MAP COURTESY OF THE UNIVERSITY OF WASHINGTON SPECIAL COLLECTION

City of Seattle in 1891

CHAPTER 4 - THE PROJECT AREA

What is in Chapter 4?

This chapter describes existing conditions in the project area for the alternatives evaluated.

1 Where is the Alaskan Way Viaduct Replacement Project?

The Alaskan Way Viaduct Replacement Project proposes to replace State Route 99 (SR 99) from approximately S. Royal Brougham Way to Roy Street and remove the existing viaduct (SR 99) from approximately S. King Street to the Battery Street Tunnel.

2 What elements of Seattle's history have shaped the project area?

Viaduct replacement will be influenced not only by transportation needs and other uses in the project area, but also by the soil beneath Seattle. This soil forms the foundation of future improvements. For this reason, it is helpful to look at the forces that have shaped the land around and under downtown Seattle. Some of these forces are part of the human history of the project area, like the efforts of Seattleites in the late 1800s and early 1900s to level hills that stood in their way and extend the narrow shoreline where early Seattle took root. Equally important are the natural forces and physical geography of the land in the project area, which continue to affect it today.

Earth Movements

One of the major forces affecting the Seattle waterfront lies far beneath the coastal waters of Washington State. There, an upwelling of molten rock from deep within the earth is forcing apart the solid rock of the earth's crust along a long line that follows the coasts of Washington and Oregon. Over many millions of years, this slow but powerful force has fractured the ocean floor to a depth of several miles, splitting off a large piece of the earth's crust (named the Juan de Fuca Plate) and pushing it eastward on a slow-motion collision course with the coast of Washington.

At the point of collision, the Juan de Fuca Plate is pushed beneath the plate of land that makes up the west coast of the North American continent, as shown in Exhibit 4-1. The entire front edge of the North American Plate is uplifted (something like the prow of a boat being pushed up by a wave), while inland it is tilted downward. The uplifted edge is the Olympic Mountains, and the down-turned area is a trough between the Olympic Mountains and the Cascade Mountains. As the Juan de Fuca Plate slides beneath the North American Plate, friction between them causes both of them to compress, rotate, and fracture into pieces (sometimes miles across) in a broad area that includes the Seattle waterfront. The Seattle Fault Zone is the name for the boundaries between several of these fractured pieces, located at the southern end of the project area, as shown in Exhibit 4-2.

The movement of a great landmass can be gradual and imperceptible, but occasionally it can be sudden and abrupt, causing the entire landmass to shudder violently. This movement is what we experience as earthquakes. The strongest recorded earthquakes in the project area have originated from the Juan de Fuca Plate, after it has been forced far below the overlying North American Plate (to depths of 32 miles and greater). Earthquakes that occurred at these depths include the 1949 Olympia earthquake (magnitude 7.1), the 1965 Seattle-Tacoma

Cascadia Subduction Zone & the Juan de Fuca Plate

What is included in the project area?

The project area includes the overall area that could be affected by the project. The area described for each resource varies as shown in Exhibit 7-2.

Seattle Fault & Liquefaction Areas

earthquake (magnitude 6.5), and the 2001 Nisqually earthquake (magnitude 6.8).

Two other types of earthquakes may occur in the project area. Shallow crustal zone earthquakes occur 12 miles or less beneath the Earth's surface, when fractured pieces of the earth's crust move suddenly in an up/down direction (this is what happens in the Seattle Fault Zone). Interplate earthquakes—potentially the strongest quakes that could affect our area—occur at the interface between the Juan de Fuca and North American Plates. Although no interplate earthquakes have occurred in the project area in recorded history, geologists believe that in the past, this type of quake caused estuaries in our region to rapidly subside, lowering the elevation of coastal areas by several feet.

Rivers of Ice

To find the origin of most of the soil types in and around the project area, one needs to look back in geologic history, to the time when our region was shaped by the ice ages. Geologists have developed maps that show the types of soil found in the project area. The maps show a complicated variety of sand, silt, gravel, clay, peat, boulders, and various combinations of these soil types. Some of this variety is due to Seattleites digging, moving, and importing soil for a century and a half.

Beginning about 2 million years ago, the earth's climate went through at least six periods of cooling that caused glaciers to cover the Puget Sound region with vast sheets of ice flowing slowly in a generally southward direction. Each glaciation deposited new sediments and partially eroded previous sediments. During the intervening periods when glacial ice was not present, normal stream processes, wave action, and landslides eroded and reworked some of the glacial sediments, further complicating the geologic setting.

The last glacier to cover the project area 13,500 years ago is estimated to have been 3,000 feet thick. The massive ice flows bulldozed the land beneath them, gouging valleys, deepening Puget Sound, and pushing up huge piles of gravel and soil that became the hills that we know in present-day Seattle. The steep slopes in the area are a good example of landforms created by the force of these ancient ice flows. As the glaciers melted and retreated from the area in and around the project, they left behind enormous quantities of assorted material that was displaced by the scouring force of glacial movement. Although in a few spots in Seattle one can see bedrock right at the surface, in the project area, glaciers dumped layers of material over the bedrock. Most of this material was tightly compacted by the weight of the glaciers, while some of it was randomly deposited at the foot of retreating ice sheets. In the project area, the randomly deposited (unconsolidated) glacial soils and soils deposited in between glacial events are approximately 1,300 to 3,500 feet thick.[1]

Over the years, rock and soil were gradually weathered and altered by water, wind, and temperature. Creeks were fed by water percolating into the glacial soils. The shoreline in the project area was eroded by the forces of tides and waves. On occasion, the landscape would change dramatically—entire sections of hillside would break off and slide, creating bluffs like the one that can still be seen along the waterfront at Pike Street. Over time, the waters at the edge of Elliott Bay grew shallow and muddy as soils were carried downhill from as far away as Mt. Rainier and deposited near the shoreline, and the Duwamish River released its load of sediment. Periodically, eruptions from Mt. Rainier also instigated soil movement and deposition in tributaries that fed the Duwamish River. Finally, plants recolonized the glacier-scoured landscape, adding organic material to the barren soil and providing habitat for humans and for terrestrial and aquatic wildlife.

Throughout the project area, highly compacted glacial material provides a sturdy foundation for future improvements; however, recent sand and silt deposits lie on top of the glacial material. Most of the recent soil deposits in the project area were naturally washed down from the surrounding hillsides, carried by rivers draining the Cascade Mountains, or were placed as fill by humans much more recently. These deposits tend to be deeper in the south portion of the project area and along the waterfront. Much of the project area's geological story was played out thousands of years ago. To understand the whole story, however, we need to know how and why the land was changed to suit the ambitions of people who lived here before us.

Cultural Resources

More than 5,000 years before 18th-century European explorers first sailed Washington's inland waters, native peoples made their way to the shoreline of what is now downtown Seattle. Some of these peoples passed through, gathering for a while to take advantage of seasonal abundance, while others settled in permanent communities. The story of native peoples who lived in the project area is told largely by the remains of objects they left behind, such as matting, basketry, fish weirs, stone hearths, tools made of bone or stone, and shells and stones used in shellfish processing. Because only the most recent part of this history has been recorded, archaeologists believe that some of these objects may exist in a number of places within the project area, including beaches and tidal flats that have been filled, landslide deposits, former bluff tops, and the site of a ravine that was filled during the regrading of Seattle's hills where part of Belltown is now located.

More recent peoples—both native and European—also left behind physical evidence. Former tidelands and beaches that were filled between 1860 and the early 1900s may contain remnants of piers, wharves, roadbeds, discarded remains of household items, industrial refuse, and ballast dumped from visiting ships before they took on cargo. Former shorelines, areas on or below former bluffs, and areas near the bases of filled ravines may include objects deposited by native peoples who coexisted with the settlers who founded Seattle and the growing numbers of people that followed.

Leveling the Hills

When the first European settlers came to the shores of Elliott Bay, they saw a landscape that was very different from the one we see today. In much of what is now the

What tribes have cultural interests in the project area?

The lead agencies seek to address the concerns of tribal nations through ongoing consultations with tribes that have active cultural interests in the project area. These tribes include the Confederated Tribes and Bands of the Yakama Nation, Jamestown S'Klallam, Lower Elwha Klallam, the Muckleshoot Indian Tribe, the Port Gamble S'Klallam, the Snoqualmie Indian Tribe, the Suquamish Tribe, and the Tulalip Tribes. The lead agencies also consult with the Duwamish Tribe as an interested party.

Throughout the project, the lead agencies have involved the tribes by sending them information, contacting them by phone to discuss the project, requesting their input on tribal issues related to the project, and holding one-on-one meetings. The lead agencies will continue to communicate with the tribes about their concerns through project final design and construction.

For more information about tribal coordination, please see *Appendix I, Historic, Cultural, and Archaeological Resources Discipline Report*.

1 Yount et al. 1985.

project area, bluffs and heavily forested hillsides plunged directly into the waters below, with only a few narrow beaches. Deep ravines along the shore made even a short overland trip difficult.

Because the steep hills were difficult to negotiate and build on, citizens of the growing community had to find inventive ways to make space for homes, businesses, and roads. Much of early Seattle, including wharves, mills, coal bunkers, streets, and railroads, was built out over the tidal mudflats on a jumble of wooden pilings. Much more ambitious was the effort to move soil from slopes too steep for development, and to use it to fill shallow areas along the shoreline.

Over seven decades from the 1870s to the 1930s, entire hilltops were leveled, at first by sluicing soil into tidal areas after removing it with giant jets of pressurized water, and later by using heavy equipment. The best known of these earth moving projects created the Denny Regrade (an area in downtown Seattle), whose name is a reminder that it was not always as flat as it is today. Other types of fill that were used to push the shoreline out into Elliott Bay included sawdust from local mills, ballast from visiting ships, assorted garbage, and sediments dredged from shallow waters to make them deep enough for ships to dock. In all, more than 2,000 acres of useable land were created by filling tidal wetlands and beaches along the waterfront and the Pioneer Square and South of Downtown (SODO) areas.

During an earthquake, this loose fill soil can turn into something very much like quicksand (geologists call the phenomenon "liquefaction"). Soils prone to liquefaction in the area are shown in Exhibit 4-2. As the soil slides and gives way, buildings, bridges, and roads settle, tilt, move around, and even collapse (some of the damage from the Nisqually earthquake was caused this way). The viaduct was built before we knew much about the Seattle Fault and the potential for earthquakes in the Puget Sound region.

3 What is the viaduct's condition today?

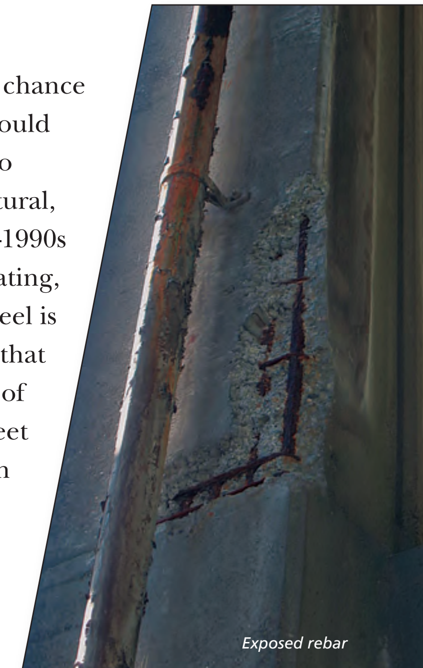
A 2007 study concluded that there is a 1-in-10 chance during the next 10 years that an earthquake could render the viaduct unusable or even cause it to collapse.[2] Investigations by engineering, structural, and seismic consultants beginning in the mid-1990s have clearly found that the viaduct is deteriorating, and vulnerable to earthquakes. Reinforcing steel is corroding and concrete is cracking—all signs that the viaduct is aging and approaching the end of its service life. The viaduct was designed to meet seismic criteria from the 1950s that were much less protective than today's standards. The Nisqually earthquake imposed extreme forces on the viaduct, and these forces were well beyond those the structure was designed for in the 1950s when it was built. At least two consequences of the extreme forces imposed during the Nisqually earthquake continue to affect the structural integrity of the viaduct today:

- Increasing cracks and crack widths
- Continued settlement of the viaduct's foundations

After the Nisqually earthquake, there were indications of early stages of soil liquefaction. As a result, Washington State Department of Transportation (WSDOT) made over $3.5 million of immediate repairs to some sections of the viaduct, particularly a one-block section near S. Washington Street. WSDOT also imposed roadway restrictions for large vehicles such as trucks and buses that remain in effect today. These restrictions prohibit vehicles weighing more than 10,000 pounds from using the two left lanes on each level of the viaduct. They also limit the use of the southbound exit to First Avenue S., which is located on the left side of southbound SR 99. Vehicles weighing more than 105,500 pounds are not allowed to use the viaduct.

In addition, the viaduct has several roadway deficiencies that confront drivers on a daily basis. These deficiencies occur on the main elevated structure, the on- and off-

Viaduct Deterioration



Exposed rebar

Steel reinforcing rods placed in weak columns as supports

Misaligned expansion joint

What is liquefaction?

Liquefaction is what can happen to loose soils when shaking motion from an earthquake causes the soil to turn into a quicksand-like condition. This can cause foundations to fail.

Appendix C, Transportation Discipline Report

The transportation safety concerns and collision rates associated with the existing viaduct are further described in *Appendix C*, Section 4.12.

2 Parsons Brinckerhoff 2007.

ramps, and in the Battery Street Tunnel. Viaduct roadway deficiencies include the following:

- **Narrow lane widths –** In some places, lanes are too narrow (less than 10 feet wide). Highways built to today's standards usually have lanes that are 11 or 12 feet wide.
- **Narrow shoulder widths –** Narrow shoulders or no shoulders.
- **Insufficient merge lane lengths and/or auxiliary lanes –** The length of the merge lanes to and from the ramp connections are too short, which makes it difficult for drivers using the ramps to safely enter and exit SR 99.
- **Inadequate guardrails –** The railing on the viaduct is not as strong as barriers used for modern construction.
- **Inadequate sight distance –** In some locations, drivers cannot see far enough ahead of their vehicles to react to roadway conditions.

These deficiencies contribute to SR 99 having a higher collision rate than the average urban, limited-access highways in the state. The majority of accidents on SR 99 are fixed-object or rear-end collisions. Fixed-object accidents were most common on the SR 99 mainline, most likely due to barriers close to moving traffic. Most of the accidents on ramps were rear-end collisions. Traffic backups due to signals near SR 99 off-ramps and design deficiencies such as ramps with inadequate acceleration/deceleration lengths can contribute to rear-end accidents.

4 What are key features of Seattle's downtown roadway network?

The transportation study area examined depends on the transportation metric examined. The primary transportation study area examined for this Final Environmental Impact Statement (EIS) is roughly bounded by Interstate 5 (I-5) to the east, Elliott Bay to the west, S. Spokane Street to the south, and Aloha Street to the north. This area includes a range of multimodal transportation facilities, including limited-access highways (I-5 and SR 99), connections to limited access highways (SR 519), local streets, high-occupancy vehicle (HOV) facilities (e.g., Downtown Seattle Transit Tunnel), transit and ferry services, nonmotorized facilities, and freight corridors.

Seattle's Center City is also a useful area for reference. The Seattle Center City area represents the core of Seattle, in terms of geography and density of jobs and housing. This area is roughly bounded by S. Royal Brougham Way in the south, just north of Mercer Street to the north, Broadway to the east, and Elliott Bay to the west. Modeled changes in travel patterns outside the primary study area were studied, and include broader areas such as the four-county region (King, Pierce, Snohomish, and Kitsap counties).

SR 99

SR 99 is an important part of the local and regional transportation network, as shown in Exhibit 4-3. Within the project area, it provides access to and through downtown for many parts of the western neighborhoods of Seattle and provides freight access between the Interbay/Ballard areas and the SODO and Duwamish industrial areas. It is an important alternative route parallel to I-5, the most heavily used highway in the Pacific Northwest. SR 99 also provides an important link to major league sports stadiums at the south end of downtown and access to I-90 for trips coming from northwest Seattle.

Access to and from SR 99 is currently provided by ramps at First Avenue S. near the stadiums, at Columbia and Seneca Streets, at Elliott and Western Avenues, and at Denny Way just north of the Battery Street Tunnel. There are also a number of streets where drivers can access SR 99 via right-on and right-off maneuvers in the South Lake Union area. The S. Holgate Street to S. King Street Viaduct Replacement Project will provide additional access to and

Regional Roadway Network

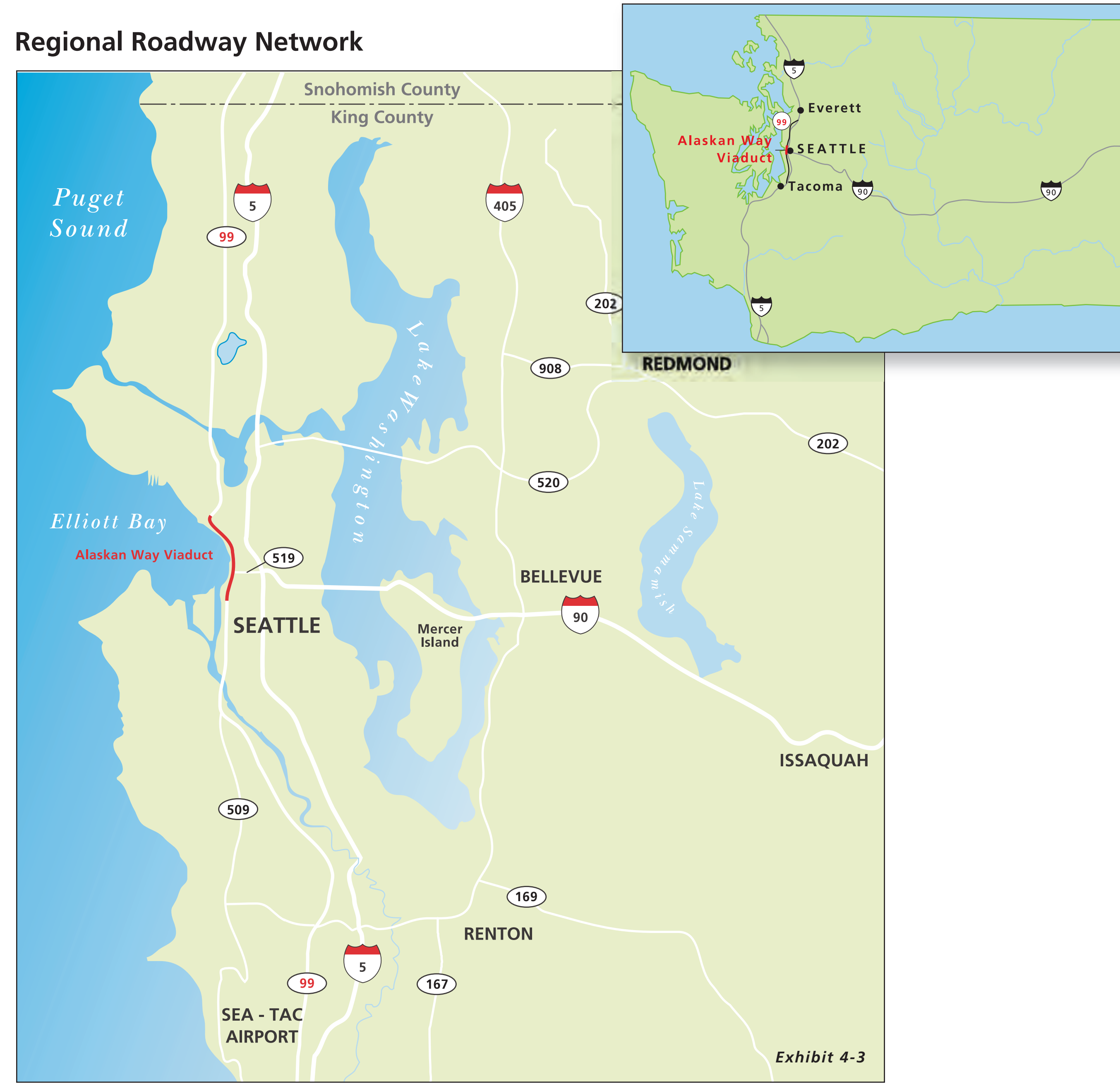


Exhibit 4-3

from SR 99 via a new on-ramp and off-ramp that will connect to Alaskan Way near S. King Street.

In the project area, SR 99 provides two lanes in each direction for through traffic. Additional lanes in the south, central, and north sections collect and distribute traffic to destinations near the stadiums and Pioneer Square, downtown, and the Seattle Center/South Lake Union area, as shown in Exhibit 4-4.

I-5

I-5 is a major interstate freeway that runs the length of the west coast from the Mexican border south of San Diego, California, to the Canadian border north of Bellingham, Washington. I-5 is the most used and most important highway corridor in the region. Within the transportation study area, I-5 runs north-south just east of downtown. The corridor serves a number of roles, including freight transport, commuting, and longer-distance regional trips.

I-5 varies from two to five travel lanes in each direction with additional collector-distributor lanes providing access to downtown ramps and accommodating merging traffic from I-90 and SR 520. Two continuous lanes are provided through downtown in each direction, as other lanes are added or dropped to provide access in downtown. In addition to the mainline, a reversible set of express lanes provides HOV access to and from downtown and additional capacity for general-purpose through traffic.

SR 519

SR 519 is a short segment of state highway that provides connections to and from I-90 and I-5 near S. Royal Brougham Way and S. Atlantic Street/Edgar Martinez Way. These connections provide freight traffic to and from Port of Seattle facilities with access to major freeways. It also provides general traffic with access to the stadiums, Colman Dock ferry terminal, the central waterfront, and SODO area. Finally, it provides reliable and safe connections for the high volume of vehicles and pedestrians that use this area to be separated for nearby rail activities.

Local Streets

Seattle city streets provide critical connections and additional through-traffic capacity for vehicles and transit; Exhibit 4-4 shows the downtown street network. Approximately 42 percent of all daily users (vehicle and transit) on the viaduct have one trip end in downtown Seattle. Therefore, connections to the downtown street network are important.

5 How are existing conditions evaluated in this EIS?

This chapter describes many study area conditions as they now exist, but transportation conditions are described as they may exist in 2015. Transportation conditions in 2015 are described because notable changes to the regional transportation network are currently being implemented. Including these imminent changes in the description of the affected environment more clearly shows conditions that will exist in the area and the effects of this project on the transportation network.

Specific transportation network changes that have recently been completed or are underway include:

- Construction of the S. Holgate Street to S. King Street Viaduct Replacement Project
- Implementation of RapidRide transit service between downtown and West Seattle, Ballard, and along Aurora Avenue/SR 99
- Completion of the SR 519 – South Seattle Intermodal Access Project

Construction of the S. Holgate Street to S. King Street Viaduct Replacement Project, which began in August of 2010, is expected to be completed in 2014. This section of SR 99 is being replaced with a new side-by-side roadway that will have three lanes in each direction. A northbound off-ramp and southbound on-ramp is provided to Alaskan Way S. just south of S. King Street.

The S. Holgate Street to S. King Street Viaduct Replacement Project will create two new multi-purpose bicycle/pedestrian facilities between S. Royal Brougham Way and S. King Street. The Port Side Pedestrian/Bicycle Facility will run along the western edge of the Alaskan Way Surface Street, while the City Side Trail will run between SR 99 and First Avenue S.

SR 99 Existing Lane Configuration

Exhibit 4-4

Why are 2015 transportation data used to reflect existing conditions?

Previous EISs for this project used year 2005 conditions to describe the affected environment for the project area. The affected environment describes the context, or setting, of the project. However, for the Final EIS, the year 2015 was chosen to reflect the affected environment based on projects recently completed or currently underway. The S. Holgate Street to S. King Street Viaduct Replacement Project affects access to the Alaskan Way Viaduct. The project is funded, under construction, and will be complete by 2015. SR 519 has also been recently modified resulting in new traffic patterns in the south area and needs to be captured as part of the affected environment. Based primarily on these two projects, it was determined that 2015 would serve as a better description of the project setting in the Final EIS than 2005 conditions.

In addition to the S. Holgate Street to S. King Street Viaduct Replacement Project, by 2015 transit riders to downtown Seattle will benefit from the implementation of RapidRide, an enhanced bus service that will have unique low-floor buses with wider aisles, three doors, and faster fare collection for shorter travel times. Service will be frequent, with trips every 10 minutes or less in the peak periods and every 15 minutes or less in the off-peak periods. The C Line, serving West Seattle, is scheduled to be completed in 2012, although some of the new service will be implemented in 2011. The D Line, serving Ballard-Uptown, is scheduled to be implemented in 2012. The E Line serving Aurora Avenue N. is scheduled to be implemented in 2013. The C, D, and E Lines will all serve downtown Seattle via Third Avenue.

The completion of the SR 519 South Seattle Intermodal Access Project in 2010 improved connections to I-90 and I-5 for traffic heading to the Port of Seattle terminals, Colman Dock ferry terminal, central waterfront area, sports stadiums, and destinations in Seattle's SODO neighborhood. The project constructed the S. Atlantic Street on-ramp to I-5 and I-90, which separates road and railway traffic and improves access from the Port of Seattle and Seattle Ferry Terminal to I-5 and I-90. The project also constructed the Royal Brougham Way Bridge and the I-90/I-5 off-ramp to S. Atlantic Street, which eliminated the remaining safety concerns related to surface-level rail crossings on S. Royal Brougham Way, and provides safe and efficient waterfront and stadium access for drivers and freight haulers.

6 How much traffic is estimated to travel on SR 99, in Seattle, and in the region each day?

Though daily traffic volumes on SR 99 are estimated to vary considerably depending on location, the viaduct is estimated to carry about 20 percent of downtown traffic traveling north-south each day near Seneca Street. I-5 is estimated to carry about 54 percent, and the local streets collectively are estimated to carry approximately 26 percent. Because traffic volumes on SR 99 vary from location to location, these proportions would be different depending on location. For example, SR 99 volumes near Yesler Way are estimated at about 116,000 vehicles per day; volumes north of Seneca are estimated at about 98,500 vehicles per day, and volumes through the Battery Street Tunnel are estimated at around 70,000 vehicles per day.

Exhibit 4-5 provides data showing the estimated vehicle miles of travel (VMT) and vehicle hours of delay (VHD) for all modeled roadways located in the Seattle Center City and within the broader four-county region (King, Pierce, Snohomish, and Kitsap counties). VMT indicates how many miles vehicles travel on the roadway network. VHT (vehicle hours of travel) measures how long travelers spend on the roadway system, and VHD measures the number of hours lost by travelers due to traveling at a speed less than the posted speed limit.

Exhibit 4-5
2015 VMT, VHT, and VHD for Seattle Center City and Region

Measure	AM Peak	PM Peak	Daily
SEATTLE CENTER CITY			
Vehicle miles of travel (VMT)	431,900	536,600	2,425,200
Vehicle hours of travel (VHT)	16,900	26,800	87,200
Vehicle hours of delay (VHD)	5,300	9,100	23,000
FOUR-COUNTY REGION			
VMT	18,003,800	21,210,200	97,141,400
VHT	746,800	857,400	3,310,100
VHD	253,600	271,400	678,300

Vehicle volumes are estimated at selected locations (called screenlines) to gauge the effects such volumes may have on nearby parallel facilities. Exhibit 4-6 summarizes the estimated combined daily vehicle volumes expected to travel on SR 99, I-5, and city streets in 2015 at selected locations in the transportation study area.

Exhibit 4-6
2015 Estimated Daily Vehicle Volumes
on SR 99, I-5, and City Streets at Selected Locations

Location	Daily Vehicle Volumes
South – south of S. King Street	535,200
Central – north of Seneca Street	474,900
North – north of Thomas Street	548,800

Analysis uses person-trips to measure the number of people that use the transportation system, rather than vehicles. Exhibit 4-7 summarizes the estimated combined daily person-trips that are expected to travel on SR 99, I-5, and city streets in 2015 at selected locations in the transportation study area.

Exhibit 4-7
2015 Estimated Daily Person Throughput
on SR 99, I-5, and City Streets at Selected Locations

Location	Total Person Throughput	Transit Riders
South – south of S. King Street	787,900	101,100
Central – north of Seneca Street	728,700	126,700
North – north of Thomas Street	791,200	118,400

7 Where are the people using the viaduct coming from and going to?

SR 99 is an important route to, from, and through downtown Seattle. SR 99 primarily serves short regional trips and trips within Seattle. Regional trips served by SR 99 include trips from northwest Seattle neighborhoods to the Seattle-Tacoma International (Sea-Tac) Airport or trips from downtown to Shoreline or Burien. Examples of Seattle trips include those to or from West Seattle, South Park, Downtown, Belltown, South Lake Union, Queen Anne, Magnolia, Ballard, and Fremont.

SR 99 serves as a major freight corridor providing access for businesses in the SODO and Duwamish industrial areas to northwest Seattle neighborhoods. SR 99 is an important route for freight to and from the Ballard and Interbay manufacturing and industrial area. WSDOT classifies the viaduct section of SR 99 as a freight corridor carrying more than 10 million tons per year—the highest classification made. Also, SR 99 is an important link to Safeco Field, Qwest Field, and Seattle Center.

Modeling indicates that 44 percent of travelers using the viaduct would be heading to or coming from Seattle's downtown central business district by 2015. The remaining 56 percent of travelers would use SR 99 to travel through downtown. Specifically, 23 percent of travelers would pass through downtown to nearby locations just north or south of downtown, such as SODO, Capitol Hill, Queen Anne, or South Lake Union. The remaining 33 percent of travelers on SR 99 are making longer-distance through trips, such as trips from Ballard to Burien.

Appendix C, Transportation Discipline Report

Regional traffic demand and traffic distributions for SR 99, I-5, and city streets are further discussed in *Appendix C*, Section 4.1.4.

Travel speeds on SR 99 are discussed in *Appendix C*, Section 4.2.3.

What area does Seattle Center City refer to?

The area defined as Seattle Center City is roughly bounded by S. Royal Brougham Way in the south, just north of Mercer Street to the north, Broadway to the east, and Elliott Bay to the west.

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 lost by travelers due to traveling at a speed less than the posted speed limit. VHD is often used as an indicator of congestion.

Where are SR 99 travelers coming from and going to?

To understand who uses this section of SR 99, the project team studied where SR 99 travelers are coming from and going to (origin and destination study). Additional information about this study is provided in *Appendix C*, *Transportation Discipline Report*, Section 4.1.4.6.1.

Where are access points provided to and from SR 99?
Between S. Spokane Street and the Battery Street Tunnel, all access to SR 99 is provided via ramps. North of the Battery Street Tunnel, access is mostly provided by surface street connections. Exhibit 4-8 shows SR 99 access and ramp locations and the number of vehicles estimated to be using those connections in 2015. As shown in Exhibit 4-8, daily traffic volumes on SR 99 are fairly balanced for northbound and southbound traffic. Exhibit 4-9 describes the connections.

Exhibit 4-9
Existing Connections Provided To and From SR 99

Connections	Access Descriptions
To/From Stadium Area	Access at First Avenue S. is provided by: • a northbound on-ramp along Railroad Way S. • a southbound off-ramp along Railroad Way S.
To/From Downtown Seattle	Access is provided by: • a northbound off-ramp at Seneca Street • a southbound on-ramp Columbia Street By 2015, access as part of the S. Holgate Street to S. King Street Viaduct Replacement Project will include: • a northbound off-ramp to Alaskan Way near S. King Street • a southbound on-ramp to SR 99 near S. King Street
To/From Elliott and Western Corridor	SR 99 connections are provided by: • a northbound off-ramp at Western Avenue • a southbound on-ramp at Elliott Avenue • a northbound on-ramp near Battery Street • a southbound off-ramp at Battery Street
To/From South Lake Union	Access is provided by: • a northbound on-ramp and southbound off-ramp at Denny Way • a southbound off-ramp at Broad Street • a northbound off-ramp at Mercer Street/Dexter Avenue N. • several side-street connections

8 What are typical travel conditions on SR 99?

What are typical traffic patterns on SR 99?
Daily SR 99 traffic volumes are fairly balanced between north- and southbound traffic, and that trend is expected to continue in 2015. However, during the morning and evening commutes traffic volumes are directional, with heavier volumes headed toward downtown during the AM peak hour (8:00 a.m. to 9:00 a.m.) and heavier volumes leaving downtown during the PM peak hour (5:00 p.m. to 6:00 p.m.).

How does traffic flow on SR 99?
During non-peak hours, there is less congestion on SR 99 so travelers typically find faster operating speeds. During the morning and evening commutes, drivers on SR 99 experience reduced speeds in some locations. Exhibit 4-10 shows estimated speeds on SR 99 in 2015.

Exhibit 4-10
Estimated Average Traffic Speeds on SR 99 during Peak Hours in 2015
in miles per hour

		SOUTHBOUND		NORTHBOUND	
SR 99 Segment	Speed Limit	AM Peak	PM Peak	AM Peak	PM Peak
S. Spokane Street to Stadium Ramps	50 40 trucks	48	32	37	46
Stadium Ramps to First Avenue S. Ramps	50 40 trucks	49	42	27	35
First Avenue S. Ramps to Seneca/Columbia Ramps	50 40 trucks	24	31	22	21
Seneca/Columbia Ramps to Elliott/Western Ramps	50 40 trucks	36	43	17	14
Battery Street Tunnel	40 35 advisory	33	33	33	33
North of the Battery Street Tunnel	40	25	33	35	33

SR 99 travelers are expected to experience delay and substantially reduced travel speeds between First Avenue S. and the Columbia and Seneca ramps during the morning and evening commutes in 2015. As noted previously, by 2015 about 44 percent of travelers on SR 99 are expected to be heading to or from downtown. Reduced speeds in this section confirm that a high volume of trips are heading to or leaving downtown using the Columbia and Seneca ramps. The Columbia on-ramp offers very little room for drivers to accelerate as they enter the highway. This design deficiency, coupled with slowdowns caused by traffic weaving to access the First Avenue S. off ramp, leads to decreased travel speeds for southbound traffic during the evening commute. During the morning commute, traffic in this area backs up due to weaving movements associated with the northbound on-ramp at First Avenue S. and traffic queues at Seneca Street that can back up onto SR 99.

Traffic in both directions is expected to slow during peak commute hours through the Battery Street Tunnel. This is due to a combination of high traffic volumes and roadway constraints such as narrow lanes and limited shoulders.

2015 SR 99 Existing Daily Ramp and Traffic Volumes

SR 99 Volumes *Ramp Volumes*

Exhibit 4-8

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 commutes. 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.

North of Denny Way, travelers would experience slightly reduced speeds due to increased traffic volumes during the daily commute.

9 How well do local streets and intersections operate?

Traffic delay at key intersections was studied to understand how local streets and intersections operate throughout the downtown street grid. In 2015, most intersections located in the project area are expected to operate within acceptable levels of service, which means that, on average, drivers can expect to wait at a traffic signal for less than a minute. There are a few intersections that are expected to operate with a minute or more of delay. These intersections are described as congested and highly congested intersections. For the traffic analysis conducted for this project, congested intersections are defined as intersections that may cause drivers considerable delay during the AM and PM peak hours. 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 travel through the traffic signal. Intersections located in the project area that are defined as congested or highly congested are discussed in detail below:

South – South of S. King Street

By 2015, the intersections shown in Exhibit 4-11 and listed below are expected to be congested.

- Alaskan Way S./just south of S. King Street – This intersection is expected to operate with just over 1.5 minutes of delay during the morning commute. In the evening commute, delay at this intersection is projected to be about 1 minute. Increased delay at this location is not expected to affect drivers traveling on Alaskan Way S., since the delay is largely a result of the operational approach to hold ferry traffic for a period of time and release it in groups.

- East Marginal Way S. and S. Atlantic Street – During the morning commute, this intersection is expected to operate with just over 1.5 minutes of delay (102 seconds). During the evening commute, this intersection is expected to operate with about 1 minute of delay.

- Colorado Avenue and S. Atlantic Street – During the morning commute, this intersection is expected to operate with about 1 minute of delay.

During the evening commute, these three intersections are expected to operate with about 1 minute of delay:

- First Avenue and Yesler Way
- First Avenue S. and S. Atlantic Street
- Fourth Avenue S. and S. Royal Brougham Way

Central – S. King Street up to Denny Way

In the central section, one intersection is expected to experience congestion:

- First Avenue and Columbia Street – During the evening commute, this intersection is expected to be highly congested, with just over 2 minutes of delay (146 seconds). Congestion at this intersection is due primarily to traffic traveling to the Columbia Street on-ramp to SR 99.

North – From Denny Way North

There are several intersections north of Denny Way that are expected to experience congestion during the morning and evening commute. These intersections include:

- W. Mercer Place and Elliott Avenue W. – In the morning commute, this intersection is expected to operate with about 1 minute of delay. During the evening commute, this intersection is expected to operate with just over 2 minutes of delay (130 seconds).

- Ninth Avenue N. and Mercer Street – During peak commute hours, this intersection is expected to operate with about 1 minute of delay.

Congested Intersections in 2015

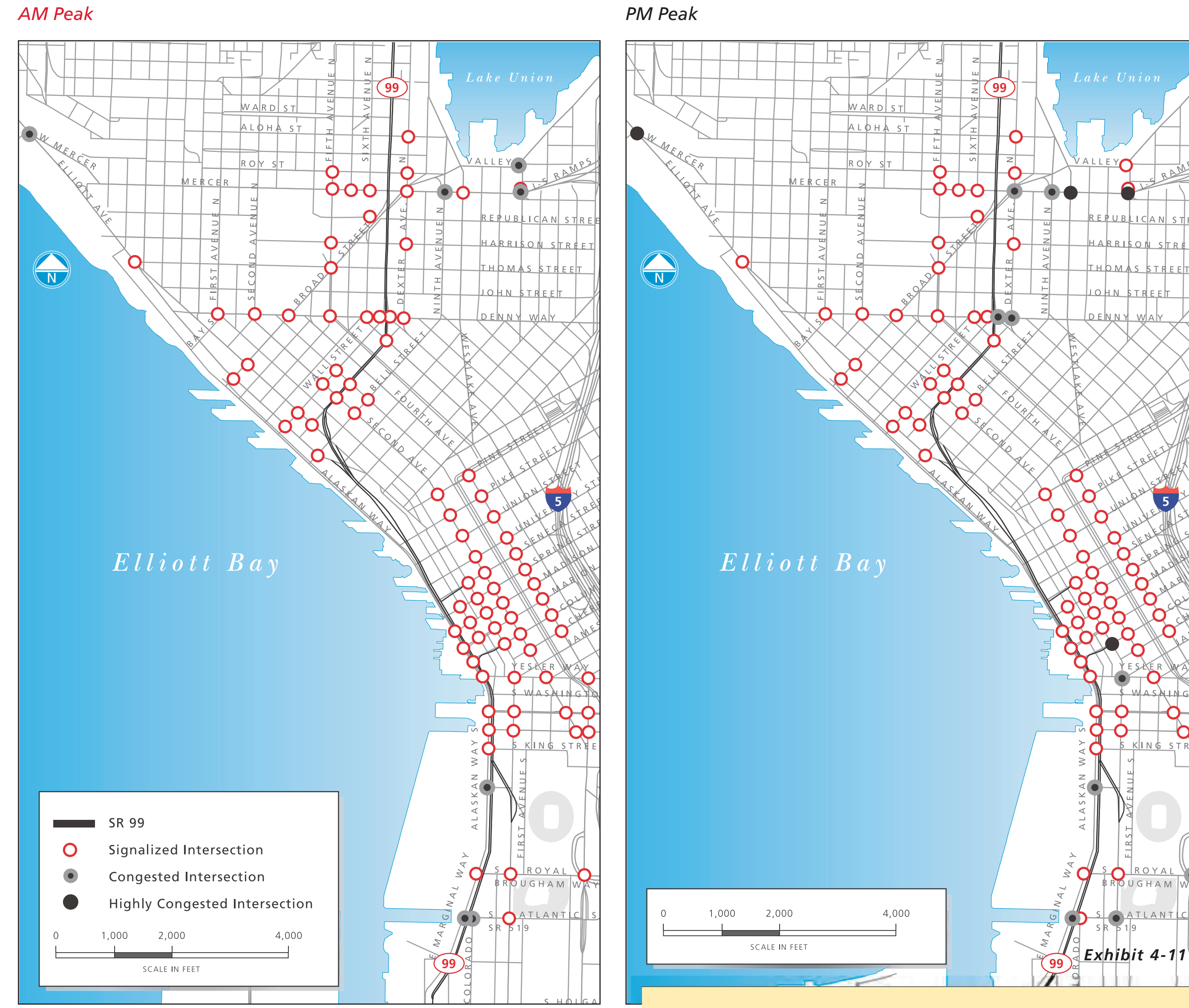


Exhibit 4-11

- I-5 ramp and Mercer Street – During the morning commute, this intersection is expected to operate with about 1 minute of delay. During the evening commute, this intersection is expected to operate with about 3 minutes of delay.

During the morning commute, about 1 minute of delay is expected at the following intersection:

- Valley Street near South Lake Union

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. On average, 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. Traffic analysts use the phrase Level of Service (LOS) to describe intersection delay. The information presented on congested intersections in this text captures intersections expected to operate at LOS E and F in 2015. Detailed information about LOS at individual intersections is discussed in *Appendix C*, Section 4.3.

During the evening commute, delay is expected at the following intersections:

- Aurora Avenue Northbound and Denny Way – This intersection is expected to operate with about 1.5 minutes of delay.
- Dexter Avenue N. and Denny Way – This intersection is expected to operate with about 1 minute of delay.
- Dexter Avenue N. and Mercer Street – This intersection is expected to operate with just over 1 minute of delay (78 seconds).
- Westlake Avenue N. and Mercer Street – This intersection is expected to operate with about 2 minutes of delay.

10 What are the existing conditions for specific types of users?

How does transit use the viaduct?
Downtown Seattle is served by a well-developed system of bus transit, supplemented by a large, regionally implemented vanpool program, Link light rail between Westlake Center and Sea-Tac Airport, the new South Lake Union streetcar, and Sound Transit commuter rail.

Buses use SR 99 for routes serving Burien and West Seattle via the Seneca and Columbia ramps. Buses serving north Seattle using Aurora Avenue enter and exit SR 99 using the Denny Way ramps. Exhibit 4-12 shows the bus routes using SR 99 in the project area. In addition to buses, vanpools from several areas use SR 99 in the project area.

By 2015, travelers to downtown Seattle will benefit from the implementation of RapidRide, an enhanced bus service that will improve travel times. The C Line will serve West Seattle, the D Line will serve Ballard-Uptown, and the E Line will serve Aurora Avenue N.

What are existing conditions for freight and rail?
SR 99 connects areas that generate substantial freight and truck traffic. These include the Ballard/Interbay and Duwamish manufacturing and industrial areas shown in Exhibit 4-13. In addition, light industrial and warehouse areas farther north and south of the project area and in the South Lake Union neighborhood also generate truck traffic.

The Ballard Interbay Northend Manufacturing and Industrial Center (BINMIC) includes approximately 650 businesses and workplaces employing 14,500 people in 2008.[3] Many of these businesses are located there because of the area's marine and railroad access. The BINMIC is not directly served by SR 99 or I-5, though SR 99 provides primary access since it is the closest and most reliable route through Seattle. Drivers from the BINMIC reach SR 99 via 15th Avenue W., which turns into Elliott Avenue and connects to the viaduct. Alternative routes also lead to Mercer Street and I-5. However, Mercer Street and I-5 is a less direct and typically more congested route than SR 99.

The Duwamish Manufacturing and Industrial Center (MIC) is another significant generator of freight traffic. In 2008, approximately 1,900 businesses and workplaces employing 65,300 people were located in the Duwamish MIC. This area includes Boeing's Plant 2 and most of the Port of Seattle. The Port of Seattle owns several container terminals in the Duwamish MIC, and it is one of the largest West Coast cargo centers, serving as the entry and exit point for marine cargo to and from the Pacific Rim and Alaska. Most of the freight shipped through the port is in containers that are transferred to or from railcars or trucks on the dock. Some of the containers are shuttled by truck to or from the railyards within the Duwamish MIC. These trucks use several possible routes in the project area, including SR 99, SR 519, S. Atlantic Street/Edgar Martinez Drive S., S. Spokane Street, S. Spokane Street Viaduct to I-5 or I-90, E. Marginal Way S., and Alaskan Way. Truck travel to and from Port facilities is fairly constant throughout the workday. Terminal 46, leased to Hanjin, borders East Marginal Way S. in the south segment of the

SR 99 Existing Bus Routes

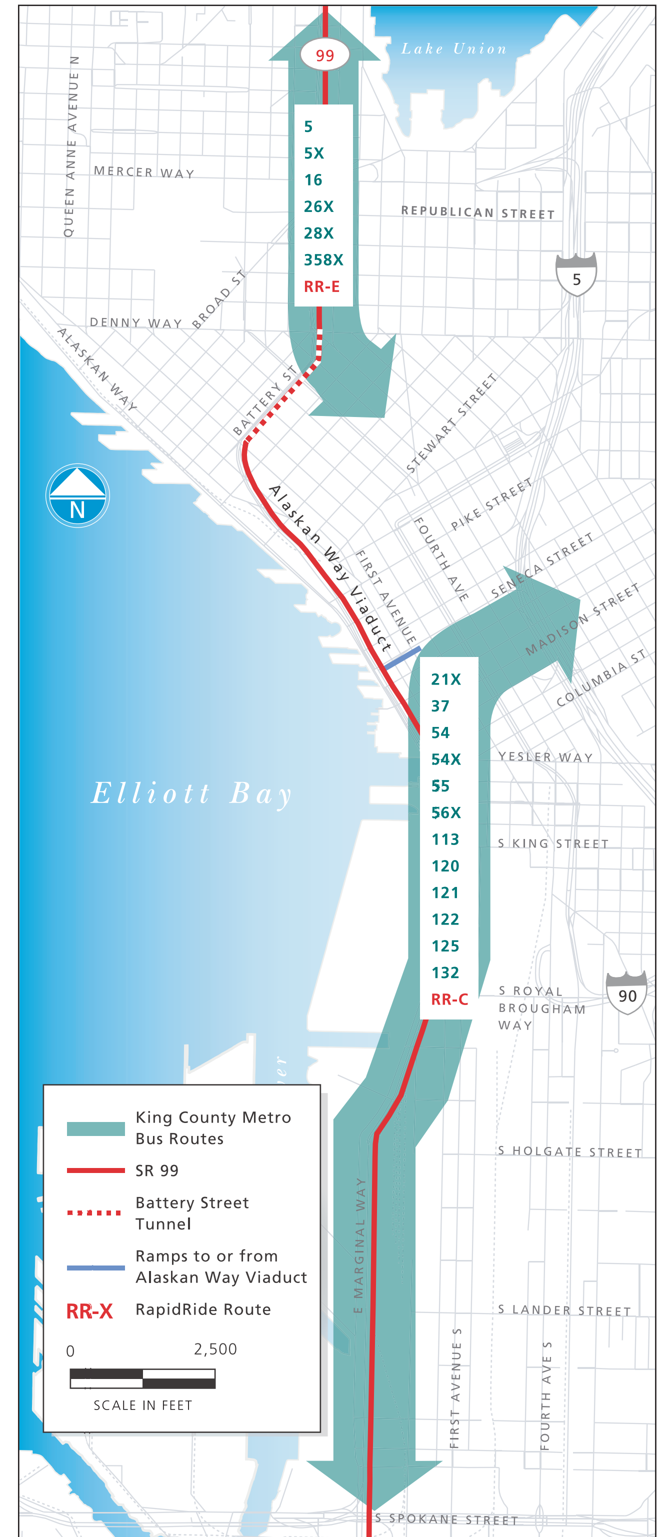


Exhibit 4-12

Appendix C, Transportation Disipline Report

Detailed information about the individual intersections that were evaluated is discussed in *Appendix C*, Section 4.3.

Transit operating in the project area is discussed in *Appendix C*, Section 4.6.

Freight conditions and connections are discussed in *Appendix C*, Section 4.7.

Duwamish and BINMIC Industrial Areas

Exhibit 4-13

3 City of Seattle 2009a.

project area and is the largest container terminal in the project area.

Two railyards located near SR 99 are integral links for moving freight. The BNSF North Seattle International Gateway (SIG) Railyard is east of SR 99 south of S. Atlantic Street. The Whatcom Railyard is west of East Marginal Way S. and has tracks owned by Union Pacific and BNSF. Both railyards have tail tracks that extend well north of the main yard. The tail track is needed to assemble and sort railcars for both the Whatcom and BNSF SIG Railyards.

SR 99 is designated as a high-use freight route by WSDOT, and the City of Seattle (the City) has designated it as a Major Truck Street. SR 99 provides access for businesses in the Duwamish and SODO areas and is a key route for freight to and from the BINMIC. Freight trips in the North Duwamish area, including port-related trips, must share the street system with other uses, including stadium event and ferry access traffic, both of which can overwhelm the street network at times. Rail lines intersect roadways at many locations, and rail traffic preempts use of the roadway when trains are passing.

Alaskan Way and Western and Elliott Avenues are Major Truck Streets and are used as routes for over-legal (over-sized or overweight) trucks that are not allowed on the viaduct. Vertical clearance is limited at the Marion Street pedestrian bridge.

Based on truck volume counts collected in June 2006, an estimated 3,720 trucks use the Alaskan Way Viaduct through central Seattle on a typical weekday; trucks represent about 3 percent of daily traffic volumes on SR 99. As shown in Exhibit 4-14, daily truck volumes are directionally balanced, though slightly more trucks use southbound SR 99 south of the Railroad Way ramps than northbound SR 99. SR 99 daily truck volumes for the SR 99 mainline and ramps are shown in Exhibit 4-14. Unlike overall traffic volumes, which peak during the morning and evening commutes, truck volumes peak during the midday and afternoon. Northbound truck volumes peak between 2:00 p.m. and 3:00 p.m. and southbound truck volumes peak between 3:00 p.m. and 4:00 p.m.

Trucks hauling combustible or flammable materials are prohibited in the Battery Street Tunnel at all times and are prohibited on the viaduct during peak travel periods (7:00 to 9:00 a.m. and 4:00 to 6:00 p.m. on weekdays). Between 80 and 100 tanker trucks are estimated to use the viaduct each day; the exact share of these trucks hauling combustible or flammable materials is unknown. However, based on observation, it is estimated that 55 to 70 tankers per day may be carrying flammable or hazardous loads on the viaduct and exit prior to entering the Battery Street Tunnel.

What are existing conditions for ferry traffic?
Washington State Ferries operates the largest ferry fleet in the United States. In downtown Seattle, Washington State Ferries operates from the Seattle Ferry Terminal at Colman Dock, located on the waterfront near Yesler Way. From the Seattle Ferry Terminal, Washington State Ferries provides daily ferry service to Bainbridge Island and Bremerton. Two ferries that carry both vehicles and passengers serve each of these routes. Service is provided between 4:45 a.m. and 1:35 a.m. daily.

Vehicle access to Colman Dock is provided from Alaskan Way at Yesler Way and exits are provided to Alaskan Way at Yesler Way and Marion Street. Drivers heading south on SR 99 after leaving the ferry exit on Marion Street to reach First Avenue and then access the southbound on-ramp at Columbia Street. Drivers who want to travel northbound on SR 99 can choose to exit the ferry terminal on south- or northbound Alaskan Way:

- From southbound Alaskan Way, drivers could take S. Royal Brougham Way to reach First Avenue S., and then access the First Avenue S. northbound on-ramp near Railroad Way S.
- From northbound Alaskan Way, drivers could continue on Alaskan Way up to Broad Street, and then rejoin SR 99 north of the Battery Street Tunnel.

Daily Truck Volumes

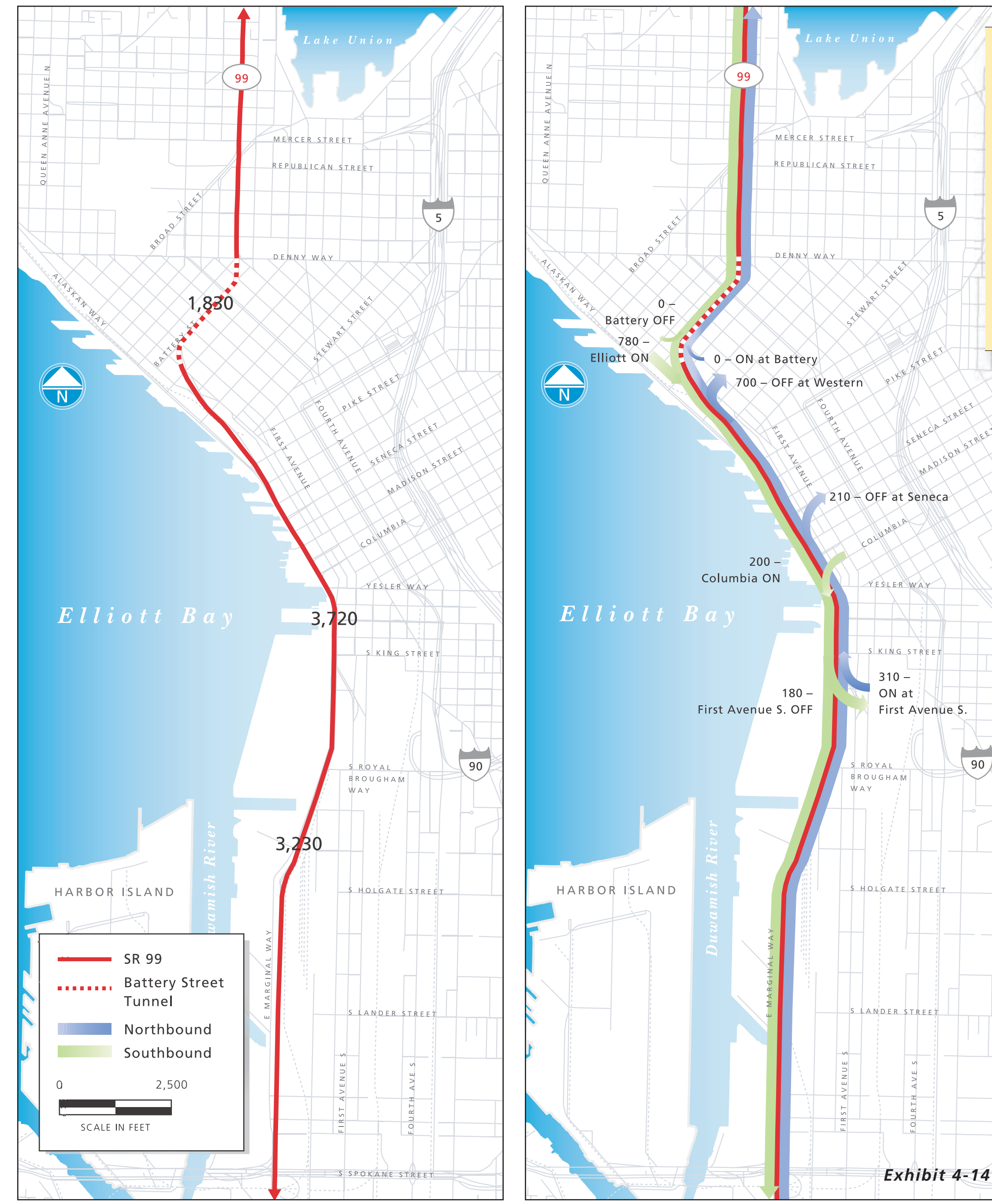


Exhibit 4-14

What is an over-legal truck?

An over-legal truck is one that is oversized or overweight. These trucks are limited to the designated over-legal route along Alaskan Way and Broad Street, or I-5.

Appendix C, Transportation Disipline Report

Ferry services operating in the project area are discussed in *Appendix C*, Section 4.11.

Both Colman Dock access points operate well, even during the AM and PM peak hours. When a ferry is offloading, traffic exiting Colman Dock at Marion Street or Yesler Way has signal priority, which restricts movement of north-south traffic on Alaskan Way. This causes a temporary delay for Alaskan Way drivers, but normal traffic operations typically resume quickly once ferry unloading is complete. During the AM peak hour, approximately 545 vehicles currently exit and 240 vehicles arrive at Colman Dock. During the PM peak hour, approximately 435 vehicles currently exit and 530 vehicles arrive at Colman Dock.

Every day, several thousand people walk to and from the Seattle Ferry Terminal at Colman Dock. People get to Colman Dock via Alaskan Way or from the Marion Street pedestrian bridge, a pedestrian overpass that connects First Avenue to Colman Dock. In addition, many people get to the ferry on bicycle from various locations in downtown and elsewhere.

King County also provides two passenger-only ferry (Water Taxi) routes to downtown Seattle from West Seattle and Vashon Island. The Port of Kingston also provides passenger-only service. These ferries dock just south of Colman Dock at Pier 50. Service to West Seattle is provided in April through October with a boat that has capacity for 250 people. Weekday service begins at 6:50 a.m. and ends most days at approximately 7:00 p.m. Weekend service begins at 8:30 a.m. and continues to 11:00 p.m. on Saturdays and 6:30 p.m. on Sundays. Service to Vashon Island is provided with a boat that has capacity for 150 people. The ferry to and from Vashon Island runs year-round on weekdays during peak commute times in the morning and evening. The Kingston ferry runs on weekdays and select holidays and has two ferries that can accommodate up to 150 people.

What are existing conditions for event traffic?

South

By 2015, completion of the S. Holgate Street to S. King Street Viaduct Replacement Project will improve roadway connections near the stadiums to and from regional facilities such as SR 99, I-90, and I-5.

Regional access from the stadium area to northbound SR 99 and from southbound SR 99 is provided via the on- and off-ramps at First Avenue S. The S. Holgate Street to S. King Street Viaduct Replacement Project will provide new ramps to southbound SR 99 and from northbound SR 99 to Alaskan Way S. near S. King Street.

Similar to conditions today, during events at Safeco Field or Qwest Field, traffic levels in the general vicinity will intensify within a relatively short amount of time, travel patterns change as patrons search for parking, and pedestrian activity increases. As a result, local traffic conditions will typically be much more congested prior to and following events compared to typical, non-event conditions. For example, for a typical Seahawks game, estimates indicate that between 15,000 and 20,000 additional vehicles, beyond background traffic levels, enter and exit the stadium area.

Explicit detour routing and comprehensive traffic control measures are typically in place on First Avenue S. and critical east-west arterials (e.g., S. Royal Brougham Way and S. Atlantic Street) for large events at Safeco Field and Qwest Field such as Seahawks, Sounders, and Mariners games. These measures commonly include police-based traffic management commissioned by the City. During events, many patrons shift to alternative means of travel (bus, light rail, commuter rail, walking, etc.), particularly public transit.

North

Seattle Center is the major event facility in the north end. It is home to many events including Bumbershoot, the Northwest Folklife Festival, and the Seattle Storm women's basketball team. Other large-scale events related to holidays and the theatre district also occur throughout the year.

For larger events at Seattle Center, traffic control measures and minor detours are occasionally used to manage access to parking and general circulation. However, due to the smaller scale of events and the capacity of the Seattle Center facility, such measures are not in place as consistently, nor are they required as frequently compared to the larger sporting venues in the south. Local bus and monorail service is provided to and from the downtown core (and some neighborhoods on the periphery).

What are existing conditions for pedestrians?

Popular destinations for pedestrians in the project area include Safeco and Qwest Fields; waterfront attractions; Pioneer Square; Pike Place Market; Seattle Center; numerous shops, restaurants, and cafes; office buildings; and residences.

In the south near the stadiums, pedestrian activity is highly variable due to special events. First Avenue S. and Occidental Avenue S. provide the main north-south pedestrian facilities, in addition to east-west streets such as S. Royal Brougham Way.

North of S. Royal Brougham Way, people can walk on the west side of Alaskan Way north along the waterfront. The Waterfront Bicycle/Pedestrian Facility runs on the east side of Alaskan Way from approximately S. Royal Brougham Way to approximately Bell Street, where the separated facility turns into a sidewalk. By 2015, the new Port Side Pedestrian/Bicycle Facility and the City Side Trail will replace the Waterfront Bicycle/Pedestrian Facility south of S. King Street. Pedestrians can use sidewalks on both sides of the roadway, and crossing signals are located at intersections to help people make their way between the east and west sides of Alaskan Way. People on foot can also reach the waterfront via the Marion Street pedestrian bridge, which connects over Alaskan Way to Colman Dock; the Lenora Street pedestrian bridge, which connects Elliott Avenue to the east side of Alaskan Way; and the Bell Street Skybridge, which connects over Alaskan Way to the Bell Street International Conference Center. Because of the steep hill, the pedestrian bridges at Lenora and Bell Streets also help to connect the waterfront to the Belltown neighborhood. Pedestrian activity along the waterfront varies substantially,

Appendix C, Transportation Disipline Report

Ferry services operating in the project area are discussed in *Appendix C*, Section 4.11.

Event traffic is discussed in *Appendix C*, Section 4.13.

Pedestrian connections are discussed in *Appendix C*, Section 4.9.

Bicycle connections are discussed in *Appendix C*, Section 4.10.

What is on-street parking?

There are two types of on-street parking, short-term and long-term. On-street short-term parking includes metered spaces with a time limit of up to 2 hours, time-restricted public parking spaces (such as 1-hour parking and loading zones), bus/taxi zones, and spaces reserved for police parking. On-street long-term parking includes unmetered, unrestricted on-street public parking spaces and 10-hour metered spaces.

What is off-street parking?

Off-street parking includes public parking garages and lots where people pay to park. Most off-street parking is privately owned and operated.

both day-to-day and seasonally due to ferry, tourist, and cruise ship activities. Overall pedestrian volumes are typically higher during the summer months and tend to peak on weekends.

Colman Dock is an important destination for pedestrians heading to and from the ferry. On an average workday, several thousand people walk between Colman Dock and downtown workplaces. This is one of the biggest concentrations of pedestrian commuters in the region. Most of them cross on the Marion Street pedestrian bridge that passes just underneath the lower level of the viaduct.

North of the Battery Street Tunnel, there are several north-south pedestrian routes; however, east-west routes are limited. The only pedestrian crossings in the area are along Broad and Mercer Streets. Denny Way is the primary pedestrian corridor in this area. Pedestrian volumes are highly variable in this area as well, due to event foot traffic going to and from Seattle Center.

What are the existing conditions for bicyclists?
The project area has several local and regional connections for bicycle travel, as shown in Exhibit 4-15. However, bicycles are not allowed on SR 99. Cyclists use dedicated lanes and trails in the area for commuting to work, to access the Seattle Ferry Terminal at Colman Dock, for recreation, and to get to many activities along the waterfront and in adjacent neighborhoods. Bicycle routes in the area link to a regional trail system that connects with local communities to the south and north. The regional trail system connects from Seattle's waterfront through the Cascade Mountains to Eastern Washington.

From the south or West Seattle, cyclists can connect via the Duwamish and Alki Trails to the bicycle route located along East Marginal Way S. A bicycle lane is located between S. Spokane Street and S. Royal Brougham Way. From S. Royal Brougham Way to Bell Street, bicycle and pedestrians travel along Alaskan Way on the Waterfront Bicycle/Pedestrian Facility, a multi-use pathway separated from the roadway. By 2015, the new Port Side Pedestrian/Bicycle Facility and the City Side Trail will replace the Waterfront Bicycle/Pedestrian Facility south of S. King Street. The separated pathway ends at Bell Street. Either cyclists can share the road with other vehicles along the waterfront up to Broad Street and Myrtle Edwards Park, or they can use the 20-foot-wide sidewalk up to Clay Street. From there, the Elliott Bay pedestrian and bicycle trail continues to the Interbay and Magnolia neighborhoods. Other major bicycle routes within or near the area include Second, Fourth, and Dexter Avenues, which all feature bicycle lanes.

Near the stadiums, S. Dearborn Street connects to the I-90 Trail, which provides access to I-90 and the Mountains to Sound Greenway Trail. The Mountains to Sound Greenway Trail currently runs along S. Atlantic Street and by 2015 will connect to the new City Side Trail along the east side of the new Alaskan Way surface street.

11 How many parking spaces exist in the project area?
Parking spaces within the project's footprint are a mix of short-term spaces, long-term spaces, and other privately owned spaces. Existing on- and off-street public parking spaces in the south and north portal areas are shown in Exhibit 4-16.

Exhibit 4-16
Existing Public Parking Spaces in the Project Area

	ON-STREET Short-Term	ON-STREET Long-Term	OFF-STREET	Total
Stadium Area	170	20	250	440
Pioneer Square Area	220	10	130	360
Central Area	560	0	110	670
Belltown Area	120	0	200	320
North Area	170	300	140	610
Total	**1,240**	**330**	**830**	**2,400**

Note: Private business parking is not included.

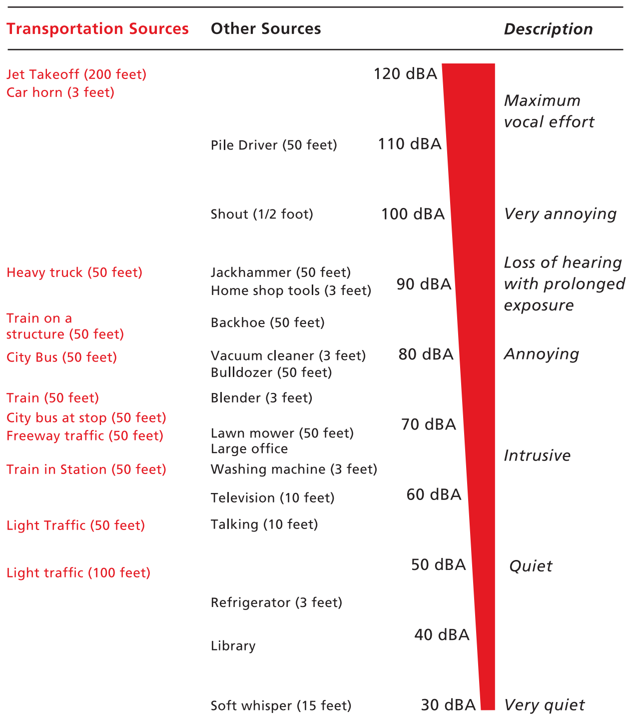
12 How noisy is it in the project area?
Noise from traffic, construction, and the diverse activities of city dwellers is a normal part of life in the project area. Environmental noise is composed of many frequencies, each occurring simultaneously at its own sound pressure level. The equivalent sound level (L_{eq}) is an averaged sound level reported in A weighted decibels (dBA) to account for how the human ear responds to sound

Exhibit 4-15

frequencies. To the human ear, a 5-dBA change in noise is readily noticeable. A 10-dBA decrease would sound like the noise level has been cut in half. Typical noise levels are presented in Exhibit 4-17.

Exhibit 4-17

Typical Sound Levels



Source: FTA 1995, EPA 1971, EPA 1974

Existing outdoor noise levels in the project area range from 61 to 80 dBA (both for short durations and over a 24-hour period), which is typical for major downtown metropolitan areas. Noise levels tend to be about 10 dBA quieter during the nighttime and early morning hours (midnight to 6:00 a.m.).

High noise levels can interfere with conversation, disturb sleep, and detract from the overall quality of life. Traffic noise levels that approach or exceed the Federal Highway Administration (FHWA) noise abatement criterion, which is 67 dBA for noise-sensitive outdoor uses such as parks, hotels, and residences, can cause a negative impact. Noise measured at the Washington Street Boat Landing, the Seattle Aquarium, and along much of the waterfront exceeds FHWA's criterion for traffic noise abatement.

Noise levels for the loudest hour of the day were modeled throughout the study area to understand expected noise conditions in 2015. By 2015, existing traffic noise levels approach or exceed the FHWA noise abatement criteria at 53 of the 70 modeled sites, which represent approximately 4,578 residential units, 1,612 hotel rooms, 120 shelter beds, 1 church, 1 school, 12 parks or public spaces, and 8 commercial use areas. The noise levels at these sites are shown in Exhibit 4-18. WSDOT has also determined that traffic noise above 80 dBA generates a severe impact at outdoor areas frequented by people. Noise at one site, an apartment building adjacent to the Elliott Avenue on-ramp, is modeled to exceed the severe noise impact criterion.

13 How is the project area affected by vibration from traffic traveling on the viaduct?

The human body responds to an average vibration decibel level (VdB), which is typically calculated over a 1-second period. The abbreviation "VdB" is used to reduce the potential for confusion with sound decibels. The threshold for most people to feel vibration is around 65 VdB, and our response to vibration is not usually significant unless the vibration exceeds 70 VdB.

Normally, people do not feel vibration when an average passenger vehicle is passing by on an at-grade roadway. However, a person standing next to one of the vertical piers supporting the Alaskan Way Viaduct would sense that the ground was rumbling beneath them. This is because vibration levels measured on the ground 3 to 5 feet from the vertical piers range from 66 to 89 VdB. These existing vibration levels represent the sum of vibrations from trucks of a range of weights, and irregular roadway conditions. In addition, the mass and span of the viaduct concentrates vibrations from heavy vehicles to the piers of the viaduct.

Vibration levels were measured at 17 locations in the project area. Of the 17 locations, 10 are in the south, 1 is along the central waterfront, and 6 are in the north portion of the project area. The levels are below the existing vibration criterion of 90 VdB that the lead agencies have adopted for this project to protect extremely

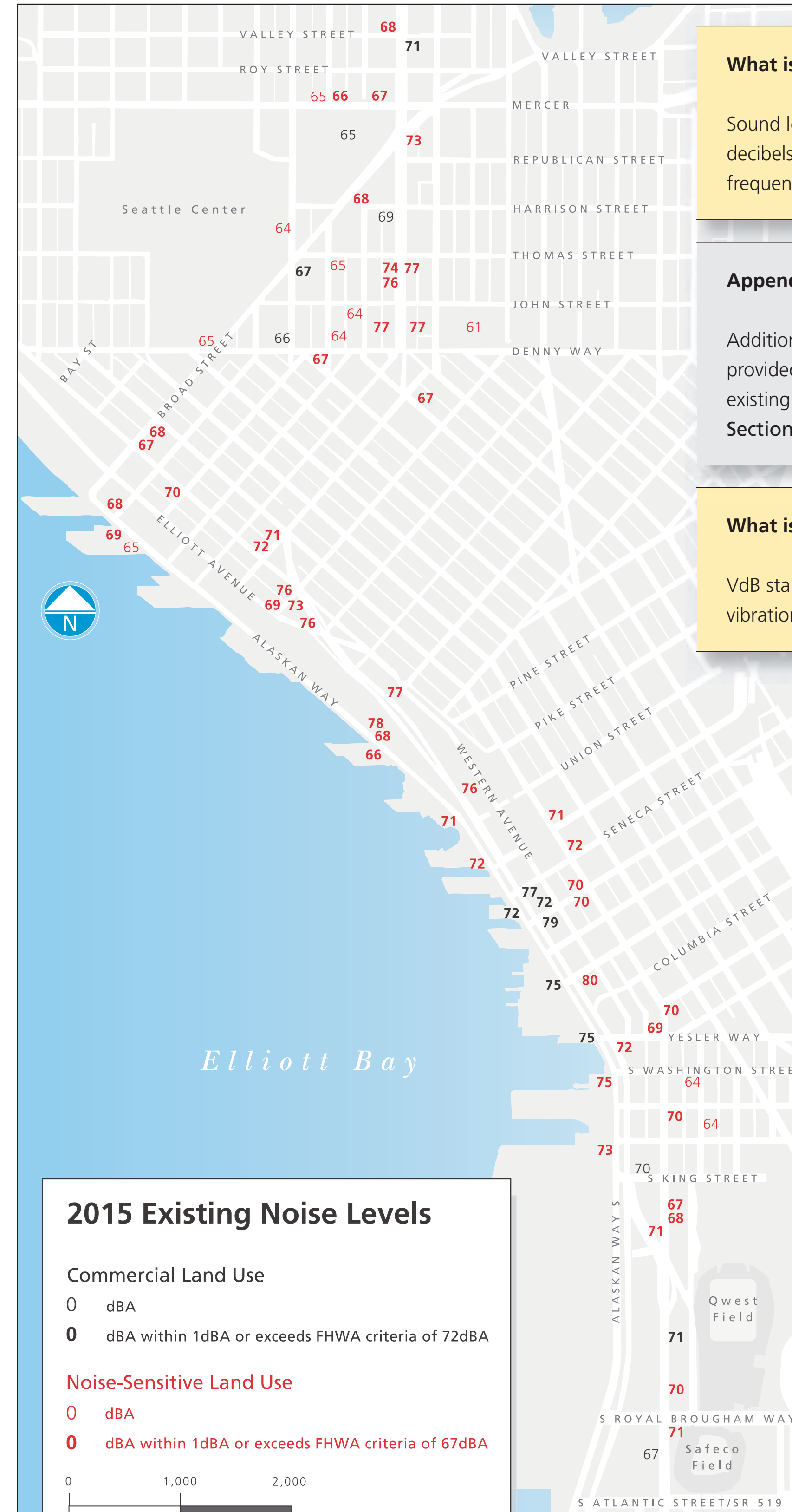


Exhibit 4-18

What is a dBA?

Sound levels are expressed on a logarithmic scale in units called decibels (dB). A-weighted decibels (dBA) are a commonly used frequency that measures sound at levels that people can hear.

Appendix F, Noise Discipline Report

Additional information on the existing noise environment is provided in *Appendix F*, Section 4.2, and information on the existing vibration environment is provided in *Appendix F*, Section 4.3.

What is a VdB?

VdB stands for vibration decibels. It is a measure of the average vibration level, typically calculated over a 1-second period.

fragile buildings (this criterion is consistent with the Federal Transit Administration's vibration criteria). These vibrations can be felt but do not generally damage buildings.

Ground vibration levels decrease substantially over distance. At distances of 25 feet or more from the vertical piers, the vibration levels are below 65 VdB. Most perceptible indoor vibration is caused by sources within buildings, such as operation of mechanical equipment, movement of people, or slamming of doors. Typical outdoor sources of perceptible vibration are construction equipment, steel-wheeled trains, and traffic on rough roads.

14 What visual features are located in the project area?
Attractive scenic views, historic buildings, trees, and the waterfront are all positive elements of the visual experience for drivers on the Alaskan Way Viaduct. However, there are also things that present lower visual qualities, such as parking lots, some parts of industrial areas, buildings that need maintenance, and to many, the viaduct itself.

The south end of the project area is located near Safeco Field and Qwest Field, which dominate the view in much of this area. Closer to the waterfront, cranes and shipping containers at the Port of Seattle's facilities are a major component of views. Today SR 99 is elevated in this area. The double-level viaduct structure is an obvious part of the view, and its scale is compatible with the many large-scale buildings also found along the working waterfront. The side-by-side aerial roadway structure being constructed as part of the S. Holgate Street to S. King Street Viaduct Replacement Project will have effects upon the visual environment that are similar to the existing viaduct.

The existing viaduct in this area offers views of Puget Sound and Elliott Bay, the Olympic Mountains, and the distant outlines of Bainbridge Island and the Kitsap Peninsula.

At the south end of the central section, the Pioneer Square Historic District's brick buildings and tree-lined streets are reminders that this neighborhood was central to Seattle's boomtown beginnings. Characteristic of 19^{th}-century architecture, the front doors of many buildings are right up to the sidewalk. Telephone and electric lines in this neighborhood generally run underground, reducing visual clutter. The viaduct runs along the west side of the Pioneer Square Historic District, partially obstructing views to the west.

The downtown commercial core is located from just north of Yesler Way to approximately Stewart Street and from the waterfront to just west of I-5. This part of the project area includes many of Seattle's high-rise office buildings, as well as several notable historic buildings from the early decades of the 20^{th} century. The steep hills of downtown slope toward the waterfront, providing good westward views from streets and sidewalks, open spaces, and buildings. Cars, buses, and trucks crowd the streets and largely contribute to the look in the commercial core.

The City's Green Streets program has included three east-west streets in the downtown commercial core (Marion, Spring, and University Streets). The Green Streets program promotes broad sidewalks, landscaping, and other features. The City has also designated some east-west streets as view corridors, in which views are to be protected. The existing viaduct runs along the west side of the commercial core.

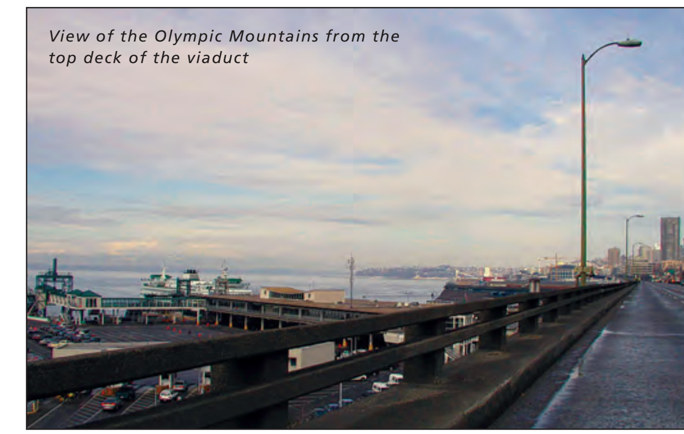
The downtown waterfront area follows along Alaskan Way from Yesler Way to Denny Way. Waterfront views, diverse attractions, and the maritime ambience make this one of Seattle's most popular areas. In this area, pier buildings that once held goods unloaded from cargo ships and trains now house shops, restaurants, and businesses. A narrow pedestrian promenade and mixed-use trail run the length of Alaskan Way along the waterfront. The viaduct runs along the east border of the central waterfront area and is a dominant feature in views toward downtown Seattle.

Walkways along the waterfront allow pedestrians to go out onto piers for a close-up view of waterfront activities and a view back at the downtown skyline rising over the top of the viaduct. Looking back toward the city from Elliott Bay or from the ends of waterfront piers, the view east is dominated by the high-rise office buildings of downtown. To the south, one can see cranes and container cargo ships at the Port of Seattle facilities. To the north, the Space Needle and grain elevators are prominent features. Because of the very large scale of all of these structures, the buildings along Alaskan Way seem like a minor part of the view. The viaduct blends in, appearing as a gray band crossing the bottom of the view.

Although Pike Place Market has sweeping outward views, the colorful views from within the market are what make it unique. The market's traditional produce and goods stalls are mixed with a wide variety of shops, restaurants, offices, and apartments. Narrow brick-paved streets, modest market buildings, and the bustle of street-oriented activities make this a pedestrian-friendly environment. Victor Steinbrueck Park is a prominent green space in this area. The viaduct is adjacent to the park, its top deck located just below the viewing area on the park's west side. Although the viaduct does not obstruct scenic views in this area, it is a prominent part of the view to both the west and southwest.

The Belltown area is bounded by Pike Place Market and Stewart Street on the south, Fifth Avenue on the east, Denny Way on the north, and the waterfront on the west. East-west streets offer good westward views of the water, Bainbridge Island and the Kitsap Peninsula, and the Olympic Mountains. As in other parts of the project area, scenic views are highly valued, and the City has passed ordinances that discourage new development from blocking them. The viaduct runs along the west side of part of this area before turning northeast to enter the Battery Street Tunnel. Views to the west are partly obstructed by the viaduct, where the elevated structure crosses Elliott Avenue.


View of downtown Seattle from Steinbrueck Park


View of the Olympic Mountains from the top deck of the viaduct


Park area along the waterfront with view of downtown Seattle

Appendix D, Visual Quality Discipline Report and Appendix E, Visual Simulations

Appendices D and *E* contain additional information and pictures of the project area.

North of the Battery Street Tunnel, views along the Aurora Avenue portion of SR 99 are dominated by traffic, the roadway, on- and off-ramps, and ends of east-west streets. The downtown skyline, Capitol Hill, and the greenbelt on the east slope of Queen Anne Hill are visible from SR 99 in this area. There are a few motels along and near Aurora Avenue, as well as businesses housed in a variety of different building styles and sizes that are between one and five stories tall. The different features in this area do not seem to merge visually as a neighborhood, partially because Aurora Avenue acts as a barrier throughout the section.

15 What are some of the positive and negative visual conditions created by the viaduct?

The Alaskan Way Viaduct is a dominant visual feature in much of the project area. Motorists traveling north on the top level of the viaduct have broad westward views across the waterfront to the Olympic Mountains and east views of the downtown skyline, sports stadiums, and the Space Needle. From the southbound lanes on the lower level of SR 99, the view is limited by the northbound lanes above, support columns, and buildings along the east side of the viaduct. However, many southbound motorists value the good view to the southwest between the Battery Street Tunnel and Pine Street.

From the ground, the existing viaduct affects the overall look of the area in several ways. It partially blocks some westward views from the east side of the structure and looms above both the pedestrians and motorists passing beneath it. In some places along the waterfront, the viaduct all but blocks views back toward the downtown area. Because on- and off-ramps obstruct views from the street level all the way to the top of the viaduct, they are especially noticeable to people in adjacent neighborhoods. The viaduct's size, bulk, and industrial concrete design conflict with the historic character of the Pioneer Square Historic District, the pedestrian-oriented environment along the central part of the waterfront, and the shops and offices on the west side of Belltown. The areas below and next to the viaduct are often in the shade, and much of the land beneath the viaduct has been given over to parking and alley-like side streets—places that people pass through to get somewhere else. Because of these various effects, many people see the viaduct as a barrier that cuts off the central part of the waterfront from Seattle's downtown core and neighborhoods located to the east.

16 What is the character of and land use in the project area?

The project area passes through seven of the City's neighborhood planning areas. The project area begins in the Duwamish neighborhood, with its industrial buildings, Port of Seattle cargo container facilities, Qwest Field, and Safeco Field and few residences. The many 19th-century buildings in the Pioneer Square neighborhood make it Seattle's most historic neighborhood and one of its most distinctive.

The downtown commercial core is characterized by mostly high-rise office buildings with tens of thousands of workers who commute to the neighborhood each day. The commercial core includes the city's financial district, retail core, and a few condominiums and apartment buildings. It also includes the central waterfront.

Belltown, north of the downtown commercial core, is characterized by a mix of mid- and high rise offices, neighborhood shops, and residences. The neighborhood has undergone substantial redevelopment over the past 15 years, and many condominiums and apartment buildings have been built overlooking the waterfront. This mixed neighborhood also has many old hotels and apartment buildings, some of which have been converted into subsidized housing.

In addition, the project area passes through small sections of the Uptown neighborhood and the Denny Triangle area. Seattle Center, site of the 1962 World's Fair, is a regional civic center hosting theatre, ballet, opera, exhibitions, festivals, and basketball. The South Lake Union area at the northeast end of the project area has also been undergoing substantial redevelopment with several mid- and high-rise buildings and residences. Many of these buildings are occupied by medical and biotechnology research organizations or businesses.

17 What is the regional and local economy like now?

The greater Seattle area and King County host a large and diverse economy. King County is the largest business center in both the state of Washington and the Pacific Northwest, and it is a leading global center for several industries, including aerospace, biotechnology, clean technology, information technology, and international trade and logistics.[4]

International commerce plays a large role in the local economy. The Port of Seattle is one of the largest West Coast cargo centers, serving as a gateway for cargo shipped to and from Alaska and countries along the Pacific Rim. More than 33,000 regional jobs (direct, indirect, and induced) were generated in 2007, translating to a payroll of $2.8 billion.[5]

Tourism is also an important part of Seattle's economy, particularly in the project area. According to the City, "The Seattle-King County area attracts more than 9.4 million overnight visitors annually who spend $4.75 billion and contribute more than $419 million in state and local tax revenues. Direct visitor spending supports 62,000 jobs in the Seattle region."[6]

In 2008, the work force in King County was about 1,088,440 people (not including military personnel). Approximately 47,000 people (4.3 percent) were unemployed. The economy entered a recession in September 2008, and conditions continue to change quickly. The unemployment rate in King County rose to 8.4 percent in 2010.[7] While current conditions may vary, Seattle lost about 68,800 jobs between July 2008 and July 2009.[8]

Within one block of the project area there are approximately 1,040 businesses, including the following types:

- Commercial office businesses – 59.3 percent

Appendix G, Land Use Discipline Report

Additional information about land use in the project area is provided in *Appendix G*, Chapter 4.

Appendix L, Economics Discipline Report

Additional information about the economy in the project area is provided in *Appendix L*, Chapter 4.

4 CTED 2009.

5 Port of Seattle 2009a.

6 City of Seattle 2008.

7 LMEA 2010b.

8 Thomas 2009.

Exhibit 4-19

Steinbrueck Park and the viaduct ramps

Steinbrueck Park looking towards West Seattle and Elliott Bay

- Commercial retail businesses – 13.5 percent
- "Other service" businesses – 8.7 percent
- "Other" businesses – 8.3 percent[9]
- Residential multi-family management – 8.2 percent[10]
- Government service – 2 percent[11]

Almost half of the "other service" businesses were involved in food services such as restaurants and coffee shops. About 15 percent of "other" businesses identified were pay parking areas. Businesses in the area depend on parking spaces, freight delivery spaces, and transit to accommodate employees, customers, and freight transport.

18 What historic and archaeological resources are located in the project area?

The Alaskan Way Viaduct and Battery Street Tunnel are recorded as one historic property and have been determined eligible for the National Register of Historic Places (NRHP). Many historic properties are located within the two national historic districts, the Pioneer Square Historic District and the Pike Place Market Historic District, shown in Exhibit 4-19. Each of these areas have a locally designated boundary that is slightly larger than the nationally designated boundary. There is one National Historic Landmark (inclusive of the Pioneer Building, Pioneer Place, and Pergola), which is located at First Avenue and Yesler Way. Including the districts themselves, there are 30 properties listed in the NRHP (including several buildings that are within historic district boundaries) within the study area. Many City-designated landmarks and NRHP-eligible properties are in the study area as well, as shown on Exhibit 4-19.

One identified archaeological site in the project area has been determined eligible for listing in the NRHP. The Dearborn South Tideland Site (45KI924) is a late 19th- and early 20th century historic archaeological site consisting of building foundations and associated refuse. Another archaeological site, 45KI958, has been identified near the north portal area. Although this archaeological site has not been formally determined eligible for the NRHP, WSDOT will treat it as an eligible site for this analysis. This site is an early- to mid-20th century historic archaeological site also consisting of building foundations and associated refuse. Given the constraints imposed by the urban environment and deep historic fill, evaluation and, if necessary, data recovery of this archaeological site would be undertaken in concert with construction. This process is described in a Memorandum of Agreement created in consultation with the State Historic Preservation Officer, the tribes, and consulting parties.

19 What parks and recreational facilities are located in the project area?

Publicly owned parks and recreation spaces in the project area include Occidental Park, Pioneer Square Park, the Washington Street Boat Landing, Waterfront Park, Victor Steinbrueck Park, Pier 62/63 Park, Pier 66, Belltown Cottage Park, Olympic Sculpture Park, Myrtle Edwards Park, Elliott Bay Park, Tilikum Place, Denny Park, Lake Union Park, and Seattle Center, as shown in Exhibit 4-20. Private or semi-public open spaces include several of the waterfront piers and the plazas and terraces around the Seattle Art Museum and Benaroya Hall. From Pier 55 a boat service provides access to Tillicum Village and Blake Island State Park, which are located across Puget Sound. Cultural, environmental, and educational facilities include the Seattle Aquarium and the interpretive center at the Klondike Gold Rush National Historic Park. Thousands of local residents and tourists also attend events at Qwest Field and Safeco Field in the north end of the Duwamish neighborhood.

Recreational facilities in the project area include several types of land uses, such as open spaces around buildings (both public and private), viewpoints, shoreline access points, and the trails, promenades, and walkways that allow people to make their way through the area without relying on cars. There are several viewpoints along the waterfront, including Waterfront Park and Victor Steinbrueck Park. Trails include the Waterfront Bicycle/Pedestrian Facility, which connects to several adjacent trail systems such as the Mountains to Sound Greenway Trail; bike and pedestrian trails are shown in Exhibit 4-15. By 2015, the S. Holgate Street to S. King Street Viaduct Replacement Project will replace this connection with two new trails, the Port Side Pedestrian/Bicycle Facility and the City Side Trail, in the vicinity of the stadiums.

Recreational facilities also include streets that are part of Seattle's Green Streets program, which promotes creation of pedestrian-oriented features such as wide sidewalks and landscaping. Outdoor art is also located throughout the project area, including sculptures, fountains, and murals. Most of these attractions are located at a distance from proposed construction activities.

20 Who lives in the neighborhoods located in the project area?

The residents of the project area represent a diverse mix of individuals. Like the rest of the city, approximately a quarter of the residents are minorities. The proportion of minorities (non-white) is a bit lower in the project area compared to the rest of the city, but a higher percentage of Latino persons live in the project area. Nearly three-quarters of all residents live alone, and only a small number of families with children live in the area.

Residents in the project area reside in new luxury downtown condominiums and apartment buildings, older apartments and converted old hotels, subsidized housing, and homeless shelters. Some people live on the city streets and even sleep under the viaduct itself.

The Seattle/King County Coalition on Homelessness reports that approximately 8,900 people lacked permanent housing in King County in 2009,[12] and preliminary data for 2010 show similar conditions. The vast majority of these people obtained shelter in the county's homeless shelters, most of which are located in downtown Seattle. However, more than 1,900 individuals reportedly lived on the streets in Seattle in 2009[13] and in 2010.[14]

Compared to the rest of Seattle's population, the project area has a much higher proportion of people who live at or below the poverty level and a slightly higher percentage of people with disabilities and mobility limitations, as shown in Exhibit 4-21. About 45 percent of the residents

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

Maps and a table showing the properties that are listed in or eligible for the National Register of Historic Places, as well as City-designated landmarks, are included in *Appendix I*, Chapter 4. *Appendix I* also provides more detail on how the area around Seattle was settled and developed.

Attachment A includes an inventory of buildings in the area that are more than 40 years old.

Appendix H, Social Discipline Report

Community and neighborhood resources and social services in the area are identified in *Appendix H*.

Appendix H also contains additional background information about minority, low-income, and homeless populations living in the project area.

9 Other businesses include private non-profit social service organizations.

10 Residential multi-family use does not include individual residential units, but refers to an apartment or condo building with a front desk for a property manager who works in the building.

11 Government service, while not a for-profit business, still operates in a business like manner and is included in this inventory. Government service includes municipal government offices and social service agencies.

12 Eisinger 2009.

13 Seattle/King County Coalition on Homelessness 2009.

14 Seattle/King County Coalition on Homelessness 2010.

in the project area do not own a private automobile and rely on walking or public transit for transportation. Low-income residents, minorities, the elderly, and those with disabilities are protected by a combination of laws, policies, and an executive order called Environmental Justice (Executive Order [EO] 12898, issued in 1994).

Exhibit 4-21
Population Characteristics in 2000

	Census Tracts in the Project Area	City of Seattle
Population	17,336	563,374
Percent Minority[1]	28	32
Percent Latino[2]	7	5
Percent at or Below Poverty Level	23	12
Percent Disabled with Mobility Limitations	9	6
Percent Transit Reliant	45	16

Source: U.S. Census Bureau 2000
1 Minority includes persons of all races except white.
2 Latino persons may be white or minority race.

The 2010 census data was not available at the time the analysis for this Final EIS was prepared. However, updated demographic data at the city level are available for 2008 through the U.S. Census Bureau's American Community Survey.

The American Community Survey estimated the city's total 2008 population to be 582,490, which reflects an increase of 3 percent since 2000.[15] The Hispanic/Latino population

What is environmental justice?

Environmental justice acknowledges that the quality of our environment affects the quality of our lives, and that minority and low-income populations should not bear an unequal environmental burden. Environmental justice seeks to lessen unequal distributions of environmental burdens (e.g., pollution, industrial facilities, crime) and equalize benefits and access to clean air and water, parks, transportation, etc.

Environmental Justice Statutes and Regulations

- Presidential Executive Order 12898 (Environmental Justice)
- Title VI of the Civil Rights Act of 1964
- Civil Rights Restoration Act of 1987
- USDOT Environmental Justice Order (DOT Order 5610.2)
- Presidential Executive Order 13166 (Limited English Proficiency)
- NEPA

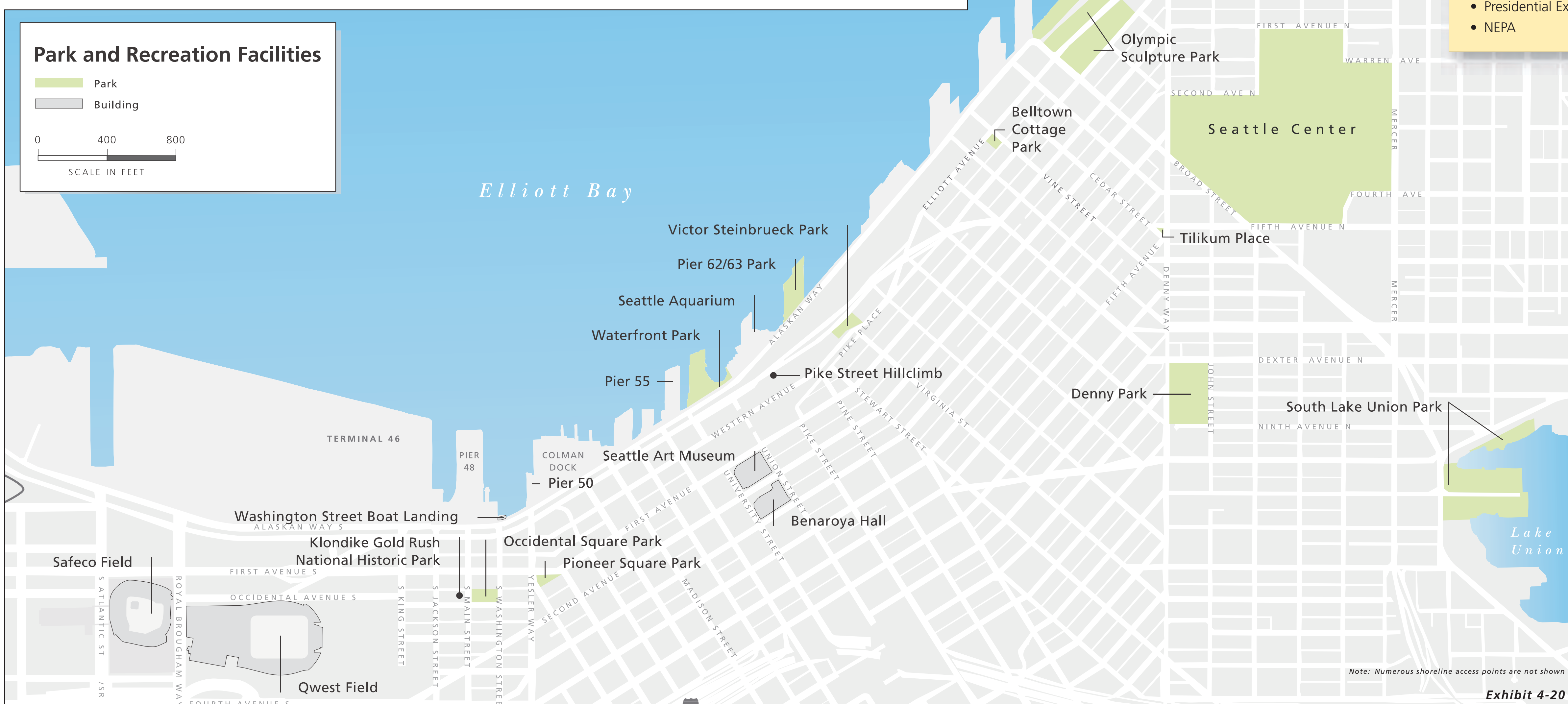


Exhibit 4-20

15 U.S. Census Bureau 2008.

was reported to comprise 5 percent of the total population in 2000 and has not changed based on the 2008 American Community Survey. The total minority population in 2000 was reported to be about 32 percent and has decreased slightly to 30 percent in 2008. Based on this analysis, the racial, Hispanic/Latino ethnicity, and total minority composition of the project area population is likely to be similar to the demographic characteristics reported in the 2000 census (i.e., 25 percent non-white, 7 percent Hispanic/Latino, and 28 percent total minority).

Similarly, the percentage of persons living at or below the poverty level in the city of Seattle has remained the same between 2000 and 2008. Based on this analysis, the proportion of the population living at or below the poverty level and residing in the project area has not changed substantially and remains approximately 23 percent.

21 What community and social services serve these neighborhoods?

The project area is home to many people who have low incomes and/or disabilities. The Pioneer Square and Belltown neighborhoods include much of Seattle's subsidized, special needs, and emergency housing. Nearly 4,000 subsidized housing units are located within five blocks of the project area.

A variety of community-based organizations and government agencies in the area offer help and support to people in need. These organizations provide meals, hygiene facilities, donated clothing, and emergency housing (shelters). Many also offer counseling to help people manage problems such as substance abuse, domestic violence, or mental health issues. Others provide employment training, referrals for day labor, job placement, and structured daytime activities.

Most of the government agencies and organizations providing these services depend heavily upon volunteers from church groups or the community and operate on very limited budgets.

22 What public services and utilities are located in the project area?

Public Services

Public services and facilities located in the project area include emergency medical services, fire stations, police, medical clinics, public schools, postal services, disaster preparedness, solid waste pick-up, and recycling. Harborview Medical Center, a major regional trauma center and Medic One headquarters, is located just east of the project area on Ninth Avenue.

Several fire stations are located within or adjacent to the project area. Fire Station No. 10 is located adjacent to the south end of the project area on Fourth Avenue S. and S. Washington Street; it houses an engine company, a ladder unit, and an aid unit. The Fire Alarm Center and the City's Emergency Operations Center are co-located with Fire Station No. 10. Fire Station No. 5 is located on the waterfront, near the Seattle Ferry Terminal at Colman Dock; it is the base for both an engine and a fireboat. Fire Station No. 2 is located near the north end of the Battery Street Tunnel and houses one engine company, a ladder unit, a medic unit, and a reserve medic unit. In addition, Fire Stations No. 8, 14, and 25 are a short distance outside of the project area and may respond to an emergency in the project area if additional support is needed. The Fire Department Headquarters is also located near the project area on Second Avenue S. and S. Main Street.

Although no police stations are located within the project area, the West Precinct of the Seattle Police Department is located nearby at Eighth Avenue and Virginia Street. The operations center for Washington State Ferries is also located nearby at Third Avenue and Broad Street. Farther south along Alaskan Way, the Coast Guard has a facility where its rescue vessels and ocean-going vessels are docked.

Utilities

The area near the existing viaduct serves as a major utility corridor critical to providing services in Seattle. Potentially affected utilities within the study area are summarized in the following list:

- Wet vaults or regulators, which are underground structures used for water quality treatment, flow control, containment of discharges during fire suppression events, or control of diversions to the combined sewer outfalls.
- Water distribution mains (8- to 12-inch-diameter lines), large water feeder mains (16- to 48-inch-diameter lines), water services, and hydrants.
- Sanitary sewer mains (8- to 12-inch-diameter lines), large conveyances (16- to 48 inch-diameter, 60-inch-diameter, and larger), and manholes.
- Storm drainage and combined sewer facilities.
- Natural gas facilities including low-pressure, intermediate-pressure, and high-pressure mains, metering equipment, and valves.
- Low-pressure and high-pressure steam lines, valves, and vaults.
- Telephone service and fiber-optic cable lines.
- Electrical distribution and transmission lines. The electrical distribution network includes overhead and underground primary lines, secondary lines, individual lines, manholes, vaults, transformers, switches, and ducts. The transmission facilities include ducts, vaults, and high-voltage, pressurized dielectric underground cable.
- Electrical systems (underground and overhead wire) serving transit systems.

23 Is air quality a concern in the project area?

Air quality in the immediate project area is a concern due to the dense urban environment and high volume of traffic that emit pollutants such as ozone, nitrogen dioxide, particulate matter ($PM_{2.5}$ and PM_{10}), and carbon monoxide. Air quality in the area is regulated by the U.S. Environmental Protection Agency (EPA), Washington

Appendix K, Public Services and Utilities Discipline Report

Additional information about public services and utilities in the project area are provided in *Appendix K*, Chapter 4.

Appendix M, Air Discipline Report

Additional information about air quality in the project area is provided in *Appendix M*, Chapter 4.

What is a maintenance area?

In a maintenance area, the air quality standard for a specific pollutant such as carbon monoxide or PM_{10} was not met previously, but the standard has since been met.

State Department of Ecology (Ecology), and the Puget Sound Clean Air Agency. Air quality data were compiled using Ecology and EPA AirData databases for 2008, the latest calendar year for which these data are available.

The project area is located entirely in a carbon monoxide maintenance area. Just south of the project area is a PM_{10} maintenance area. These maintenance areas were previously not in compliance with the National Ambient Air Quality Standards, established by EPA under the Clean Air Act, but since then they have met the standards (demonstrated attainment) and are classified as maintenance areas. Monitored levels for carbon monoxide do not exceed national and state ambient air quality standards in the project area. The project area is designated in attainment for all other EPA-regulated pollutants, including $PM_{2.5}$.

Regional trends show that carbon monoxide concentrations have decreased considerably over the last 20 years. Technological advances in control of motor vehicle emissions have caused pollutant levels to drop, even though the numbers of vehicles and VMT have increased.

24 Are greenhouse gas emissions a concern in the region?
Human-caused greenhouse gas emissions are a concern in the region because they contribute to global warming and climate change. In Washington State, transportation-related emissions from cars, trucks, planes, and ships account for nearly half of the state's total greenhouse gas emissions.[16] Vehicles are the most common source of greenhouse gas emissions in the area.

To help reduce greenhouse gas emissions in Washington State, Governor Gregoire issued EO 07-02 in February 2007, which established the following goals:

- By 2020, reduce greenhouse gas emissions to 1990 levels

- By 2035, reduce greenhouse gas emissions to 25 percent below 1990 levels

- By 2050, reduce emissions to 50 percent below 1990 levels or 70 percent below our expected emissions that year

In 2008, Washington State set greenhouse gas reduction goals (Revised Code of Washington [RCW] 70.235.020) and VMT benchmarks (RCW 47.01.440) in law:

- Reduce statewide greenhouse gas emissions to 1990 levels by 2020, 25 percent below 1990 levels by 2035, and 50 percent below 1990 levels by 2050 (from a baseline of 94.6 million metric tons of carbon dioxide equivalent).

- Reduce per capita VMT from a business-as-usual projection by 18 percent by 2020, 30 percent by 2035, and 50 percent by 2050.

In 2009, the Washington State Legislature passed laws to encourage electric vehicles, create a sustainable energy trust, set performance standards for greenhouse gas emissions, improve energy efficiency, establish a climate change/land use work group, and support commute trip reduction for state agencies. Governor Gregoire issued an executive order (EO 09-05)[17] that directs the state to do additional work to reduce greenhouse gas emissions and VMT and to work with larger metropolitan transportation organizations to adopt regional transportation plans that would achieve statutory benchmarks. WSDOT is working closely with Puget Sound Regional Council and other government jurisdictions in the region to address these important issues. In 2009, WSDOT developed Guidance for Project-Level Greenhouse Gas and Climate Change Evaluations.[18] WSDOT's current guidance is compatible with the proposed national approach from the White House Council on Environmental Quality.[19] In addition, WSDOT serves on the advisory team reviewing Ecology's draft guidance on addressing climate change and greenhouse gas emissions for the State Environmental Policy Act (SEPA).

How did the project consider future conditions related to climate change?
WSDOT acknowledges that effects of climate change may alter the function, sizing, and operations of our facilities. Therefore, in addition to mitigating greenhouse gas emissions, WSDOT must also ensure that its transportation facilities can adapt to the changing climate.

Pacific Northwest climate projections are available from the Climate Impacts Group at the University of Washington: http://cses.washington.edu/cig/fpt/ccscenarios.shtml.

Washington State is likely to experience over the next 50 years:

- Increased temperature (extreme heat events, changes in air quality, glacial melting)

- Changes in volume and timing of precipitation (reduced snow pack, increased erosion, flooding)

- Ecological effects of a changing climate (spread of disease, altered plant and animal habitats, negative impacts on human health and well-being)

- Sea-level rise, coastal erosion, salt water intrusion

The project team considered the information on climate change with regard to preliminary design as well as the potential for changes in the surrounding natural environment.

To ensure that our facilities can function as intended for their planned 50-, 70-, or 100-year lifespan, they should be designed to perform under the variable conditions expected as a result of climate change. The standard design for this project has incorporated features that will provide greater resilience and function with the potential effects brought on by climate change. For example, drainage culverts may need to be resized to accommodate more intense rainfall events or increased flows due to more rapid glacial thawing.

What are greenhouse gases?

Climate-changing greenhouse gases generally include carbon dioxide (CO_2), methane, nitrous oxide, and fluorinated gases.

The greenhouse gases often associated with transportation sources are CO_2, methane, and nitrous oxide (found in dentists' offices as the anesthetic laughing gas). CO_2 makes up the bulk of vehicle emissions. Any process that burns fossil fuel releases CO_2 into the air. Vehicles are a significant source of greenhouse gas emissions and contribute to climate change primarily through the burning of gasoline and diesel fuels.

What is climate change?

Climate change is the term used to describe the changes to weather patterns that are currently being seen on a global level. These patterns are measured by temperature, rainfall, wind patterns, ocean currents, and many other indicators.

The project's design takes into account current research on projected sea level rise over the 100-year design life of the facility.

16 CTED 2008.

17 Ecology 2009a.

18 WSDOT 2009.

19 CEQ 2010.

WSDOT is working with other state agencies to develop the state's climate response strategy (see details on line at http://www.ecy.wa.gov/climatechange/adaptation.htm).

25 How much energy does transportation in the region use?

Transportation currently accounts for approximately 30 percent of the energy consumed in Washington. (By comparison, the residential sector consumes 25 percent, commercial 19 percent, and industrial 26 percent.) Washington's transportation energy consumption is approximately 322 million British thermal units (BTU) per person, which is below the national average of 333 million BTU.[20] Petroleum (i.e., gasoline, diesel fuel, and jet fuel) is the predominant source of energy for transportation in Washington State.

Seattle's carbon footprint was about 8 percent smaller in 2005 than it was in 1990, in part due to energy conservation efforts and use of cleaner-burning fuels by households and businesses.[21] The emissions from transportation sources (road, rail, marine, and air), which make up roughly 60 percent of Seattle's carbon footprint, have increased about 3 percent compared to 1990. Emissions from on-road transportation (trucks, buses, vans, cars, and light-duty trucks), which make up roughly 40 percent of Seattle's carbon footprint, were up roughly 5 percent from 1990 levels.

26 What are water quality conditions in the Duwamish River, Elliott Bay, and Lake Union?

Water bodies near the project area include the Duwamish River, Elliott Bay, and Lake Union. Development and urban activities in Seattle have degraded the quality of water in nearby water bodies for more than 100 years. Buildings and impervious surfaces, such as concrete and asphalt, cover nearly 100 percent of the project area, preventing infiltration into the soils and contributing to non-point source pollution contained in runoff. Pollutant sources include discharges from industrial facilities, combined sewer overflows, spills, contaminated groundwater, and urban storm drains.[22] Highway runoff in the Seattle area is also a measurable source of suspended solids, metals (zinc and copper), and other pollutants.[23]

Most of the stormwater runoff from the project area discharges either directly to Elliott Bay or to the combined sewer system, which discharges to Puget Sound after being treated at the West Point Treatment Plant located in northwest Seattle. A smaller portion of the project area discharges to Lake Union.

Duwamish River

The Duwamish River originates where the Green and Black Rivers merge in Tukwila, and it flows approximately 13 miles to Elliott Bay. The Duwamish River is the primary freshwater source to Elliott Bay. The mouth of the Duwamish River is divided by Harbor Island into two channels, the East and West Waterways. The Duwamish River's East Waterway is located adjacent to the southern portion of the project area and carries between 20 and 30 percent of the river's flow, depending on the tidal conditions.

Ecology has designated the following uses for protection in the Duwamish River: salmon and trout rearing, supply for industrial water, agricultural water, livestock watering, wildlife habitat, fishing, commerce and navigation, boating, and aesthetics (Washington Administrative Code [WAC] 173-201A).

The Duwamish Waterway is included on the 303(d) list for exceeding the criteria for fecal coliform bacteria and dissolved oxygen.[24] The Duwamish Waterway contains high concentrations of various metals and chemical compounds that are considered pollutants. A portion of the Duwamish Waterway near the proposed construction staging areas is also undergoing cleanup as a Superfund site under the Comprehensive Environmental Response, Compensation, and Liability Act.

Elliott Bay

Elliott Bay is an estuary adjacent to the project area. Its primary fresh water source is the Duwamish River. Along the downtown Seattle waterfront, the Elliott Bay shoreline is relatively shallow.

Ecology has designated Elliott Bay for protection to support aquatic life such as salmon migration, rearing, and spawning and shellfish habitat. Additionally, Ecology has required protection for swimming and in-water recreation, wildlife habitat, fishing, boating, aesthetic enjoyment, commerce, and navigation. Elliott Bay is included on the Ecology 303(d) list for exceeding fecal coliform criteria.[24]

Puget Sound

Puget Sound is a large marine water body that covers approximately 900 square miles. Elliott Bay is the portion of Puget Sound within the project area and is on Ecology's 303(d) list. Ecology has designated the same uses for protection in Puget Sound as for Elliott Bay. The water quality of Puget Sound in the vicinity of the project is influenced by a deep-water outfall from the West Point Treatment Plant. The West Point Treatment Plant treats water from the combined drainage system that is a mixture of sewage and stormwater runoff.

Lake Union

Lake Union is located north of the project area. Only a small portion of the project area drains to the Lake Union watershed. The lake represents a transitional area between the fresh waters of Lake Washington and marine waters of Puget Sound. The water quality of Lake Union is influenced by freshwater flows coming from Lake Washington and from storm drains and combined sewer outfalls.

Ecology has designated Lake Union to be protected for core summer fish habitat, swimming and in-water recreational uses, water supply (domestic, industrial, agricultural, and stock), wildlife habitat, harvesting, commerce, navigation, boating, and aesthetic enjoyment (WAC 173-201A). Lake Union has been included on Ecology's 303(d) list for exceeding aldrin (a pesticide), fecal coliform, lead, and total phosphorus criteria.[24]

Appendix R, Energy Discipline Report

Additional information about energy use in the project area is provided in *Appendix R*, Chapter 4.

Appendix O, Surface Water Discipline Report

Additional information about surface water in the project area is provided in *Appendix O*, Chapter 4.

What is the 303(d) list?

The EPA requires Ecology to prepare the 303(d) list to periodically assess the quality of water in the state by collecting data. Based on this data, Ecology prepares a list of all waters in which beneficial uses, such as salmon habitat and recreational uses, have been impaired due to poor water quality. Ecology then uses this list to develop plans to improve water quality. The 303(d) list is a requirement of the federal Clean Water Act (33 U.S.C. § 1313(d)).

20 EIA 2008.

21 City of Seattle 2008.

22 Ecology 1995.

23 Driscoll et al. 1990.

24 Ecology 2009b.

27 How is stormwater currently managed in the project area?

Stormwater runoff for over 58,000 acres in central Seattle is collected in a complex system of pipes that make up a combined sewer system for storm drainage and sanitary sewage. The combined sewer system normally operates by conveying flows to the West Point Treatment Plant for treatment and eventual discharge to Puget Sound. However, in heavy rain events, flows can exceed the treatment plant's capacity, leading to the direct discharge of a portion of the combined stormwater and sanitary sewage to nearby water bodies at designated combined sewer outfalls. This is one of the ways in which contaminants in stormwater runoff from the project area can discharge to local water bodies. Combined sewer outfalls and stormwater outfalls in the project area are shown in Exhibit 4-22.

In other parts of the project area, separate storm drains directly discharge stormwater (possibly containing runoff contaminants but presumably free of sanitary sewage) with only minimal treatment to local water bodies, including Elliott Bay, the Duwamish River, and Lake Union.

In the remaining project area, stormwater is collected in separate storm drains that divert water from smaller storms to the combined sewer while discharging other runoff directly to local water bodies. These storm drains also divert the first flush from larger storms to treatment facilities; this first flush tends to carry the most pollutants.

There are seven separate sub-basins that collect stormwater runoff along the viaduct. The configuration of systems is so localized and complicated that in some areas, the runoff from the viaduct itself and the surface street below are not managed in the same way. For example, runoff from the viaduct may discharge directly to Elliott Bay or to the combined sewer, while runoff from the surface street may by conveyed to the West Point Treatment Plant before being discharged.

When stormwater runoff from the project area discharges to local water bodies, it does so from 11 major and many smaller outfalls. Most of the discharge from the existing viaduct in the project area either drains to Puget Sound through the West Point Treatment Plant, or enters Elliott Bay via direct discharge to outfalls. Runoff from most of the northern portion of the project area is directed to the West Point Treatment Plant, though some of it discharges directly to Lake Union. In comparison to the overall watershed discharging to these water bodies, the project area is only about 0.01 percent of the total watershed area. For that reason, the quantity of pollutants from the runoff is very small when compared to the total quantities of pollutants discharged to local water bodies. However, the overall problem of polluted runoff entering local waters is an important issue.

To add to the complexity of the stormwater runoff and wastewater issues, drainage and sewerage ownership and operation responsibilities are split between King County and the City. Both jurisdictions have long-term plans for reducing direct discharges from combined sewer overflows, which would improve water quality.

28 What fish and wildlife species live in or near the project area?

Elliott Bay is adjacent to the project area. The shoreline adjacent to Elliott Bay and the project area has undergone substantial development, including the original construction of the existing seawall at a location seaward of the natural shoreline. No natural shoreline remains along the waterfront, from the Duwamish River mouth up the western side of Elliott Bay in downtown Seattle.

Despite these modifications, Elliott Bay supports a rich community of resident and transient fish species. Resident fish species commonly observed along the Seattle shoreline include surfperch, bay pipefish, shiner perch, sculpin, greenling, various flatfishes, and a limited number of lingcod.

Salmonid species listed under the federal Endangered Species Act (ESA) that occur in the project vicinity include Puget Sound Chinook salmon, steelhead, and bull trout. At times, the Seattle waterfront is a migration corridor and

Combined Sewer and Stormwater Outfalls

Appendix N, Wildlife, Fish, and Vegetation Discipline Report

Additional information about species in the project area is provided in *Appendix N*, Chapter 4.

ESA Species Potentially Occurring in the Project Vicinity

Threatened and endangered ESA species that may live in the project area include:

Fish
- Chinook salmon
- Steelhead
- Bull trout
- Pacific eulachon
- Canary rockfish
- Yelloweye rockfish
- Bocaccio

Birds
- Marbled murrelet

Mammals
- Killer whale
- Humpback whale
- Steller sea lion

Washington State Species of Concern Potentially Occurring in the Project Vicinity

Washington State species of concern that may live in the area include:

Fish
- Black rockfish
- Brown rockfish
- Canary rockfish
- China rockfish
- Copper rockfish
- Greenstripe rockfish
- Quillback rockfish
- Redstripe rockfish
- Tiger rockfish
- Widow rockfish
- Yellowtail rockfish
- Pacific cod
- Pacific hake
- Pacific herring
- River lamprey
- Walleye pollock

Birds
- Common loon
- Common murre
- Peregrine falcon
- Purple martin
- Western grebe
- Bald eagle
- Brandt's cormorant

Mammals
- Dall's porpoise
- Gray whale
- Harbor seal
- Pacific harbor porpoise
- California sea lion
- Townsend's beg-eared bat

rearing area for these species and other juvenile anadromous salmonids. Elliott Bay is also expected to support the three Georgia Basin rockfish species recently listed under the ESA (bocaccio, canary rockfish, and yelloweye rockfish).[25] While there are some references to the Pacific eulachon, which was also recently listed, occurring in Puget Sound, there are no known spawning populations, and individual fish have rarely been observed.[26]

The other ESA-listed species potentially occurring in the project vicinity are Steller sea lions, southern resident killer whales, humpback whales (unlikely to occur in Elliott Bay), and marbled murrelets. Steller sea lions have only occasionally been sighted in southern Puget Sound.[27] Killer whales commonly occur in Puget Sound but infrequently occur in Elliott Bay.[28] Marbled murrelets may occasionally occur in the general area;[29] however, it is unlikely that the marbled murrelets commonly forage along the Seattle shoreline in the vicinity of the project area because of the high levels of human activity. The closest known nesting area is in the Cascade Mountains, some 30 miles from the project area.[30] Species that have essential fish habitat in the Elliott Bay are Chinook salmon, English sole, starry flounder, rock sole, sand sole, Pacific sanddab, lingcod, rockfish, and spotted ratfish.

In addition to the ESA-listed species, a number of Washington State Species of Concern that are documented in King County could occur in the project vicinity (see sidebar).[31] While most of the project area currently drains to Elliott Bay, the northern portion of the area drains to Lake Union, which is part of the Lake Washington basin. More than 50 freshwater and anadromous fish species are found within the Lake Washington basin, including more than 20 nonnative freshwater species.[32, 33] In addition to the freshwater and anadromous species, some estuarine and marine species occur in Lake Union due to the saltwater intrusion through the Ballard Locks. Native freshwater species include northern pikeminnow, three-spine stickleback, peamouth chub, and sculpin; anadromous species include longfin smelt, river and Pacific lamprey, and various trout

Groundwater Movement
in the Project Area

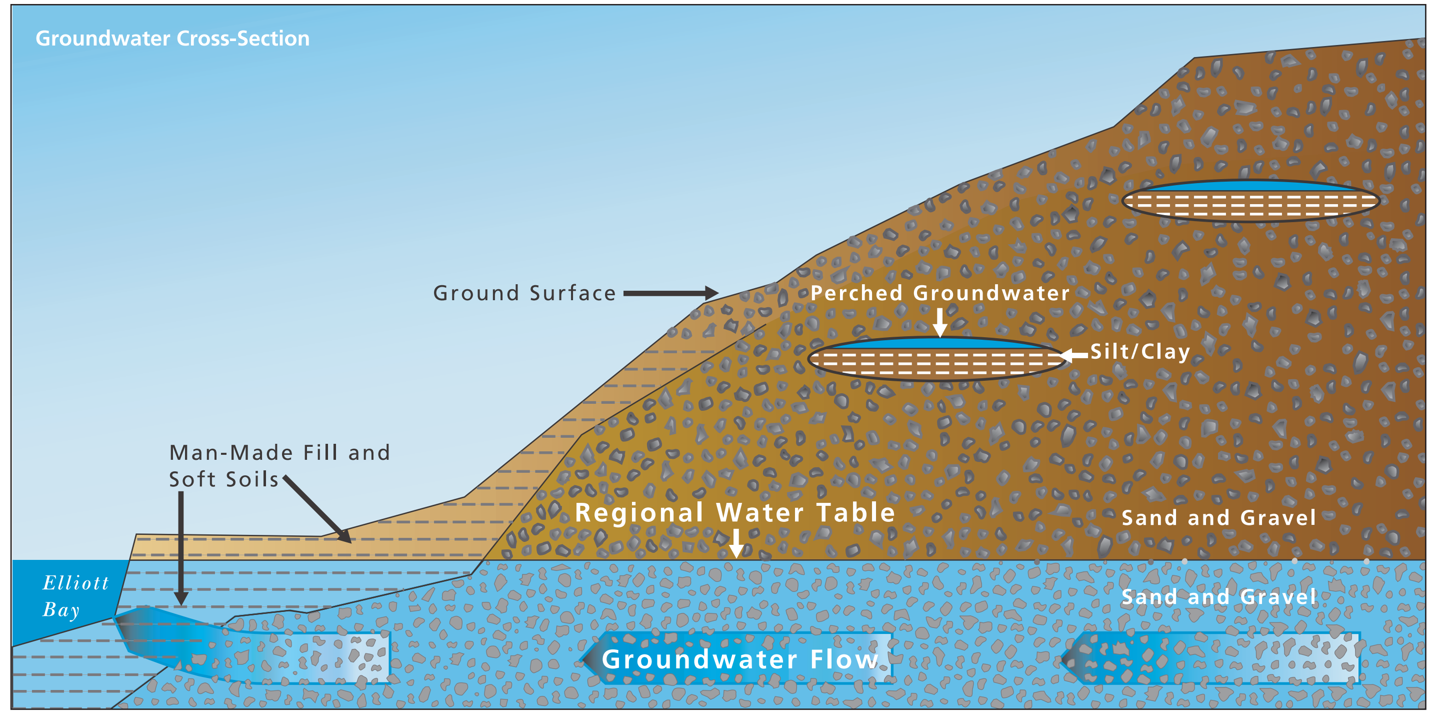


Exhibit 4-23

and salmon species; marine species include starry flounder, shiner perch, striped seaperch, and Pacific staghorn sculpin.[33] Nonnative species include yellow perch, black crappie, bluegill, and smallmouth and largemouth bass.[32] Priority Habitats and Species maps from the Washington Department of Fish and Wildlife (WDFW) indicate that the closest forage fish spawning is much more than 2 miles from the project area.[34] On land, there is no natural vegetation in the project area. The highly urban waterfront and downtown areas include a few trees and shrubs planted along the surface streets. The small amount of wildlife present in the area has adapted to human activity and a modified environment.

Birds that are commonly found in this urban environment, including robins, sparrows, and crows, generally feed on the ground and along the streets. Raptors such as osprey, peregrine falcon, and bald eagles have been observed along the project area, but they do not nest in the project area, other than one peregrine falcon nest on top of a building. Bald eagles were recently delisted as a threatened species under the ESA but are protected under the Bald and Golden Eagle Act. Bald eagles sometimes forage along the Seattle waterfront as well as other shorelines within the city, where they prey upon fish, waterfowl, and seabirds. The Seattle shoreline is not known as a wintering area for bald eagles. Waterfowl species that can be found along the Seattle waterfront include several types of gulls, loons, grebe, cormorant, and blue heron.

29 What are the groundwater conditions in the project area?

The flow of groundwater in the project area is affected by the soils it flows through, Puget Sound, and to a lesser extent by Lake Union on the north edge of the project area. Groundwater moves more easily through sand and gravels, while soils that contain silt and clay slow down groundwater movement. The line below which all of the space between soil particles is filled with groundwater is called the water table.

Appendix Q, Hazardous Materials Discipline Report

Additional information about hazardous materials in the project area and exhibits showing sites with documented and potential contaminant releases are provided in *Appendix Q*, Chapter 4. The discipline report also contains more information on each of the contaminants and their effects.

25 NMFS 2010a.

26 NMFS 2010b.

27 Jeffries, et al. 2000.

28 City of Seattle 2009b.

29 Li 2009.

30 USFWS 2009.

31 WDFW 2009b.

32 Warner and Fresh 1999.

33 Kerwin 2001.

34 WDFW 2009a.

The water table is generally flat, and the depth varies depending on the elevation of the ground surface. The water table near the south part of the project area and along the waterfront ranges between 8 to 12 feet below the ground surface within the fill soils. The depth to the water table increases to the north to about 170 feet near Lenora Street. North of Lenora Street, the depth of the water table decreases as the ground surface elevation decreases. The water table is about 90 to 100 feet below the ground surface near the Battery Street Tunnel and the north part of the project area. The water table becomes shallower as the ground surface dips downward toward Lake Union.

Groundwater conditions in the project area are highly variable due to the layering within the fine- and coarse-grained soils. In general, coarse-grained sands and gravels are the primary water-bearing soils in this area. Fine-grained sediments (silt and clay) overlie these deposits. In some areas, small zones of shallow groundwater perch on top of the fine-grained soils, as shown in Exhibit 4-23. Between and beneath these perched water-bearing zones, the fine-grained soils are generally unsaturated down to the underlying water table.

30 Are there any potentially contaminated sites in the project area?

Past industrial and commercial activities, railroad operations, and hazardous materials in the fill may have contaminated soil and/or groundwater within the project area. Contaminated sites pose a potential risk for project costs and complications, both in real estate acquisition and construction.

There are six general types of contaminants found in the project area:

- **Oil –** mid- to heavy-range petroleum hydrocarbons
- **Gasoline**
- **Metals –** such as arsenic, chromium, lead, and mercury
- **Solvents –** such as trichloroethylene and tetrachloroethylene
- **Polychlorinated biphenyls (PCBs)**
- **Polycyclic aromatic hydrocarbon (PAHs) –** may be present in fill and treated timbers

The area between S. Royal Brougham Way and S. King Street has primarily been industrial. Industries in this area have included metal works, foundries and plating operations, machine shops, warehouses, fueling facilities, and railroad operations. In the late 1800s, S. King Street terminated at a coal wharf, which also housed machine shops and a roundhouse for railcars. Metal works, metal plating shops, machine shops, and foundries were located on wharves both north and south of the S. King Street Wharf throughout the early 1900s. The most likely contaminants from industrial operations include metals, solvents, and petroleum products. Also, the area is underlain by fill that was placed in the early 1900s, which covered and incorporated timber and debris that previously had been used in the construction of piers, wharves, and trestles and wood waste from Yesler's large sawmill. Based on historical information, the northern part of the south portal area is located near the former site of the large sawmill. It is likely that there were large deposits of floating wood, piles for pier structures, and wood debris present in this area before fill was placed in the area around 1900. This wood waste is likely to be encountered in the south portal area. Other common contaminants in this fill include petroleum constituents and metals. In addition, some of the buried piles and timbers were probably treated with creosote, which likely has leached into adjoining soil and groundwater. Lubricating oil associated with railroad operations may also be encountered in the fill soils.

The project area is characterized by commercial activity that includes dry cleaners, printers, lithographers, automobile repair, gas stations, and commercial residential properties such as hotels and apartments. In the last 20 years, condominiums have been constructed at the north end of the project area, mostly displacing commercial uses. The area north of Denny Way is also a commercial area; primary businesses in this area are automobile repair shops, gas stations, and motels.

The north portion of the project area (Battery Street Tunnel to Roy Street) was shaped by the leveling of Denny Hill. Commercial and light industrial businesses developed rapidly after the regrading. In the 1930s through the 1950s, there were approximately 80 gas stations/repair shops and several automobile dealerships in this area, most of which have since been converted to other uses. Several former dry cleaners and metal work operations were also identified in the historical records for this area. These businesses are no longer in operation, and property uses have changed. Consequently, there is a high potential to encounter petroleum in soil and groundwater. Dry cleaning solvents may also be encountered.

Because there has been only limited redevelopment along the proposed alignments, many of the buildings were constructed prior to recent laws restricting the use of hazardous building materials. Therefore, asbestos-containing material and lead-based paint should be anticipated in many of the buildings in the area. Asbestos-containing material may also be present and lead-based paint is known to be present on some of the components of the existing viaduct, which would be demolished as part of the project.