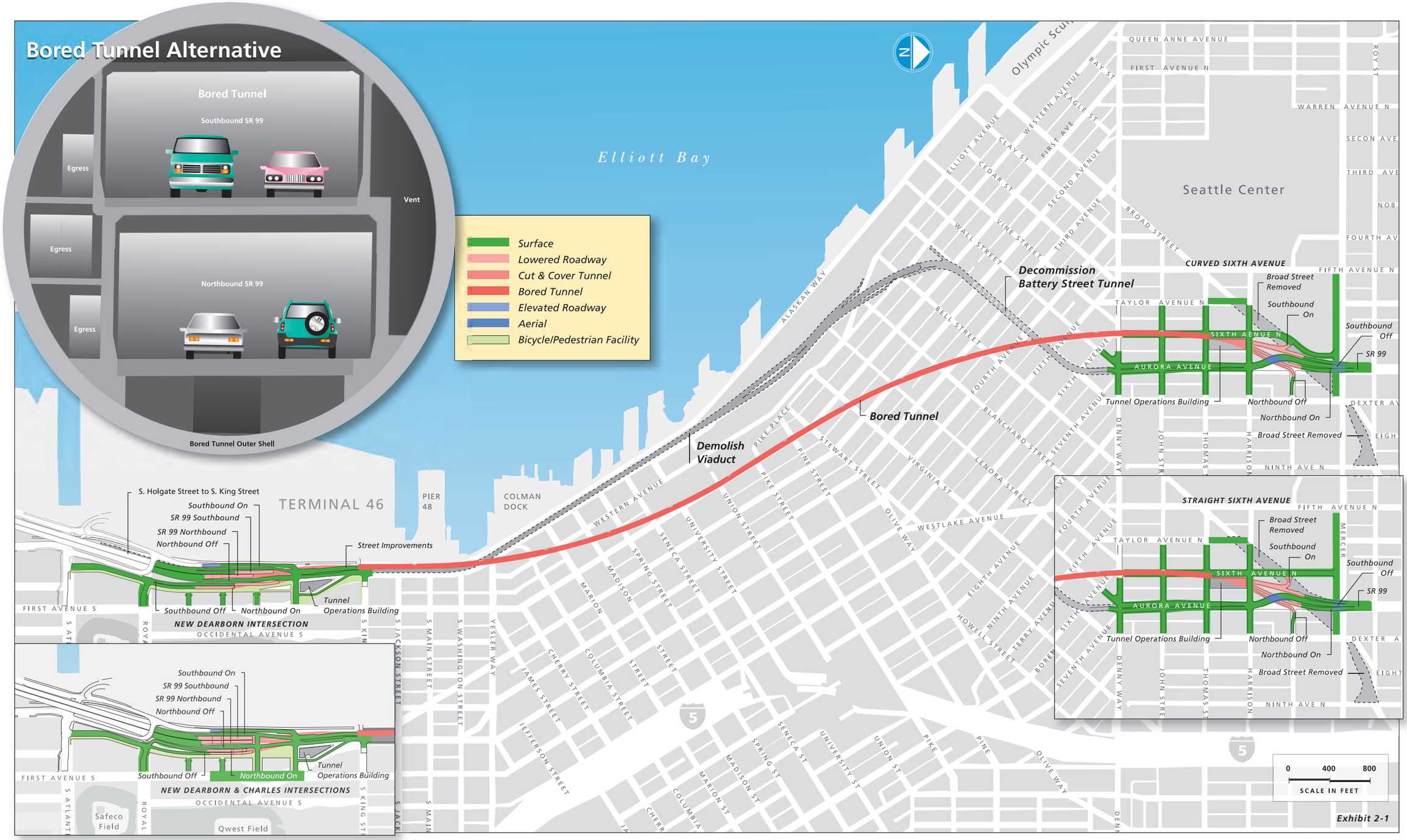

Bored Tunnel Alternative
Bored Tunnel
Southbound SR 99
Egress
Vent
Egress
Northbound SR 99
Egress
Bored Tunnel Outer Shell
Surface
Lowered Roadway
Cut & Cover Tunnel
Bored Tunnel
Elevated Roadway
Aerial
Bicycle/Pedestrian Facility
Elliott Bay
Olympic Scu
QUEEN ANNE AVENUE
FIRST AVENUE N
WARREN AVENUE N
SECON AVE
THIRD AVE
NOB
FOURTH AV
ROY ST
Seattle Center
BAY ST
EAGLE ST
WESTERN AVENUE
ELLIOTT AVENUE
CLAY ST
CEDAR ST
FIRST AVE
SECOND AVENUE
THIRD AVENUE
BROAD STREET
VINE STREET
WALL STREET
ALASKAN WAY
BELL STREET
FOURTH AVENUE
FIFTH AVENUE
SIXTH AVENUE
CURVED SIXTH AVENUE
FIFTH AVENUE N
Decommission
Battery Street Tunnel
Broad Street
Removed
TAYLOR AVENUE N
Southbound
On
SIXTH AVENUE N
Southbound
Off
SR 99
AURORA AVENUE
Tunnel Operations Building
Northbound Off
Northbound On
Broad Street Removed
DEXTER AV
EIGH
NINTH AVE N
Bored Tunnel
Demolish
Viaduct
PIKE PLACE
PINE STREET
STEWART STREET
VIRGINIA ST
LENORA STREET
DENNY WAY
JOHN STR
THOMAS ST
HARRISON
PIER
48
COLMAN
DOCK
TERMINAL 46
WESTERN AVENUE
UNION STREET
PIKE STREET
OLIVE WAY
WESTLAKE AVENUE
EIGHTH AVENUE
NINTH AVENUE
HOWELL STREET
TERRY AVENU
BOREM
SIXTH AVENUE
SEVENTH AVENUE
SPRING STREET
SENECA STREET
UNIVERSITY STREET
MADISON
MARION
S. Holgate Street to S. King Street
Southbound On
SR 99 Southbound
SR 99 Northbound
Northbound Off
Street Improvements
Southbound Off
Northbound On
Tunnel
Operations Building
FIRST AVENUE S
NEW DEARBORN INTERSECTION
OCCIDENTAL AVENUE S
S ATLANTIC
ROYAL
S KING ST
S JACKSON STREET
S MAIN STREET
S WASHINGTON STREET
YESLER WAY
JAMES STREET
CHERRY STREET
COLUMBIA STREET
JEFFERSON STREET
Southbound On
SR 99 Southbound
SR 99 Northbound
Northbound Off
Southbound Off
Northbound On
Tunnel
Operations Building
NEW DEARBORN & CHARLES INTERSECTIONS
Safeco
Field
Qwest Field
STRAIGHT SIXTH AVENUE
Broad Street
Removed
Southbound
On
Southbound
Off
SR 99
Tunnel Operations Building
Northbound Off
Northbound On
Broad Street Removed
MERCER
0
400
800
SCALE IN FEET
Exhibit 2-1

CHAPTER 2 - SUMMARY

What's in Chapter 2?

This chapter summarizes information contained in this Alaskan Way Viaduct Replacement Project Supplemental Draft Environmental Impact Statement (EIS). Specifically, this chapter summarizes the Bored Tunnel Alternative, permanent project effects and possible mitigation, temporary construction effects and possible mitigation, and cumulative effects. This chapter also briefly compares the alternatives evaluated in the 2006 Supplemental Draft EIS with the Bored Tunnel Alternative.

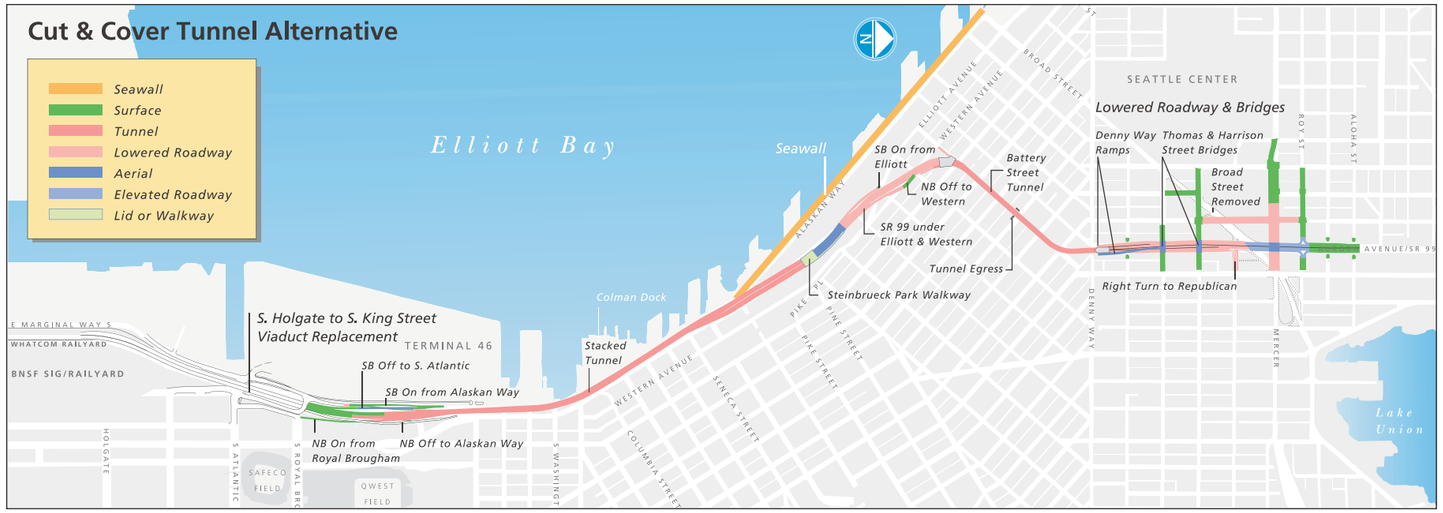
1 What alternatives are considered in this Supplemental Draft EIS?

This Supplemental Draft EIS analyzes the Bored Tunnel Alternative shown in Exhibit 2-1 and compares its effects to the Cut-and-Cover Tunnel and Elevated Structure Alternatives evaluated in a 2006 Supplemental Draft EIS shown in Exhibit 2-2. In addition, the Viaduct Closed (No Build Alternative) is carried forward as required by environmental regulations to provide baseline information about conditions in the project area if nothing were done.

The lead agencies have identified the Bored Tunnel Alternative as the preferred alternative.

2 How have the alternatives changed since the 2006 Supplemental Draft EIS?

The Cut-and-Cover Tunnel and Elevated Structure Alternatives have been updated since the 2006 Supplemental Draft EIS. Changes made to these alternatives are summarized below and are discussed in greater detail in Chapter 3, Question 7:



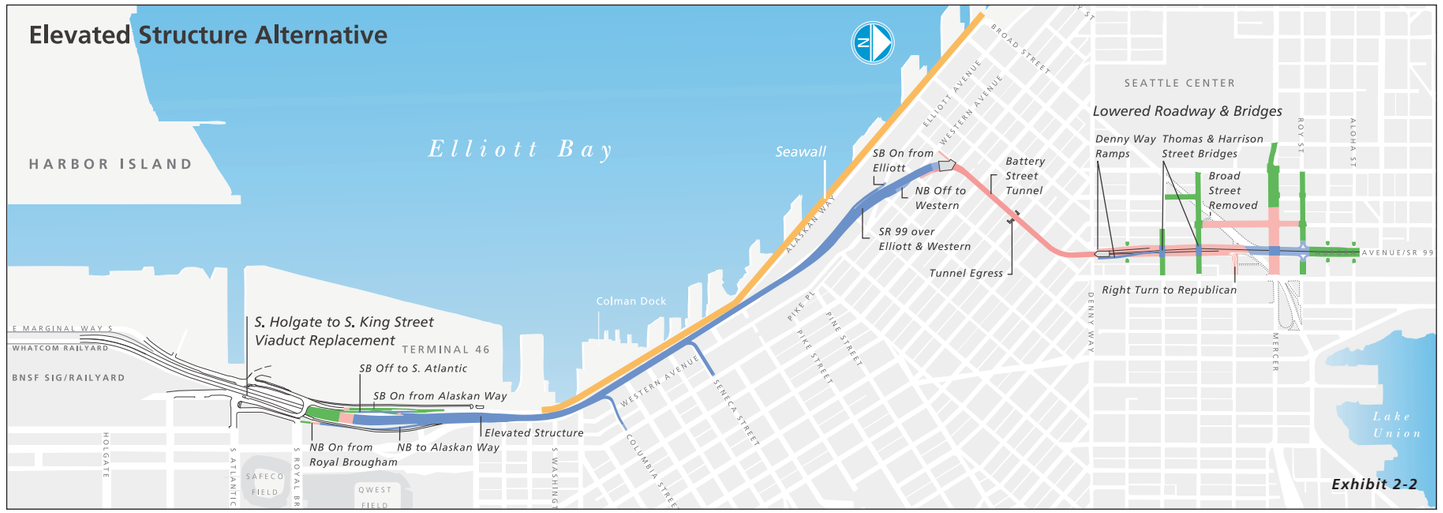


Exhibit 2-2

What is the Viaduct Closed (No Build Alternative)?

The Viaduct Closed (No Build Alternative) is described in **Chapter 3 Question 12**.

- Both alternative no longer include replacing State Route 99 (SR 99) south of S. Royal Brougham Way. This section of SR 99 will be replaced as part of the independent S. Holgate Street to S. King Street Viaduct Replacement Project.

- The design of SR 99 between S. Royal Brougham Way and S. King Street was modified for both alternatives.

- Proposed improvements for both alternatives have been redesigned so fill would no longer be required in Elliott Bay near S. Washington Street.

- Battery Street Tunnel improvements include replacing the walls of the tunnel.

- The Alaskan Way surface street design for the Elevated Structure Alternative was changed. Northbound lanes would be located under the new elevated structure, and southbound lanes would be provided west of the new elevated structure.

- In addition to these changes, the assumptions for the Viaduct Closed Alternative have changed since the 2004 Draft EIS and 2006 Supplemental Draft EIS. The 2004 and 2006 Supplemental Draft EIS considered traffic conditions for the 2030 Existing Facility, which assumed that the existing viaduct would be operational in 2030. Since the 2006 Supplemental Draft EIS, we have learned that the existing viaduct would be closed and removed before 2030. Because of this, the Viaduct Closed Alternative assumes that SR 99 would be closed between S. King Street and the Battery Street Tunnel if nothing is done to replace this section of SR 99.

3 How was the Bored Tunnel Alternative developed?

After the Supplemental Draft EIS was published in July 2006, several studies, evaluations, and events, such as the City of Seattle vote in March 2007, made it clear that there was a lack of consensus surrounding a preferred alternative for replacing the viaduct and seawall. Because of this, in December 2007 Governor Gregoire, former King County Executive Sims, and former Seattle Mayor Nickels committed to a collaborative effort, called the Partnership Process, to forge a solution that could be broadly supported and implemented. The Partnership Process included input from a 29-member Stakeholder Advisory Committee and Project Management Team, which influenced the recommendation from the Governor, former County Executive, and former Mayor.

In January 2009, the Governor, former County Executive, and former Mayor recommended replacing the central waterfront portion of the Alaskan Way Viaduct with a deep single-bore tunnel. As part of their recommendation, they also recommended replacing Alaskan Way with a new waterfront surface street and promenade, transit investments, a streetcar on First Avenue, restoring the seawall, improving a section of Mercer Street, and connecting the Elliott and Western Corridor to Alaskan Way. Their recommendation was grounded in the potential for a bored tunnel and other improvements to meet the six guiding principles established as part of the Partnership Process; technical analysis; strong support of diverse interests; and the willingness of the partners, with the support of the Port of Seattle, to develop a funding program that supplements the state's committed up to $2.8 billion.

4 How would the Bored Tunnel Alternative replace the existing viaduct?

The Bored Tunnel Alternative would replace SR 99 between S. Royal Brougham Way and Roy Street as shown in Exhibit 2-1. The tunnel would have two lanes in each direction. Access to and from SR 99 would be provided via ramp connections at the south portal north of S. Royal Brougham Way and the north portal near Harrison and Republican Streets. Unlike the existing connections, ramps to and from Columbia and Seneca Streets or Elliott and Western Avenues would not be provided. This alternative would remove the viaduct along the Seattle waterfront and would close and fill the Battery Street Tunnel after the bored tunnel is constructed.

The bored tunnel would have two lanes in each direction. Southbound lanes would be located on the top portion of the tunnel, and the northbound lanes would be located on the bottom. Travel lanes would be approximately 11 feet wide, with a 2-foot-wide shoulder on one side and a 6-foot-wide shoulder on the other side. In most places, the Bored Tunnel Alternative would be built to meet current roadway design standards; however, in some areas deviations will be required. All deviations will be approved by Washington State Department of Transportation (WSDOT) and Federal Highway Administration (FHWA) to ensure that the roadway is built to be a safe facility for travelers.

The bored tunnel would be designed to provide emergency access, evacuation routes, ventilation, and fire suppression systems in accordance with National Fire Protection Association standards and other codes and regulations. Emergency tunnel exits would be provided throughout the tunnel. In an emergency, travelers would walk along the shoulders to reach a doorway into a secure waiting area, called a refuge area, located between the tunnel's levels. Staircases inside the refuge area would provide access to a walkway which would run the length of the tunnel and would be located between the roadway levels. Signs would point travelers to the nearest exit, where they would either wait for assistance or walk out of the tunnel. Refuge areas would contain emergency telephones. People who are unable to use the stairs to exit the tunnel could wait in the enclosed, protected refuge areas for assisted rescue. Refuge areas and the pathways to the refuge areas will meet Americans with Disabilities Act (ADA) requirements.

South Portal Area

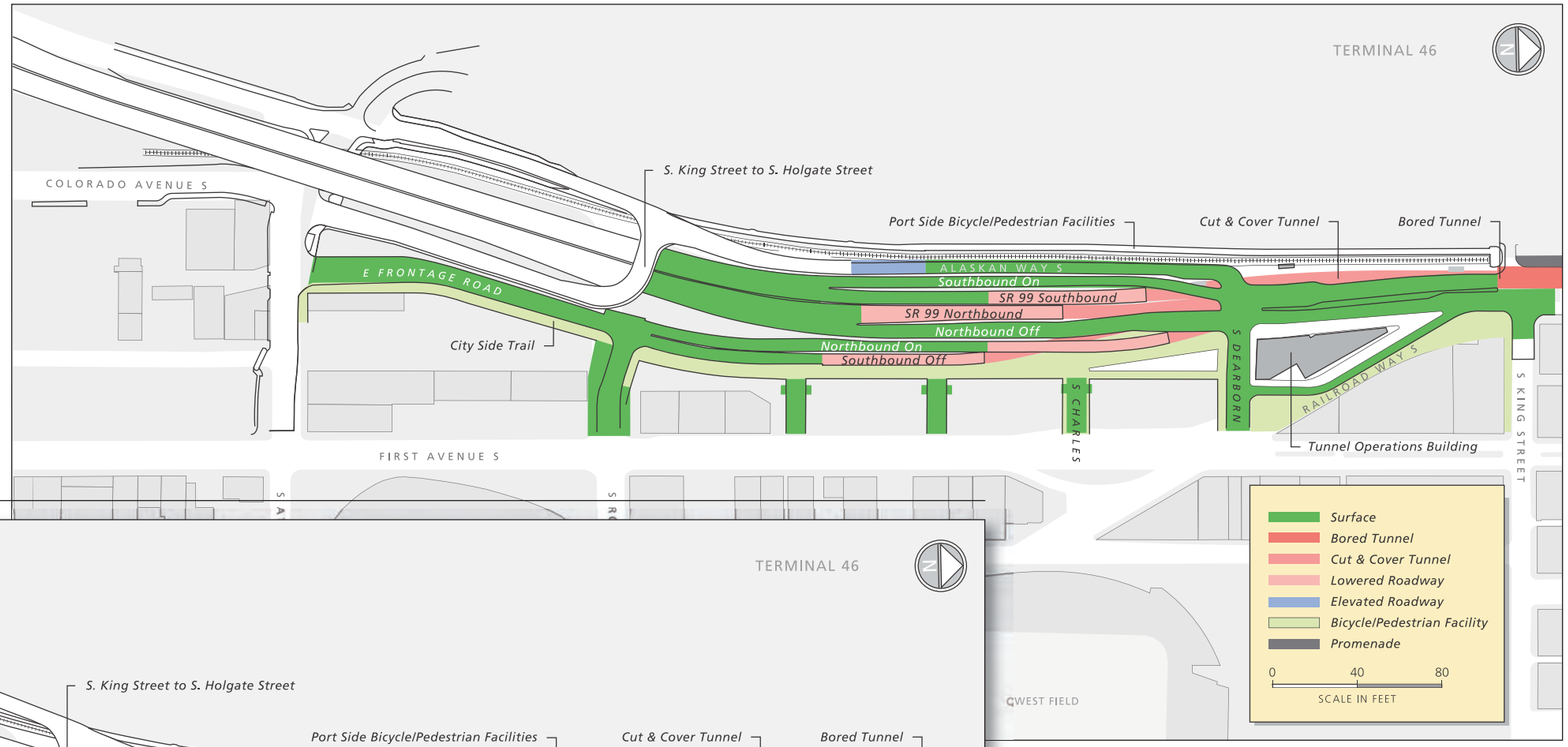
Full northbound and southbound access to and from SR 99 would be provided in the south portal area between S. Royal Brougham Way and S. King Street. The northbound on-ramp to and southbound off-ramp from SR 99 would be built near S. Royal Brougham Way and would intersect with the East Frontage Road as shown in Exhibit 2-3.

The southbound on-ramp to and northbound off-ramp from SR 99 would feed directly into a reconfigured Alaskan Way S. The northbound off-ramp would have a general-purpose lane and a peak hour transit-only lane to accommodate transit coming from south or West Seattle. The reconfigured Alaskan Way S. would have three lanes in each direction up to S. King Street. A new trail, called the City Side Trail, would replace the existing Waterfront Bicycle/Pedestrian Facility located on the east side of Alaskan Way S. A tunnel operations building would be constructed in the block bounded by S. Dearborn Street and Alaskan Way S.

This Supplemental Draft EIS considers two options for building new cross streets to intersect with Alaskan Way S. north of S. Royal Brougham Way:

South Portal Options

New Dearborn Intersection



New Dearborn & Charles Intersections

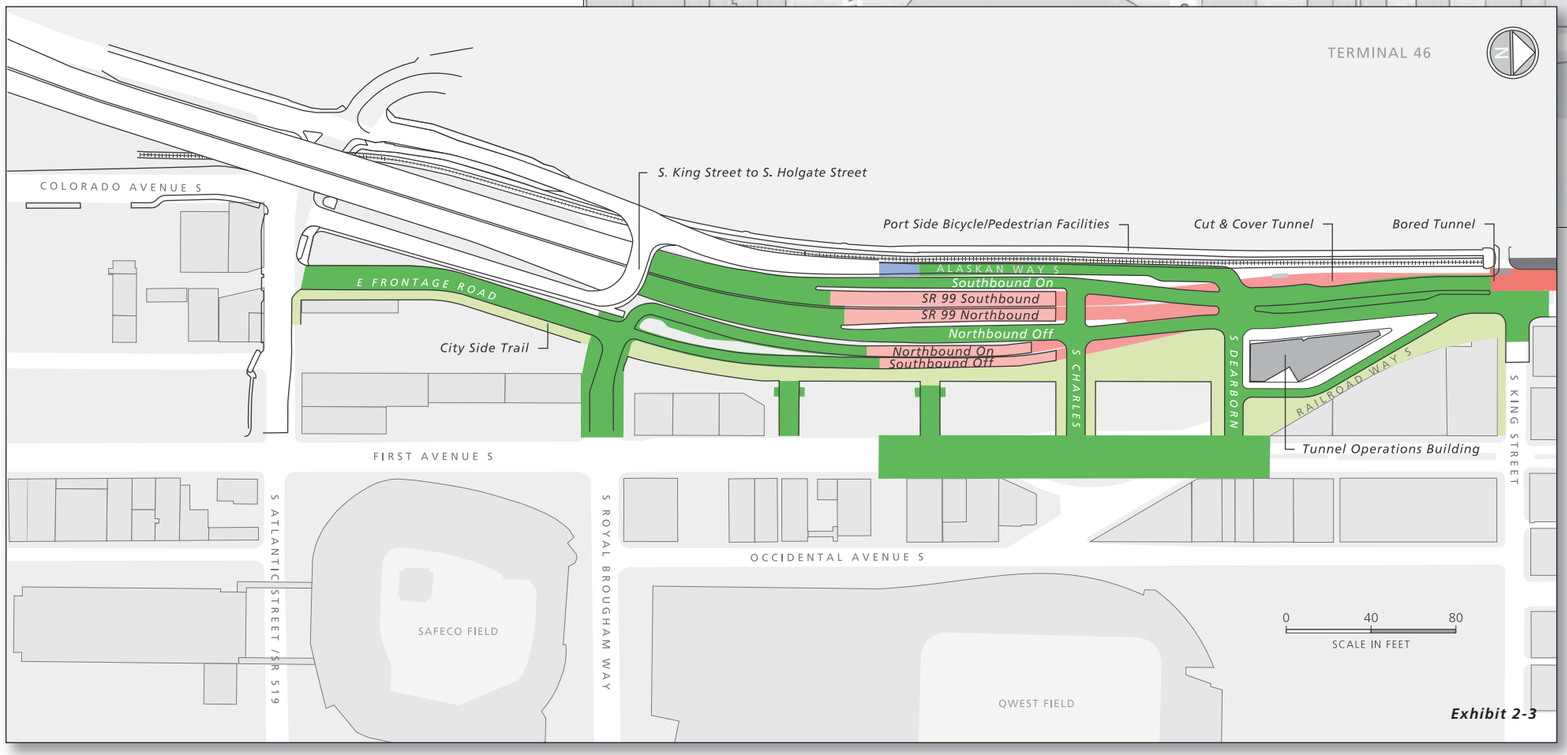


Exhibit 2-3

Conceptual Drawing of the South Portal Tunnel Operations Building

- **New Dearborn Intersection –** Alaskan Way S. would have one new intersection and cross street at S. Dearborn Street. The cross street would have sidewalks on both sides.

- **New Dearborn and Charles Intersections –** Alaskan Way S. would have two new intersections and cross streets at S. Charles Street and S. Dearborn Street. The cross streets would have sidewalks on both sides.

North Portal Area
Full northbound and southbound access to and from SR 99 would be provided near Harrison and Republican Streets. The existing on- and off-ramps provided at Denny Way would be closed and replaced by the ramps near Harrison Street that would connect to Aurora Avenue. New ramps at Republican Street would provide northbound access from SR 99 and southbound access to SR 99. The northbound off-ramp to Republican Street would be provided on the east side of SR 99 and routed to an intersection at Dexter Avenue N. Drivers would access the southbound on-ramp via a new connection with Sixth Avenue N. at Republican Street on the west side of SR 99. Access to SR 99 would continue to be available at Roy Street as it is today.

Surface streets would be rebuilt and improved in the north portal area. Aurora Avenue would be built to grade level between Denny Way and John Street. John, Thomas, and Harrison Streets would be connected as cross streets with signalized intersections on Aurora Avenue at Denny Way and John, Thomas, and Harrison Streets. The rebuilt section of Aurora Avenue would connect to SR 99 via the ramps at Harrison Street. The roadway would have two general-purpose lanes in each direction, turn pockets, and right-side transit lanes.

Mercer Street would become a two-way street and would be widened from Dexter Avenue N. to Fifth Avenue N. The rebuilt Mercer Street would have three lanes in each direction with left-hand turn pockets. Broad Street would be filled and closed between Ninth Avenue N. and Taylor Avenue N. A tunnel operations building would be constructed between Thomas and Harrison Streets on the east side of Sixth Avenue N.

This Supplemental Draft EIS considers two options for extending Sixth Avenue N. as shown in Exhibit 2-4:

- **The Curved Sixth Avenue** option proposes to build a new roadway that would extend Sixth Avenue N. in a curved formation between Harrison and Mercer Streets. The new roadway would have a signalized intersection at the southbound on-ramp.

- **The Straight Sixth Avenue** option proposes to build a new roadway that would extend Sixth Avenue N. from Harrison Street to Mercer Street in a typical grid formation. The new roadway would have

North Portal Options

Curved Sixth Avenue

Straight Sixth Avenue

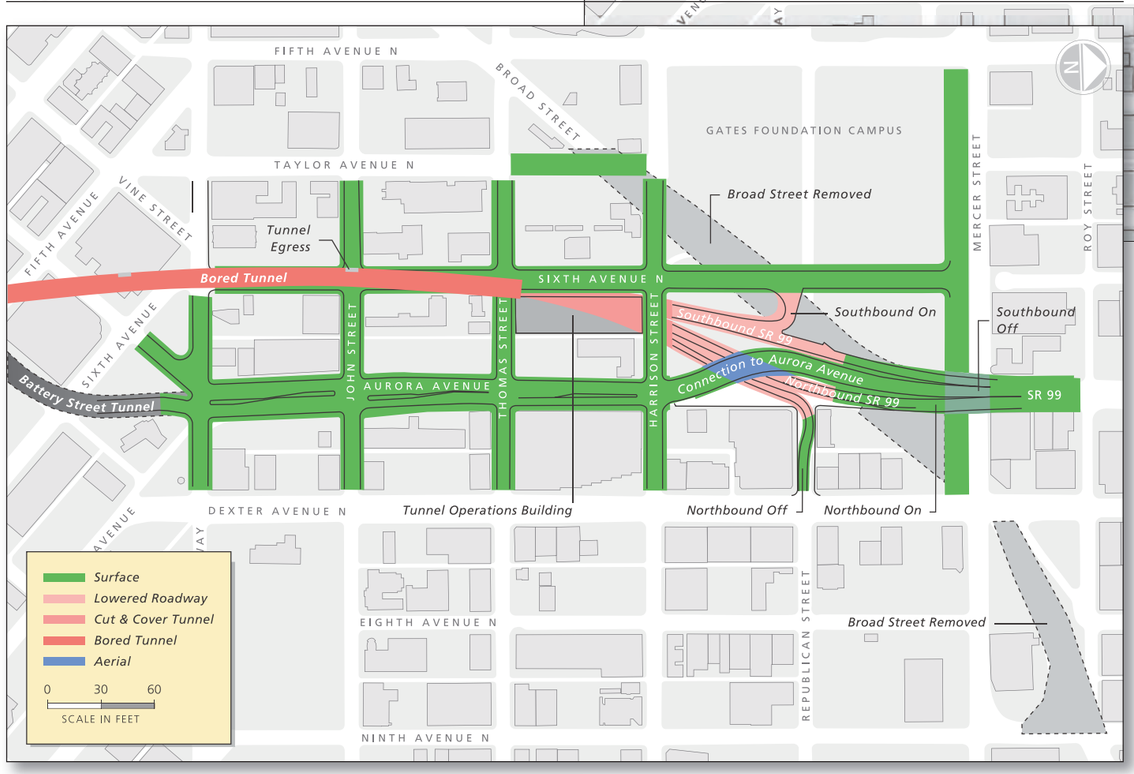


Exhibit 2-4

Which option is preferred in each portal area?

The New Dearborn Intersection is the preferred option in the south portal area.

Curved Sixth Avenue is the preferred option in the north portal area.

signalized intersections at the southbound on-ramp and Mercer Street.

5 How much would the Bored Tunnel Alternative cost?

The Bored Tunnel Alternative is estimated to cost $1.9 billion as shown in Exhibit 2-5. Because design of the tunnel is still preliminary, an allowance for unexpected changes or events is included as a risk. This cost estimate also accounts for inflation from now until the tunnel and portal improvements are complete in 2015 and surface improvements are completed in 2017.

Exhibit 2-5
Bored Tunnel Alternative Costs
in millions

Item	Cost
Construction – including Construction Management and Administration	$1,224
Right-of-Way	152
Preliminary and Final Design	169
Risk and Inflation	415
Total	**$1,960**

Costs for the Bored Tunnel Alternative along with other independent projects associated with the Alaskan Way Viaduct and Seawall Replacement Program (Program) have not been determined because costs for some elements, including the Alaskan Way surface street improvements and the Elliott Bay Seawall Project, are unknown. The cost of improvements to be implemented by WSDOT is $3.1 billion dollars as shown in Exhibit 2-6.

Exhibit 2-6
WSDOT Alaskan Way Viaduct and Seawall Replacement Program Cost Estimate
in millions

Item	Cost
S. Holgate Street to S. King Street Viaduct Replacement Project – under construction	$483
Alaskan Way Viaduct Replacement – Bored Tunnel	1,960
Central waterfront viaduct demolition and Battery Street Tunnel decommissioning	25
Alaskan Way Surface Street Improvements	265[1]
Elliott Bay Seawall – by City of Seattle	Not Available[1]
Central waterfront construction mitigation	30
Other Moving Forward Projects[2]	181
Prior environmental, right-of-way, and design costs	164
Total	**$3,108[3]**

1 Additional funding will be provided by City of Seattle.

2 Other Moving Forward Projects include: Column safety repairs, Electrical line relocation, Battery Street Tunnel maintenance, and initial transit enhancements.

3 Total only includes scope where funding has been identified.

The environmental analysis contained in this Supplemental Draft EIS focuses on evaluating environmental effects of the Alaskan Way Viaduct Replacement Project, which is a project to replace SR 99 along Seattle's central waterfront. The potential effects of independent projects associated with the Program are discussed in the cumulative effects evaluation contained in Chapter 7 and summarized in this chapter.

PERMANENT TRAFFIC EFFECTS OF THE BORED TUNNEL ALTERNATIVE

6 How would SR 99 access change?

The Bored Tunnel Alternative would change the access points, lane configuration, and the alignment of SR 99 between S. Royal Brougham Way and Roy Street. Specifically, the Bored Tunnel Alternative would make the following changes:

- **Remove the midtown ramps** at Columbia and Seneca Streets. Trips heading to and from downtown would use ramps connecting to and from Alaskan Way S. just south of S. King Street to enter and exit downtown.

- **Remove the Elliott and Western Avenue ramps.** Since about one-third of SR 99 traffic through downtown currently uses the Elliott Avenue off-ramp or the Western Avenue on-ramp, removing these ramps would change traffic patterns for these drivers. The Elliott and Western Avenue ramps mostly serve northwest Seattle neighborhoods, including Interbay, Ballard, Magnolia, and the freight community. Drivers traveling from these areas could make their trip by (1) traveling on Elliott Avenue and Alaskan Way to SR 99 ramps at Alaskan Way S., or (2) traveling on Mercer Street to the SR 99 ramp at Sixth Avenue N. and Republican Street.

- **Change connections to and from SR 99 north of Denny Way.** The Denny Way ramps would be replaced with access to Aurora Avenue via ramps at Harrison Street. The multiple access points provided to and from SR 99 via side street connections between John and Mercer Streets would be replaced with a single access point at Republican Street.

7 Would regional traffic patterns change?

Several transportation measures were analyzed to determine if the Bored Tunnel Alternative and its proposed access changes would have a regional or local effect on the total volume of vehicles and people expected to travel through the project area. Additionally, the lead agencies compared the number of expected vehicle miles traveled (VMT), vehicle hours traveled (VHT), and vehicle hours of delay (VHD) for the Bored Tunnel Alternative and the current viaduct configuration. The results of these studies indicated that within the four-county region there is virtually no difference between the existing viaduct in 2015 (called the 2015 Existing Viaduct) or the Bored Tunnel in 2015 for the total volume of vehicles or people expected to travel through the project area. Similarly, there is virtually no difference in VMT, VHT, or VHD.

Within a more local area, called the Seattle Center City area, there are no meaningful differences between the existing viaduct in 2015 or the Bored Tunnel in 2015 for the total volume of vehicles or people expected to travel through the project area. Similarly, there is no meaningful difference in VMT or VHT. VHD, which is often an indicator of congestion, is expected to increase by about 7 percent for the 2015 Bored Tunnel compared to the 2015 Existing Viaduct. This expected change in VHD within the transportation system in the center city area is likely due to changes in access proposed with the Bored Tunnel Alternative. As a result of these access changes, specifically the removal of the Elliott and Western and Columbia and Seneca ramps, more traffic is expected to use city streets for a longer portion of their trip than they would using the existing viaduct.

What traffic information is provided in this summary?

This summary compares traffic conditions for the existing viaduct and the Bored Tunnel Alternative in 2015. Additional data and a discussion of effects are provided for the Viaduct Closed and 2030 traffic conditions in **Chapter 5**. **Chapter 8** compares traffic conditions for the Bored Tunnel, Cut-and-Cover Tunnel, Elevated Structure, and Viaduct Closed Alternatives in 2030.

Does the Bored Tunnel Alternative traffic analysis include tolls?

Tolls are not currently proposed for this project and are not included in the assumptions for the Bored Tunnel Alternative. However, tolling options are being considered. Potential effects from tolling are summarized in **Question 30** of this chapter.

What are VMT, VHT, and VHD?

- Vehicle miles of travel (VMT) is a measure of how many miles vehicles travel on the roadway network.
- Vehicle hours of travel (VHT) indicates how long travelers spend on the roadway network.
- Vehicle hours of delay (VHD) measures the number of hours that travelers spend traveling on roadways at less than optimum speeds. VHD is often used as an indicator of congestion.

What is the 2015 Existing Viaduct?

The 2015 Existing Viaduct is what conditions would be like in 2015 just before the existing viaduct is closed and traffic moves to the new bored tunnel.

8 How would conditions for SR 99 traffic change?

SR 99 Traffic Speeds

As shown in Exhibit 2-7, traffic speeds during the PM peak hour on the SR 99 mainline are expected to be similar or slightly improved with the 2015 Bored Tunnel in comparison to the 2015 Existing Viaduct. Traffic speeds on SR 99 are expected to improve with the Bored Tunnel Alternative because of changes made to SR 99 access points and roadway design improvements. Increased levels of congestion expected for the 2015 Existing Viaduct are primarily due to merging and weaving friction associated with existing access points and geometric constraints such as narrow lanes, limited sight distance, and limited distances for ramp acceleration and deceleration.

Travel Times

Exhibit 2-8 compares travel times for the 2015 Existing Viaduct and 2015 Bored Tunnel during the AM and PM peak hour. Travel time findings are discussed below:

- Projected travel times for the routes investigated generally would not vary noticeably between the 2015 Existing Viaduct and the 2015 Bored Tunnel, with the majority of the times expected to be within 1 to 2 minutes of each other. Some larger travel changes may occur for specific routes, as shown in Exhibit 2-8, but such increases or decreases would likely remain within 3 to 4 minutes.

- Travel times for trips heading to or from northwest Seattle are expected to be similar with the 2015 Bored Tunnel and the 2015 Existing Viaduct in both the AM and PM peak hours despite proposed access changes, which include the removal of the Western and Elliott ramps.

- The largest travel time variations between the 2015 Existing Viaduct and 2015 Bored Tunnel are expected to be on the Woodland Park to S. Spokane Street route. For the peak direction of travel in the AM peak hour (southbound), travel times are expected to improve by 2 minutes. For the PM peak hour, peak direction (northbound) travel times could improve by up to 4 minutes.

- For most trips, travel times are expected to increase somewhat between the 2015 and 2030 Bored Tunnel due to growth in traffic demand resulting from population and employment increases.

SR 99 Vehicle Volumes

Exhibit 2-9 shows estimated daily traffic volumes on the SR 99 mainline and ramps for the 2015 Existing Viaduct and 2015 Bored Tunnel. Daily traffic volumes on SR 99 in the south and north sections are expected to be comparable in most areas between the 2015 Existing Viaduct and 2015 Bored Tunnel. The exceptions are as follows:

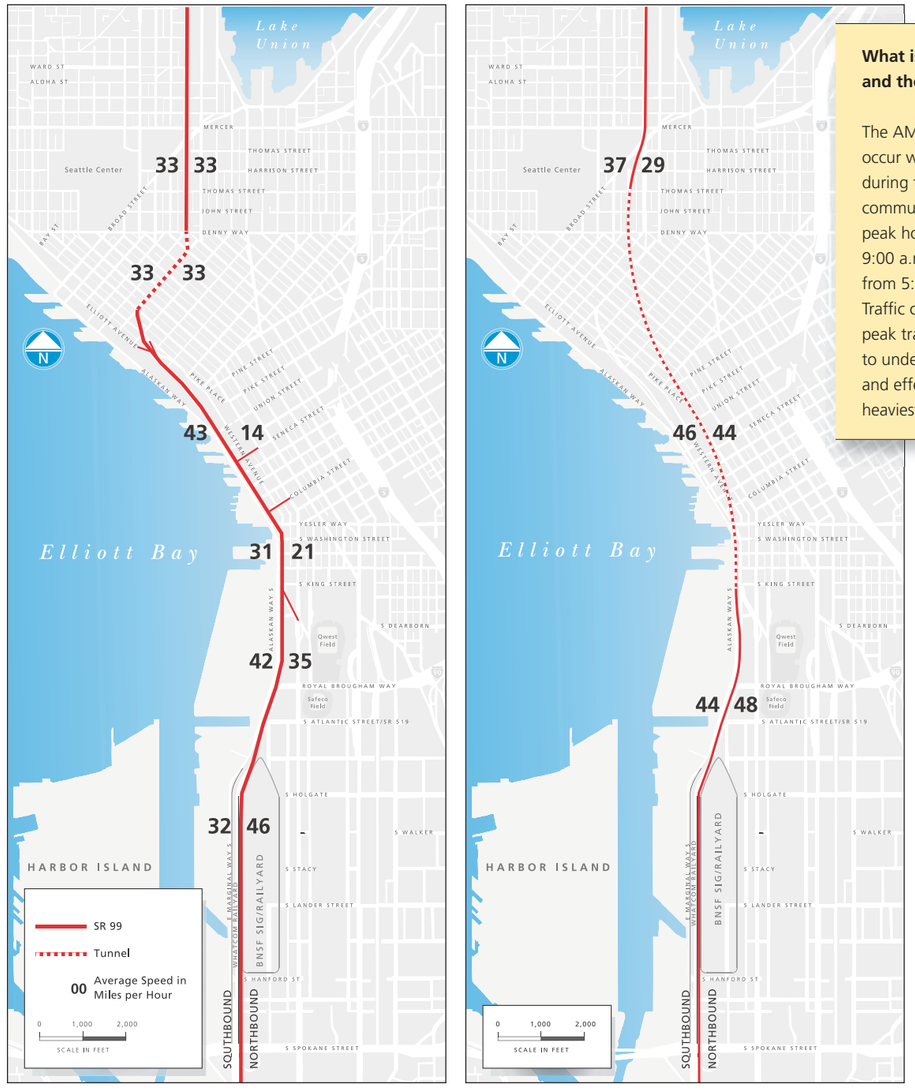
- Daily traffic volumes on SR 99 near the Battery Street Tunnel are expected to increase by about 17,000 vehicles per day with the 2015 Bored Tunnel as compared to the 2015 Existing Viaduct. Vehicle volumes are expected to increase in this area because the new bored tunnel would provide wider lanes and shoulders than the existing Battery Street Tunnel, which would improve traffic flow.

- From S. King Street to just north of Seneca Street, vehicle volumes on SR 99 are projected to decrease by about 30,000 vehicles per day for the 2015 Bored Tunnel as compared to the 2015 Existing Viaduct.

Despite these differences in vehicle volumes on SR 99, screenline analysis of the transportation network in the downtown Seattle area shows that most of the 30,000 daily trips on SR 99 from S. King Street to just north of Seneca Street would be accommodated elsewhere in the transportation system. Most of these trips (about 28,000 vehicles per day) would shift to downtown city streets and Alaskan Way and a small volume (about 1,000 vehicles per day) would shift to Interstate 5 (I-5) through downtown. The remaining difference between the 2015 Existing Facility and the 2015 Bored Tunnel (about 1,000 vehicles per day) represents expected

Travel Speeds PM Peak

2015 Existing Viaduct | *2015 Bored Tunnel*

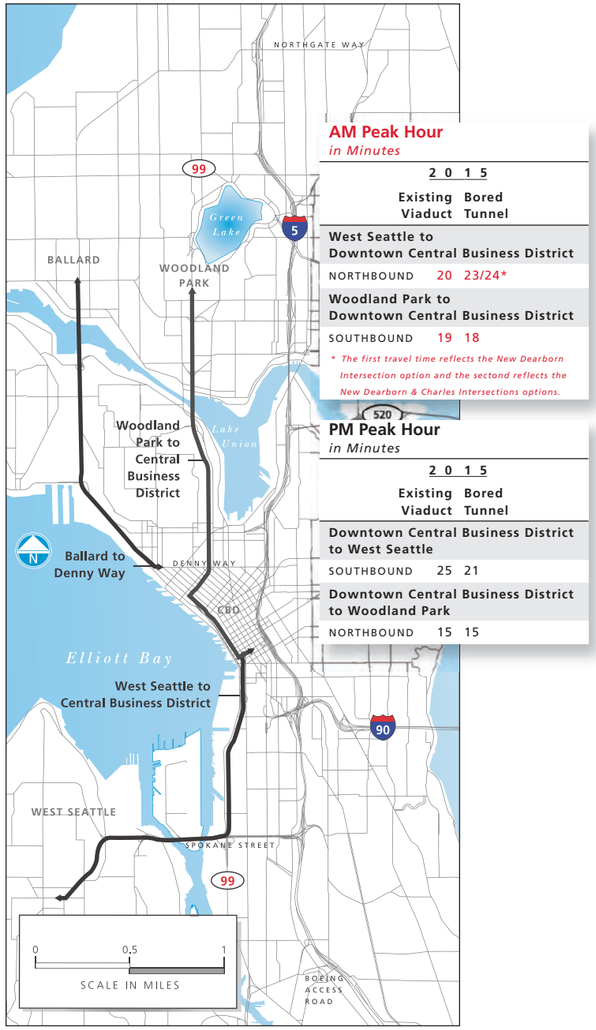


What is the AM peak hour and the PM peak hour?

The AM and PM peak hours occur when traffic is heaviest during the morning and evening commute. For SR 99, the AM peak hour is from 8:00 a.m. to 9:00 a.m. The PM peak hour is from 5:00 p.m. to 6:00 p.m. Traffic conditions during these peak travel times were modeled to understand traffic conditions and effects when traffic is heaviest on a typical day.

Exhibit 2-7

2015 Travel Time Comparison



AM Peak Hour
in Minutes

2015

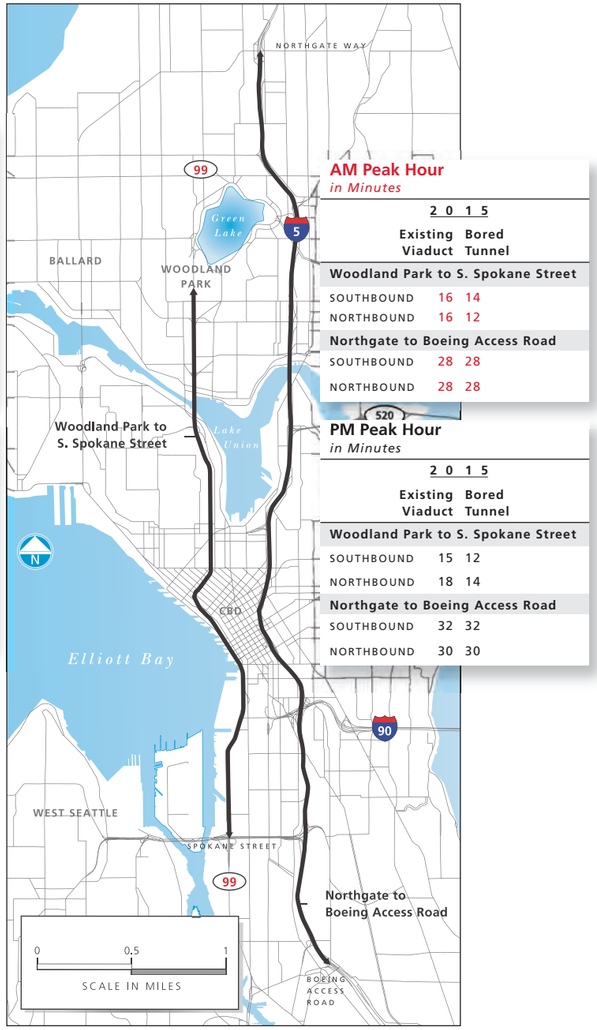
	Existing Viaduct	Bored Tunnel
West Seattle to Downtown Central Business District		
NORTHBOUND	20	23/24*
Woodland Park to Downtown Central Business District		
SOUTHBOUND	19	18

* The first travel time reflects the New Dearborn Intersection option and the sectond reflects the New Dearborn & Charles Intersections options.

PM Peak Hour
in Minutes

2015

	Existing Viaduct	Bored Tunnel
Downtown Central Business District to West Seattle		
SOUTHBOUND	25	21
Downtown Central Business District to Woodland Park		
NORTHBOUND	15	15



AM Peak Hour
in Minutes

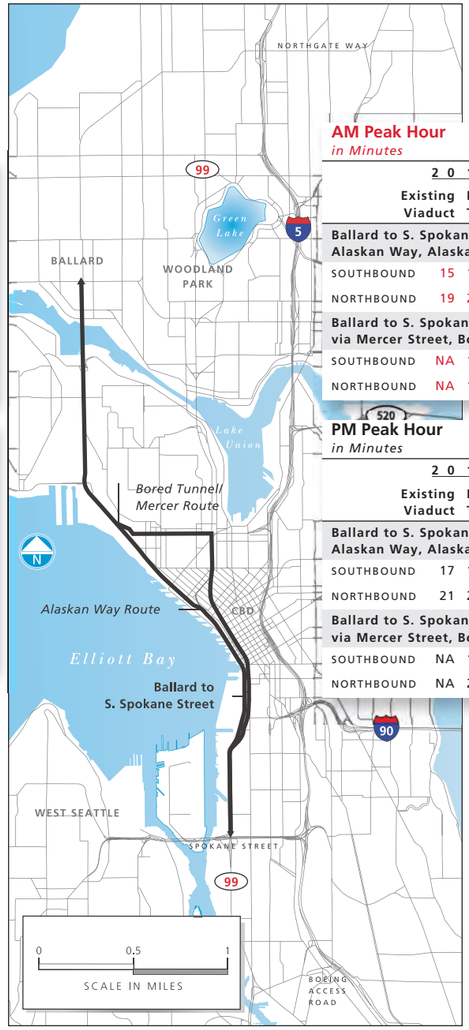
2015

	Existing Viaduct	Bored Tunnel
Woodland Park to S. Spokane Street		
SOUTHBOUND	16	14
NORTHBOUND	16	12
Northgate to Boeing Access Road		
SOUTHBOUND	28	28
NORTHBOUND	28	28

PM Peak Hour
in Minutes

2015

	Existing Viaduct	Bored Tunnel
Woodland Park to S. Spokane Street		
SOUTHBOUND	15	12
NORTHBOUND	18	14
Northgate to Boeing Access Road		
SOUTHBOUND	32	32
NORTHBOUND	30	30



AM Peak Hour
in Minutes

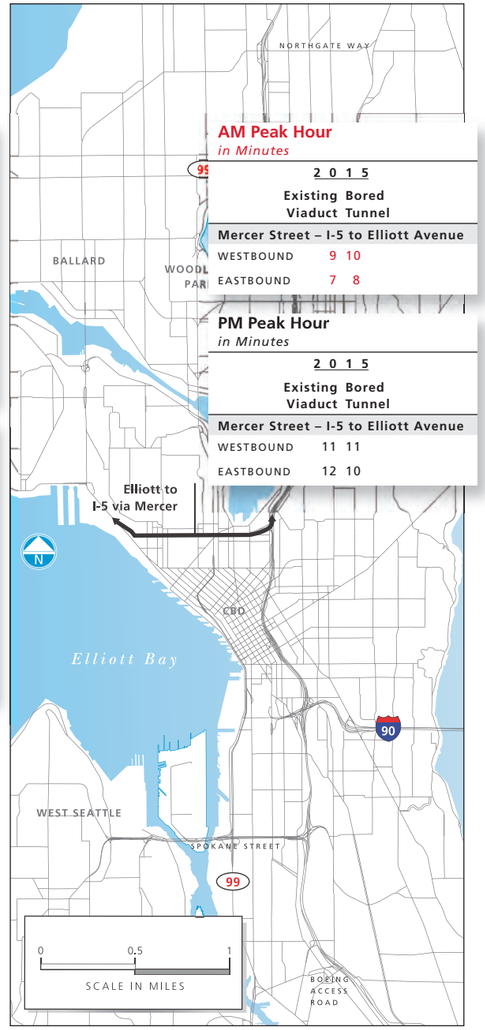
2015

	Existing Viaduct	Bored Tunnel
Ballard to S. Spokane Street – via Alaskan Way, Alaskan Way Viaduct		
SOUTHBOUND	15	15
NORTHBOUND	19	20
Ballard to S. Spokane Street – via Mercer Street, Bored Tunnel		
SOUTHBOUND	NA	14
NORTHBOUND	NA	19

PM Peak Hour
in Minutes

2015

	Existing Viaduct	Bored Tunnel
Ballard to S. Spokane Street – via Alaskan Way, Alaskan Way Viaduct		
SOUTHBOUND	17	17
NORTHBOUND	21	22
Ballard to S. Spokane Street – via Mercer Street, Bored Tunnel		
SOUTHBOUND	NA	16
NORTHBOUND	NA	21



AM Peak Hour
in Minutes

2015

	Existing Viaduct	Bored Tunnel
Mercer Street – I-5 to Elliott Avenue		
WESTBOUND	9	10
EASTBOUND	7	8

PM Peak Hour
in Minutes

2015

	Existing Viaduct	Bored Tunnel
Mercer Street – I-5 to Elliott Avenue		
WESTBOUND	11	11
EASTBOUND	12	10

Exhibit 2-8

changes in travel patterns due to access changes proposed with the Bored Tunnel Alternative.

SR 99 volumes between S. King Street and just north of Seneca Street are expected to be lower with the Bored Tunnel Alternative because Elliott and Western Avenue ramps and Columbia and Seneca Street ramps would be removed. Removing the Elliott and Western ramps would change traffic patterns and volumes on SR 99, such that this traffic volume (representing about one-third of SR 99 traffic) would likely travel one of two ways—either these drivers would use the bored tunnel and ramps at Republican Street to access Mercer Street or they would travel on Alaskan Way. Additionally, access to downtown currently provided by the Columbia and Seneca ramps would be provided via ramps near S. King Street, which would eliminate these trips through the midtown section of SR 99.

Vehicle volume estimates for the Bored Tunnel Alternative in 2030 are generally similar to the 2015 Bored Tunnel results, with modest volume increases expected due to expected population and employment growth.

9 Would conditions on I-5 change?

Exhibit 2-10 shows the number of daily vehicles expected to shift to I-5 with the Bored Tunnel Alternative.

Exhibit 2-10
Increase in Daily Vehicle Volumes on I-5 in 2015

Location	Increase in Vehicles	Percent Change
I-5 South of I-90	+2,400	Less than 1% increase
I-5 North of Seneca	+1,000	Less than 1% increase
I-5 South of SR 520	+300	Less than 1% increase

These increases are negligible and are not expected to negatively affect traffic flow or operations on I-5 for two reasons:

1 In 2015, this stretch of I-5 is expected to carry between 262,000 and 318,000 vehicles per day. An increase of 300 to 2,400 vehicles per day along this stretch represents a negligible or less than 1 percent change in daily vehicle volume on I-5.

2 Vehicle volumes on I-5 are not expected to change much during the AM and PM peak hour when I-5 is most congested. Vehicle volumes on I-5 during the AM and PM peak hours are expected to increase by less than 1 percent with the 2015 Bored Tunnel Alternative as compared to the 2015 Existing Viaduct. As a result, during the AM and PM peak hours, travel times on I-5 are expected to be the same for the 2015 Existing Facility and 2015 Bored Tunnel Alternative as shown in Exhibit 2-8. Similarly, the expected changes in vehicle volumes on I-5 during off-peak hours are expected to less than 0.5 percent. This expected increase in vehicle volumes during off-peak hours is not expected to have a measurable effect on I-5 operations because I-5 is less congested during these times and has more capacity to accommodate these trips.

10 Would conditions on area streets change?

Exhibit 2-11 compares daily vehicle volumes on Alaskan Way and other city streets. This graphic shows that some trips shift from SR 99 to city streets (particularly Alaskan Way) as a result of access changes proposed with the Bored Tunnel Alternative.

South of S. King Street

The 2015 Bored Tunnel is expected to shift about 7,400 trips daily from SR 99 to other routes such as I-5 and city streets. Exhibit 2-10 shows that about 2,400 trips are expected to shift to I-5, which represents an increase of less than 1 percent. Between S. Spokane Street and just south of S. Atlantic Street, north-south arterials such as First and Fourth Avenues are expected to accommodate about 4,300 more trips with the 2015 Bored Tunnel than the 2015 Existing Viaduct. The remaining difference between the 2015 Existing Facility and the 2015 Bored Tunnel represents expected changes in travel patterns due to access changes proposed with the Bored Tunnel Alternative. Despite this additional traffic on city streets, a similar number of intersections are expected to be congested for the 2015 Bored Tunnel and the 2015 Existing Viaduct as shown in Exhibit 2-12.

2015 Daily SR 99 Volumes

2015 Existing Viaduct | *2015 Bored Tunnel*

Exhibit 2-9

Central – S. King Street to Denny Way

As previously discussed, at about S. King Street the 2015 Bored Tunnel is expected to shift about 30,000 daily trips from SR 99 between S. King Street and just north of Seneca Street to other routes such as I-5 and city streets. This shift is mostly related to removing SR 99 ramps at Columbia and Seneca Streets and Elliott and Western Avenues. As a result, traffic coming from the south, destined for downtown would exit SR 99 via the ramps near Alaskan Way at about S. King Street and traffic heading to and from northwest Seattle would either travel along Alaskan Way or would use the bored tunnel/Mercer Street route.

As shown previously in Exhibit 2-10, about 1,000 daily trips just north of Seneca Street are expected to shift to I-5, which represents a negligible change in I-5 vehicle volumes. An additional 22,200 daily trips are expected to shift to city streets located just south of S. King Street between SR 99 and I-5, and about 5,500 daily trips are expected to shift to Alaskan Way along the central waterfront. The remaining difference between the 2015 Existing Facility and the 2015 Bored Tunnel represents expected changes in travel patterns due to access changes proposed with the Bored Tunnel.

Despite expected increases in vehicle volumes on Alaskan Way and city streets between Alaskan Way and I-5, intersection operations on city streets are not expected to substantially change. As shown in Exhibit 2-12 (on the next page), the number of congested intersections is expected to be similar in both the AM and PM peak hours for the 2015 Existing Viaduct and 2015 Bored Tunnel.

Travel times were assessed on Second and Fourth Avenues to determine possible effects of increased vehicle volumes on city streets. In particular, this travel time analysis shows the cumulative delay that a driver traveling on Second or Fourth Avenues through downtown might experience while traveling through several intersections. As shown in Exhibit 2-13, in the AM Peak hour travel times are expected to increase by about 1 minute on Second and Fourth Avenues with the 2015 Bored Tunnel. Exhibit 2-14 shows that travel times on Fourth Avenue in the PM peak hour are expected to be the same for the 2015 Existing Viaduct and 2015 Bored Tunnel. On Second Avenue, travel times are expected to increase by about 2 minutes with the 2015 Bored Tunnel as compared to the 2015 Existing Viaduct. Increases in travel times on city streets for the 2015 Bored Tunnel can be attributed to increased traffic volumes due to changes in access locations.

Exhibit 2-13
Travel Time Comparison on Second & Fourth Avenues
in the AM Peak Hour

	2015	
Route	**Existing Viaduct**	**Bored Tunnel**
Second Avenue – S. Jackson Street to Wall Street	8	9
Fourth Avenue – S. Jackson to Battery Street	8	9

Exhibit 2-14
Travel Time Comparison on Second & Fourth Avenues
in the PM Peak Hour

	2015	
Route	**Existing Viaduct**	**Bored Tunnel**
Second Avenue – S. Jackson Street to Wall Street	9	11
Fourth Avenue – S. Jackson to Battery Street	9	9

North of Denny Way

North of Denny Way, expected SR 99 traffic volumes are nearly identical, despite proposed access changes. However, there are notable changes to traffic volumes on north-south arterials located west and east of SR 99. As shown in Exhibit 2-11, for the 2015 Bored Tunnel, vehicle volumes on north-south arterials located west of SR 99 are expected to increase by about 3,000 vehicles per day compared with the 2015 Existing Viaduct. Vehicle volumes on arterials located east of SR 99 are expected to increase by about 10,000 vehicles per day with the 2015 Bored Tunnel. These changes suggest that the new east-west connections provided across Aurora Avenue with the Bored Tunnel Alternative provide greater mobility in the South Lake Union area and better utilize available capacity on existing streets like Dexter Avenue N. and Westlake Avenue N.

As shown in Exhibit 2-12, intersection operations vary slightly between the 2015 Bored Tunnel and 2015 Existing Viaduct, but intersection performance is expected to be

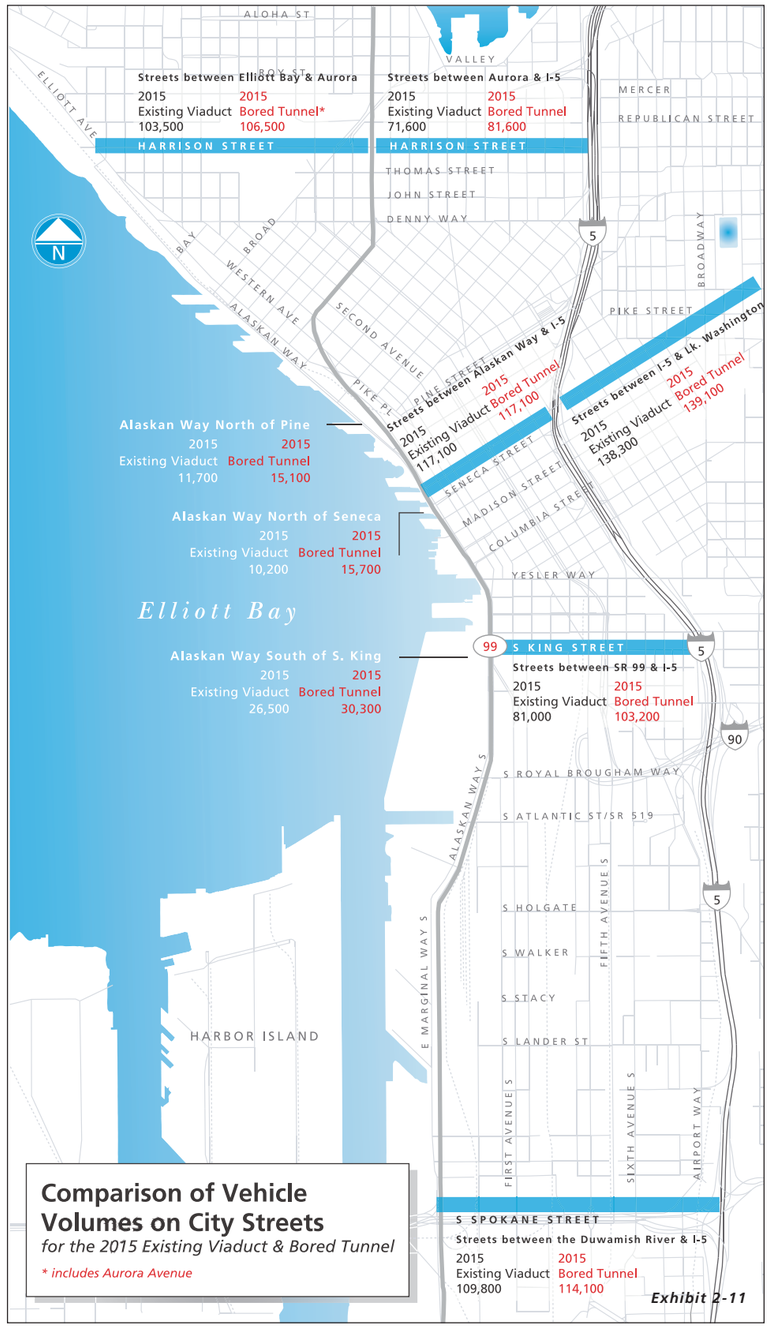


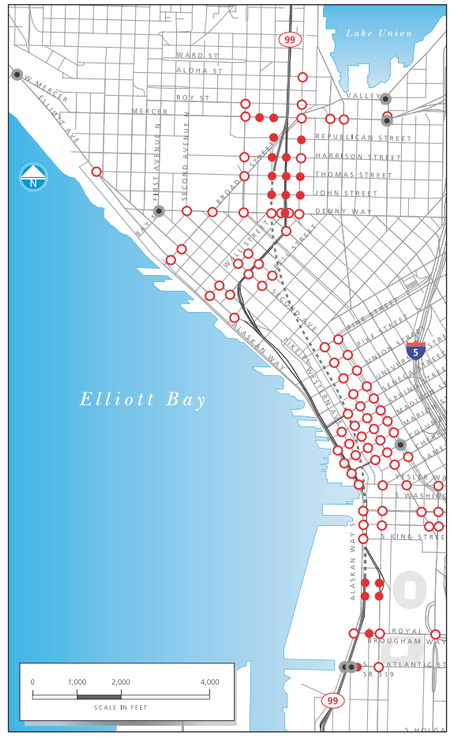
Exhibit 2-11

2015 Comparison of Congested Intersections

AM PEAK

2015 Existing Viaduct

2015 Bored Tunnel



PM PEAK

2015 Existing Viaduct

2015 Bored Tunnel

Exhibit 2-12

What are congested and highly congested intersections?

For the traffic analysis conducted for this project, congested intersections are intersections that may cause drivers considerable delay. A driver might wait about 1 or 2 minutes to travel through a traffic signal at a congested intersection. At a highly congested intersection a driver might wait 2 minutes or more to get through the traffic signal.

Additional Discussion about Effects to City Streets

Chapter 5, Question 8 provides additional discussion about possible effects to city streets from the Bored Tunnel Alternative.

comparable despite proposed changes to the roadway network. With the 2015 Bored Tunnel, intersection congestion during the PM peak hour is expected to shift away from Denny Way and Aurora Avenue to intersections located along Mercer Street. This shift is likely due to proposed changes to ramp access, which would be provided near Harrison and Republican Streets, as well as the conversion of Mercer Street to a two-way street.

OTHER PERMANENT EFFECTS OF THE BORED TUNNEL ALTERNATIVE

11 Would noise levels permanently change?

Exhibit 2-15 shows the change in traffic noise levels with the 2030 Bored Tunnel Alternative at each of the 68 modeled sites. Traffic noise levels would decrease at several locations compared to existing conditions. Traffic noise levels currently approach or exceed FHWA noise abatement criteria of 67 A-weighted decibels (dBA) for noise-sensitive uses such as parks, hotels, and residences, at 48 of the 68 sites. With the 2030 Bored Tunnel Alternative, 40 of the 68 sites would approach or exceed FHWA noise abatement criteria. The loudest hour traffic noise levels with the Bored Tunnel Alternative would range between 59 and 74 dBA at the modeled locations.

Between approximately S. Royal Brougham Way and Yesler Way, changes in noise levels would either be the same as they are today or would decrease by 1 or 4 dBA. Along the central waterfront up to Battery Street, several locations would experience substantial decreases in noise levels once the viaduct is removed and SR 99 traffic is in the bored tunnel. Noise levels at three locations at the north end of the waterfront near Broad Street are estimated to increase by 3 dBA because of minor changes in traffic patterns. Near the north portal, the noise levels near Denny Way would either remain similar to what they are today or decrease by 3 to 5 dBA. Noise levels would increase slightly at the north portal itself, and on Mercer Street near Sixth Avenue N.

12 Would properties or land uses be permanently affected?

Eleven properties would be partially or fully acquired for the Bored Tunnel Alternative. Five of the eleven properties are in the south portal area, and six properties are in the north portal area. There would be no residential displacements.

The 11 acquired properties would be converted from office, retail, and commercial land uses to transportation uses due to right-of-way acquisitions. Conversion of land to transportation use would result in a slight reduction in the overall density of potential development in the project area. However, development activity or trends are not expected to be influenced by the Bored Tunnel Alternative and some of the acquired properties may be sold when construction is complete. In addition, permanent tieback easements for subsurface wall shoring systems would be needed on three properties in the north portal area. The Bored Tunnel Alternative would be consistent and compatible with existing land use plans.

The bored tunnel would also require subsurface property acquisitions for between 52 to 59 parcels. These subsurface acquisitions may constrain future improvements to land uses above the tunnel if excavations for grouting, pilings, installing heat pumps, or other ground stabilization improvements are needed. The subsurface acquisitions are not anticipated to change the development potential of the affected properties under current zoning.

There would be few indirect effects to land use with the Bored Tunnel Alternative because it replaces an existing transportation facility in an already densely developed urban environment. The surrounding area and region have been developed and planned assuming this type of transportation facility. Existing land uses and development expect and depend on such a facility, so changes from its replacement are expected to be small. To the extent that the existing viaduct has been perceived as a barrier to waterfront uses, new development on vacant or underused property or redevelopment may take place around the new Alaskan Way surface street.

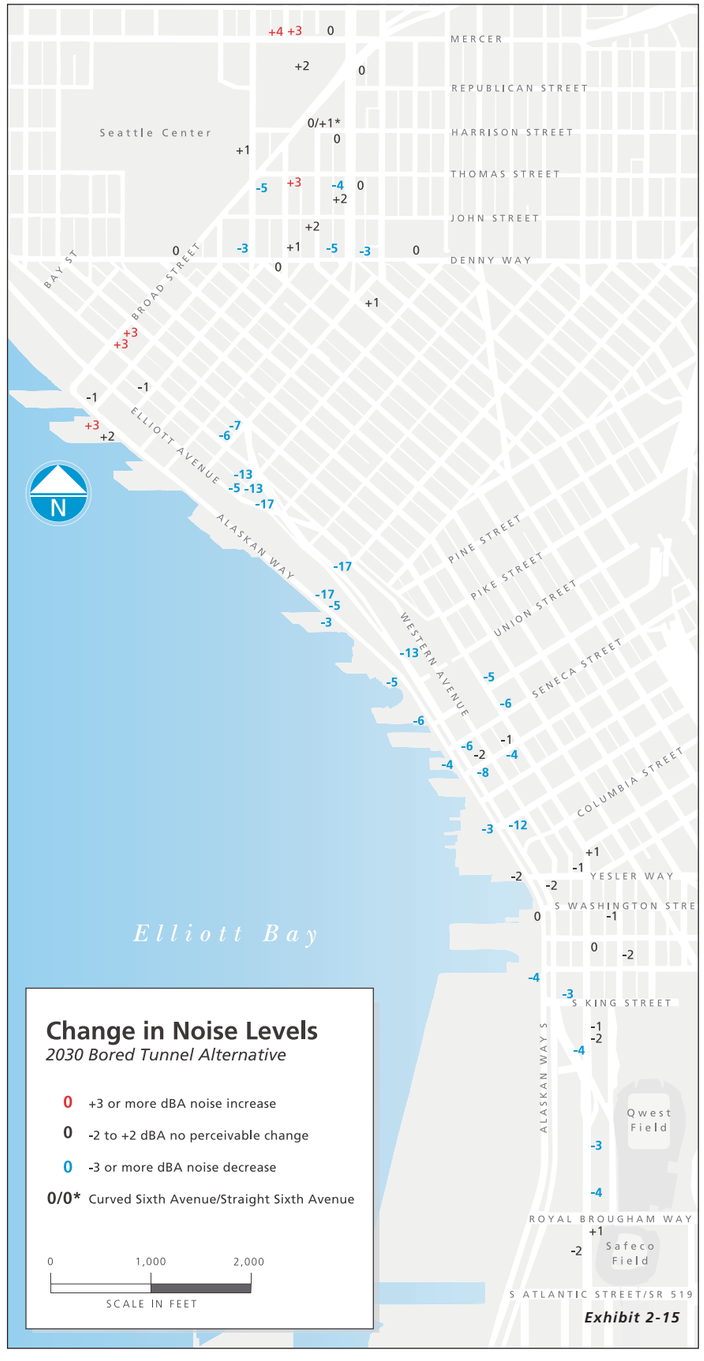


Exhibit 2-15

13 Would the economy be permanently affected?

Effects to Businesses and Employees

Of the 11 properties acquired, 5 would be fully acquired and 6 would be partially acquired. The economic effects of acquiring these properties are summarized in Exhibit 2-16.

Exhibit 2-16
Acquired Property Effects

	South Portal	North Portal	Total
Number of parcels subject to acquisition	5	6	11
Number of parcels subject to full acquisition	2	3	5
Number of buildings acquired	2	1	3
Approximate area of work space relocated or displaced *in square feet*	70,400	51,500	121,900
Estimated number of permanent jobs relocated or displaced[1]	25	119	144
Approximate property tax paid by fully acquired parcels[2]	$189,300	$74,800	$264,100
Area of fully acquired tax-paying parcels *in square feet*[3]	173,730	39,900	213,630

1 This estimate was based on the total square footage of each individual building, the use of the building (car wash, educational, and office), and the average square feet required per worker based on the use of the building (U.S. Department of Energy 2006).

2 This estimate was based on actual amounts collected in 2009 by the King County Finance and Business Operations for all of the parcels to be acquired. This estimate is for 1 year and represents less than 0.01 percent of all property tax revenue collected by King County in 2009 (King County GIS Center 2010).

3 The area of tax-paying parcels is less than the total area of property acquired because the City-owned maintenance yard is not a tax-paying property.

Three buildings would be removed, which would relocate or displace an estimated 144 workers. The 144 workers represents about 0.07 percent of the total 2010 forecasted workforce in the Seattle Central Business District.

Effects to Freight

Aside from SR 99 access changes discussed in Question 6, vehicles carrying hazardous and flammable cargo would be restricted from using the bored tunnel. This type of cargo is currently not permitted on the viaduct during peak periods or in the Battery Street Tunnel. Instead of traveling on SR 99 through downtown, freight carrying hazardous or flammable cargo would be required to use another route, such as Alaskan Way or I-5. This change is estimated to affect 55 to 70 tanker trucks per day that currently may be legally carrying flammable or hazardous loads on the viaduct.

Effects to Parking

The Bored Tunnel Alternative would remove approximately 570 parking spaces, as shown in Exhibit 2-17.

Exhibit 2-17
Parking Spaces Removed by the Bored Tunnel Alternative

	On-Street	Off-Street	Total
South Portal	110	250	**360**
North Portal	210	0	**210**
Total	**320**	**320**	**570**

Exhibits 2-18 and 2-19 show the location of the parking spaces affected in the south and north portal areas. In the south portal, 250 off-street spaces would be removed. Off-street parking spaces are not anticipated to be difficult to find on non-event days. A number of major parking facilities and many smaller parking lots and garages are within walking distance of the stadiums. On event days parking would continue to be in high demand, and event-goers would continue to be encouraged to carpool and use transit.

There are more than 6,000 off-street parking spaces in the Pioneer Square neighborhood, the removal of 360 parking spaces in the south portal area is not expected to substantially affect businesses or community services in the area. Similarly, near the north portal, there are over 7,000 off-street parking spaces located between Denny Way and Roy Street and between about Westlake Avenue N. and Fifth Avenue N. The 210 parking spaces removed in near the north portal are not expected to substantially affect businesses or community services in the area.

14 Would views permanently change?

The Bored Tunnel Alternative would change views in the existing SR 99 corridor as shown in Exhibits 2-20, 2-21, and 2-22. Once the viaduct is removed, views to and from the waterfront that are currently obstructed by the structure would be substantially improved. The changes to views at the south and north ends of the project area would not be as dramatic.

South Portal Affected Parking Spaces

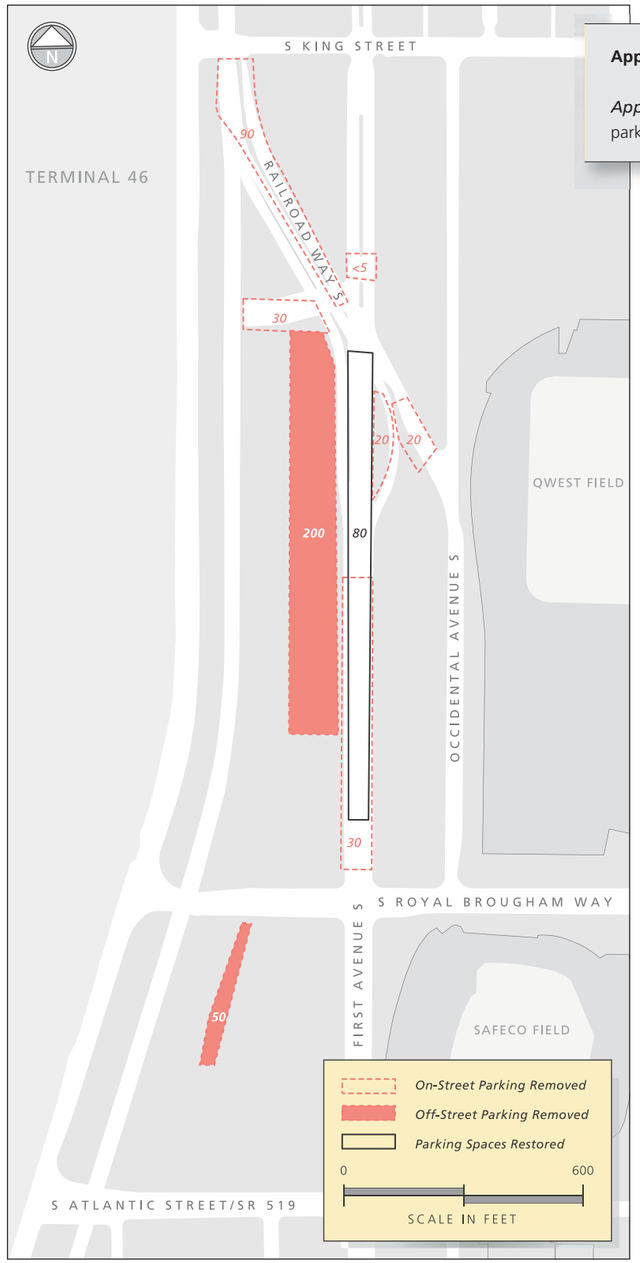


Exhibit 2-18

Appendix C, Transportation Discipline Report

Appendix C, Section 5.8 provides additional information on parking.

Near the south portal, drivers on SR 99 would see the stadium area and Terminal 46. Drivers on SR 99 through central Seattle would no longer have views along the waterfront as they would be inside the tunnel. At the north portal, views for drivers entering and exiting the portal would be similar to views entering and exiting the Battery Street Tunnel portal today.

In the south portal area, the tunnel operations building may be constructed in a portion of the Railroad Way S. right-of-way underneath the existing ramps, which may obscure some views. The building would be designed to fit into the surrounding neighborhood. In the north portal area, the tunnel operations building located on Sixth Avenue N. between Thomas and Harrison Streets would be similar in size to existing buildings in the vicinity. Both tunnel operations buildings are expected to be approximately 65 feet tall with vent stacks extending up to 30 feet above the roof.

15 Would historic and archaeological resources be permanently affected?

The Bored Tunnel Alternative would demolish the Alaskan Way Viaduct and decommission the Battery Street Tunnel, which are eligible for the National Register of Historic Places (NRHP). These structures have been documented with photos and a narrative history in accordance with Historic Engineering Record (HAER) standards. FHWA has consulted with the Washington Department of Archaeological and Historic Preservation, who concurred on July 8, 2010 that the project will have an adverse effect on one or more resources that are on or eligible for the NRHP. These properties are the Alaskan Way Viaduct and Battery Street Tunnel, Western Building, Polson Building, and the Dearborn South Tideland site. WSDOT and FHWA have also determined that there is a potential adverse effect to an archaeological site that is currently a Seattle maintenance yard adjacent to the north portal. This site has not yet been determined eligible for the NRHP, but is assumed to be eligible. Potential effects to the Western Building, Polson Building, the Dearborn Tideland site, and the site on the Seattle maintenance yard would occur during construction and are discussed in Questions 23 and 24 of this chapter.

Adverse affects to these resources would be addressed by a Memorandum of Agreement (MOA) developed in consultation with the State Historic Preservation Officer (SHPO), tribes, and the consulting parties and would meet the requirements of Section 106 of the National Historic Preservation Act and other applicable laws, regulations, and policies.

The Pioneer Square Historic District and Piers 54 through 59 on the central waterfront would benefit from removing the existing viaduct structure. This change would reduce noise, vibration, and air pollution and would improve views of and from the historic buildings. Removing the adjacent Columbia and Seneca Street ramps would provide similar benefits for the Polson and Journal Buildings (both in the Pioneer Square Historic District) and the Colman, Grand Pacific, and Olympic Warehouse Buildings (listed in the NRHP).

16 What other permanent effects would the Bored Tunnel Alternative have?

Neighborhoods

The Bored Tunnel Alternative would generally benefit adjacent neighborhoods. Removing the existing viaduct would reduce traffic, noise, and shadows in neighborhoods adjacent to the viaduct but would change access and could increase congestion near the tunnel portals. Near the north portal, connecting John, Thomas, and Harrison Streets across Aurora Avenue would improve mobility between the Uptown and South Lake Union neighborhoods. The sidewalks and bicycle paths near the south and north portals would encourage pedestrian and bicycle travel, although additional traffic on surface streets may have a negative effect on the pedestrian and bicycle environment. This would create more opportunities for informal interaction between neighborhood residents, employees of local businesses, and visitors.

North Portal Affected Parking Spaces

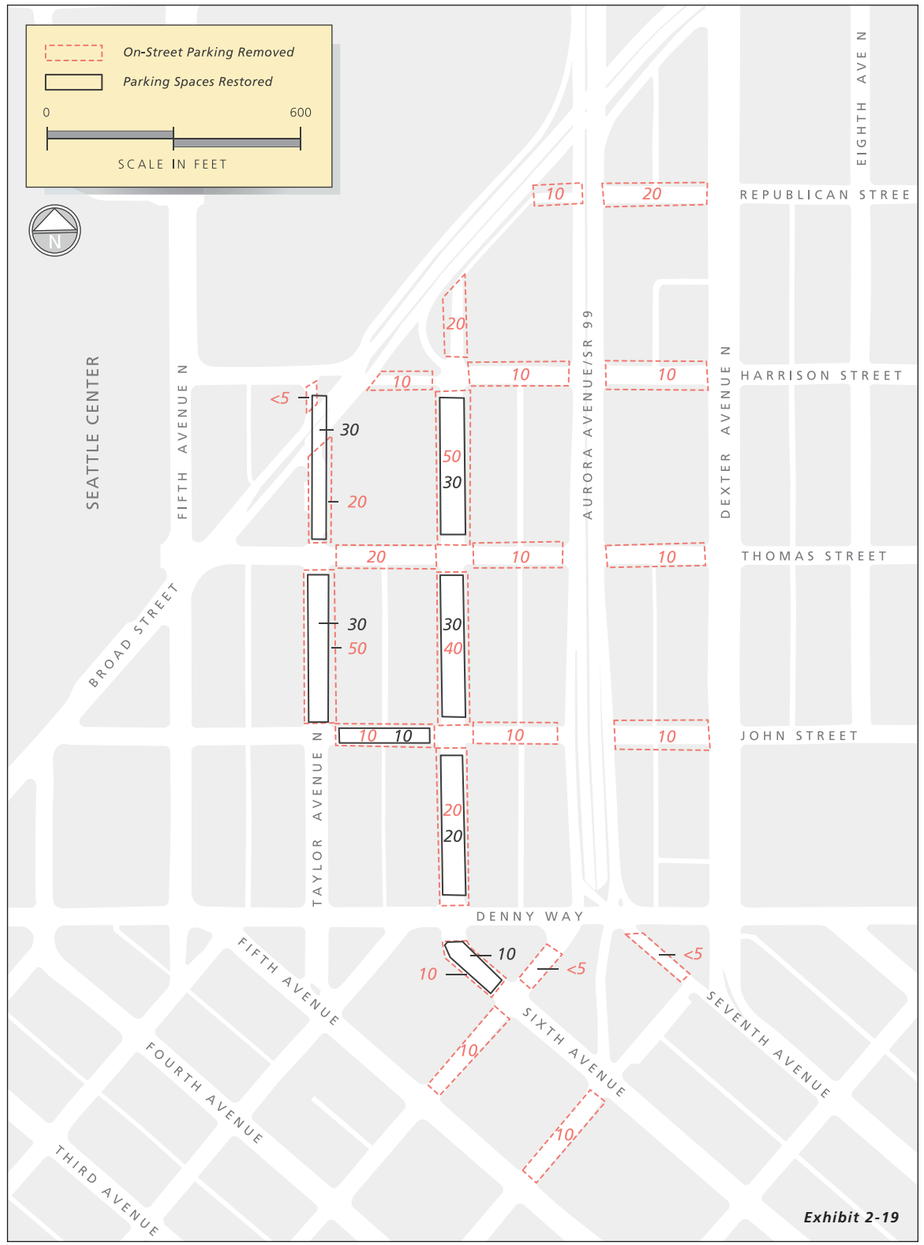


Exhibit 2-19

Community, Social Services, and Low-Income or Minority Populations

SR 99 access changes proposed with the Bored Tunnel Alternative would generally improve linkages to community facilities and social services, particularly near the south portal in the stadium area and Pioneer Square neighborhood and near the north portal in the Uptown/South Lake Union neighborhoods. The Bored Tunnel Alternative may alter the routes and travel times for service providers, which could be slightly shorter or longer depending upon the location.

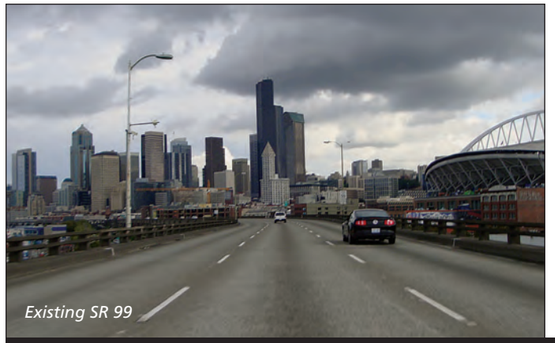
One non-profit organization, the Seattle Jobs Initiative, serves low-income individuals and has office space in the building that would be acquired near the north portal. This office is used primarily for administration purposes. Relocation assistance would be provided by the project so that they could continue operation.

Overall the project would not result in a disproportionately high and adverse impact because the city's downtown low-income and homeless residents would continue to have good transit and pedestrian access to key service providers in the area. For social service organization workers and patrons living outside of downtown Seattle, travel routes may be altered because of the changes in SR 99 access. Travel times could increase or decrease slightly depending on their end location, but this would not substantially affect the organizations' continued operations.

Parks and Recreation

The Bored Tunnel Alternative would benefit parks and recreational resources by removing the existing viaduct, which would improve connections between elements of Seattle's park and recreation system, such as Waterfront Park, and Seattle's downtown neighborhoods. Piers 55 to 57 also attract many tourists and would be enhanced by reduced noise levels, improved views, and a more pedestrian-friendly environment.

In addition, the existing Waterfront Bicycle/Pedestrian Facility located east of Alaskan Way S. would be replaced with a multi-use path, called the City Side Trail, which would benefit bicyclists and pedestrians.

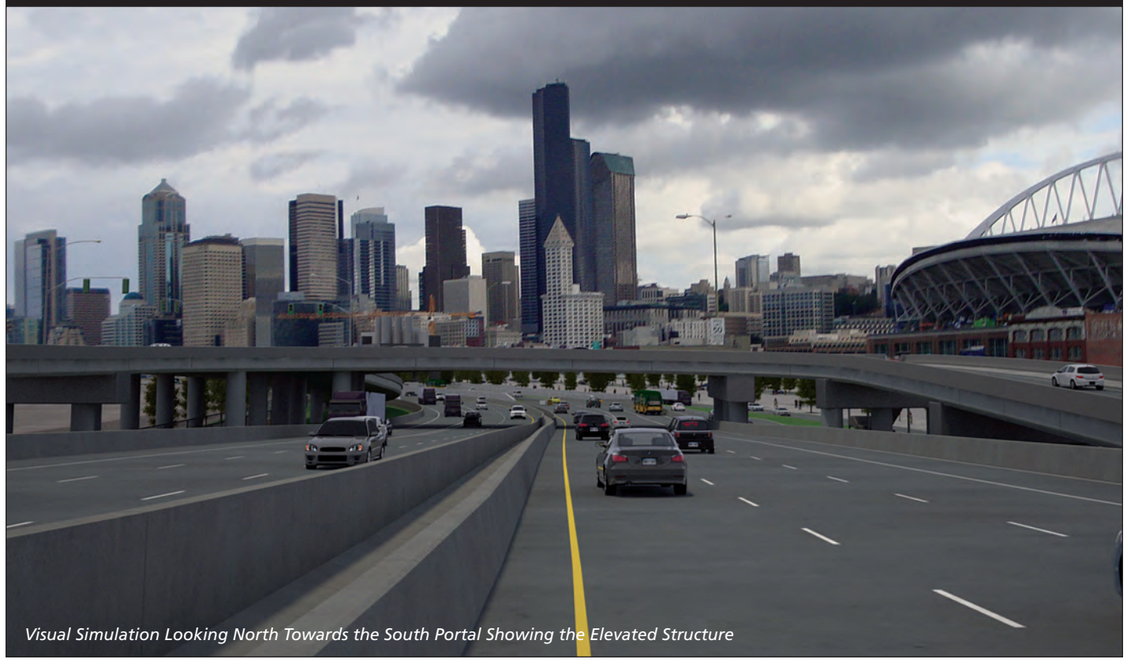


Existing SR 99

Existing View of the Alaskan Way Viaduct along Alaskan Way

Visual Simulation Looking North Towards the South Portal

Exhibit 2-20



Visual Simulation Looking North Towards the South Portal Showing the Elevated Structure

Visual Simulation Looking South on Alaskan Way S. at Union Street

Exhibit 2-21

This simulation is conceptual. The design for Alaskan Way S. is under development.

Public Services and Utilities
The Bored Tunnel Alternative is not expected to adversely affect emergency service response times and operations, because emergency responders would have comparable access to SR 99 in the case of an emergency, and traffic operations on downtown streets for the 2015 Bored Tunnel Alternative are expected to be comparable to the 2015 Existing Viaduct.

Response and travel times for public services could change slightly with the Bored Tunnel Alternative due to changes in access, intersection operations, and travel times. Effects to public services (including solid waste/recycling services, postal carriers, and school buses) would depend on the time of day and route taken. Travel times for most of the routes are not expected to vary noticeably between the 2015 Existing Viaduct and the 2015 Bored Tunnel Alternative, with the majority of travel times generally within 1 or 2 minutes of each other.

Long-term operations are not expected to restrict utility capacity, disrupt utility service, or impair access and maintenance functions. The Bored Tunnel Alternative is being designed to address access and maintenance concerns of various utility providers, and efforts are being made to reduce conflicts wherever possible.

Additional electric power would be needed for life safety requirements in the tunnel for lighting, ventilation, pump operation, and impressed current for corrosion control. Ventilation and electrical lighting in the tunnel would use an estimated 239 million British thermal units (BTUs) daily, which is a small portion of the total daily operational energy consumption of 748,944 million BTUs.

Air Quality
Air quality is not expected to be affected by the Bored Tunnel Alternative. Even though VMT in the Seattle area in 2030 is predicted to increase compared to existing conditions, mobile source air toxic emissions are predicted to dramatically decrease compared to existing levels. Emissions are expected to decrease due to the U.S. Environmental Protection Agency's (EPA's) national control programs, which are projected to reduce diesel particulate matter by approximately 94 percent and reduce other mobile source air toxic emissions by 54 to 63 percent.

Greenhouse Gas Emissions
While mobile source air toxic emissions are expected to decrease due to EPA's national control programs, greenhouse gas emissions with the Bored Tunnel Alternative in 2030 are predicted to be slightly higher than the 2015 Existing Viaduct conditions. The slight rise in greenhouse gas emissions is expected because of increases in future vehicular volumes, VMT, and power needed to operate tunnel operations and lighting systems. Most greenhouse gas emissions with the Bored Tunnel Alternative would come from vehicle exhaust.

Energy Consumption
The total energy use in 2030 is expected to increase compared to existing conditions because vehicle volumes are expected to increase in Seattle and the project area. The Bored Tunnel Alternative would require additional energy to power systems in the bored tunnel. In 2015, with the existing viaduct, vehicles are expected to use about 15,252 million BTUs daily in the city center area, or 5,566,980 million BTUs annually. In 2030 with the Bored Tunnel Alternative, vehicles within the city center area are estimated to consume 16,583 million BTUs daily or 6,052,795 million BTUs annually. In addition, about 9 million BTUs of energy would be consumed daily by roadway maintenance, and an additional 239 million BTUs would be used daily for ventilation and lighting in the bored tunnel. Together, the maintenance and operations for the Bored Tunnel Alternative would use about 90,520 million BTUs annually.

Water Resources
Compared to existing conditions, the Bored Tunnel Alternative would reduce the overall amount of pollutant-generating impervious surface within the area that drains to Elliott Bay and Lake Union. This is expected to improve water quality. Also, some portions of the project area currently discharge to Elliott Bay and Lake Union without

Visual Simulation Looking at the North Portal *Exhibit 2-22*

treatment. The Bored Tunnel Alternative would provide water quality treatment for pollutant-generating impervious surfaces in the portions of the project area where runoff is currently untreated using best management practices (BMPs) selected from the Seattle *Stormwater Manual*[1] and/or the WSDOT *Highway Runoff Manual*.[2]

The non-pollutant generating surface area would increase in the south portal area, mostly due to a wider pedestrian and bicycle facility, new sidewalks, and a tunnel operations building. These increases occur in areas where runoff discharges to the combined sewer system. Modeling has shown that the use of surface water detention in the south portal area would not reduce the potential frequency and/or volume of overflows from the combined sewer system. Therefore, an exception from the Seattle Stormwater Code peak flow control requirements has been granted by the City[3] for the south portal area, so detention would not be provided.

Fish, Aquatic, and Wildlife Habitat
The Bored Tunnel Alternative would improve water quality compared to existing conditions because stormwater runoff would be treated prior to being discharged. Treating stormwater runoff prior to discharge would reduce potential effects to fish, wildlife, and vegetation resources compared to existing conditions.

Soils and Groundwater
Soil improvements to construct the bored tunnel would permanently modify existing soil conditions in portions of the south portal area and along the bored tunnel alignment up to about Seneca Street. Soil improvements may also be considered between John and Thomas Streets in the north portal area.

Groundwater flow may be altered by the presence of soil improvements, walls supporting the retained cuts, and the cut-and-cover tunnel sections. To prevent potential impacts, groundwater monitoring devices have been installed in the study area to evaluate groundwater levels over time. If groundwater mounding is higher than anticipated, mitigation measures could be implemented.

MITIGATION FOR PERMANENT EFFECTS

17 How would permanent effects be mitigated?

The Bored Tunnel Alternative is expected to have few long-term adverse effects on the surrounding area. The best way to mitigate long-term effects of a project is by avoiding and minimizing them where feasible through design.

Near the south portal, visual effect of the tunnel operations building on the adjacent Pioneer Square historic district would be mitigated by careful design to ensure that it would be compatible with the surrounding buildings and historic context of the area.

The effect of changed traffic patterns would be mitigated through publicity and signage directing drivers to the best routes for reaching the retail and commercial areas and access to appropriate parking locations.

What is a British thermal unit (BTU)?

A BTU is the approximate amount of energy needed to heat 1 pound of water 1 degree Fahrenheit.

What is an impervious surface?

A surface is considered impervious if water cannot easily pass through it. Common impervious surfaces in the project area are pavement and concrete.

How would soils be improved?

Soil improvements could use several different methods including: permeation grouting, compaction grouting, compensation grouting, or ground freezing. These processes are described in **Chapter 6, Question 3**.

1 City of Seattle. 2009a.

2 WSDOT. 2008.

3 City of Seattle. 2009b.

Construction Activities Chart

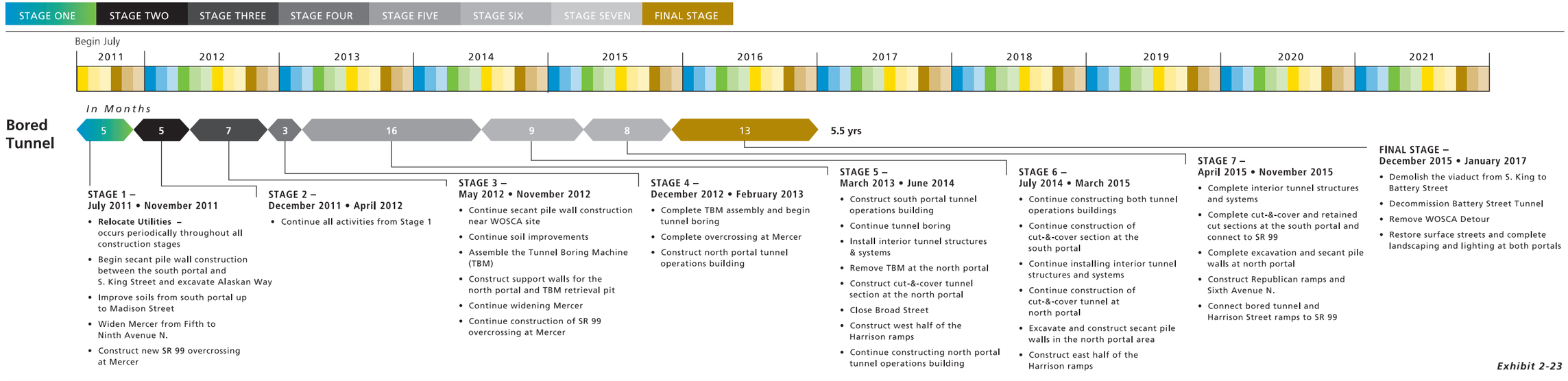
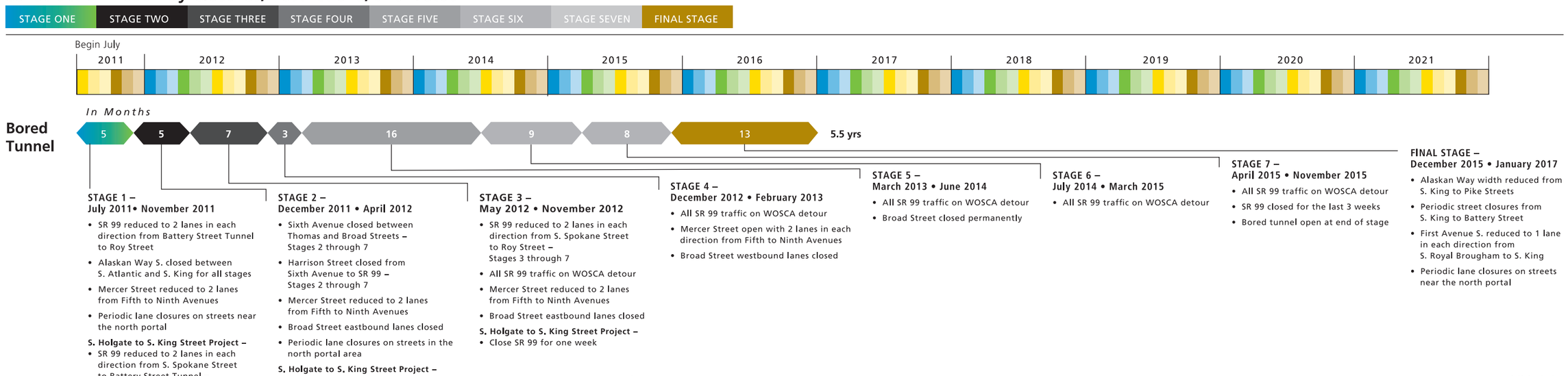


Exhibit 2-23

Note: Timeline extends to 2021 for comparison to other alternatives in Chapter 8.

Construction Roadway Closures, Restrictions, and Detour



Note: Timeline extends to 2021 for comparison to other alternatives in Chapter 8.

Exhibit 2-24

Some properties would be acquired to build the new ramps, portals, and other improvements included in the project. The lead agencies will provide relocation assistance to the affected property owners and tenants. Relocation assistance will comply with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.

18 What permanent adverse effects of the project would not be mitigated?

Almost all permanent effects of the Bored Tunnel Alternative can be avoided or mitigated. The Bored Tunnel Alternative would permanently change travel patterns compared to the existing viaduct. For example, the Columbia and Seneca ramps would be removed, which would require drivers that currently use these ramps to change their travel patterns to use ramps provided near Alaskan Way S. Similarly, the Elliott and Western ramps would be removed, which would require drivers to change travel patterns to use either Alaskan Way or Mercer Street and the bored tunnel. Changes to travel patterns may

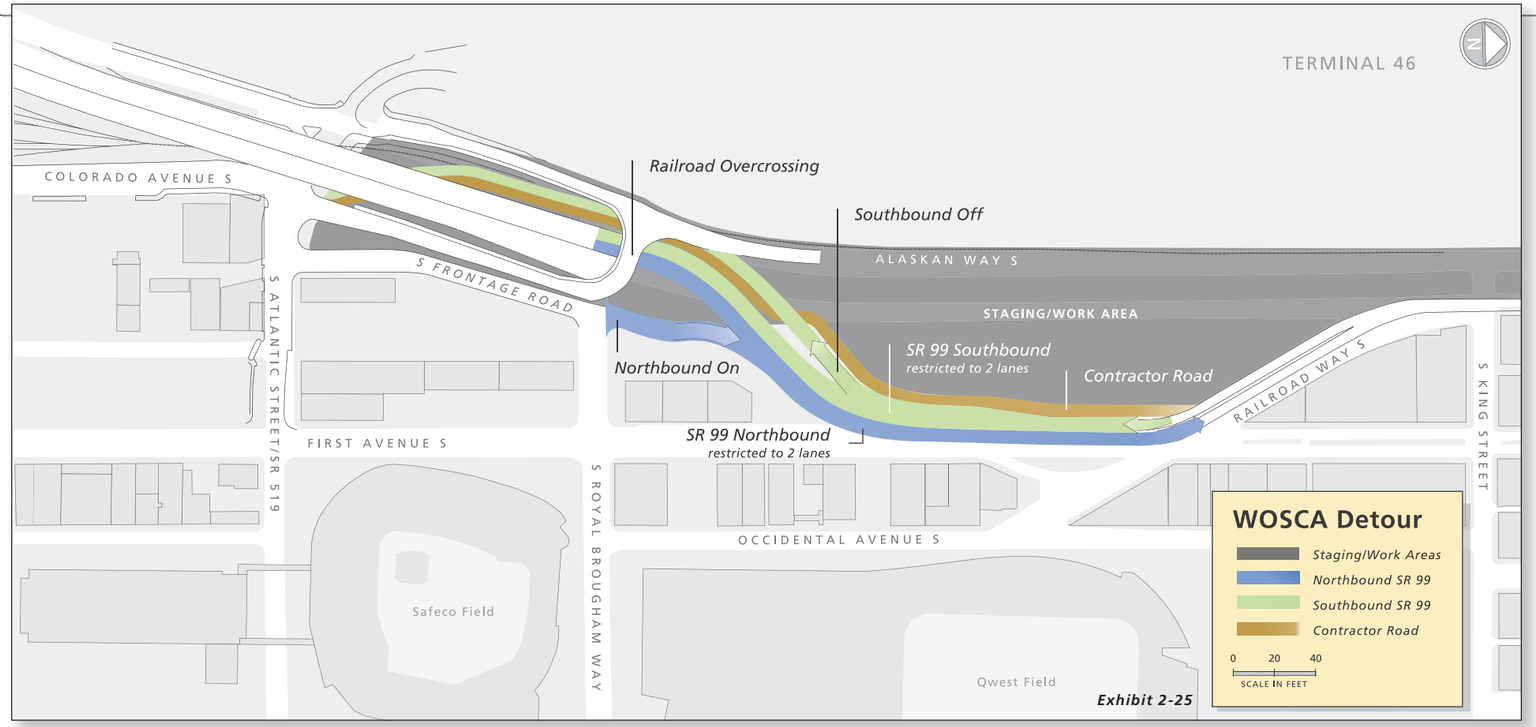


Exhibit 2-25

permanently increase travel times for some routes. There are some specific trips that may be 1 to 3 minutes slower as compared to the 2015 Existing Viaduct, and there are other trips where travel times may be 1 to 4 minutes faster.

The Bored Tunnel Alternative would not mitigate for the loss of 320 on-street parking spaces. The City's policy is to replace short-term parking only when there is a concentrated substantial loss.

TEMPORARY CONSTRUCTION EFFECTS FOR THE BORED TUNNEL ALTERNATIVE

The Bored Tunnel Alternative construction activities are expected to begin around July 2011 and last for 5.5 years (66 months). Construction activities are described in eight stages. The activities, sequencing, and durations are shown on Exhibit 2-23.

19 How would SR 99 and surrounding streets be restricted during construction?

Exhibit 2-24 shows the proposed traffic detour and roadway restrictions during construction. SR 99 would remain open for most of the construction period, but would be closed for approximately 3 weeks at the end of construction Stage 7 (about 4.5 years into construction) to connect SR 99 to the new bored tunnel. Periodic night or weekend closures of SR 99 would also be required. Keeping SR 99 open through most of the construction would help to lessen traffic impacts from roadway closures and restrictions.

SR 99 Restrictions and the WOSCA Detour

SR 99 would be reduced by one lane in each direction throughout most of the construction period for the Bored Tunnel Alternative. This is because there is only enough space for two lanes in each direction through the Washington-Oregon Shippers Cooperative Association (WOSCA) detour in the south as well as through the north portal area. Traffic will be constrained in the north portal area to construct the new SR 99 ramps and bridge across Mercer Street. On the existing viaduct, traffic would be reduced from three lanes to two lanes, except for the northbound lanes between the First Avenue S. ramps and the Western Avenue off-ramp, which would have three lanes to accommodate traffic exiting at the Seneca Street and Western Avenue off-ramps. The speed limit on the existing viaduct would be reduced from 50 miles per hour (mph) to 40 mph.

When construction begins for the Bored Tunnel Alternative, restrictions in the south portal area are mostly due to construction of the S. Holgate Street to S. King Street Viaduct Replacement Project, which will already be constructing the WOSCA detour and will have opened the temporary northbound on-ramp and southbound off-ramp. The S. Holgate Street to S. King Street Viaduct Replacement Project would reconfigure the existing SR 99 ramps to First Avenue S. and use them to route SR 99 mainline traffic to and from the WOSCA detour. A temporary southbound off-ramp would be located near S. Atlantic Street and a temporary northbound on-ramp would be located at S. Royal Brougham Way. The S. Holgate Street to S. King Street Viaduct Replacement Project would move the mainline SR 99 traffic to the WOSCA detour in two phases: first the southbound traffic would be detoured for about 5 months), and then both northbound and southbound traffic would be detoured as shown on Exhibit 2-25. These detours would be put in place during Stage 2 and the beginning of Stage 3 of the Bored Tunnel Alternative construction. Construction of the Bored Tunnel Alternative would extend the time that the WOSCA detour is needed by about 2 years beyond what is required for the S. Holgate Street to S. King Street Viaduct Replacement Project. The temporary ramps that are part of the detour would also remain in place through Stage 7 of the Bored Tunnel Alternative's construction. The WOSCA detour would have a posted speed limit of 25 mph.

SR 99 would be closed for 3 weeks to allow the connection of the completed bored tunnel to the south and north portals. During this closure, congestion on local arterials in the downtown core is expected to increase noticeably compared to congestion during other stages of construction, because all SR 99 traffic would be diverted to city streets and other major freeways such as I-5 and Interstate 90 (I-90). Point-to-point travel times during the 3-week closure are expected to increase substantially. For example, a trip between Woodland Park and S. Spokane Street that typically takes about 15 minutes could take about 45 minutes.

Other Traffic Restrictions during Construction

As shown in Exhibit 2-24, in addition to SR 99 restrictions, detours and roadway restrictions would be needed near the south and north tunnel portals and along the waterfront during viaduct demolition. Some detours and restrictions would be short-term, such as those associated with utility relocations and closures of cross streets during the demolition of the existing viaduct. Others, such as closing Alaskan Way S. between S. Atlantic Street and S. King Street would occur for most of the 5.5-year construction period.

South Portal Roadway Restrictions and Detours

Alaskan Way S. would be closed between S. Atlantic Street and S. King Street to accommodate south portal construction activities. S. King Street would be closed between Railroad Way S. and Alaskan Way S. Traffic on Alaskan Way S. would be detoured at S. Atlantic Street to the East Frontage Road. From there Alaskan Way S. traffic would be routed to S. Royal Brougham Way, First Avenue S., to Railroad Way S., where traffic would be routed under the viaduct and would connect back to Alaskan Way S. For most of the 5.5-year construction period, First Avenue S. would continue to have two lanes in each direction. However, for about 1 year after the bored tunnel is opened, First Avenue S. would be reduced to one lane in each direction.

North Portal Roadway Restrictions and Detours

In the north portal area, there would be periodic closures on Sixth Avenue N., Taylor Avenue N., and Broad Street for utility relocations during construction Stages 2 and 3. On Broad Street, the eastbound lanes would be closed for 12 months during Stages 2 and 3 and would reopen briefly in Stage 4, when the westbound lanes would be closed for 3 months. These closures will require detours for local

traffic. Broad Street would be permanently closed in Stage 5.

Mercer Street would be reduced to two eastbound lanes between Fifth and Ninth Avenues N. during the first three stages of construction. In Stage 4, Mercer Street would become a two-way street with two lanes open in each direction. Mercer Street would increase to three lanes in each direction during Stage 5. These reductions will cause some delays, especially during peak hours. There would be periodic lane closures and restrictions for street construction on Denny Way; John, Thomas, and Harrison Streets; and Aurora and Sixth Avenues N. during Stage 8 that would require short detours.

Other Roadway Restrictions

Throughout most of the construction period, few long-term lane closures are expected for local streets located between the south and north portals. However, periodic lane closures would be required during demolition of the viaduct and to fill and close the Battery Street Tunnel. On Battery Street, short-term lane and street closures would likely be required as part of closing the Battery Street Tunnel. During the 9-month period when viaduct demolition occurs, Alaskan Way would be narrowed. Cross streets that pass under the viaduct would be temporarily closed between S. King Street and the Battery Street Tunnel. These closures will require detours for local traffic and cause some delays, especially during peak hours. Periodic lane closures would also be needed in specific areas along the bored tunnel alignment where soil improvements are needed and could cause short detours.

20 How would SR 99 and local street traffic be affected by construction?

Effects to SR 99 Traffic

Restricting the speed limit and number of lanes on SR 99 and routing the mainline traffic onto the WOSCA detour would reduce SR 99 capacity during the first 4.5 years of construction. SR 99 travel times and vehicle delays are expected to increase slightly. The highest increase modeled was 7 minutes in the AM peak hour between Ballard and S. Spokane Street. Traffic flow would be close to capacity during construction and more likely to experience increased delay and congestion following a disruption. Bottlenecks to the south and north of the viaduct would cause many drivers to divert from the facility, resulting in less overall traffic on this section of SR 99. Modeling results indicate that this diverted traffic would have little effect on I-5 trips, but it would have a larger effect on trips diverting to local streets. Impacts to local streets are discussed below. Approximately two-thirds of the vehicles that travel on the viaduct today would continue to use SR 99 during construction.

SR 99 would be closed for 3 weeks to connect the completed bored tunnel to the south and north portals. During the closure period, traffic effects would be similar to periodic weekend viaduct closures. Drivers would avoid the area or use alternative routes. Traffic on nearby roadways, such as First Avenue S., and I-5 would be more congested during the closure period.

South Portal Area

Delays at the majority of intersections investigated in the south would not change substantially during construction Stage 7 compared to the 2015 Existing Conditions. However, the temporary northbound on-ramp for the WOSCA detour may experience considerable queues during the PM peak. These queues could back up into adjacent intersection, affecting operations at the following locations:

- East Frontage Road/S. Royal Brougham Way
- First Avenue S./S. Royal Brougham
- First Avenue S./S. Atlantic Street

Delay is expected to increase by about 30 to 45 seconds at each of these intersections.

While SR 99 is reduced by one lane in each direction, some drivers may choose to use other routes such as First, Second, and Fourth Avenues, which may add congestion and increase delay at intersections along these routes. Delay at most of the intersections along First, Second, and Fourth Avenues is not expected to increase by more than 1 minute, with the following exceptions:

- First Avenue S./S. Washington Street during the PM peak hour (delay of 3 to 4 minutes)
- First Avenue S./S. Main Street during the PM peak hour (delay of more than 5 minutes)
- Second Avenue S./S. Jackson Street during the PM peak hour (delay of about 3 minutes)
- Fourth Avenue S./S. Royal Brougham during the PM Peak hour (delay of about 2 minutes)

Drivers would also be affected by the closure of Alaskan Way S. between S. Atlantic Street and S. King Street throughout construction. Drivers would need to travel on First Avenue S. or other north-south streets in this area by using S. Atlantic Street and east-west cross streets north of S. King Street.

Central Downtown and Waterfront Area

In the central downtown and waterfront areas, peak hour volumes are expected to increase for the majority of intersections along north-south arterials such as First, Second, and Fourth Avenues. However, the magnitude of these increases would not result in high levels of congestion for most of these locations. Exceptions include the intersection of Second Avenue and Marion Street during both the AM and PM peak hours and Fourth Avenue and Marion Street during the PM peak hour, where congestion would result in delays of a minute or more.

North Portal Area

The widening and conversion of Mercer Street to a two-way corridor and restrictions to SR 99 access between Denny Way and Mercer Street would increase congestion slightly. These access changes would shift a portion of the peak hour traffic to connections farther north or south.

Peak hour congestion levels at intersections near affected on- or off-ramp connections or along affected city streets would potentially increase due to higher concentrations of peak hour traffic demand and changes in ramp

configurations during construction. At the Denny Way northbound on-ramp to SR 99, delays would increase by more than 1 minute in the PM peak hour. This area is already congested during peak conditions, and the effects of construction activities and traffic diversion would likely increase delays and congestion during times of increased demand. Mercer Street reconstruction would cause further increases in traffic volumes at the following locations:

- Mercer Street at Dexter Avenue N., delay is expected to increase by more than one minute during the AM peak hour
- Mercer Street at Fifth Avenue N., delay is expected to increase by approximately one minute during the PM peak hour
- Broad Street at Fifth Avenue N., delay is expected to increase by more than 3 minutes during the AM peak hour

21 How would specific SR 99 users be affected during construction?

People traveling on SR 99, Alaskan Way, or on nearby surface streets through Seattle would experience more congestion and increased delays throughout construction. Effects to specific users are discussed below.

How would freight be affected during construction?
Routes used for hauling construction materials and spoils to and from the south portal area may cause delays for some freight traffic. In the south portal area, the primary route to haul construction materials would likely use the temporary SR 99 off-ramp, which is adjacent to the WOSCA construction staging area, to access S. Atlantic Street to SR 519 (Edgar Martinez Drive S.) to First Avenue S. Over-legal loads to the south end of the project would likely travel via West Marginal Way S. (SR 599) to First Avenue S.

Routes being considered for hauling construction materials and spoils in the north portal area include I-5 to Fairview Avenue N. to Denny Way to Sixth Avenue N. to the construction zone. SR 99 to and from the north is also available as a potential haul route.

How would transit be affected during construction?
King County Metro bus services that use SR 99 would be affected by lane and speed restrictions on SR 99 during construction. Congestion is expected to increase and result in slower travel speeds on SR 99, resulting in travel time increases for transit ranging from 1 to 3 additional minutes as compared to the 2015 Existing Viaduct. The outside lane of northbound SR 99 north of the S. Spokane Street interchange would be a transit-only bypass lane until SR 99 merges to two lanes near the WOSCA detour. This transit-only lane would help mitigate the effects of construction on transit travel times. In the north end, most buses enter or exit SR 99 at Denny Way; these travel times may increase slightly during construction. For example, delay at the Denny Way northbound on-ramp to SR 99 is expected to increase by more than one minute in the PM Peak hour. Increased congestion on First Avenue S. or Fourth Avenue S. during construction could also affect transit operations.

How would ferry traffic be affected during construction?
Ferry traffic would be affected by the closure of Alaskan Way S. between S. Atlantic Street and S. King Street throughout construction. Vehicle traffic accessing the Seattle Ferry Terminal from the south would need to use First Avenue S. to connect to a cross street and access Alaskan Way S. north of S. King Street. Vehicle traffic exiting the Seattle Ferry Terminal would also need to connect to First Avenue S. or other north-south streets north of S. King Street to travel southbound. North of the Seattle Ferry Terminal, traffic entering and exiting the ferry terminal would have the same access to Alaskan Way as they do today until the last year of the project when the viaduct would be demolished.

During viaduct demolition, Alaskan Way would be restricted and cross streets located under the viaduct would be closed for about two weeks in the section where demolition is occurring. Ferry passengers would need to be informed of street closures and short-term detours that may affect their route to and from the Seattle Ferry Terminal. For drivers accessing the ferry terminal, it may take a little longer to get to and from the ferry terminal during viaduct demolition. During the time period of a few weeks, when cross-streets near the ferry terminal are closed, drivers would be routed to cross-streets located a block or two to the north and south.

Many walk-on ferry passengers accessing ferries at either the Seattle Ferry Terminal or water taxi service at Pier 50 use the Marion Street pedestrian bridge that connects the Seattle Ferry Terminal to First Avenue at Marion Street. The bridge would continue to be used until the last year of construction. Viaduct demolition would also remove this pedestrian bridge. Temporary pedestrian access compliant with ADA requirements would be in place until a new pedestrian overcrossing is constructed.

How would event traffic be affected during construction?
People attending major events at the stadiums or Seattle Center would also experience additional delays due to temporary lane closures, detours, and access modification to SR 99 ramps. The closure of Alaskan Way S. between S. Atlantic Street and S. King Street would likely increase congestion on First Avenue S. when event traffic is heading to or leaving the stadium area.

Lane restrictions on Mercer Street and Broad Street in Stages 2 through 4 and closure of Broad Street in Stage 5 (mid-2013) would cause delays and confuse some drivers that may be traveling to and from events at Seattle Center. Signage, signal timing, road closures, and detours would be critical for maintaining traffic flow and circulation during major events. Periodic closures on John, Thomas, and Harrison Streets, and Aurora and Sixth Avenues N. during the last year of construction for surface street restoration could also cause some delays.

How would bicyclists and pedestrians be accommodated during construction?
For safety, bicyclists and pedestrians would be routed around construction zones. During construction, sidewalks

and trail facilities would be temporarily closed for utility relocations, construction, demolition, and street restoration. The duration of temporary closures would be minimized to the extent practical to maintain bicycle and pedestrian mobility and accessibility. The location and duration of temporary closures will be determined by the contractor during final design.

22 How would area noise levels change during construction?

Construction noise would mostly affect areas adjacent to the south and north portals during the 5.5-year construction period. Viaduct removal would be the loudest construction activity for residents and employees located near the viaduct between S. King Street and the Battery Street Tunnel. Although viaduct demolition would take approximately 9 months, demolition of individual two-block segments is only expected to last up to 4 weeks.

Noise during the construction period would be bothersome to nearby residents and businesses because it would make it unpleasant to be outside and hard to hold conversations. Construction noise would be intermittent, occurring at different times over the 5.5-year construction period at various locations in the project area. Noise levels would depend on the type, amount, and location of construction activities.

The most common noise sources during all stages of construction would be from machine engines such as bulldozers, cranes, generators, and other earth- and material-moving equipment. Construction could occur up to 24 hours a day, 7 days a week. The project corridor is currently noisy, with peak hour average daytime sound levels that range from 61 to 80 dBA. The majority of construction activities would fall within the range of about 75 to 95 dBA at 50 feet, with some activities like impact pile driving reaching just over 100 dBA at 50 feet, as shown in Exhibit 2-26. Pile driving would only be used in instances where less disruptive techniques are not available. These noise levels would vary considerably throughout each construction stage as the type and location of the construction activities change.

Exhibit 2-26

Typical Sound Levels

Source: FTA 1995, EPA 1971, EPA 1974

23 How would historic resources be affected during construction?

Effects to historic resources during construction could occur from settlement as the tunnel boring machine (TBM) moves from Alaskan Way S. to First Avenue, moving beneath buildings at the northwest corner of the Pioneer Square Historic District and buildings listed in the NRHP that are north of the historic district.

The anticipated amount of settlement along the alignment is typically small with mitigation measures in place to minimize settlements. However, two properties, the Western and Polson Buildings, are contributing buildings in the Pioneer Square Historic District and may experience settlement that could damage the buildings. The Western Building is in poor structural condition and settlement may cause further extensive structural damage, if unmitigated. Mitigation measures to protect the building may not prevent the need for demolition to avoid the possibility of collapse. The Polson Building may also experience settlement if unmitigated but is in good structural condition. Protective measures prior to construction, along with high levels of monitoring during construction, should prevent major structural damage of the Polson Building, and aesthetic damage would be repaired.

In addition to the Western and Polson Buildings, twelve buildings that are within the Pioneer Square Historic District or listed in the NRHP may be affected by settlement during construction:

- 1 Yesler Building
- Maritime Building
- Federal Building
- National Building
- Alexis Hotel/Globe Building
- Arlington South/Beebe Building
- Arlington North/Hotel Cecil
- Grand Pacific Hotel
- Colonial Hotel
- Two Bells Tavern
- Fire Station No. 2
- Seattle Housing Authority

The Watermark/Colman Building façade, which is listed as a city landmark, would also warrant monitoring. All of these buildings may experience utility disruptions, and cracks or other aesthetic damage from settlement that could be repaired. These repairs would not affect the eligibility of the properties. To limit damage to historic structures, measures would be implemented to avoid or minimize potential damage. Improvements such as compensation grouting or compaction grouting would be used prior to tunnel boring to prevent damage. It is anticipated that using these measures will prevent damage to the vulnerable buildings. In the event that unavoidable damage occurs, it would be mitigated as required and in accordance with the Secretary of the Interior's Standards for Rehabilitation of Historic Buildings.

Appendix I, Historic, Cultural, and Archaeological Resources Discipline Report

Appendix I, Chapter 6 provides additional information on construction effects to resources.

Section 4(f) and Protection of Historic and Archaeological Resources

The project is adjacent to some of Seattle's most well-known historic buildings and neighborhoods. Section 4(f) is a provision of federal law pertaining to transportation projects that requires FHWA to carefully consider and address protection of these resources in order to receive federal funding. Historic and cultural resources that would be subject to use under Section 4(f):

- Alaskan Way Viaduct
- Battery Street Tunnel
- Western Building
- Site 45KI958 – Seattle maintenance yard

In addition, the following historic resources were evaluated for use during construction but were not found to be subject to use:

- Dearborn South Tideland Site
- Polson Building
- 1 Yesler Building
- Maritime Building
- Federal Building
- National Building
- Alexis Hotel/Globe Building
- Arlington South/Beebe Building
- Arlington North/Hotel Cecil
- Grand Pacific Hotel
- Colonial Hotel
- Two Bells Tavern
- Fire Station No. 2
- Seattle Housing Authority

The Section 4(f) Evaluation can be found at the end of this document on page 225. The **Section 4(f) Supplemental Materials** are provided in *Appendix J*.

Parking Affected During Construction

Exhibit 2-27

24 How would archaeological and cultural resources be affected during construction?

Construction effects to cultural and archaeological resources would likely occur during excavation of the tunnel portal areas, which would disrupt fill and potentially cultural deposits. Construction near the south portal would adversely affect an NRHP-eligible archaeological site, the Dearborn South Tideland Site (45KI924). FHWA and WSDOT have determined that the site is considered eligible under Section 106 Criterion D for its potential to yield information about early development in Seattle, but its value is in the data that may be recovered and does not depend on being preserved in place. Section 4(f) regulations provide an exception for the use of these types of archaeological properties in 23 CFR 774.13(b), and the SHPO has concurred with FHWA's finding.

Construction in the north portal area may adversely affect Native American and historic-period archaeological sites from about Harrison Street north beyond the margins of the Denny Regrade. One historic-period archaeological site has been identified in this area, 45KI958. Although this archaeological site has not been formally determined eligible for the NRHP, WSDOT will treat it as eligible under Section 106 Criterion D for planning purposes.

A Historic Properties Treatment Plan, which details all measures to evaluate archaeological sites for NRHP eligibility and recover the information that qualifies a site for the NRHP, would be developed and implemented prior to the initiation of construction. An Unanticipated Discovery Plan will be prepared for the project that provides for notification and consultation among SHPO, tribes, and consulting parties related to discoveries of archaeological material or human remains. All of these measures will be developed in consultation with SHPO, tribes, and consulting parties and will be included as part of an MOA to minimize and mitigate for adverse effects to historic properties.

25 How would the economy be affected during construction?

Construction would inconvenience or disturb businesses and business customers adjacent to the project. Construction-related effects such as noise, loss of parking (discussed below), and congestion would vary considerably over time and by area. Mitigation measures would be employed to minimize impacts.

Construction would also benefit the economy by directly creating new demand for construction materials and labor over a number of years. This increase in employment leads to additional wages and salaries paid to workers, which fosters higher consumer spending. The estimated average number of jobs directly related to construction of the Bored Tunnel Alternative would be 480 jobs per year, representing about $64.9 million per year in wages and benefits.

Effects to Parking

During Stages 1 through 7, the Bored Tunnel Alternative would affect between 680 and 760 on-street and 50 off-street parking spaces in the project area, as shown in Exhibits 2-27 and 2-28. In addition, there may be short-term (such as peak period) parking restrictions on some streets near the portals to help accommodate transit or general-purpose traffic during construction. The 680 to 760 on-street spaces would result in the annual loss of approximately $4.5 million to $5.0 million in parking revenue for the City.

Exhibit 2-28
Construction Parking Effects During Stages 1 Through 7

	ON-STREET SPACES				
	Short-Term	Long-Term	Sub-Total	Off-Street Spaces	Total Spaces
South Portal Area	180	50	230	50	280
Central	70 – 150	10	80 – 160	0	80 – 160
North Portal Area	140	230	370	0	370
Total	**390 – 470**	**290**	**680 – 760**	**50**	**730 – 810**

During Stage 8, viaduct demolition would affect up to 750 spaces along the central waterfront area as shown in Exhibit 2-29. Directly following viaduct demolition, Seattle expects to begin work on the Alaskan Way Promenade/Public Space and the new Alaskan Way surface street. Construction of these projects would likely reduce parking availability until they are completed in 2018. Additional information about these effects can be found in Chapter 7, Cumulative Effects.

Exhibit 2-29
Construction Parking Effects During Stage 8

	ON-STREET SPACES				
	Short-Term	Long-Term	Sub-Total	Off-Street Spaces	Total Spaces
South Portal Area	180	50	230	50	280
Central	540 – 550	10	550 – 560	Up to 190	Up to 750
North Portal Area	140	230	370	0	370
Total	Up to **870**	Up to **290**	Up to **1,160**	Up to **240**	Up to **1,400**

During events such as Seahawks, Mariners, and Sounders games, parking is currently highly utilized, and private lots charge a premium for event parking. Only about 50 off-street parking spaces would be removed during project construction, which is not expected to noticeably affect the overall parking supply. Approximately 6,900 off-street parking spaces are available in the major parking facilities near the stadiums.

As construction nears, parking mitigation measures will be refined to address specific effects to businesses, community services, or other locations. The project will comply with ADA requirements.

Construction Worker Parking

The number of construction workers is anticipated to be about 500 workers for much of the construction period. The number of workers would take a few months to ramp up at the beginning of construction and then taper off towards the end of construction. The work areas for these construction workers would be located in several different locations, with concentrations near the south portal, north portal, and central waterfront as demolition is occurring. Pier 48 uplands may be used for construction parking. Construction workers who are not able to park within the construction zone may seek available long-term parking in the area, first pursuing on-street spaces, and then pay lots away from the jobsite. Construction workers would be prohibited from parking on the street or in pay lots near the construction zone.

26 What other effects would there be during construction?

Vibration
Construction activities that cause the highest levels of vibration are associated with viaduct demolition and the use of impact equipment, such as jack hammers and hoe rams. Viaduct demolition and removal in locations adjacent to existing buildings would use concrete munchers to control the size and dispersion of concrete debris. In other areas, the viaduct could be demolished using various methods of concrete removal, including jackhammers and hoe rams.

Buildings will be evaluated on a case-by-case basis during final project design to determine what specific mitigation measures would be needed to minimize vibration. The TBM would also produce some ground vibration, but due to the depth of the TBM and the noise levels along the surface streets the vibration levels would not be noticeable at building level.

Views
The visual effects of construction would be temporary and would not change regional views. Where distant views of water features and mountains are present, they likely would remain visible.

Views for drivers and pedestrians near construction areas would include elements common to construction activities, including staging areas, detours, heavy equipment, scaffolding, cranes, trucks, and temporary materials storage. At both the south and north portals, views may also include construction pits and equipment needed to launch and extract the TBM.

Neighborhoods
Businesses, government offices, services, and residents would be inconvenienced on a daily basis by construction traffic detours, congestion, noise and vibration, light and glare, and dust. Construction may be perceived as a temporary barrier to get to or through a neighborhood. People living or working within approximately two blocks of the construction zones at each portal would likely be most affected by construction activities.

Community, Social Services, and Low-Income or Minority Populations
Thirteen community or social service providers who may assist low-income, minority, and homeless populations are located near the south portal and 12 providers near the north portal are located within two blocks of construction and would be affected. Vehicle and transit access to these social resources could be more difficult during the construction period, particularly during the first 4.5 years. Access to buildings may also change for short periods of time, but would be maintained throughout the construction period. Except for the professional sports stadiums, these land uses are active during daytime hours when people generally have higher thresholds for loud noises, vibration, light, and glare. Social resources near the south portal are not expected to experience substantial construction effects. However, construction noise near the north portal could be disruptive to services held by religious organizations and to two childcare facilities that are nearby. Disruptions may occur at times when they would not normally be expected. As a result, construction could have temporary adverse effects to these facilities.

Removing the existing viaduct would affect adjacent community and social resources. The existing viaduct extends over 20 city blocks, and demolition would likely occur in two 2-block segments at a time over a 9-month period. An estimated 22 adjacent community resources including social service providers and day care facilities could be affected by noise, vibration, light, glare, dust, and truck traffic associated with demolition activities. Most of these resources are visited during daytime or early evening hours, when people have higher thresholds for construction-related disturbances.

The project will continue working to find ways to avoid or reduce construction-related effects on these populations through careful planning and design. With the mitigation proposed, the project would not have a disproportionately high and adverse effect on low-income or minority populations.

Parks and Recreation
Construction could disrupt access to park and recreation facilities in the project area. Local streets and sidewalks would be periodically restricted during construction, disrupting access to specific sites. Parking would also be reduced during construction, potentially reducing visits by those who normally drive to the area and use park and recreation facilities.

In the south portal area, the proposed trail connection from the Mountains to Sound Greenway Trail to the waterfront would likely be rerouted. The Waterfront Bicycle/Pedestrian Facility would also be rerouted. Bicyclists would have the option of continuing to use First Avenue S. or using the Port Side Pedestrian/Bike Trail in the south portal area. Bicyclists could also choose to use in-street bike lanes, sharing the road with vehicles, on Second Avenue or Fourth Avenue.

In the north portal area, traffic congestion, restrictions, changes to access, and loss of parking could affect people attending events at Seattle Center during construction. Construction noise may disturb users at Denny Park, although the park itself would not be affected.

During viaduct demolition, visitors to the waterfront and resources adjacent to the viaduct would experience noise and temporary access changes.

Properties and Land Use
Temporary easements would be needed for tiebacks and a variety of construction activities. Temporary tieback easements would be needed on the Port of Seattle's Terminal 46 property in the south portal area and four properties in the north portal area. Of the four properties, two are located at Republican Street and Aurora Avenue N., and the other two are located along the Sixth Avenue options.

Appendix G, Land Use Discipline Report

Appendix G, **Chapter 6** lists all of the properties where temporary tieback easements or construction easements would be needed.

Temporary construction easements would be needed on 18 properties along the bored tunnel alignment, and 1 property near the north portal area. Fifteen of the properties along the bored tunnel alignment would be between Yesler Way and University Street, and three would be in the vicinity of Denny Way. The property near the north portal would be just south of Thomas Street. Most of these temporary construction easements would be needed to implement settlement mitigation measures, such as grouting.

Public Services
During construction, public services would be affected by lane closures, detours, and increased traffic congestion and delays on roadways in and around the construction area. Construction would affect emergency vehicle access to and through the construction area. Response times for police, fire, and emergency medical aid to locations within and near the construction area would likely increase. Fire and emergency medical services outside the project area also could be affected due to changes in traffic patterns on local roads. Increased travel times could be experienced by other public services, such as solid waste and recycling collection and disposal services, postal services, and school bus routes.

Utilities
Several major construction activities could cause temporary interruptions to utility service customers within the project area; however, these outages would be planned in advance and affected customers would be notified.

Settlement from tunnel boring could affect various utilities, including traffic signals. Where needed, protective measures such as compensation grouting or compaction grouting would be used during tunnel boring to prevent or limit damage to buildings and utilities from settlement.

Air Quality
Air quality effects during construction would occur primarily as a result of dust and emissions from construction equipment. A dust control plan would be developed and implemented to avoid and minimize effects. A mobile source analysis demonstrated that concentrations would be within the National Ambient Air Quality Standards during construction.

Greenhouse Gas Emissions
Daily carbon dioxide equivalent (CO_2e) emissions from construction equipment and trucks are estimated to be 27 metric tons. Compared to the existing daily CO_2e emission estimate of 39,189 metric tons and 2015 Existing Viaduct estimate of 46,557 metric tons for the region, the 27 metric tons that construction of the Bored Tunnel Alternative would produce is a negligible portion of the total regional emissions.

Energy Consumption
Energy would be used during all construction activities. Common activities that would consume energy are excavating soils, transporting excavated material and debris, and operating diesel and gasoline-powered construction equipment. The existing energy consumed by vehicles daily in the city center is 13,221 million BTUs. The daily energy consumed during construction would be about 114 million BTUs, which is just a small fraction of the energy consumed daily by vehicles in the city center area. Over the 5.5-year construction period, approximately 249,271 million BTUs of energy would be consumed.

Water Resources
Construction effects to surface water could occur due to material spills. The most likely construction-related water quality effects from staging areas would come from erosion of disturbed soil areas or soil stockpiles, which could result in stormwater runoff carrying silt and sediment to receiving waters. Temporary construction-related effects would be minimized or prevented through proper selection and implementation of BMPs.

Fish, Aquatic, and Wildlife Habitat
Construction effects on species and habitats in the project area would be associated with construction noise, materials handling and stockpiling, and dewatering processes. Potential effects would be avoided, minimized, and mitigated by implementing appropriate BMPs, which would also include monitoring for contamination and proper disposal of these waste materials. By implementing BMPs, no effects to fisheries are anticipated.

Soil Excavation and Hazardous Materials
Seventeen contaminated sites are located on the 11 properties and four easements that would be acquired to build the project. Conducting site investigations in advance of construction when feasible would allow WSDOT to consider risk when developing construction schedules and costs.

Excavated materials, particularly near the portals, may be contaminated, which would require special handling and disposal. The volume of excavated material is estimated to be between 1,418,000 and 1,498,000 cubic yards, depending on the options at the portals. The amount of that material that may be contaminated is about 322,450 cubic yards and would be disposed of at a site that accepts hazardous and contaminated materials. Spoils and materials that are removed during construction would be hauled away in trucks, railcars, or barges to a predetermined disposal site.

MITIGATION FOR TEMPORARY CONSTRUCTION EFFECTS

27 How would construction effects be mitigated?
After reviewing public, tribe, and agency comments on this document as well as the previous 2004 Draft EIS and 2006 Supplemental Draft EIS, the project team will prepare more specific mitigation measures to address identified construction effects. The project will finalize the list of mitigation measures and commit to their implementation in the Final EIS and the Record of Decision (ROD) issued by FHWA. This Supplemental Draft EIS presents potential measures that could be used to mitigate temporary effects in Chapter 6, Question 37.

Some of the mitigation measures will be included in formal mitigation plans for effects related to transportation, noise, business and residences, Section 106 and historic and cultural resources, Endangered Species

What are CO_2 equivalents?

Greenhouse gases have different abilities to trap heat. To compare different greenhouse gases, scientists use a weighting factor. Carbon dioxide (CO_2) is used as the standard. Other gases are converted into CO_2 equivalents using the weighting factor.

Act, and water quality. Mitigation measures and plans will be developed by considering effects to adjacent and nearby properties in terms of intensity and duration. Mitigation measures and plans will be tailored to specific construction stages and varying effects. Many mitigation measures will become contractual requirements and monitored through WSDOT's on-going project oversight.

WSDOT, King County, and the City of Seattle have also developed Transportation Improvements to Minimize Traffic Effects During Construction to keep people and goods moving during construction of the Program. These enhancements and improvements are independent projects that will help keep traffic moving during the construction of all the projects that compose the Program. They are designed to increase transit options, shift traffic away from construction areas, and provide drivers with the information they need to choose less congested routes. These measures are described in more detail in Chapter 7, Question 13.

28 How would this project, the Alaskan Way Viaduct and Seawall Replacement Program, and other downtown projects affect Seattle and surrounding areas?

Cumulative effects represent the total effect of the proposed Alaskan Way Viaduct Replacement Project when added to other past, present, and reasonably foreseeable future projects or actions. Cumulative effects may be partly caused by this project, but they may also be caused by other projects. The cumulative effects analysis for this EIS considered potential cumulative effects from the other projects identified as part of the Program, in addition to past projects, relevant plans and other planned projects that may be built in a similar timeframe or nearby location.

Individual projects included in the Program are expected to have few long-term, adverse cumulative effects. Most of the long-term effects of the Program are expected to be beneficial, particularly to traffic operations in the surrounding transportation network. The projects collectively replace failing infrastructure, improve existing transportation facilities, provide improved public amenities, and increase transit capacity and services.

These other projects, if implemented, would provide additional benefits to the transportation network, complementing the Alaskan Way Viaduct Replacement Project. These projects would benefit numerous drivers traveling to and through downtown Seattle, but specifically these improvements will benefit drivers traveling to and from northwest Seattle. Transit enhancements would benefit numerous transit riders that use the transit system to travel to and through downtown Seattle. Together, these improvements are not expected to provide a substantial benefit to the regional transportation network, but they are expected to accommodate slightly more trips in the downtown Seattle transportation network with slightly less travel delay.

The Bored Tunnel combines with the Program and other projects and plans to bring cumulative improvements to:

- Transportation: The combined improvements will facilitate the safe and efficient movement of passenger vehicles, transit, and freight to and through downtown Seattle.
- Visual quality: The removal of the existing viaduct along with the development of a new Alaskan Way surface street and promenade would benefit the visual environment in the central waterfront area.
- Noise: Along the central waterfront and north of Denny Way to Harrison Street, the noise levels would be greatly reduced compared to existing conditions.
- Land use: The Project and Program would complement the numerous ongoing improvements in Seattle and, in particular, the central waterfront and downtown area consistent with adopted land use plans and policies.
- Economics: By maintaining local and regional mobility, the Project and Program combines with other transportation improvements to help maintain businesses that depend on the efficient movements of goods and freight and support a core part of the local economy.
- Social resources: The cumulative effects of the Project, the Program, and other transportation and urban development projects would benefit social resources in downtown Seattle neighborhoods by invigorating community life and strengthening neighborhood identity.
- Water quality: The Project, Program, and other actions would improve water quality in Elliott Bay and Lake Union by retrofitting currently untreated stormwater discharges with basic water quality treatment, reducing peak flows and the frequency of combined sewer overflows through the use of detention facilities, reducing the amount of pollutant-generating impervious surfaces, and removing contaminated sediments that may be leaching pollutants into Elliott Bay.

Because the Bored Tunnel avoids many adverse effects and replaces an existing highway, it has no cumulative effects on the following:

- Historic, cultural, and archaeological resources
- Public services and utilities
- Earth and groundwater
- Hazardous materials
- Fish, aquatic, and wildlife species and habitat
- Air quality
- Energy
- Greenhouse gasses

Potential adverse cumulative effects are primarily limited to short-term, construction-related impacts due to the potential for the construction schedules and areas of individual projects to overlap. Construction of projects that overlap with construction of the Bored Tunnel Alternative and could exacerbate the following localized construction effects:

- Traffic detours and congestion caused by lane restrictions
- Parking restrictions
- Increased noise and dust
- Utility relocations and the potential for unplanned service disruptions

29 How do the effects of the Bored Tunnel and other alternatives compare?

Chapter 8 of this Supplemental Draft EIS compares the Bored Tunnel Alternative to updated versions of the Cut-and-Cover Tunnel and Elevated Structure Alternatives evaluated in the 2006 Supplemental Draft EIS. A brief description of the Cut-and-Cover Tunnel and Elevated Structure Alternatives is provided below.

Cut-and-Cover Tunnel Alternative

The Cut-and-Cover Tunnel Alternative would replace SR 99 between S. Royal Brougham Way and Roy Street. In the central waterfront SR 99 would be replaced with a six-lane facility up to about Virginia Street. The tunnel would be built along the central waterfront, and the west wall of the tunnel would replace the existing seawall. Ramps to and from SR 99 would be provided near S. King Street, Elliott and Western Avenues, and Republican Street. Ramps to and from Columbia and Seneca Streets would not be provided. Improvements would be made to the Alaskan Way surface street, the Battery Street Tunnel, and SR 99 and adjacent surface streets between the Battery Street Tunnel and Roy Street.

Elevated Structure Alternative

The Elevated Structure Alternative would replace SR 99 between S. Royal Brougham Way and Roy Street. In the central waterfront SR 99 would be replaced with a six-lane, stacked elevated structure up to about Virginia Street. The seawall would be replaced to provide structural stability to the new elevated structure. Ramps to and from SR 99 would be provided near S. King Street, Columbia and Seneca Streets, Elliott and Western Avenues, and Republican Street. Improvements would be made to the Alaskan Way surface street, the Battery Street Tunnel, and SR 99 and adjacent surface streets between the Battery Street Tunnel and Roy Street.

Summary Comparison of Long-Term Effects

The Bored Tunnel Alternative would replace the Alaskan Way Viaduct (SR 99) with a new transportation facility under downtown Seattle, while the Cut-and-Cover Tunnel and Elevated Structure Alternatives would replace the viaduct along the central waterfront near its existing location. All of the alternatives provide at least two lanes in each direction from S. King Street to Denny Way.

Both the Cut-and-Cover Tunnel and Elevated Structure Alternatives maintain existing ramp connections to Elliott and Western Avenues. The Elevated Structure also maintains ramps to and from downtown Seattle at Seneca and Columbia Streets, while both tunnel alternatives eliminate these ramps and replace them with ramps near the stadiums at S. King Street. All three alternatives would connect the local street grid across SR 99 north of Denny Way and improve access to and from SR 99 in this area. The Bored Tunnel creates a more complete local street grid north of Denny Way, but drivers would pass through more intersections to get to or from downtown when accessing SR 99 to the north. Because of differences in the proposed facilities, travel times for key trips vary to between the alternatives. Travel time differences between the alternatives depend on the trip taken and the time of travel. Exhibit 2-30 compares travel times for the three alternatives. For many trips, travel times are expected to be faster during the AM and PM peak hour for the Bored Tunnel Alternative than the Cut-and-Cover Tunnel and Elevated Tunnel Alternatives. Improved travel times during peak hours with the Bored Tunnel Alternative are mostly due to the fact that it provides fewer ramp connections, which reduces vehicle back-ups from ramps onto the SR 99 mainline as well as friction and reduced speeds often caused by weaving and merging traffic movements associated with the ramps.

Along the central waterfront both tunnel alternatives would greatly reduce the noise and visual barrier that today separates the waterfront from downtown. The Elevated Structure would be slightly less noisy, but the visual impact would be greater than the existing viaduct, since the new structure would be wider than the current viaduct. Because of this, the Elevated Structure Alternative would continue to be a barrier between downtown and the waterfront. Both tunnel alternatives create more public open space and best help Seattle realize its vision for the central waterfront.

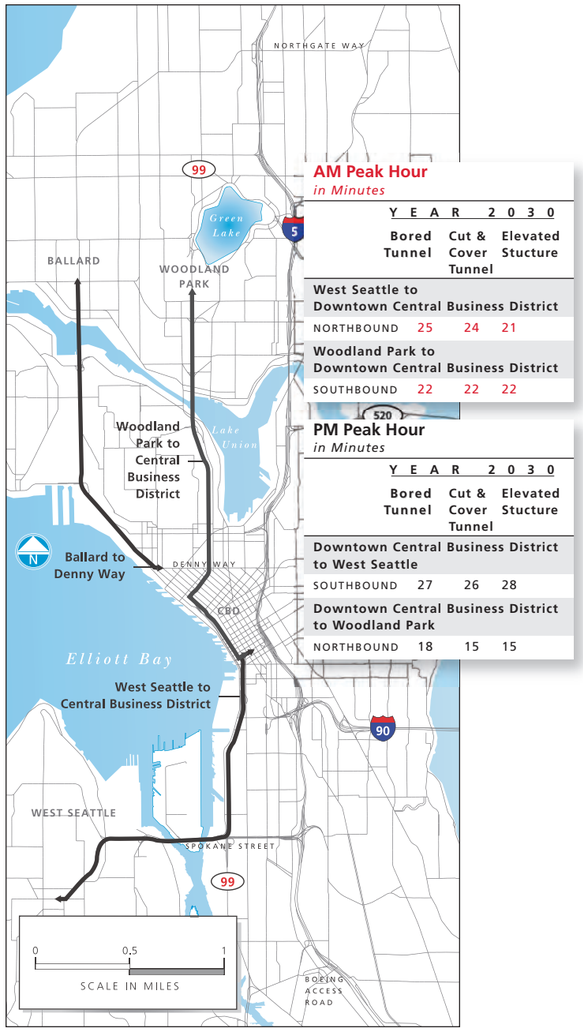
Both the Cut-and-Cover Tunnel and Elevated Structure Alternatives would repair the seawall, rebuild the Alaskan Way surface street, and construct a streetcar on Alaskan Way as part of replacing the viaduct. Repairing the seawall, rebuilding Alaskan Way, and building a streetcar would be separate, independent projects that are not included with Bored Tunnel Alternative because the new tunnel is located inland and does not require replacement of the seawall and Alaskan Way.

For Seattle and surrounding communities the three build alternatives to replace the Viaduct are similar. If the viaduct is closed (the No Build Alternative), congestion and travel times on surrounding streets, I-5, and indirectly throughout the Puget Sound region, would increase. This would have severe economic consequences and ultimately cause many people and businesses to relocate. Other transportation investments might be needed to replace the lost capacity.

Summary Comparison of Short-Term Construction Effects

The greatest differences among the three alternatives are their construction impacts and construction duration. The Bored Tunnel would take about 5.5 years to construct, followed by the Cut-and-Cover Tunnel at 7 to 8.75 years and the Elevated Structure at 10 years. In addition to a shorter construction duration, the Bored Tunnel Alternative would mostly limit construction activity to the portals located at the south and north ends of the project area, with virtually no impacts to the central waterfront until the existing viaduct is demolished. Conversely, construction of the Cut-and-Cover Tunnel and Elevated Structure Alternatives would be quite disruptive in a much broader area and for a much longer period than the

2030 Travel Time Comparison

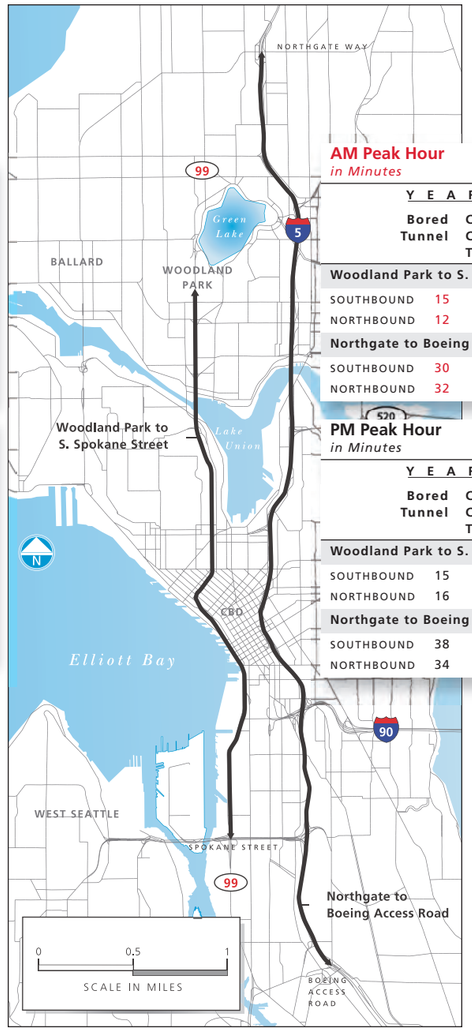


AM Peak Hour
in Minutes

	YEAR 2030		
	Bored Tunnel	Cut & Cover Tunnel	Elevated Stucture
West Seattle to Downtown Central Business District			
NORTHBOUND	25	24	21
Woodland Park to Downtown Central Business District			
SOUTHBOUND	22	22	22

PM Peak Hour
in Minutes

	YEAR 2030		
	Bored Tunnel	Cut & Cover Tunnel	Elevated Stucture
Downtown Central Business District to West Seattle			
SOUTHBOUND	27	26	28
Downtown Central Business District to Woodland Park			
NORTHBOUND	18	15	15

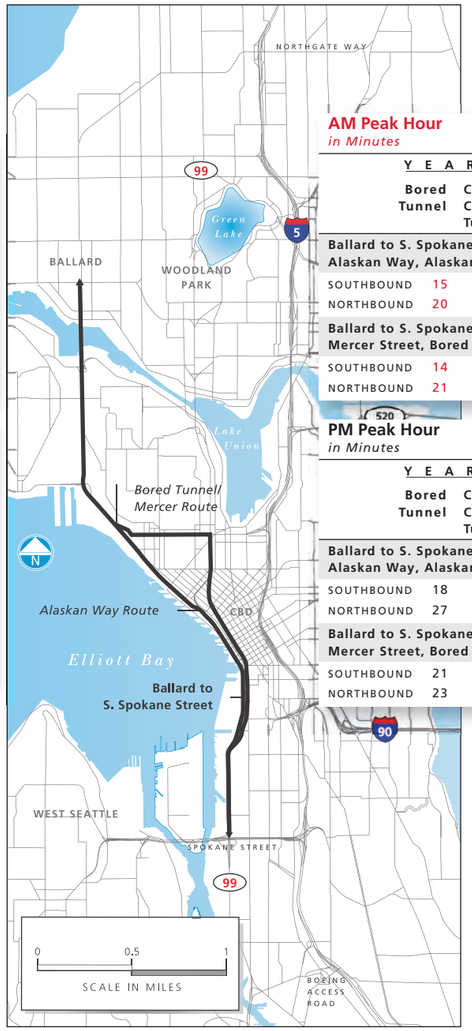


AM Peak Hour
in Minutes

	YEAR 2030		
	Bored Tunnel	Cut & Cover Tunnel	Elevated Stucture
Woodland Park to S. Spokane Street			
SOUTHBOUND	15	22	22
NORTHBOUND	12	14	15
Northgate to Boeing Access Road			
SOUTHBOUND	30	31	30
NORTHBOUND	32	32	32

PM Peak Hour
in Minutes

	YEAR 2030		
	Bored Tunnel	Cut & Cover Tunnel	Elevated Stucture
Woodland Park to S. Spokane Street			
SOUTHBOUND	15	15	16
NORTHBOUND	16	18	19
Northgate to Boeing Access Road			
SOUTHBOUND	38	38	38
NORTHBOUND	34	34	34



AM Peak Hour
in Minutes

	YEAR 2030		
	Bored Tunnel	Cut & Cover Tunnel	Elevated Stucture
Ballard to S. Spokane Street via Alaskan Way, Alaskan Way Viaduct			
SOUTHBOUND	15	19	21
NORTHBOUND	20	18	19
Ballard to S. Spokane Street via Mercer Street, Bored Tunnel			
SOUTHBOUND	14	NA	NA
NORTHBOUND	21	NA	NA

PM Peak Hour
in Minutes

	YEAR 2030		
	Bored Tunnel	Cut & Cover Tunnel	Elevated Stucture
Ballard to S. Spokane Street via Alaskan Way, Alaskan Way Viaduct			
SOUTHBOUND	18	20	21
NORTHBOUND	27	23	23
Ballard to S. Spokane Street via Mercer Street, Bored Tunnel			
SOUTHBOUND	21	NA	NA
NORTHBOUND	23	NA	NA

Exhibit 2-30

Bored Tunnel Alternative. In addition to effects in the south and north, the central waterfront and areas adjacent to the viaduct as it climbs to the Battery Street Tunnel would be heavily affected during the majority of the construction period.

The Bored Tunnel would be built with limited SR 99 closures (3 weeks in addition to occasional night and weekend closures). The Cut-and-Cover Tunnel would close SR 99 for 27 to 42 months, and the Elevated Structure would close it for 6 months. The Bored Tunnel Alternative would require reducing SR 99 to two lanes in each direction between S. Spokane Street and Roy Street for a period of 3.5 years. Comparatively, the other two alternatives require extensive roadway closures and restrictions on SR 99 for a period of 3.5 to 6.5 years. These effects would be substantial to the more than 110,000 vehicles that travel on the viaduct each day, as well as I-5 and the surrounding surface streets that would be negatively affected by an extended SR 99 closure. Additionally, the Cut-and-Cover Tunnel and Elevated Structure Alternatives would have substantial effects to Alaskan Way traffic, since Alaskan Way would be restricted for 7 to 10 years. Because of this, construction of the Bored Tunnel Alternative would be far less disruptive and cause less congestion in Seattle's entire transportation network than the other build alternatives.

The Cut-and-Cover Tunnel and Elevated Structure both require a temporary bridge for access to Colman Dock while the seawall is replaced, though none of the alternatives would have any long-term effects to Elliott Bay.

30 What effects would be expected if the build alternatives were tolled?

As currently planned and developed, the build alternatives do not include tolls. However, during the 2009 legislative session, the state legislature passed Engrossed Substitute Senate Bill 5768, which directed WSDOT to study the possibility of tolling this portion of SR 99 to provide up to $400 million in funding. WSDOT does not currently have the authority from the Washington State Legislature to toll SR 99, which is why the build alternatives evaluated in this Supplemental Draft EIS do not include tolls.

WSDOT developed three scenarios to test the effects of tolling. All three scenarios charged drivers a toll as they entered the bored tunnel, but each scenario charged a different average toll, from $1.87 (Scenario E) to $2.16 (Scenario A) to $2.44 (Scenario C). A detailed analysis of the three scenarios was conducted for the Bored Tunnel Alternative and qualitative effects were considered for the Cut-and-Cover and Elevated Structure Alternatives.

Scenarios A, C, and E were constructed to test the revenue generating capability of tolling SR 99. While the scenarios provide a range of toll rates, they have not been optimized for operation. If the legislature authorizes tolling on SR 99, the city and state would work together to design a toll scenario that balances the need for revenue generation with the need for optimal operating conditions, both on SR 99 and city streets. Therefore, the analysis results presented below for Bored Tunnel Toll Scenarios A, C, and E are likely to be more conservative than the results of an optimized toll scenario.

Traffic Diversion from Toll Scenarios A, C, and E

Modeling results indicate that tolling SR 99 would cause traffic to shift to I-5 and city streets. Projections show 40,000 to 45,000 trips shifting to other facilities with the Toll Scenarios A and C as follows:

- 14,000 to 15,000 more vehicles are projected to use I-5.
- 16,000 to 18,000 more vehicles are projected to travel on north-south downtown city streets west of I-5.
- 10,000 to 12,000 additional daily vehicles are projected on north-south arterials east of I-5.

North of Seneca Street, the number of vehicles traveling on Alaskan Way each day is projected to increase by 6,000 to 7,000 vehicles.

The effects of this diverted traffic are shown in Exhibits 2-31 and 2-32, which show modeled travel times for selected locations during the AM and PM peak hours for the untolled 2015 Bored Tunnel and the toll scenarios considered.

Exhibit 2-31
General-Purpose & Transit Travel Times on Second & Fourth Avenues
for the 2015 Bored Tunnel & Bored Tunnel Toll Scenarios in minutes

	TOLL SCENARIO				TOLL SCENARIO			
	Bored Tunnel	A	C	E	Bored Tunnel	A	C	E
	AM PEAK				PM PEAK			
Second Avenue – Wall Street to S. Royal Brougham Way								
Southbound – General Purpose	**11**	17	19	13	**14**	18	20	15
Southbound – Transit	**13**	13	13	13	**14**	16	16	14
Fourth Avenue – S. Royal Brougham Way to Battery Street								
Northbound – General Purpose	**12**	14	15	13	**12**	15	16	14
Northbound – Transit	**14**	15	15	15	**14**	14	15	14

The following list presents general observations regarding the relative differences in travel times between the 2015 Bored Tunnel and Bored Tunnel Toll Scenarios A, C, and E:

- For most trips analyzed, modeling results show travel times are 1 to 2 minutes longer for Bored Tunnel Toll Scenarios A and C as compared to the 2015 Bored Tunnel.
- For two trips analyzed (West Seattle to downtown and Woodland Park to downtown), modeling results show travel times that are 3 to 4 minutes longer for Bored Tunnel Toll Scenarios A and C, as compared to the 2015 Bored Tunnel.
- For trips using Alaskan Way (Ballard to S. Spokane Street), modeling results show travel times that are 1 to 3 minutes longer for Bored Tunnel Toll Scenarios A and C, as compared to the 2015 Bored Tunnel.
- Routes to and from the Central Business District on SR 99 (as opposed to routes using the bored tunnel) generally are projected to have higher travel time increases than through routes traveling through the bored tunnel.

Travel Time Comparison with Toll Scenarios

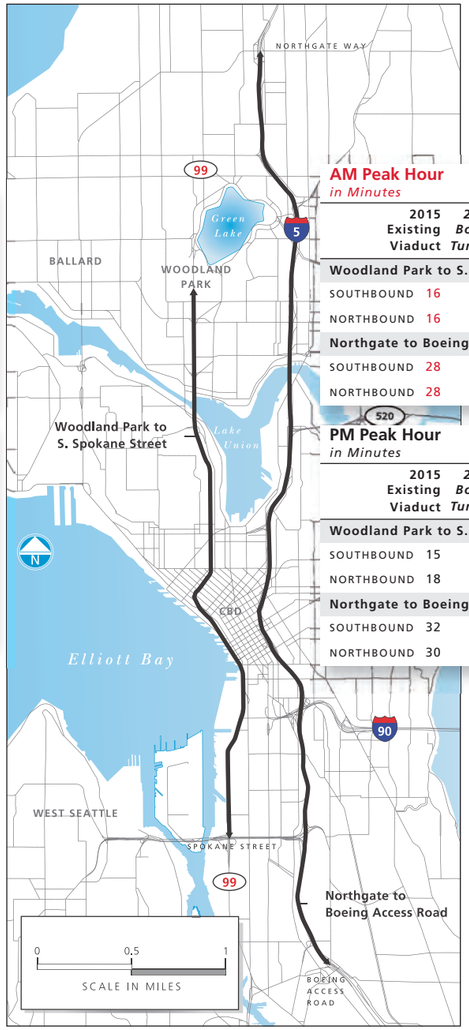
2015 Bored Tunnel vs. Toll Scenarios A, C, E

AM Peak Hour
in Minutes

	2015 Existing Viaduct	*2015 Bored Tunnel*	*2015 TOLL A*	*C*	*E*
West Seattle to Downtown Central Business District					
NORTHBOUND	20	***23***	*25*	*26*	*24*
Woodland Park to Downtown Central Business District					
SOUTHBOUND	19	***18***	*20*	*22*	*18*

PM Peak Hour
in Minutes

	2015 Existing Viaduct	*2015 Bored Tunnel*	*2015 TOLL A*	*C*	*E*
West Seattle to Downtown Central Business District					
NORTHBOUND	25	***21***	*21*	*21*	*21*
Woodland Park to Downtown Central Business District					
SOUTHBOUND	15	***16***	*17*	*17*	*16*

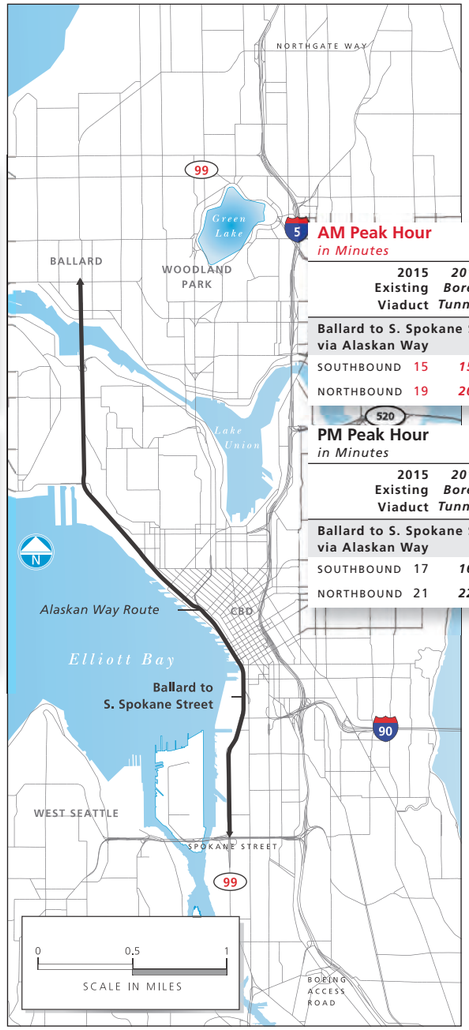


AM Peak Hour
in Minutes

	2015 Existing Viaduct	*2015 Bored Tunnel*	*2015 TOLL A*	*C*	*E*
Woodland Park to S. Spokane Street					
SOUTHBOUND	16	***14***	*15*	*15*	*14*
NORTHBOUND	16	***12***	*12*	*12*	*12*
Northgate to Boeing Access Road					
SOUTHBOUND	28	***28***	*29*	*29*	*29*
NORTHBOUND	28	***28***	*29*	*30*	*29*

PM Peak Hour
in Minutes

	2015 Existing Viaduct	*2015 Bored Tunnel*	*2015 TOLL A*	*C*	*E*
Woodland Park to S. Spokane Street					
SOUTHBOUND	15	***12***	*12*	*12*	*12*
NORTHBOUND	18	***14***	*14*	*13*	*14*
Northgate to Boeing Access Road					
SOUTHBOUND	32	***32***	*34*	*34*	*33*
NORTHBOUND	30	***30***	*31*	*31*	*30*



AM Peak Hour
in Minutes

	2015 Existing Viaduct	*2015 Bored Tunnel*	*2015 TOLL A*	*C*	*E*
Ballard to S. Spokane Street – via Alaskan Way					
SOUTHBOUND	15	***15***	*16*	*17*	*15*
NORTHBOUND	19	***20***	*21*	*21*	*20*

PM Peak Hour
in Minutes

	2015 Existing Viaduct	*2015 Bored Tunnel*	*2015 TOLL A*	*C*	*E*
Ballard to S. Spokane Street – via Alaskan Way					
SOUTHBOUND	17	***16***	*18*	*17*	*16*
NORTHBOUND	21	***22***	*25*	*25*	*24*

Exhibit 2-32

- Drivers using the bored tunnel for 2015 Bored Tunnel Toll Scenarios A and C are projected to have slightly longer travel times than they would for the 2015 Bored Tunnel due to expected backups on the SR 99 mainline. These back-ups would be due heavier off-ramp volumes just before the bored tunnel, which would increase delay at intersections at the ramp termini.

- As shown in Exhibit 2-13, modeling results show that the diverted traffic on Second and Fourth Avenues would increase travel times by 4 to 8 minutes for traffic traveling in general-purpose lanes under Bored Tunnel Toll Scenarios A and C, but by only 1 to 2 minutes under Bored Tunnel Toll Scenario E. This travel time increase is a result of increased delay at the following intersections along Second and Fourth Avenues: Second and Marion, Second and Spring, Second and Pine, Second and Virginia, Fourth and Columbia, Fourth and Madison, Fourth and Marion, Fourth and Spring, and Fourth and Seneca.

Environmental Justice
Tolling a transportation corridor has the potential to result in disproportionately high and adverse impacts on low-income and minority populations. This is because the low-income population would have to pay a higher portion of their income to use the tolled facility. Although tolls would be charged to all users, tolls would be appreciably more severe for low-income users. Other studies of tolling have concluded that effects on low-income populations would not be disproportionately high and adverse, either because tolling often results in improved trip reliability and higher speeds, which are benefits that offset the burden of the tolls, or because there are viable options to avoiding the toll.

While the current analysis shows most trips would take about 1 or 2 minutes longer than the untolled bored tunnel, this increased travel time does not take into consideration reasonable measures to optimize operation that would be applied to a tolled facility and nearby untolled alternate routes to improve trip times. Reasonable measures could include queue bypasses and intersection timing. Although the preliminary analyses of Toll Scenarios A, C, and E have not shown an improvement in trip reliability, either on SR 99 or on the viable alternate untolled routes through downtown Seattle, the effects shown in this analysis would not be not acceptable as part of a long-term tolling solution. Therefore, other scenarios would be evaluated and reasonable optimization measures would be applied and analyzed before tolling would be implemented.

However, based on the current analysis of Scenarios A, C, and E, it appears that tolling SR 99 could have the potential of a disproportionately high and adverse effect on some low-income populations, especially those without access to transit or who are dependent on their cars unless proper optimization measures are implemented.

Other Environmental Effects of Tolling
The potential effects of Toll Scenarios A, C, and E on historic and cultural resources, air quality, noise, energy, and greenhouse gases are analyzed in Chapter 9. The diverted traffic was found to have localized effects in each of these environmental disciplines, but no new adverse effects were identified.

31 What opportunities have we provided for people, agencies, and tribes to be engaged in the project since the 2006 Supplemental Draft EIS?

The lead agencies have provided a number of opportunities for the public to be engaged, ask questions, and learn about the project since the 2006 Supplemental Draft EIS was published. Opportunities have been provided for the general, interested public as well as businesses, residents, agencies, tribes, minority, and low-income people who may be affected by the project.

The lead agencies have engaged the public in the following ways:

- Held 29 public meetings, including 4 public hearings to receive comments on the 2006 Supplemental Draft EIS. Approximately 175 people or groups submitted comments on the 2006 Supplemental Draft EIS. In addition, three of the 29 public meetings were scoping meetings for this Supplemental Draft EIS.

- Gave briefings at over 360 community meetings

- Attended more than 100 community fairs and festivals

- Held 8 viaduct tours

- Information sharing through web updates, press releases, project fact sheets, email messages, and the project information line

Opportunities for specific groups have been provided in the following ways:

- The Partnership Process and established stakeholder working groups
- Property owner and tenant notifications

The lead agencies conducted interviews and held briefings with social service providers near the project area to ensure that these organizations are engaged in the decision-making process and to discuss their respective concerns and the potential effects on their property and operations. The interviews and briefings helped us understand the population within the program area, learn about potential adverse effects, and identify ways to keep minority populations and low-income populations, as well as the social service providers they depend on, informed and involved in the project.

Opportunities for public agencies have been provided by:

- Scoping meeting with agency staff on June 8, 2009
- Individual meetings with agency staff

Opportunities for tribal nations have been provided by:

- Invitations to agency scoping meetings
- Individual meetings with tribes.

32 What issues are controversial?

Building an Elevated Structure
Some people and groups feel another elevated structure is the best replacement for the existing viaduct. An elevated structure could keep the same connections at Elliott and Western Avenues and Columbia and Seneca Streets. These connections provide good access to northwest Seattle and into the downtown area and are familiar travel routes. In addition, flammable and hazardous materials generally can travel on elevated structures whereas they are prohibited in tunnels. People also appreciate the views available from the viaduct, especially northbound. Other people feel strongly that any structure on the waterfront would be a barrier that separates downtown from Elliott Bay.

Surface and Transit Alternative
Some people and groups feel the viaduct could be replaced by a combination of improvements to surface streets, I-5, and additional transit service. This approach was seriously considered during the Partnership Process, but was rejected because the lead agencies determined it lacked the capacity to serve the long-term needs of the region. The approach remains popular with those who think it would be less expensive and better meets the State's Greenhouse Gas reduction goals by discouraging vehicles and encouraging transit.

Tolling
Tolling is controversial because this portion of SR 99 is currently not tolled. The Washington State Legislature directed WSDOT to study how tolls might be charged to help pay for replacing the viaduct. The study considered what times of day and what portions of SR 99 could be tolled, how much money could be generated, and whether traffic might divert into other areas to avoid the tolls. The Legislature has not yet acted on the study and is expected to consider tolling during its 2011 session. The Bored Tunnel Alternative evaluated in this Supplemental Draft EIS does not include tolls because legislative action is required to toll SR 99.

Construction Impacts
Although the Bored Tunnel has substantially fewer construction impacts than any other alternative, it would cause delays for traffic and affect some nearby areas. SR 99 will follow the WOSCA detour from S. Royal Brougham Way to S. King Street for over 3.5 years. Demolition of the existing viaduct will cause some disruption along the central waterfront. Construction of the Cut-and-Cover Tunnel or Elevated Structure would have significantly greater impacts on SR 99 traffic and the central waterfront.

33 What issues need to be resolved?
The Washington State Legislature will likely consider imposing tolls on this portion of SR 99 in 2011. Since information related to how tolls would work is currently unknown, potential effects of a range of tolling scenarios were summarized in Question 30 and are discussed in Chapter 9 of this Supplemental Draft EIS. Legislative action would be required to toll SR 99 and it is possible that the project could be built using other funding sources and would not be tolled.

34 What are the next steps?
This Supplemental Draft EIS will be distributed for the public and agencies to review and comment on. Comments on this Supplemental Draft EIS are due by December 13, 2010. These comments, along with comments on the 2004 Draft EIS and 2006 Supplemental Draft EIS, will be addressed in a Final EIS. The Final EIS will also update information on the project and its effects. After publication of the Final EIS, scheduled for mid-2011, FHWA can issue a ROD. This will complete the environmental review process.

While the public, tribes, and agencies review the Supplemental Draft EIS, WSDOT expects to receive responses to its request for proposals (RFP) for a design-build contract on the bored tunnel and parts of each portal. The RFP allows that contractors could take up to an additional year to complete the tunnel, although substantial incentives are given to meeting the schedule described in this Supplemental Draft EIS. As provided by SAFETEA-LU and 23 USC 139, the RFP includes preliminary design on the bored tunnel to avoid impacts, develop mitigation measures, and facilitate compliance with environmental laws and regulations. Final design on the bored tunnel will not proceed until the ROD is issued. The RFP does not preclude consideration of the Cut-and-Cover Tunnel or Elevated Structure Alternatives. All reasonable alternatives will be evaluated in the Final EIS.