across SR 99 would be provided by sidewalks on S. Royal Brougham Way and S. Atlantic Street, which would cross over the SR 99 mainline.

All of the alternatives would add a new over-water pier connecting Pier 48 near the end of S. Washington Street with the Colman Dock Ferry Terminal. The pier would accommodate pedestrians on its waterside edge. In addition, for all alternatives, a pedestrian bridge may be added over the Alaskan Way surface street connecting the Colman Dock Ferry Terminal near Madison Street. The existing pedestrian bridge for people traveling to and from the Ferry Terminal at Marion Street would be rebuilt near its existing location.

North of the Battery Street Tunnel, a bridge would be added at Thomas Street across SR 99. This bridge would have sidewalks on both sides, which would add a new east-west route for pedestrians in the South Lake Union area. In addition, the existing sidewalks on both sides of Mercer Street would be widened in some areas, which would improve conditions for pedestrians.

4 How would the Tunnel Alternative affect travel times and traffic flow?

How would daily traffic patterns and volumes on SR 99 change with the Tunnel Alternative?

In the central section of SR 99 where traffic volumes are the highest, daily traffic is expected to peak at 122,000 vehicles per day for the Tunnel Alternative compared with 126,000 vehicles per day for the existing facility in 2030. Travel patterns would change somewhat compared with the existing facility if the Tunnel Alternative were built.

With the Tunnel Alternative, the number of hours that the SR 99 mainline is expected to be congested is comparable to the year 2030 existing facility as shown in Exhibit 7-3.

Exhibit 7-3

Daily Hours of Congested Operations on the SR 99 Mainline

	2002 Existing	*2030 Existing Facility*	*Tunnel*
Southbound	<1	3	3
Northbound	<1	4	4

In the south end of the project area, mainline SR 99 traffic volumes and ramp volumes are expected to increase due to improved access between SR 99 and SR 519. This additional traffic is not expected to negatively affect operations on SR 99 since there would be adequate roadway capacity for the increased number of trips.

In the central section of the project area, SR 99 traffic volumes are expected to be slightly lower than year 2030 existing conditions because trips to and from downtown would access SR 99 further to the south at S. King Street. The number of vehicles using ramps near Stewart Street to the Ballard / Interbay area is slightly lower than the number of vehicles expected to use the existing Elliott / Western ramps.

In the north end of the project area, traffic volumes at the Denny Way ramps are expected to increase.

Tunnel Alternative Travel Times

During the PM Peak

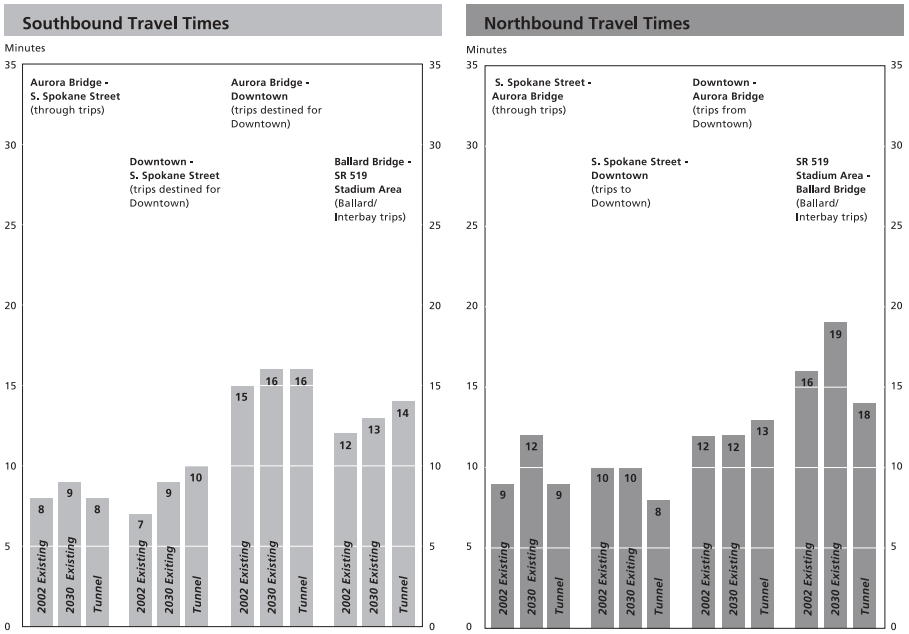


Exhibit 7-4

What is the "year 2030 existing facility" and why is it evaluated?

The year 2030 existing facility shows how much traffic is projected to use the existing SR 99 facility in the year 2030. It takes into account future population growth and other funded transportation projects such as Monorail and Link light rail. It assumes that the viaduct would remain in the year 2030 in its existing condition. We know it is unlikely that the viaduct will last until 2030. However, the information provides a baseline that can be compared with traffic conditions for the proposed alternatives.

Traffic at these ramps would increase because the Battery Street ramps would be closed.

How would travel times and travel speeds change on SR 99 with the Tunnel Alternative?

Travel times for northbound and southbound traffic would be comparable to those expected for the existing facility in 2030 as shown in Exhibit 7-4. Travel times for drivers traveling between the south section of SR 99 and the Ballard / Interbay area would remain similar to the 2030 existing facility. Travel times for these trips are comparable with the Tunnel Alternative, even though access to this area would change from the existing Elliott / Western configuration to the Alaskan Way surface street ramps.

In almost all cases, travel speeds on SR 99 would improve with the Tunnel Alternative, as shown in Exhibit 7-5. Specifically in the area from Seneca Street through the Battery Street Tunnel, northbound travel speeds would be 33 to 46 miles per hour compared with 25 to 27 miles per hour for the existing facility in 2030. Similarly, average traffic speeds would increase for southbound traffic traveling through the Battery Street Tunnel and downtown. Increased traffic speeds through downtown and the Battery Street Tunnel would occur because the Battery Street ramps would be closed, which would improve traffic operations. Speeds throughout the corridor would also improve because the roadway would be wider than the existing facility, making it easier for people to drive.

How would local streets and intersections operate?

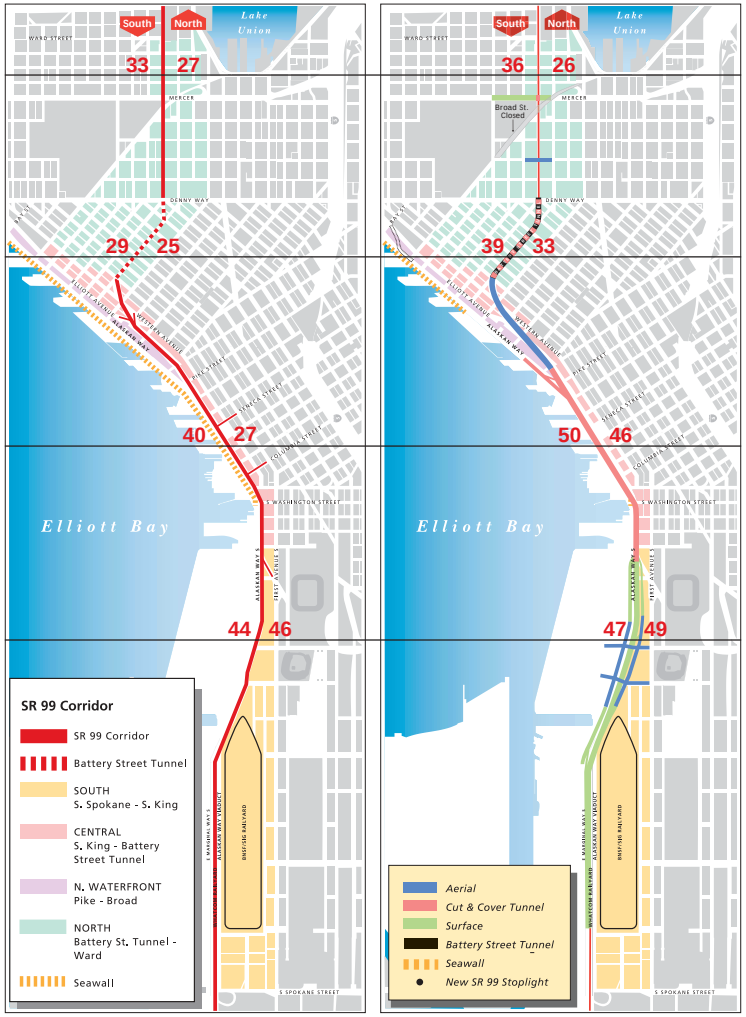
Traffic on local streets and delay at intersections would not substantially change in the south area, as shown in Exhibit 7-6. Intersection delay would be reduced in the downtown area, and it would be increased in the north waterfront and north area.

In the south, intersections at First Avenue S. and S. Royal Brougham Way and First Avenue S. and S. Atlantic Street would slightly improve from highly congested conditions to congested conditions. Conditions at these intersections would improve

Average Traffic Speeds

During the PM Peak

2030 Existing Facility | Tunnel



Southbound SR 99 Speeds

During the PM Peak Hour

Shown as miles per hour

SR 99 Section	*2002 Existing*	*2030 Existing*	*Tunnel*
South Lake Union Area	39	33	36
Battery Street Tunnel	34	29	39
Downtown	41	40	50
Stadium Area	44	44	47

Northbound SR 99 Speeds

During the PM Peak Hour

Shown as miles per hour

SR 99 Section	*2002 Existing*	*2030 Existing*	*Tunnel*
South Lake Union Area	33	27	26
Battery Street Tunnel	33	25	33
Downtown	39	27	46
Stadium Area	46	46	49

How are congested operations on SR 99 defined?

The number of hours SR 99 would be congested was estimated by determining how long the busiest sections of SR 99 would be expected to have regular traffic slow downs or stop and go traffic.

What are congested and highly congested intersections?

Congested intersections are intersections that cause drivers considerable delay. A driver might wait between one and two minutes to get through a traffic signal at a congested intersection. At a highly congested intersection, a driver might wait two minutes or more to get through the traffic signal.

Exhibit 7-5

because fewer drivers would need to turn to connect with SR 519. Also, the new interchange distributes traffic between two streets, compared with the existing facility that distributes traffic at only one street (First Avenue S.).

In the downtown area, the number of congested intersections would decrease from eight intersections to five. Intersection delay would be reduced because ramps at Columbia and Seneca Streets would be removed, which would cause traffic to be more evenly distributed on downtown streets. Also, delay at the intersection of Alaskan Way and Yesler Way is expected to be reduced from an estimated 124 seconds of delay to 54 seconds of delay. Delay at Yesler is reduced because ferry access to Colman Dock would be moved from Yesler Way to S. King Street. The tradeoff is that an intersection would be added at Alaskan Way and S. King Street. This intersection would have about 61 seconds of delay during the PM Peak.

In addition, traffic on Elliott and Western Avenues would be reduced, since ramps to these streets would be removed and replaced with ramps to the Alaskan Way surface street. Consequently, more traffic is expected on Alaskan Way north of Stewart Street. The north waterfront section of Alaskan Way is expected to operate well, with the exception of the area where Alaskan Way traffic would be routed to an underpass crossing below the BNSF railroad tracks north of Broad Street. This intersection would be congested.

In the north end, the Tunnel Alternative would have more congested intersections than the 2030 existing facility. The Tunnel Alternative proposes to widen Mercer Street and convert it to a two-way street between Fifth Avenue and Dexter Avenue. At the intersections of Mercer Street/Fifth Avenue and Mercer Street/Dexter Avenue, Mercer would transition back to a one-way street. Congestion is expected to increase near the areas where Mercer converts from a two-way street to a one-way street (see Exhibit 7-6). Congestion projected in this area could get better if improvements beyond the limits of this project were made. The City of Seattle is currently studying several alternatives to improve the roadway network in the South Lake Union area as a separate project. Improvements to the roadway network in the South Lake Union area are not necessary for north end improvements proposed as part of the Alaskan Way Viaduct and Seawall Replacement Project.

At first glance, it may seem that the Mercer Street improvements provide little benefit to the area since congestion would increase at a few north end intersections. However, what is not captured by the intersection analysis is the fact that the north end improvements would increase east-west mobility across SR 99, which is currently constrained. Also, the north end improvements could help reduce congestion during construction.

Would traffic volumes change on the Alaskan Way surface street?

Traffic volumes on the Alaskan Way surface street are expected to double to 21,000 cars per day. However, the only intersection where congestion would increase compared with the 2030 existing facility is the area where Alaskan Way traffic would be routed to an underpass crossing below the BNSF railroad tracks north of Broad Street.

Would traffic on other parallel city streets change?

In the south end of the project area, fewer vehicles are expected to use parallel city streets, mostly due to new connections to SR 519 at S. Atlantic Street and S. Royal Brougham Way. The reduction in cars on city streets may slightly improve traffic flow for these routes.

In the central section of the project area, fewer drivers are expected to use parallel city streets. Intersection delay would be reduced because traffic would no longer be restricted to enter or exit SR 99 via ramps at Columbia and Seneca Streets. Instead, drivers would access SR 99 via multiple east-west city streets along the Alaskan Way surface street or they would access downtown from ramps provided at Denny Way and S. King Street. Also, fewer vehicles would be expected on Elliott and Western Avenues because SR 99 ramps to or from these streets would

Tunnel Alternative Congested Intersections

During the PM Peak

2030 Existing Facility | **Tunnel**

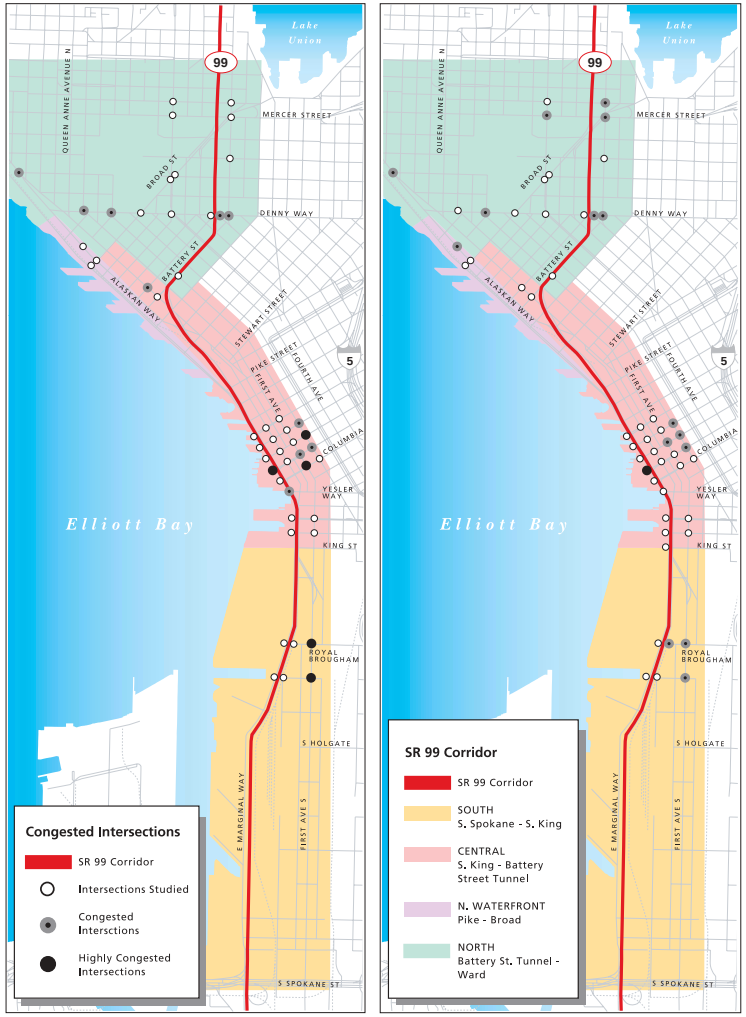


Exhibit 7-6

be replaced with ramps to the Alaskan Way surface street. As a result, the number of vehicles using Alaskan Way north of Pike Street would increase.

In the north end of the project area, more drivers are expected to use city streets. This shift is mostly expected due to new city street connections at Thomas and Mercer Streets, which would improve access across SR 99.

Would the Tunnel Alternative affect traffic volumes on I-5?

The Tunnel Alternative would not affect traffic volumes on I-5.

How would the options affect traffic conditions if they were built instead of the alternative?

The Tunnel Alternative includes options in the south and central sections. These could become part of the preferred alternative in the Final EIS. In brief, here's how they would affect traffic:

- In the south end - If a side-by-side aerial structure was built, it would operate similarly for traffic as the roadway proposed for the Aerial Alternative.
- In the central section - If ramps were built to Elliott and Western Avenues, they would be expected to operate similarly to those proposed with the Aerial Alternative. Traffic patterns for Ballard/Interbay traffic would be similar to what they are now. In addition, this option would result in less traffic on the Alaskan Way surface street north of Stewart Street than what is proposed for the Tunnel Alternative, because Ballard/Interbay traffic would not be routed on Alaskan Way.

5 How would the Tunnel Alternative change conditions for freight and transit?

How would the Tunnel Alternative change conditions for freight?

Freight access, travel times, and travel speeds would be maintained or slightly improved with the Tunnel Alternative. A new interchange would be built at S. Atlantic Street and S. Royal Brougham Way, which would improve access between SR 99 and SR 519. This interchange would improve freight connections between the Duwamish industrial area, Harbor Island, SR 519, and I-90.

Freight connections to and from the Ballard/Interbay industrial area would be changed under the Tunnel Alternative. The Elliott/Western ramps would be replaced with new ramps to the Alaskan Way surface street. Drivers heading to the Ballard/Interbay area would use these ramps and drive on Alaskan Way to reach Elliott Avenue. The replacement route is expected to have similar travel times to the Western/Elliott route compared with the 2030 existing facility, though congestion is expected on Alaskan Way near Broad Street.

For example, travel time between SR 519 and the Ballard Bridge would be reduced from 19 minutes to 18 minutes for traffic heading northbound. In the southbound direction, this same trip would take 14 minutes, compared with a 13-minute trip for the 2030 existing facility. Also, speeds would be improved for northbound and southbound traffic throughout the corridor. For example, through downtown, average travel speeds are expected to increase from 40 miles per hour to 50 miles per hour. Travel times and speeds are expected to improve because ramp connections would be changed and the roadway and ramps would be wider than the existing facility, making it easier for people to drive.

If the ramp option to Western/Elliott were constructed, connections for freight would be similar to existing conditions.

If the Tunnel Alternative is constructed, it is likely that flammable and/or combustible cargo would be prohibited in the tunnel. Flammable and/or combustible cargo would continue to be prohibited in the Battery Street Tunnel. If flammable materials were prohibited, freight carrying these materials would need to use a different route, such as the Alaskan Way surface street.

Finally, due to the viaduct's deteriorating condition, speeds for large vehicles over 10,000 pounds are currently restricted to 40 miles per hour (10 miles below the speed limit for other vehicles). Large vehicles also must use only the right lanes of the viaduct. These restrictions would be removed once the viaduct and seawall are replaced, which would benefit both freight and transit.

How would the Tunnel Alternative change transit conditions?

Conditions for transit would be maintained with the Tunnel Alternative. Bus routes that currently reach downtown from Columbia and Seneca Streets would be changed since the Columbia and Seneca ramps would be replaced. Buses could either use ramps to S. King Street to get to or from downtown or they could reach downtown via the SR 519 ramps. If the S. King Street ramps were used, travel times would be similar to the 2030 existing facility. If the SR 519 ramps were used, travel times for transit to the downtown area would likely increase, but buses could access the entire Fourth Avenue corridor, thereby expanding services to growing employment centers in the Internation-al District and Pioneer Square area. Please note, if buses were routed to the SR 519 ramps, transit would be subject to traffic congestion in the stadium area during events unless alternate routes were developed.

On the north end, buses would continue to access downtown from the Denny Way ramps. Travel times for buses using the Denny Way ramps would be similar to those expected in 2030 with the existing facility.

Conditions for bus transit would be improved because speed and lane restrictions currently in effect for large vehicles (including buses) would be removed once the viaduct was replaced. Also, the SR 99 roadway and ramps would be wider than the existing facility, which would make it easier for bus operators to drive.

The lead agencies are committed to improving other transportation options in the corridor as part of this project, particularly as part of construction. A Flexible Transportation Package has been developed that includes several different programs and tools to respond to varying needs in the corridor. Most of the

What is the PM Peak Hour and why is traffic data analyzed for the PM Peak?

The PM Peak Hour is the time period when traffic is heaviest during the late afternoon commute. For SR 99, the PM Peak Hour occurs from 4:00 to 5:00 p.m. For this project, PM Peak data was evaluated because overall traffic conditions in and around the project area are the most congested during that time of day.

Appendix O contains additional information about flammable cargo.

tools are designed to decrease reliance on single-occupancy vehicles and increase other modes of transportation during construction of the project, though some investments would provide long-term benefits once the project was completed. The range of programs that could be implemented to provide long-term benefits includes implementing parking strategies to decrease long-term parking in the area and installing traffic management and transit priority systems. A more defined Flexible Transportation Package will be presented in the Final EIS as part of the preferred alternative.

6 How would the Tunnel Alternative improve roadway safety?

The Tunnel Alternative would improve roadway safety over existing conditions. The existing, deteriorating facility would be replaced, reducing seismic and other risks associated with the aging structure. In the south end, the viaduct would be removed and replaced with a new at-grade roadway from S. Holgate Street to near S. King Street. The new at-grade roadway would be built with wider lanes and shoulders than the existing SR 99, which would improve safety. In addition, the ramps at First Avenue S. would be removed and re-placed with improved ramps with wider shoulders in the S. Atlantic Street/S. Royal Brougham Way area.

In the tunnel, the roadway widths and shoulders would be wider than on the existing viaduct. North of Spring Street, the shoulders would narrow, but would still be an improvement over existing conditions. The ramps to and from the Alaskan Way surface street would be an improvement over existing conditions. However, it is possible that traffic on the Alaskan Way surface street could back up into the tunnel at times and negatively affect safety. Also, more traffic on Alaskan Way north of these ramps could lead to more accidents in this area for both vehicles and pedestrians. The ramps at Battery Street would be open to only emergency vehicles, which would improve roadway safety. If the ramp option was constructed, new aerial ramps to Elliott and Western Avenues would be built. These ramps would be an improvement over existing conditions.

North of the Battery Street Tunnel, the Widened Mercer Underpass and new Thomas Street bridge would provide new pathways for pedestrians to safely cross this section of SR 99.

7 How would the Tunnel Alternative affect parking?

There are 2,038 parking spaces located in the project area. As shown in Exhibit 7-7, a total of about 670 parking spaces would be removed with the Tunnel Alternative between the south end and the north waterfront area. An additional 40 spaces would be removed in the north end due to the improvements associated with the Widened Mercer Underpass.

Exhibit 7-7

Parking Changes for the Tunnel Alternative

	Short-Term[1]	Long Term[2]	Off-Street[3]	Total
Existing Parking Spaces	814	276	900	2,038
South End	+27	-261	+3	-231
Pioneer Square	-115	-15	+2	-128
Central Waterfront	-218	0	-79	-297
North Waterfront	-18	0	+4	-14
Net Change	**-324**	**-276**	**-70**	**-670**
Parking Spaces with the Tunnel Alternative	**490**	**0**	**830**	**1,368**

[1] Short-term metered parking spaces
[2] Free, long-term parking spaces
[3] Pay parking and tenant only parking

The majority of parking spaces that would be removed are free, long-term spaces located in the south section of the project area. Approximately 27 short-term spaces and 3 off-street spaces would be gained. This project does not currently propose to replace these long-term parking spaces because there is enough long-term parking available in the project area. People currently parking for free would need to pay to park, or they would need to use transit. According to the Puget Sound Regional Council's 2002 parking inventory study, 46.6 percent of parking spaces in the south end are utilized. There are more than five parking facilities in this area providing more than 6,000 parking spaces. Using the estimated parking utilization rate in this area, approximately 2,800 spaces are available in this area on a normal business day.

Tunnel Alternative Simulation
from Victor Steinbrueck Park

Exhibit 7-8

In the Pioneer Square area, 115 short-term parking spaces would be removed. An additional 218 short-term spaces would be removed along the central waterfront area. Many businesses in these areas, particularly retail shops, restaurants, and tourist destinations, rely on short-term parking for customer and user access. Some parking mitigation options have been identified:

- Increase utilization of other existing parking facilities in the area.
- Lease an existing parking facility and convert it to short-term parking.

Chapter 10 and Appendix B contain additional details about tools proposed for the Flexible Transportation Package.

- Purchase property and build new short-term parking.

A formal parking mitigation strategy for short-term parking losses in the Pioneer Square area and along the central waterfront will be developed and presented in the Final EIS. In the north end, parking lots in the area have available capacity to help offset the loss of 40 parking spaces, so mitigation is not proposed.

If the side-by-side aerial option were built in the south end, it is likely that there would be fewer parking losses in this area because some parking could be provided under the aerial structure.

8 If the Tunnel Alternative were built, what would it look like?

In this alternative, the existing viaduct would be replaced with a tunnel, starting near S. King Street and ending north of Pike Street, near the Seattle Aquarium. This alternative would change the corridor in several important ways.

With the viaduct gone, views to and from the waterfront, currently obstructed by the viaduct, would be opened up for the first time since the early 1950s. From the Pioneer Square Historic District and from the commercial core, views to the west that are currently dominated by the viaduct would instead focus on pier buildings along the waterfront, and then past those buildings to the Kitsap Peninsula, Bainbridge Island, and the Olympic Mountains.

Looking back to downtown from the waterfront, views of the city's skyline would no longer be interrupted by the viaduct's two elevated lanes and numerous support columns. As a result, the waterfront would appear far more connected with the city than it now does.

The area currently beneath the viaduct is visually cluttered with parking and vertical support columns, almost always in shadow, and dominated by the elevated structure above. With the Tunnel Alternative, the Alaskan Way surface street would be changed to improve the look and feel of this waterfront area for the public. Improvements could include streetscaping, a broadened waterfront promenade, sidewalks on the east side of Alaskan Way, a landscaped trolley corridor, a parking and access lane along the waterfront, and bike lanes. Gone would be existing effects from the viaduct's height, scale, bulk, and its industrial concrete design, which contrast with the visual character of Pioneer Square Historic District, the central waterfront, and parts of the commercial core.

South of S. King Street, in an area where views are dominated by sports stadiums and industrial buildings, the overpass that would connect SR 99 with S. Atlantic Street and S. Royal Brougham Way would be about half the height of the existing viaduct and would not be expected to affect the existing visual character. Where SR 99 emerges from the tunnel near Pike Street and the Seattle Aquarium, the tunnel portal would be covered by a landscaped lid that would be stepped to cover the roadway as it begins to rise toward the Battery Street Tunnel.

The portal connecting the Alaskan Way surface street to the tunnel might be visually prominent, but the effect of the portal on the character of the waterfront would be less intrusive than the effect of the existing viaduct.

Views of the central waterfront from Pike Place Market and Victor Steinbrueck Park would be enhanced by removal of the viaduct. The elevated part of SR 99 would be a few feet lower than it is now, but it would still be a large part of views west in this area. Both in Belltown, where the viaduct would be replaced with a new elevated structure, and on SR 99 north of Battery Street Tunnel, the overall character of the area would not be affected by this alternative.

Drivers traveling north and south along the waterfront would no longer have the scenic views currently available from the viaduct roadway. Many pleasant views would be available along the waterfront, including waterfront buildings and activities. Views stretching from Elliott Bay to the Olympics and newly revealed views of the Seattle skyline would be available for those not in vehicles.

9 How would noise or vibration levels change?

Traffic noise with the Tunnel Alternative would be substantially reduced along the central waterfront because SR 99 would be routed underground. Traffic noise levels would decrease up to 12 dBA compared to existing levels in the central waterfront. Traffic noise levels would increase by up to 6 dBA in the immediate vicinity of the north portal of the waterfront tunnel, where traffic would enter and exit the tunnel near Stewart Street. The levels would not change by more than 2 dBA in other areas. To the human ear, a 2-dBA change is generally not noticeable, while a 5- dBA change is readily noticeable. A 10-dBA decrease would sound like the noise level has been cut in half. Along most of the central waterfront, traffic noise would appear to be approximately one-half as loud as it currently is, but it would not change substantially in the remainder of the project area under the Tunnel Alternative.

The noise abatement criterion is 67 dBA for noise-sensitive outdoor uses at locations such as parks, hotels, and residences. Existing traffic noise approaches or exceeds the FHWA traffic noise abatement criteria at 43 sites of 48 sites modeled. Traffic noise levels with the Tunnel Alternative would approach or exceed the traffic noise abatement criteria at 30 sites. These sites include approximately 4,250 residential units, 1,290 hotel rooms, and 120 shelter beds. Four of the sites are park or public open spaces, two are educational or childcare sites, and three sites are commercial or other less noise-sensitive uses only. Six sites that are severely affected by noise for the year 2030 existing facility would continue to be severely affected by the Tunnel Alternative. Modeled noise levels at specific locations may be found in Exhibits 5-1 and 5-2 of Appendix F. In addition, throughout the corridor, noise from other sources, such as aircraft, sounds from restaurants and other businesses, sidewalk noise, construction noise, building mechanical noise, alarms, and sirens, would also contribute to the total noise environment.

The new tunnel along the central waterfront would include a mechanical ventilation system with several

Appendices D and E contains additional information about views.

Appendix F contains additional noise and vibration information.

ventilation buildings spaced along the tunnel with tall ventilation stacks. At the south portal near S. King Street, noise from vent buildings would not be intrusive because the land uses are mostly industrial and commercial. Around the north portal, near Pike Street, people in residential and commercial buildings would be more likely to notice fan noise. During normal daytime operations, ventilation fans would be designed not to exceed 60 dBA at the nearest commercial property line or 57 dBA at the property line of the nearest residential use, whichever reduces noise more. A level of 57 dBA is about as loud as a conversation between two people standing 10 feet apart. If the fans are to be operated regularly during nighttime hours, they would be designed not to exceed 47 dBA during those hours.

Improvements to the Battery Street Tunnel would include the extension of the tunnel portals and installation of jet fans to provide ventilation, both for everyday use and emergencies. Noise from the ventilation fans and jet fans in the tunnel would be especially loud next to the fan and near fan vents. Near the south portal of the tunnel, where several residential buildings are located, jet fans would be designed not to exceed 57 dBA at the residential buildings during normal daytime operations, or 47 dBA if used regularly during nighttime hours.

The following mitigation measures were evaluated for their potential to reduce noise impacts from the Tunnel Alternative: traffic management measures, acquiring land as buffer zones or for construction of noise barriers or berms, realigning the roadway, and installing noise insulation for public use or nonprofit institutional structures. Because the Tunnel Alternative would already greatly reduce traffic noise levels in much of the corridor, additional mitigation would generally not be feasible and reasonable. Depending on further engineering development, a small noise wall integrated with the north portal of the waterfront tunnel may be beneficial in the vicinity of the Waterfront Landing Condominiums.

10 How would the Tunnel Alternative change character and land use in the project area?

This alternative would replace the Alaskan Way Viaduct with a six-lane tunnel, beginning south of S. King Street and ending just north of Pike Street, near the Seattle Aquarium. Currently, the viaduct blocks views between the waterfront and neighborhoods to the east and restricts options for land use and development-both under and adjacent to the elevated structure.

The Tunnel Alternative could affect land uses in the corridor in several important ways. The current layout of the central waterfront's streets, sidewalks, and open space would be reconfigured in this alternative, adding part of the area that's currently under the viaduct to the surrounding public open space (compatible with the City of Seattle's central waterfront planning efforts). Additions might include features such as landscaping, bike lanes, planted traffic medians, and broadening the waterfront promenade. Closer to the water, extra room could be provided for shoreline access, outdoor seating for restaurants, and seating along the shoreline. Replacing the central portion of the viaduct with a tunnel could affect land uses away from the waterfront as well. Areas adjacent to the viaduct would experience lower levels of noise and vibration caused by fast-moving traffic. Without the viaduct, a scenic view would stretch from the edge of the commercial core to the Olympic Mountains. A clear visual connection could be established between the waterfront and the city, and the way to the waterfront and back could be enhanced with unobstructed sight lines, improved street crossings, and an extension of the City of Seattle's Green Streets efforts to the waterfront on east-west streets. Overall changes resulting from this alternative could make nearby buildings and land more desirable for land uses that benefit from views, proximity to public open space, and foot traffic-possibly leading to new kinds of development in the project corridor.

Some land along the corridor would be converted to roadway, most of it in the industrial area in the south. About 620 parking spaces in the corridor would be removed. North of Pike Street, where ramps would connect the proposed tunnel to Alaskan Way surface street, traffic would probably be more congested than it is presently. This might affect businesses along Alaskan Way. However, the corridor would also see improvements to the promenade along the shoreline in this area, making it more pleasant for people walking along the replaced seawall. South of S. King Street, new ramps would connect SR 99 to S. Atlantic Street and S. Royal Brougham Way. These would be partially located in the Port of Seattle's container cargo facilities, reducing the area used for container delivery, storage, and pickup. However, the ramps would also make it easier for trucks to move between the Port's facilities and both SR 99 and I-5.

11 How would the Tunnel Alternative affect parks, recreation, and open space?

With the viaduct removed from the central waterfront, part of the area that is currently beneath the viaduct could be incorporated into an open space corridor in the central waterfront with streetscaping, sidewalks, broadening of the existing promenade, and bike lanes. Access between waterfront recreational facilities and downtown would be improved, and views between the waterfront and downtown would no longer be blocked by the viaduct. Additionally, putting a section of SR 99 underground would result in far less noise and visual distraction from vehicles.

One of the benefits of this alternative to parks and recreational facilities is that the areas above some parts of the tunnel could be used as public open space. From Union to Pine Streets (east of the Seattle Aquarium), part of the area above the tunnel would be occupied by a broad open space that could be developed as plaza or park. At the north end of the plaza, where the lanes of SR 99 would rise toward the tunnel portal, the lid above would slope accordingly, providing an inclined area that could also be developed as a park or recreational facility.

A new over-water pier with a ferry access road would be built near the end of S. Washington Street connecting to Colman Dock. The pier would remove Alaska Square, a small public access and shoreline viewing area. Alaska Square is currently closed

Historic Washington Street Boat Landing

The Land Use and Shorelines Technical Memorandum found in Appendix G discusses this topic more extensively and looks at the alternatives with an eye toward their consistency with current local land use plans and policies.

Appendices H and N contain additional information about parks and recreation.

because the bulkhead supporting it is failing. Alaska Square could be replaced with sidewalks and shoreline viewing near its current location. The new overwater pier would also require relocating the Washington Street Boat Landing about 125 feet west of its current location.

The Tunnel Alternative would modify the Waterfront Trail, which is separated from the Alaskan Way surface street and shared by bicyclists and pedestrians. The separated, shared path would be extended south from S. Royal Brougham Way to S. Atlantic Street. From S. Atlantic Street to Yesler Way, the Waterfront Trail would be moved from the east side of E. Marginal Way/Alaskan Way to the west side. Between Yesler Way and Union Street, the trail would change from being a separated, shared bicycle and pedestrian pathway. Bicyclists would ride in striped lanes along the Alaskan Way surface street, and pedestrians could walk on sidewalks on the east side of Alaskan Way or the waterfront promenade located on the west side of Alaskan Way. From Union Street north, the Waterfront Trail would remain in its existing location, though it might be narrowed slightly near Stewart Street where the ramps from the tunnel connect to the Alaskan Way surface street.

The Tunnel Alternative would result in the loss of parking spaces that are currently beneath the viaduct, possibly making parking somewhat more difficult for some people visiting the waterfront.

12 How would the Tunnel Alternative affect neighborhoods and the people who live there?

In the Duwamish neighborhood, the Tunnel Alternative new interchange at SR 519 could benefit local businesses. The alternative would dramatically change the character of the commercial core along the central waterfront. Removing the viaduct would reduce noise and remove the visual barrier that now separates the downtown portion of the neighborhood from the waterfront. It would likely be more inviting to walk to and from the waterfront and nearby areas along Western, First, and Second Avenues. What now feels like two different areas separated by a noisy, shadowy zone would become an attractive waterfront landscaped arterial bordered by Elliott Bay, the piers, and downtown buildings. This could encourage more people to live and work in the area.

Along the north waterfront, however, more traffic along Alaskan Way surface street could increase the feeling of separation between the waterfront and upland sides. The option with ramps to Elliott and Western Avenues would move traffic off of the waterfront and into the Belltown area, which would be similar to existing traffic patterns.

In the north end of the project area, SR 99 currently makes it difficult for people and traffic to travel between the Uptown and South Lake Union neighborhoods to the east and west of the roadway. The Widened Mercer improvements would benefit these neighborhoods in this area by improving east-west connections across SR 99 at Mercer and Thomas Streets.

13 Would the Tunnel Alternative affect community and social services?

The Tunnel Alternative would have little effect on most community and social services providers in the corridor. The CASA Latina Day Workers' Center (which dispatches jobs for casual day laborers) is located near the south portal of the Battery Street Tunnel and would be displaced. In the south, a new southbound on-ramp from E. Marginal Way in front of the St. Martin de Porres homeless shelter would increase traffic substantially. This could make driving to and from the shelter more difficult during peak travel times when transporting overnight clients to and from other downtown social service agencies. This alternative would reduce noise and improve views for residents of the Lutheran Compass Center (a shelter and transitional housing facility), which is located next to the viaduct. Other social services would not be affected.

14 What residences, businesses, or other properties would need to be acquired?

No residences would be affected. Up to 20 parcels would be permanently acquired for the Tunnel Alternatives. If these parcels are fully acquired, the total area obtained would be approximately 1,115,000 square feet (26 acres). Additionally, about 169,000 square feet along the eastern edge of Terminal 46 may be acquired for right-of-way needs or ferry holding. Up to 10 buildings would be modified or displaced during construction, including seven commercial buildings, two industrial buildings, and Fire Station No. 5. At this time, the number of businesses or employees that would need to be relocated is unknown; however, it is estimated that up to 356 employees in the 10 buildings may be affected. Specific information about the number of businesses and employees requiring relocation will be developed as part of the Final EIS.

Of the 20 parcels that would potentially be acquired, 7 are located in the southern section of the project, 12 are located in the central section, and 1 is located in the north section. Additional parcels or buildings would receive minor modifications, such as changes to driveways, parking, or fences, which would not alter their existing use. The lead agencies will work closely with the affected businesses and properties to minimize the level of disruption.

15 How would the Tunnel Alternative affect historic resources?

The Tunnel Alternative would replace the viaduct with a tunnel, starting at S. King Street, with ramps ending at about Stewart Street. The benefits of this alternative to the historic buildings in the central waterfront would include reduced noise levels and substantially increased views of and from the historic buildings. Gone with the viaduct would be much of the noise and blocked views to and from historic buildings and neighborhoods. The existing viaduct detracts from the Pioneer Square Historic District and the distinctive working waterfront architecture of Piers 54 to 59 (eligible for consideration as a historic district in the National Register of Historic Places). With the viaduct gone, it would be easier to enjoy the historic character of these neighborhoods and their buildings.

Appendices I and J contain additional information about neighborhoods.

Will the agencies help relocate properties that need to be purchased for the project?

The lead agencies will provide relocation assistance and compensation to the affected property owners and tenants as mitigation. Compensation will comply with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Relocation assistance includes determining special needs and providing referrals to comparable properties.

Further details for properties that would potentially be acquired are included in Appendix K, Relocations Technical Memorandum.

Appendices L and N contain additional information about historic resources.

As with all alternatives, new ramps would connect SR 99 to S. Royal Brougham Way and S. Atlantic Street (on the south edge of the Pioneer Square neighborhood). These ramps would affect nearby historic buildings with traffic noise and blocked views. Old ramps connecting SR 99 with First Avenue would be removed, benefiting the surrounding area. However, new ramps connecting SR 99 to S. Royal Brougham Way and S. Atlantic Street (on the south edge of the Pioneer Square neighborhood) would have some of the same effects as the existing viaduct, and could affect access to a nearby historic building. In the south end of the corridor, one building eligible for listing in the National Register of Historic Places may be demolished. That building is the Washington-Oregon Shippers Cooperative Association (WOSCA) Freight House, at 801 First Avenue S. A tunnel portal would be located just south of S. King Street. Although traffic noise and exhaust from cars could affect parts of Pioneer Square Historic District that would be close to the portal, overall it would be an improvement over current noise and exhaust from the viaduct.

Continuing into downtown, ramps at Columbia Street and Seneca Street would be removed, eliminating their existing effects to the historic buildings around them. Along the waterfront, the Washington Street Boat Landing pergola would be relocated approximately 125 feet west of its current location, to make way for the Colman Dock ferry access road. In the Pioneer Square Historic District, the One Yesler Way building would be in the way of the tunnel, but it could be moved across the street. The tunnel would be vented through structures with stacks tall enough to clear the buildings next to them. These structures could be designed to blend in with their surroundings. Finally, the Battery Street Tunnel, another structure eligible for historic listing, would be remodeled to make it safer. These updates might change the character of the tunnel portals. The tunnel already intrudes on the basement of the Catholic Seamen's Club, which may be altered for the tunnel improvements and is eligible for listing in the National Register of Historic Places.

The existing viaduct is eligible to be listed in the National Register for Historic Places. The seawall is also eligible. The potential historic status of these structures would be considered as part of the planning process but is not expected to prevent their replace-ment. Replacement of the seawall is not expected to affect any other historic resource in the corridor.

As part of the planning and design of the Tunnel Alternative, measures would be taken to lessen the effects it would have on historic buildings and neighborhoods. These measures might include designing new structures to blend in with their historic surroundings, moving historic buildings instead of tearing them down, and documenting buildings and structures that need to be removed (with photos, surveys, measurements, and notes) to help preserve the memory of Seattle's history for the future.

16 How would the Tunnel Alternative affect public services (such as police and fire)?

The effects of the alternatives on public services would mostly be caused by changes in traffic patterns within the corridor. The Tunnel Alternative would maintain or slightly improve traffic flow in the corridor. It may change routes for public service providers since ramp connections would change, but this should not have a negative effect on the ability to provide comparable services.

Project elements that would improve overall operations for public service providers include adding roadway connections in the south end at SR 519, shifting access to the ferry terminal from Yesler Way to S. King Street, and closing the Battery Street ramps to general traffic. The Battery Street ramps would remain open to emergency vehicles, which would provide direct access to the Battery Street Tunnel for emergency service providers. Improvements to the Battery Street Tunnel would enhance the ability to fight fires in the tunnel, and additional exits from the tunnel would improve overall safety.

Ramp connections from SR 99 into downtown at Columbia, Seneca, Elliott, and Western would not be provided with this alternative. This may change routes for public service providers. However, comparable access would be provided elsewhere in the corridor, so public service providers would not be negatively affected by these changes.

North of the Battery Street Tunnel, effects to public service providers would be mixed. Mercer Street would be widened and would become a two-way street, and a bridge would connect Thomas Street over the top of SR 99. The bridge at Thomas Street and expanded Mercer would provide additional east-west traffic movements in this section of the corridor. However, additional congestion and delay is expected at a couple of additional intersections due to the roadway changes. Therefore, traffic conditions in the north end would have improved connections, but with more congestion.

17 How would the Tunnel Alternative affect the local and regional economy?

The Tunnel Alternative would benefit the local and regional economy by making the facility safer, by maintaining freight mobility, and by providing reliable transportation corridor for goods and services.

The Tunnel Alternative would permanently displace up to 10 buildings with approximately 356 employees. If the businesses are not relocated within the city, local sales, business and occupation (B&O), and property tax revenue might be lost. FHWA, WSDOT, and the City will work closely with affected businesses and properties to minimize disruptions and provide relocation services to displaced businesses. If displaced businesses leave Seattle but stay in the region, the new location would continue to collect B&O taxes and support the regional economy.

Under the Tunnel Alternative, approximately 670 parking spaces would be removed. About 276 of these spaces are free long-term spaces underneath the viaduct south of S. King Street. Therefore, people currently parking for free would need to pay for long-term parking, use public transit, or find other

Appendix O contains additional information about public services.

Appendix P contains additional information about Economics.

places to park. Most of the other spaces that would be re-moved, about 333, are short-term spaces in Pioneer Square and the central waterfront project area. This short-term parking is used by customers and tourists in the AWV Corridor. Without mitigation, the
property displacements and loss of parking spaces could affect the economic viability of businesses in these areas.

The Tunnel Alternative would provide improved connections to the Duwamish area, Harbor Island, and SR 519 with the overcrossing ramps at S. Royal Brougham Way and S. Atlantic Street. The new interchange at SR 519 would provide grade-separated access over the tail track, allowing for vehicular access from the waterfront to SR 519 when freight trains are present. The Elliott / Western ramps would be replaced with new ramps to the Alaskan Way surface street. Drivers heading to the Ballard / Interbay area would use these ramps and drive on Alaskan Way to reach Elliott Avenue. The replacement route is expected to have similar travel times to the Western / Elliott route compared with the 2030 existing facility, though congestion is expected on Alaskan Way near Broad Street. Thus, freight operating and shipping costs would not be expected to change under this alternative.

18 Would the Tunnel Alternative change air quality?

Under the Tunnel Alternative, concentrations of carbon monoxide and particulate matter (PM_{10}) were estimated under peak traffic conditions for study area intersections (Exhibits 6-1, 6 2, and 6-3 in Appendix Q). The future pollutant concentrations were estimated to be below (within) the National Ambient Air Quality Standards (NAAQS).

Daily pollutant emissions from traffic in the study area in 2030 were also estimated. Comparison between existing study area emissions and the various alternatives in 2030 demonstrates the trend towards cleaner operating vehicles for carbon monoxide, oxides of nitrogen, and hydrocarbons in 2030 (Exhibit 6-4 in Appendix Q).

The Tunnel Alternative includes four ventilation buildings that would be located adjacent to the tunnel near S. King Street, Yesler Way, Spring Street, and Pike Street. The ventilation buildings would be approximately 30 feet tall with 15-foot stacks. During the peak of an average rush hour, carbon monoxide emissions at the ventilation buildings and tunnel portals would not exceed the NAAQS for the surrounding neighborhoods.

19 How would the Tunnel Alternative affect fish and wildlife species and their habitat?

The Tunnel Alternative would replace the seawall with a tunnel wall from Colman Dock up to Pike Street and a rebuilt seawall from Pike Street to Virginia Street. Additionally, the sheet pile wall around Pier 48 would be replaced by the new seawall. The new seawall would be constructed slightly landward of the existing seawall through the majority of the corridor, increasing water volume in the immediate area by an estimated 6,000 cubic yards. However, a section of the tunnel would be located up to 21 feet farther into the water along about 270 feet of the shoreline between Pier 48 and Colman Dock. This would extend the Washington Street outfall further into Elliott Bay. Like the old seawall, the basic structure in the aquatic habitat along the new seawall would consist of a vertical concrete wall with rock riprap placed at its base where needed to prevent erosion from waves. Up on the street level, urban habitat-mostly street trees and shrubs-would remain much the same as it currently is. The existing stormwater facilities that collect and convey water from the viaduct are old and would be replaced with new facilities using current design standards and technology, improving the quality of water discharged.

The vertical concrete seawall is poor intertidal habitat for many species, including ESA listed species such as Chinook salmon and bull trout. The Seattle waterfront is a migration corridor and rearing area for juvenile Chinook and other juvenile anadromous salmonids. Juvenile salmon are commonly present at various protected locations near the water's surface in the vicinity of the seawall during spring migration.

Other fish species commonly observed in the shoreline area along the seawall include seaperch, bay pipefish, shiner perch, sculpins, greenling, various flatfishes, and a few lingcod. These fish would experience the same basic habitat as they do today when the new seawall is constructed. The habitat along the seawall is also occupied by a range of marine invertebrates, such as red crab, hairy crab, coon-striped shrimp, octopus, starfish, and anemones.

Between Pier 48 and Colman Dock, a new over-water pier would be built to provide vehicle access to the Colman Dock Ferry Terminal. The total area that would be altered is approximately 33,000 square feet. The new tunnel structure would fill about 4,000 square feet in this location. The new pier would extend out from the new tunnel structure and cover approximately 29,000 square feet of the intertidal shoreline (areas that are exposed during low tides), including riprap, and shallow subtidal habitat (areas normally covered by water).

Under other piers along the waterfront, marine biologists observed that macro algae (a kind of seaweed, important for food and habitat for aquatic animals) have a hard time growing in shade cast by the piers. The shade would probably keep macro algae and other aquatic vegetation from growing under the new pier.

Project planners and designers would work with resource agencies (like the Corps of Engineers) to address habitat that could be affected by shading from the construction of the pier. These efforts could include protecting an existing intertidal beach with an offshore berm or breakwater and creating new beaches in open areas along the waterfront that would provide much-needed aquatic habitat along Seattle's urban shoreline. This would give young salmon the protective shallow water habitat they need to grow and provide a corridor along the waterfront in which adult salmon could migrate on their way to and from the Pacific Ocean. Other possibilities for restoring more natural habitat characteristics where possible are also being studied.

Changes to Elliott Bay at S. Washington Street

Tunnel

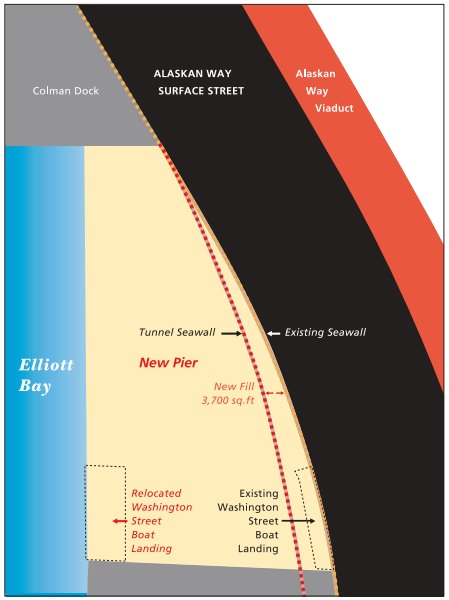


Exhibit 7-9

Appendix Q contains additional information about air quality.

Appendix R contains additional information about fish and wildlife.

What is a BMP?

A Best Management Practice (BMP) is an action or structure that reduces or prevents pollutants from entering the stormwater and degrading water quality.

20 Would the Tunnel Alternative change water quality?

The amount of impervious surface area would not increase under the Tunnel Alternative. Incorporation of Best Management Practices (BMPs) into the Tunnel Alternative would improve the water quality of runoff discharged from the project area compared with existing conditions. Rain running off the streets and highways collects pollutants like zinc and copper that reduce water quality and can be harmful to aquatic plants and wildlife. By using BMPs, the Tunnel Alternative would reduce the amount of these potentially harmful materials.

Exhibit 7-10

Summary of Water Quality Benefits for the Tunnel Alternative BMP Approach

Annual Pollutant Load (lbs/yr)[1]	*Existing Conditions*	*Aerial Alternative*	*Change (% Reduction)*[2]
Total Suspended Solids	87,300	46,400	47%
Zinc	132	83	37%
Copper	26	17	35%

[1] Annual pollutant load from project area pollutant-generating impervious surface (PGIS) after treatment with the BMP Approach

[2] Pollutant reduction is an estimate based on a mass balance model developed for this project

The new tunnel along the waterfront and the Battery Street Tunnel improvements include a fire suppression system. In an emergency, it is possible that runoff from this system could discharge directly into Elliott Bay, temporarily reducing dissolved oxygen needed by aquatic plants and wildlife. These short-term impacts are allowed under State of Washington laws.

The volume of stormwater being treated and discharged to the Duwamish River, Elliott Bay, and Puget Sound would not change. The project would extend both the stormdrain and combined sewer outfall at Washington Street further into Elliott Bay. The Tunnel Alternative could result in a net benefit to the environment compared to existing conditions. The reduction in pollutants discharged to Puget Sound is minimal because the West Point Treatment Plant efficiency would not change.

21 How would the Tunnel Alternative change the soil conditions once the project is completed?

To meet earthquake standards, the soil would have to be strengthened to ensure that it would not liquefy in an earthquake. A large part of the Alaskan Way Viaduct project area is located on loose fill, soft sediment, sand, and gravel (described in Chapter 3 Question 2). In the central area of the Tunnel Alternative, much of these loose materials are removed during tunnel excavation; however, in the south end and in locations where the alternative has elevated structures, soil improvements are required. The Tunnel Alternative's structures must be anchored in soils that are stronger than these loose materials to withstand an earthquake. Where piles or drilled shafts are needed, they would be installed 60 to 150 feet deep to reach the dense glacial soils that would support the facility.

Soils would be strengthened primarily in the south section around the new foundations needed for the structure, under some proposed retaining walls, and behind the seawall sections that are not part of the tunnel wall. Soils can be strengthened by using jet grouting or deep soil mixing techniques. These techniques inject, mix, or replace the existing soil with cement grout to strengthen the soils.

The soils between the new tunnel's north portal and the Battery Street Tunnel have sufficient strength and do not need to be improved. In the north section of the Tunnel Alternative, the Battery Street Tunnel improvements may require some shallow foundations, which would displace a small amount of soil. The changes to the street grid would require soil excavation to widen Mercer Street and fill to be placed along Broad Street.

In the central section, soils would not need to be strengthened because excavation for the cut-and-cover tunnel would permanently remove a large amount of the liquefiable soils that are a seismic hazard. Various types of contamination may potentially be found in some of the excavated soils, such as creosote piles or petroleum from underground fuel storage tanks. Removing these contaminated soils would improve the soil conditions in the area.

The new tunnel wall would also function as the new seawall between approximately S. Washington Street and Pike Street. The seawall improvements that are separate from the tunnel wall would take place in the south section between S. King Street and S. Washington Street and in the north section from approximately Pike Street to Myrtle Edwards Park. The area of soil behind the seawall that would be improved depends upon the type of seawall and depth to glacial soils. From S. King Street to S. Washington Street, soil improvements behind the existing sheet pile wall would be made to a depth of about 40 feet and a width of about 35 feet. The majority of the seawall between Pike Street and Myrtle Edwards Park is Type A Seawall, with a small section of Type B Seawall at Clay Street. The soil improvements behind the Type A Seawall would improve approximately the first 40 feet east of the seawall to a depth of about 55 feet. Behind the Type B Seawall, the soil improvements would be around 60 feet in width and 65 feet in depth.

22 Would the Tunnel Alternative change groundwater flows?

Any groundwater flow in the tunnel vicinity would flow around, under, or over the tunnel structure. Consequently, the tunnel would not cause long-term operational impacts on water quality from affected groundwater. Overall, groundwater flow in the watershed would not be substantially affected by the project. Groundwater levels may change slightly, although the changes would probably be less than the natural fluctuations in groundwater levels that already occur.

23 Would the Tunnel Alternative create or remove any contaminated materials or sites?

The Tunnel Alternative would not create any new contaminated materials or sites. This alternative would result in removal of an estimated 2,290,000 cubic yards of soils or material generated as spoils during construction. Of this amount, approximately 672,000 cubic yards of potentially contaminated soils

The approaches for stormwater management are described in Chapter 2.

Appendix S contains additional information about water quality.

Appendix T contains more information about geology, soils, and groundwater.

Appendix U contains additional information about contaminated materials.

would be removed and disposed of appropriately, which would benefit the project area. Removal of the contaminated soil could reduce future groundwater contamination. Additionally, most of the utilities would be placed in clean backfill above the tunnel, reducing the potential of exposure to contaminated soil and its associated air-borne contaminants for the workers servicing these utilities.