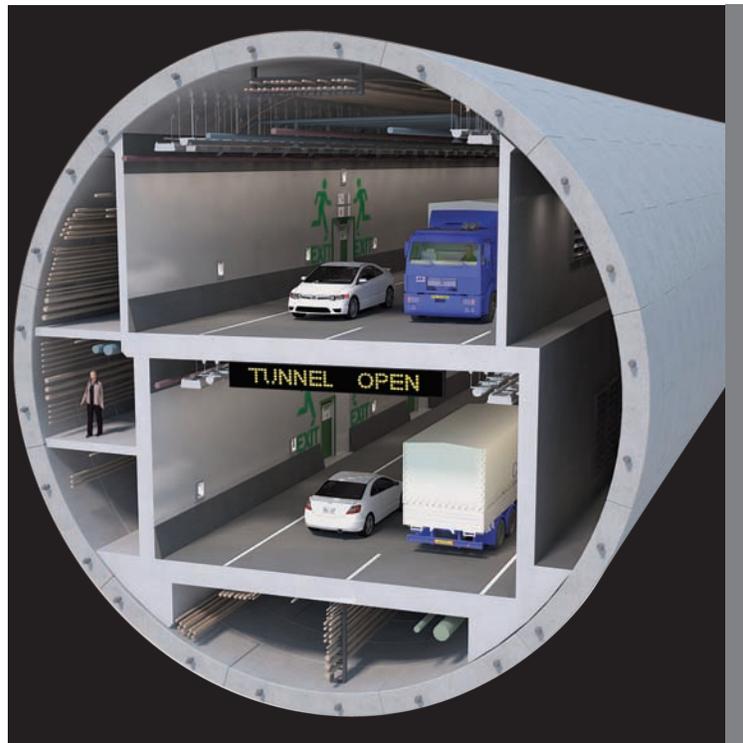


ALASKAN WAY VIADUCT REPLACEMENT PROJECT

2010 Supplemental Draft Environmental Impact Statement

APPENDIX L Economics Discipline Report



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Alaskan Way Viaduct Replacement Project

Supplemental Draft EIS

Economics Discipline Report

The Alaskan Way Viaduct Replacement Project is a joint effort between the Federal Highway Administration (FHWA), the Washington State Department of Transportation (WSDOT), and the City of Seattle. To conduct this project, WSDOT contracted with:

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ACRONYMS AND ABBREVIATIONS

B&O	business and occupation
BEA	U.S. Department of Commerce Bureau of Economic Analysis
BINMIC	Ballard Interbay Northend Manufacturing and Industrial Center
CBD	Central Business District
CEVP®	Cost Estimate Validation Process
City	City of Seattle
EIS	environmental impact statement
FAZ	forecast analysis zone
FHWA	Federal Highway Administration
HOV	high-occupancy vehicle
I-5	Interstate 5
I-90	Interstate 90
MIC	Manufacturing and Industrial Center
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
O&M	operations and maintenance
Program	Alaskan Way Viaduct and Seawall Replacement Program
project	Alaskan Way Viaduct Replacement Project
PSRC	Puget Sound Regional Council
RIMS II	Regional Input-Output Modeling System
SDOT	Seattle Department of Transportation
Sea-Tac	Seattle-Tacoma International (Airport)
SEPA	State Environmental Policy Act
SMC	Seattle Municipal Code
SODO	South of Downtown
SR	State Route
TBM	tunnel boring machine
VMT	vehicle miles of travel
WOSCA	Washington-Oregon Shippers Cooperative Association
WSDOT	Washington State Department of Transportation

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Chapter 1 INTRODUCTION AND SUMMARY

1.1 Introduction

This discipline report evaluates the Bored Tunnel Alternative, the new alternative under consideration for replacing the Alaskan Way Viaduct. This report and the Alaskan Way Viaduct Replacement Project Supplemental Draft Environmental Impact Statement (EIS) that it supports are intended to provide new information and updated analyses to those presented in the March 2004 Alaskan Way Viaduct and Seawall Replacement Project Draft EIS and the July 2006 Alaskan Way Viaduct and Seawall Replacement Project Supplemental Draft EIS. The discipline reports present the detailed technical analyses of existing conditions and predicted effects of the Bored Tunnel Alternative. The results of these analyses are presented in the main volume of the Supplemental Draft EIS.

The Federal Highway Administration (FHWA) is the lead federal agency for this project, primarily responsible for compliance with the National Environmental Policy Act (NEPA) and other federal regulations, as well as distributing federal funding. As part of the NEPA process, FHWA is also responsible for selecting the preferred alternative. FHWA will base their decision on the information evaluated during the environmental review process, including information contained within the Supplemental Draft EIS and the subsequent Final EIS. FHWA can then issue their NEPA decision, called the Record of Decision (ROD).

The 2004 Draft EIS (WSDOT et al. 2004) evaluated five Build Alternatives and a No Build Alternative. In December 2004, the project proponents identified the cut-and-cover Tunnel Alternative as the preferred alternative and carried the Rebuild Alternative forward for analysis as well. The 2006 Supplemental Draft EIS (WSDOT et al. 2006) analyzed two alternatives—a refined cut-and-cover Tunnel Alternative and a modified rebuild alternative called the Elevated Structure Alternative. After continued public and agency debate, Governor Gregoire called for an advisory vote to be held in the city of Seattle. The March 2007 ballot included an elevated alternative and a surface-tunnel hybrid alternative. The citizens voted down both alternatives.

Following this election, the lead agencies committed to a collaborative process to find a solution to replace the viaduct along Seattle’s central waterfront. This Partnership Process is described in Appendix S, the Project History Report. In January 2009, Governor Gregoire, King County Executive Sims, and Seattle Mayor Nickels announced that the agencies had reached a consensus and recommended replacing the aging viaduct with a bored tunnel.

The environmental review process for the Alaskan Way Viaduct Replacement Project (the project) builds on the five Build Alternatives evaluated in the 2004 Draft EIS and the two Build Alternatives evaluated in the 2006 Supplemental Draft EIS. It also incorporates the work done during the Partnership Process. The bored tunnel was not studied as part of the previous environmental review process, and so it becomes the eighth alternative to be evaluated in detail.

The Bored Tunnel Alternative analyzed in this discipline report and in the Supplemental Draft EIS has been evaluated both quantitatively and qualitatively. The Bored Tunnel Alternative includes replacing State Route (SR) 99 with a bored tunnel and associated improvements, such as relocating utilities located on or under the viaduct, removing the viaduct, decommissioning the Battery Street Tunnel, and making improvements to the surface streets in the tunnel's south and north portal areas.

Improvements at the south portal area include full northbound and southbound access to and from SR 99 between S. Royal Brougham Way and S. King Street. Alaskan Way S. would be reconfigured with three lanes in each direction. Two options are being considered for new cross streets that would intersect with Alaskan Way S.:

- New Dearborn Intersection – Alaskan Way S. would have one new intersection and cross street at S. Dearborn Street.
- New Dearborn and Charles Intersections – Alaskan Way S. would have two new intersections and cross streets at S. Charles Street and S. Dearborn Street.

Improvements at the north portal area would include restoring Aurora Avenue and providing full northbound and southbound access to and from SR 99 near Harrison and Republican Streets. Aurora Avenue would be restored to grade level between Denny Way and John Street, and John, Thomas, and Harrison Streets would be connected as cross streets. This rebuilt section of Aurora Avenue would connect to the new SR 99 alignment via the ramps at Harrison Street. Mercer Street would be widened for two-way operation from Fifth Avenue N. to Dexter Avenue N. Broad Street would be filled and closed between Ninth Avenue N. and Taylor Avenue N. Two options are being considered for Sixth Avenue N. and the southbound on-ramp:

- The Curved Sixth Avenue option proposes to build a new roadway that would extend Sixth Avenue N. in a curved formation between Harrison and Mercer Streets. The new roadway would have a signalized intersection at Republican Street.
- The Straight Sixth Avenue option proposes to build a new roadway that would extend Sixth Avenue N. from Harrison Street to Mercer Street in a typical grid formation. The new roadway would have signalized intersections at Republican and Mercer Streets.

For these project elements, the analyses of effects and benefits have been quantified with supporting studies, and the resulting data are found in the discipline reports (Appendices A through R). These analyses focus on assessing the Bored Tunnel Alternative's potential effects for both construction and operation, and consider appropriate mitigation measures that could be employed. The Viaduct Closed (No Build Alternative) is also analyzed.

The Alaskan Way Viaduct Replacement Project is one of several independent projects that improve safety and mobility along SR 99 and the Seattle waterfront from the South of Downtown (SODO) area to Seattle Center. Collectively, these individual projects are often referred to as the Alaskan Way Viaduct and Seawall Replacement Program (the Program). This Supplemental Draft EIS evaluates the cumulative effects of all projects in the Program; however, direct and indirect environmental effects of these independent projects will be considered separately in independent environmental documents. This collection of independent projects is categorized into four groups: roadway elements, non-roadway elements, projects under construction, and completed projects.

Roadway Elements

- Alaskan Way Surface Street Improvements
- Elliott/Western Connector
- Mercer West Project (Mercer Street improvements from Fifth Avenue N. to Elliott Avenue)

Non-Roadway Elements

- First Avenue Streetcar Evaluation
- Transit Enhancements
- Elliott Bay Seawall Project
- Alaskan Way Promenade/Public Space

Projects Under Construction

- S. Holgate Street to S. King Street Viaduct Replacement
- Transportation Improvements to Minimize Traffic Effects During Construction

Completed Projects

- SR 99 Yesler Way Vicinity Foundation Stabilization (Column Safety Repairs)
- S. Massachusetts Street to Railroad Way S. Electrical Line Relocation Project (Electrical Line Relocation Along the Viaduct's South End)

1.2 Summary

This report describes the existing economic conditions, effects, and mitigation related to the construction and operation of the Bored Tunnel Alternative. This discipline report includes the following chapters.

Chapter 2 describes the methodology used for the economic analysis and preparation of this discipline report.

Chapter 3 describes the studies and coordination that contributed to the economic analysis and preparation of this report.

Chapter 4 describes the most current economic conditions of the affected environment. The information is often described at three levels: local economic conditions of neighborhoods, districts, and the city; regional economic conditions of King County and, in some instances, Pierce and Snohomish Counties; and statewide economic conditions.

Chapter 5 describes the operational effects, mitigation, and benefits of the Bored Tunnel Alternative as compared to the current conditions detailed in Chapter 4. Specific effects of the Bored Tunnel Alternative are described in five sections: south portal, bored tunnel, north portal, viaduct removal, and operations and maintenance (O&M) costs of the entire alternative.

Chapter 6 describes the Bored Tunnel Alternative's construction effects on Seattle's economy and presents possible mitigation strategies developed with input from the Washington State Department of Transportation (WSDOT).

Chapter 7 describes the Bored Tunnel Alternative's cumulative effects on Seattle's economic condition.

Chapter 8 lists the references used to prepare this report.

Attachment A describes the Regional Input-Output Modeling System (RIMS II) model used to analyze effects that would be attributed to project construction, as measured by increases in regional and state activity, employment, and associated job earnings.

Attachment B describes the cumulative effects analysis.

The following sections summarize the key findings of this report.

1.2.1 Affected Environment

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. The county is a leading global center for several emerging industries: aerospace, biotechnology, clean technology, information technology, and international trade and logistics (CTED 2009). To support this economy,

transportation infrastructure in this area includes two transcontinental railroads, extensive nationwide trucking capacity, three interstate highways, dozens of state highways, a ferry system, a world-class port, and an international airport.

Tourism is a major industry for Washington State and is a critical component of Seattle's economy, particularly in the study area. According to the City of Seattle (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." (City of Seattle 2008)

The study area for economic effects consists of an area of direct effects during construction, as well as a broader geographic area. The area of direct effects extends one city block around all sides of the portal construction areas (north and south) and one block on either side of the existing viaduct alignment; it includes all access ramps and all surface street modifications. Regional economic benefits for the economic multipliers associated with construction are considered to be at the Puget Sound regional level and at the state level. Regional economic effects associated with traffic effects from construction activity are evaluated at the neighborhood, district, or industrial area level. Operational economic benefits and effects are assessed as they relate to the economic health of Seattle and the Puget Sound region.

Established Business Districts

The study area is located within or near several retail/commercial centers, manufacturing/industrial centers, and urban centers. These districts and centers include the Ballard Interbay Northend Manufacturing and Industrial Center (BINMIC), the Greater Duwamish Manufacturing and Industrial Center (MIC), the International District, Pike Place Market Historic District, the Pioneer Square Historic District, the Seattle Central Business District (CBD), Seattle Center, the South Lake Union Urban Center, the Uptown Urban Center, central waterfront, and Westlake Center.

Employment

The number of jobs in the King-Kitsap-Pierce-Snohomish County region has nearly doubled over the last three decades, with an increasing percentage of jobs gained in the services industries. Most of the employment in the Seattle CBD and the Seattle Central area (see Exhibit 4-3 for a map of forecast analysis zones, including Seattle Central) is in the service sector (55.6 to 60.0 percent), the percentage being substantially higher than the regional, King County, and Seattle average of 38.9 percent.

Unemployment rates within the region have historically been lower than the statewide average. In 2009, approximately 8.0 percent of King County's civilian

labor force was unemployed, compared with the average statewide unemployment of 9.0 percent (LMEA 2009).

Parking Inventory

Parking is categorized by on-street and off-street parking throughout the study area. The available inventory of on-street parking provided by the City is quantified by the number of paid parking spaces, which is the predominant on-street parking control. According to the Seattle Department of Transportation (SDOT) Parking Strategic Advisor, there are more than 13,500 paid on-street parking spaces citywide. About 55 percent (or about 7,400) of these spaces are in the Seattle CBD (bounded by Denny Way, Interstate 5 (I-5), S. Royal Brougham Way, and Elliott Bay). These are a portion of the nearly 26,000 total parking spaces within the Seattle CBD. The total number of spaces in paid service at any time fluctuates somewhat depending on construction, temporary no-parking zones, and other measures that remove curb-space from use; however, the average daily occupancy rate for off-street parking within the Seattle CBD is 70.1 percent (PSRC 2006b).

State and Local Government Revenues

The state of Washington and the City of Seattle rely on a variety of taxes to fund state and local government programs. These taxes include a combined state and local sales and use tax; business and occupation (B&O) tax; public utility tax; property tax; and several other excise, real estate, and estate taxes.

The combined state and local tax rate for the study area is 9.5 percent, which also includes a Regional Transit Authority tax. For the City's endorsed 2010 budget, retail sales tax revenues account for \$156.6 million, which is almost 21 percent of the General Subfund Revenue (City of Seattle 2009d). Most businesses operating in the state are subject to the B&O tax. The B&O tax is typically assessed on gross income, proceeds of sales, or value of doing business.

Real and personal property is subject to property tax. Within King County, property taxes account for 50 percent of the total taxes collected as revenue (King County Budget Office 2009). Property tax revenues in the City's endorsed 2010 budget account for \$251.1 million, which is slightly more than one-third of the General Subfund Revenue (City of Seattle 2009d).

Urban Mobility and the Cost of Congestion

Data on traffic congestion and the cost of congestion as it relates to vehicle mobility in Seattle and other urban areas are compiled from the Texas Transportation Institute's 2009 *Urban Mobility Study* (TTI 2009b) for the following congestion measures:

- Annual delay – person hours
- Number of “rush hours” – time when system has congestion

- Amount of congested travel – percent of peak vehicle miles of travel (VMT)
- Total annual congestion cost; annual congestion cost per peak hour road traveler
- Annual congestion cost per person

The costs for travelers associated with congestion in Seattle have increased year after year. However, Seattle has seen a slowing trend, especially in the beginning of this decade, whereas both large and very large urban areas have seen steady increases, particularly for annual congestion cost per peak hour road traveler and per person.

Ferry and Cruise Ship Facilities

Five areas of the central waterfront are used for ferry and cruise ship operations: The Terminal 91 Cruise Facility, Seattle Ferry Terminal at Colman Dock (Pier 50/52), Pier 66/Bell Street Cruise Terminal, Argosy Cruises/Piers 55 and 56, and Pier 69/*Victoria Clipper*. In 2008, the Port of Seattle hosted 886,039 cruise ship passengers and 210 cruise ship vessel calls (Port of Seattle 2009a).

Inventory of Existing Businesses

The environmental team inventoried businesses within the area of direct effects by pedestrian reconnaissance. The area of direct effects for the inventory includes businesses within one block of proposed changes to existing facilities or proposed new facilities. For this discipline report, approximately 1,040 businesses could be directly affected by the project.

Businesses operating in commercial office space accounted for more than half (59.3 percent) of the businesses, while commercial retail accounted for 13.5 percent of the businesses. “Other service” accounted for 8.7 percent of businesses; almost half (47.1 percent) of these “other service” businesses were involved in food service as opposed to retail grocery. “Other” represented 8.3 percent of the businesses, with the majority identified as parking (14.2 percent). Residential multi-family¹ use represented 8.2 percent of the businesses. Government service² represented only 2 percent of the businesses.

¹ Residential multi-family was included as a business to capture individuals employed for property management.

² Government service, while not a for-profit business, still operates in a business-like manner and was included in this inventory. Government service includes municipal government offices and social service agencies.

Most (79.4 percent) of the businesses were estimated to be small (fewer than 20 employees). Medium-sized businesses (20 to 100 employees) accounted for 14.7 percent of the businesses. The remaining businesses were divided between large businesses (more than 100 employees) at 1.3 percent and vacant businesses (no discernable business activity) at 4.5 percent.

The majority of businesses (68.6 percent) in the area of direct effects had neither on-site nor readily identifiable off-street parking for customers and employees. More than a quarter of all businesses (25.9 percent) provided on-site parking for employees and customers. The remainder had directly identifiable off-street parking (5.5 percent).

1.2.2 Operational Effects, Mitigation, and Benefits

Viaduct Closed (No Build Alternative)

The Viaduct Closed (No Build Alternative) would close SR 99 between S. King Street and the south portal of the Battery Street Tunnel. All vehicles that would have used SR 99 would either navigate the Seattle surface streets to their final destination or take S. Royal Brougham Way to I-5 and continue north.

Two scenarios were evaluated as part of the Viaduct Closed (No Build Alternative). Scenario 1 would involve an unplanned closure of the viaduct for some structural deficiency, weakness, or damage due to a smaller earthquake event. The loss of the viaduct could result in a substantial increase in traffic volumes on the surface street network and on I-5, as these roadways would have to absorb the bulk of the north-south traffic that previously used the viaduct. The flow of goods and vehicles through this area would be disrupted. Depending on the severity of the damage, all use of the roadway beneath the viaduct, including parking, may be taken out of service if the structure is isolated from all access for public safety reasons. Transportation agencies would then be forced to deal with this closure as a crisis. This response necessarily would occur be implemented with limited timelines and resources.

Scenario 2 would involve catastrophic failure and collapse of the viaduct. If this occurred, a number of the waterfront and Port of Seattle facilities may be rendered unusable due to the resulting collapse of piers and buildings. Collateral damage to buildings and railroad facilities within and adjacent to the viaduct may occur due to falling aerial structures. Complete dismantling and removal of the entire collapsed structure would be required before access to the waterfront and use of the roadway beneath the elevated structure could be restored. The loss of the viaduct could result in a substantial increase of traffic volumes on the surface street network as well as I-5, as these roadways would have to absorb the bulk of the north-south traffic that previously used the viaduct. The movement of goods and vehicles through this area would be severely curtailed even after removal of

the collapsed structure. In addition, serious personal injuries or death to people working and visiting the area could occur during the viaduct collapse.

Bored Tunnel Alternative

South Portal

The Bored Tunnel Alternative would result in enhanced mobility to activity centers in both the south and north portal areas and beyond, particularly to the SODO commercial and business district and the stadium area.

Overall, the infrastructure improvements within the south portal area would improve truck freight mobility and vehicle and pedestrian connections. Two options are under consideration for several local street connections in the south portal: one new intersection and cross street at S. Dearborn Street, or two new intersections and cross streets at S. Charles Street and S. Dearborn Street. These improvements would provide improved business efficiencies due to increased circulation near the project area.

Construction within the south portal area would remove approximately 110 of the existing 190 short- and long-term on-street parking spaces. If this estimate holds true, approximately \$726,000 in parking revenue would be lost each year from Seattle's General Fund.

Project improvements within the south portal area would require two full and three partial property acquisitions. The economic effect of full acquisition of two parcels would be their permanent conversion from private to public ownership, which would remove them from the taxable land base. The total amount of non-exempt (taxable) land to be fully acquired for the south portal is approximately 173,200 square feet (about 4 acres). Consequently, King County and the state of Washington would lose the ability to collect approximately \$189,300 from properties that currently pay annual property taxes. In addition to the economic effect associated with the loss of property tax revenue, the loss of parcels with buildings would permanently displace approximately 25 workers.

After construction, WSDOT could sell the parcels that were either fully or partially acquired and are not part of the permanent roadway right-of-way as surplus property and return them to private ownership. Parcels returned to private ownership would be subject to property taxes and could provide opportunities as replacement properties for displaced businesses, allowing owners to remain in the community. Some remnant parcels, however, may not be sold and redeveloped after construction because of potential access constraints resulting from the proposed roadway changes under the Bored Tunnel Alternative.

Bored Tunnel

The bored tunnel would provide downtown access only at the south and north portals; the on- and off-ramps at Columbia and Seneca Streets, respectively, that currently provide direct downtown access would no longer be available. Some vehicles destined for the central and northern portions of downtown would have to travel farther on arterial streets to access the ramps, but direct access to and from the south half of downtown, including the Financial District, would increase. Furthermore, the Bored Tunnel Alternative would contribute to local and regional mobility by providing drivers with an alternative to I-5 and Seattle's surface streets. A more in-depth discussion of mobility, including freight, is provided in Appendix C, Transportation Discipline Report.

Removal of the ramps at Columbia and Seneca Streets would improve pedestrian safety at these intersections with First Avenue. No properties would be acquired along this segment of the project alignment.

North Portal

Overall, the infrastructure improvements within the north portal area would improve truck freight mobility and vehicle and pedestrian connections. In turn, these benefits would improve business efficiencies due to the increased circulation near the project area. Two options are being considered for extending Sixth Avenue N. between Harrison Street and Mercer Street. The Curved Sixth Avenue option proposes to build a new roadway that would extend Sixth Avenue N. in a curved formation between Harrison and Mercer Streets. The Straight Sixth Avenue option proposes to build a new roadway that would extend Sixth Avenue N. from Harrison Street to Mercer Street in a typical grid formation. These two options would have similar effects on truck freight mobility and vehicle and pedestrian connections.

Construction within the north portal area would remove about 210 of the existing 370 short- and long-term on-street parking spaces. If this estimate holds true, approximate \$1.4 million in parking revenue would be lost each year from Seattle's General Fund.

Improvements within the north portal area would require three full and three partial property acquisitions. The economic effect of full acquisition of three parcels would be their permanent conversion from private to public ownership, which would remove them from the taxable land base. The total amount of non-exempt (taxable) land to be fully acquired for the north portal is approximately 40,000 square feet (about 0.9 acre). Consequently, King County and the state of Washington would lose the ability to collect taxes from properties that paid approximately \$74,800 in annual property taxes. In addition to the economic

effect associated with the loss of property tax revenue, the loss of parcels with buildings would permanently displace an estimated 119 workers.

After construction, WSDOT could sell those parcels that were either fully or partially acquired and that are not part of the permanent roadway right-of-way as surplus property and return them to private ownership. Parcels returned to private ownership would be subject to property taxes and could provide opportunities as replacement properties for displaced businesses, allowing owners to remain in the community. Some remnant parcels, however, may not be sold and redeveloped after construction because of potential access constraints resulting from the proposed roadway changes under the Bored Tunnel Alternative.

Viaduct Removal

Viaduct demolition from S. King Street to the Battery Street Tunnel would begin after the bored tunnel is open for use. Viaduct removal would permanently improve the visual quality along Seattle's waterfront by eliminating the psychological, visual, and auditory barrier caused by the structure. This alternative would allow for easier recognition of individual businesses by vehicle occupants traveling on the Alaskan Way surface street but not while they are within the tunnel structure. Parking underneath the viaduct north of S. King Street would be removed prior to demolition of the viaduct; some parking near the existing viaduct may be reinstated after completion of the waterfront promenade and the new Alaskan Way surface street, but the quantity and timing of this reinstatement of parking are unknown at this time.

Operations and Maintenance Costs

The project would result in an increase in O&M costs compared to existing conditions. For the Bored Tunnel Alternative, the annual O&M expenditures would increase by \$2.6 million to \$4.1 million over the O&M costs for maintaining the existing viaduct.

1.2.3 Construction Effects and Mitigation

Construction expenditures would occur over a number of years, directly creating new demand for construction materials and labor. These direct effects would lead to indirect, or secondary effects, as the production of output by firms in other industries increases to supply the demand for inputs to the construction industry. Both the direct and indirect effects of construction expenditures typically cause firms in all industries to employ more workers to meet increases in demand. This increase in employment leads to induced effects because the additional wages and salaries paid to workers foster higher consumer spending.

1.2.4 Cumulative Effects

Effects From Other Roadway Elements of the Program

Other roadway elements of the Program include the Alaskan Way Surface Street Improvements, the Elliott/Western Connector, and the Mercer West Project. All of these projects would increase pedestrian accessibility within their project effect areas and would improve freight mobility once construction is completed.

During construction, most of the projects would contribute to increased noise, dust, and traffic congestion; cause temporary lane restrictions and loss of on-street parking and freight loading zones; and reconfigure access to businesses and restaurants in the general areas where construction would occur.

The capital improvements would have similar multiplier effects on the regional economy through the expenditure of construction funds, although the magnitude of those effects would be smaller than those resulting from construction of the bored tunnel.

Effects From Non-Roadway Elements of the Program

Non-roadway elements of the Program include the Elliott Bay Seawall Project, Alaskan Way Promenade/Public Space, First Avenue Streetcar Evaluation, and Transit Enhancements.

The Elliott Bay Seawall Project would protect the shoreline along Elliott Bay, including the Alaskan Way surface street, from seawall failure due to seismic or storm events. The presence of heavy construction equipment immediately adjacent to the piers along the central waterfront could have a negative effect on tourism and result in a loss of revenue for businesses on the piers.

During construction of the Alaskan Way Promenade/Public Space, adjacent businesses and restaurants would experience increased noise, dust, and possibly reconfigured pedestrian access to businesses and restaurants in the general areas where construction would occur.

Prior to the construction associated with the First Avenue streetcar, water utilities would need to be relocated, and conflicts in overhead catenaries and turning radii would need to be resolved.

Cumulative Effects of the Project and Other Program Elements

The benefits of the Program elements include a transformed waterfront environment, improvements to the transit system, and improved Alaskan Way surface street connectivity to the Elliott and Western Avenues corridor. These effects would be converted into three categories of economic value: enhanced value to waterfront users, new visitor spending locally and regionally, and increased freight connectivity. Under the Bored Tunnel Alternative, properties

that currently pay property taxes would be acquired. As a result, there would be fewer properties across which to distribute the property tax burden; however, these effects are expected to be small.

Although the Bored Tunnel Alternative would not result in the creation of large areas for redevelopment, changes in land use may be supported by the overall improvements associated with the new roadway configurations at the north and south portals. This redevelopment could increase economic activity compared to current conditions in these areas.

Cumulative Effects of the Project, Other Program Elements, and Other Actions

The potential overall economic influence in the Seattle area is difficult to predict. The Bored Tunnel Alternative would contribute to effects on adjacent businesses in addition to effects from other projects that have occurred or may occur along or near the proposed project alignment. Other key transportation projects located within the study area include the following:

- Sound Transit projects (North Link, East Link, University Link, First Hill Streetcar)
- S. Spokane Street Viaduct Widening
- SR 519 Intermodal Access Project, Phase 2 (completed in spring 2010)
- SR 520 Bridge Replacement and HOV Program
- I-5 Improvements
- South Lake Union Redevelopment

In addition to the other proposed projects along the waterfront to replace the seawall, replace Alaskan Way, and construct the Alaskan Way promenade and public space, the Bored Tunnel Alternative would support additional pedestrian, bicycle, and recreational activity along the waterfront. Cumulative economic benefits could occur in the form of increased development opportunities and investment.

Although the timelines for the other projects would be staggered, taken together they would probably disrupt adjacent businesses, as described for project construction. However, the improvements to the roadway network should result in a net positive effect on the local and regional economic performance.

Indirect Benefits

Indirect economic benefits could result from implementing the Bored Tunnel Alternative. The removal of the existing viaduct would eliminate a visual impact and could help facilitate more pedestrian activity along the central waterfront. All else being equal, this alternative would create a less inhibited environment for reinvestment. The economic benefits would occur in the form of increased

development opportunity and investment; however, factors outside of the project would greatly influence the nature and extent of local investment.

These benefits would occur over time, with the potential for revitalization and reinvestment in the project area once construction is completed. Market conditions and the overall economic climate would have a substantial effect on the extent and nature of revitalization and reinvestment that may take place. Revitalization and reinvestment could stimulate more economic activity, enable opportunities for new or expanded business and employment, and generate more tax revenues. This revitalization and redevelopment could substantially increase economic activity compared to the Viaduct Closed (No Build Alternative).

Chapter 2 METHODOLOGY

This chapter outlines the process used to investigate, assess, and describe the potential economic effects that could occur under the Viaduct Closed (No Build Alternative) and the Bored Tunnel Alternative. The economic analysis (1) characterizes existing economic conditions within the study area, specific districts of Seattle, the city as a whole, King County, and the state of Washington, as appropriate; (2) identifies possible beneficial and adverse effects of the Bored Tunnel Alternative and Viaduct Closed (No Build Alternative); and (3) recommends mitigation measures, if any, that could be implemented to avoid or minimize adverse effects.

2.1 Study Area

The study area for economic effects consists of an area of direct effects during construction, as well as a broader geographic area. The *area of direct effects* is one city block around all sides of the portal construction areas (north and south), all access ramps, and all surface street modifications. The area of direct effects also extends one block to either side of the existing viaduct alignment.

Regional economic benefits for the economic multipliers associated with construction (described below) are at the Puget Sound regional level and at the state level. Regional economic effects associated with traffic effects from construction activity are evaluated at the neighborhood, district, or industrial area level.

Operational benefits and effects are assessed as they relate to the economic health of Seattle and the Puget Sound region.

2.2 Applicable Regulations and Guidelines

The following laws, statutes, local ordinances, and guidelines address potential economic effects:

- *Environmental Procedures Manual* (WSDOT 2010)
- *National Cooperative Highway Research Program (NCHRP) Report 122: Summary and Evaluation of Economic Consequences of Highway Improvements* (NCHRP 1971)
- *NCHRP Report 463: Economic Implications of Congestion* (NCHRP 2001)

2.3 Data Needs and Sources

The following data sources were used:

- Local and state agencies were contacted to obtain information on existing economic conditions within the study area.
- Capital construction costs for all major project components, all right-of-way costs, annual worker employment estimates, and all funding sources for the project were obtained from the engineering design team. The capital construction costs were developed through the Cost Estimate Validation Process (CEVP®) analysis of project construction costs performed in the fall of 2009 as additional capital construction costs were refined and value engineering decisions were incorporated into the project design.
- Surface street and off-street parking counts were obtained from the engineering design team for both existing conditions and the full project build-out.
- Changes in travel times between the Duwamish MIC and the BINMIC were provided by the transportation team.

Business inventories prepared for earlier phases of the Program were used and supplemented as necessary with additional inventories of businesses within one block of all construction activity related to the north and south bored tunnel portals as well as the surface street modifications.

2.4 Analysis of Existing Conditions

Existing conditions that could change as a result of implementation of the Bored Tunnel Alternative were identified in the study area. Information was collected to describe existing conditions for use in the discussion of potential effects, including the following topics:

- General role of the local economy, including:
 - Average wages
 - Largest private and public employers
 - Size of tourism industry
 - Amount of cargo shipped by Port of Seattle facilities
 - Specifics about economic health of the Seattle CBD
- Established business districts and retail/commercial centers
 - Updates to economic data were tracked for each of the eleven identified business districts in the study area.
- Employment
 - Current data were collected for the region, county, city, and three forecast analysis zone (FAZ) groups (Seattle CBD, Seattle Central, and Seattle South).

- Parking inventory
 - Current data were collected for number of parking spaces in the CBD, utilization rates, and conversion of single-space parking meters to pay stations.
- Local government revenues, including:
 - Sales and use tax
 - B&O tax and public utility revenues
 - Property tax revenues
 - Other taxes and user fees
 - Revenue from parking meters and public garages
- Traffic congestion and cost of congestion
 - Updated cost of congestion figures from *Urban Mobility Report 2009* (TTI 2009a)
- Ferry and Port of Seattle cargo/cruise facilities
 - Current ferry, cargo, and cruise ship utilization statistics
- Inventory of existing businesses

Existing business inventories were used to the extent that they provided complete spatial coverage of the area of direct effects. When additional areas required inventories to fill in data gaps, a pedestrian reconnaissance inventory of businesses in the area of direct effects was performed. This activity did not include contacting any of the tenants or business owners. A work plan documenting the procedures for performing the inventory was prepared for lead agency review and approval before the inventory was conducted.

2.5 Analysis of Environmental Effects

This section describes the methods used to assess potential economic effects that could occur during construction and subsequent operation of the Bored Tunnel Alternative.

Benefits to and effects on traffic, access, and visibility were qualitatively assessed as they relate to the economic health of the city and the Puget Sound region. Changes in traffic circulation patterns were correlated to adaptations by commercial vehicles required to make connections to designated freight corridors and deliveries between industrial centers. The economic benefits of improved pedestrian access and circulation were evaluated qualitatively. The visual benefit of removing the existing structure was evaluated qualitatively. The economic effect of the increased cost of congestion for those businesses that would be prohibited by the Seattle fire code from using the bored tunnel due to their hazardous cargo was evaluated qualitatively.

Changes in the number of on-street and off-street parking spaces were assessed as they relate to changes in government revenues and to the health of established business districts. Economic effects of the potential loss of available parking were assessed relative to government revenue, effects on established business districts, and effects on individual businesses that depend on nearby on-street parking. Changes in parking could result in transportation mode shifts, as well as changes in the economic viability of established business districts.

The number of properties to be acquired was identified to calculate the corresponding reduction of property tax revenue. Benefits and effects of property acquisitions are discussed as they relate to changes in government revenues. The number of affected employees, based on interviews with the businesses performed by project staff, was used to assess the impact of the displacement of workers when the buildings are acquired. For those businesses for which direct employment data were not provided to the project staff, estimates of the number of employees displaced by property acquisition were calculated using building size (in square feet) and mean number of workers per type of business floor space (U.S. Department of Energy 2008).

O&M costs were estimated for the bored tunnel structure.

Benefits and effects on regional economic activity were estimated using U.S. Department of Commerce, Bureau of Economic Analysis (BEA), RIMS II multipliers (BEA 1997). Temporary economic effects on businesses were evaluated within or adjacent to the area of direct effects. The construction footprint was evaluated for its disruptive effects on businesses and neighborhoods, especially for those businesses immediately adjacent to the construction. The disruption factors that were evaluated include loss of short-term on-street parking, loss of sidewalk access and visibility, and loss of freight delivery parking.

Temporary economic effects on Port of Seattle, ferry, and cruise ship facilities, as well as temporary changes in vehicle through-traffic on SR 99 were assessed.

Construction effects and cost of congestion were evaluated. Construction expenditures and the effect on sales tax revenue were assessed. Temporary jobs created during construction were estimated using RIMS II multipliers (BEA 1997).

The indirect stimulation, revitalization, and reinvestment associated with removal of a visual and psychological barrier and facilitation of pedestrian activity are discussed.

As reflected in Appendix G, Land Use Discipline Report, land use changes, including the potential for large areas of redevelopment, were qualitatively evaluated for their ability to generate economic activity.

2.6 Determining Mitigation Measures

Mitigation measures were developed for construction and operational effects in accordance with FHWA's mitigation policy and the State Environmental Policy Act (SEPA). The goal of the mitigation measures is to sustain business viability during and after construction for those established business districts within and adjacent to the area of direct effects. Mitigation measures were developed in close coordination with the lead agencies.

The mitigation measures are general in nature. Specific mitigation measures would be determined based on their expected cost-effectiveness, the specific needs of individual businesses, and the resiliency of individual businesses to endure the effects associated with the Bored Tunnel Alternative. Potential mitigation measures to reduce permanent adverse economic effects were developed in accordance with the following guiding principles:

- Through project design and right-of-way requirements, minimize the extent and number of businesses, jobs, and access that would be permanently affected.
- Compensate for right-of-way acquisition, displacement and relocation of businesses, and loss of property value according to the policies of the Uniform Relocation Assistance and Real Property Acquisition Policies Act. The requirements of these policies must be balanced against those of the applicable state and local policies, which will require close coordination with the lead agencies.

The parking needs of each of the businesses or groups of businesses within a district were evaluated to develop strategies to mitigate the loss of short-term on-street parking resulting from the removal of the existing viaduct structure.

Some commercial activity within the study area would be adversely affected by the duration of construction activities, the physical extent of the project area, the complexity of construction, and the accumulation of direct construction effects such as traffic restrictions, traffic congestion, and vibration or noise. Although these effects would not be permanent, they would be comparatively long term.

Transportation management strategies were developed to minimize effects on businesses by ensuring pedestrian access, identifying replacement parking strategies, and maintaining and enhancing freight mobility between the Port of Seattle and regional manufacturing and industrial centers.

Public information strategies and business assistance measures were developed. Key measures include conducting public information campaigns to encourage patronage of businesses during construction.

The project team evaluated the access needs of each of the businesses or groups of businesses within a district that are within or adjacent to the area of direct effects and proposed appropriate mitigation measures. The primary goal of this evaluation was to maintain adequate access to all businesses so that they can continue to operate. The project team also identified safe routes for customer access and freight delivery service.

Chapter 3 STUDIES AND COORDINATION

3.1 Studies

The analysis of economic effects followed procedures put forth under FHWA NEPA guidelines; FHWA Technical Advisory T6640.8A, *Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (FHWA 1987); NCHRP Report 122: *Summary and Evaluation of Economic Consequences of Highway Improvements* (NCHRP 1971); NCHRP Report 463: *Economic Implications of Congestion* (NCHRP 2001); and the WSDOT *Environmental Procedures Manual* (WSDOT 2010).

3.2 Coordination

Ongoing coordination with the City, WSDOT, and FHWA occurred during preparation of this discipline report and reviews of comments on the 2004 Draft EIS and 2006 Supplemental Draft EIS.

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Chapter 4 AFFECTED ENVIRONMENT

This chapter characterizes the existing conditions in the study area. Some aspects of the affected environment are reported for the broader geographical area, which includes King County and the King-Kitsap-Pierce-Snohomish Counties region.

The national and global economic climate at the time of this report requires consideration. When this report was written, the full scale of the current economic recession had not yet been analyzed in any of the published documents that were used for reference. This report relies on the most recent data and reports, including current and forecasted employment statistics, from state, regional, county, and local governments. Many of the statistics in the reference documents were available only through 2007 or 2008. Since September 2008, economies on all scales have responded unpredictably. Therefore, this documentation is as current as its sources allow, but actual economic conditions may vary from those reported herein.

4.1 General Role of the Local Economy

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 is a leading global center for several emerging industries: aerospace, biotechnology, clean technology, information technology, and international trade and logistics (CTED 2009). Compared to other counties in the state, King County represents a disproportionate share of the state's population (29 percent) (Washington State Office of Financial Management 2008) and jobs (40 percent) (LMEA 2007).

4.1.1 Average Wages

King County supports an average annual wage of \$56,202 (2007), compared to the state average of \$45,016 (LMEA 2007) and the national average of \$42,270 (BLS 2008). The county also has a higher proportion of jobs in services, finance/insurance/real estate, wholesale trade, and transportation/public utilities than the state (LMEA 2007).

To support this economy, transportation infrastructure in this area includes two transcontinental railroads, an extensive nationwide trucking capacity, three interstate highways, dozens of state highways, a ferry system, a world-class port, and an international airport. Local transit and transportation systems allow the shipment of goods and services within the region, state, the Pacific Northwest, and Canada.

4.1.2 Largest Private and Public Employers

The three public companies generating the highest revenue in the greater Seattle area are Costco Wholesale Corporation, Microsoft Corporation, and, prior to 2008, Washington Mutual, which contributed to combined annual revenues of more than \$131 billion in 2006 (City of Seattle 2008). JPMorgan Chase acquired Washington Mutual in September 2008 (Washington Mutual 2009). The three top regional employers (public and private) are the Boeing Company, Costco Wholesale Corporation, and Group Health Cooperative, with a combined workforce of 70,348 employees (CTED 2009). Other major businesses in terms of revenue and employment include Weyerhaeuser, Paccar, Amazon.com, Nordstrom, Starbucks, Safeco, and Expeditors International of Washington (City of Seattle 2008). Exhibit 4-1 shows the distribution of firm sizes in King County.

Exhibit 4-1. Size and Distribution of Firms in King County (First Quarter 2008)

Firm Size (No. of Employees)	No. of Firms	Percentage of Total No. of Firms	Employment	Percentage of Total Employment
0-4	48,642	63.3%	71,912	6.1%
5-9	11,237	14.6%	74,379	6.3%
10-19	7,578	9.9%	102,907	8.7%
20-49	5,581	7.3%	169,559	14.3%
50-99	2,078	2.7%	143,259	12.1%
100-249	1,211	1.6%	181,089	15.3%
250-499	316	0.4%	109,122	9.2%
500-999	115	0.1%	76,225	6.4%
1,000+	84	0.1%	256,920	21.7%
Total	76,842	100.0%	1,185,372	100.0%

Source: LMEA 2008a.

4.1.3 Size of Tourism Industry

Tourism is a major industry for the state of Washington and a critical component of Seattle's economy, particularly in the study 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" (City of Seattle 2008).

In 2008, the cruise ship industry created 2,380 jobs; it contributes \$8 million to annual state and local taxes. Every time a homeport ship docked in Seattle in 2008, \$1.7 million flowed into the local economy (Downtown Seattle Association 2009).

Key attractions and services tied to the Seattle CBD include the Washington State Convention and Trade Center, Seattle Center (location of the 1962 World's Fair) and the Space Needle, Pike Place Market, Seattle Aquarium, Pioneer Square, the International District, and various waterfront activities, shopping venues, hotels, and restaurants. In addition, professional sports teams, including Seahawks football, Mariners baseball, Sounders soccer, and Storm basketball, call Seattle home (City of Seattle 2008).

4.1.4 Amount of Cargo Shipped by Port of Seattle Facilities

International commerce also plays a large role in the local economy. Containerized shipping at Port of Seattle facilities generated 7,000 direct jobs in 2007. Other forms of cargo are shipped from Port of Seattle terminals. The total number of jobs for all cargo types and for the associated indirect and induced jobs in 2007 was 33,291, translating to a payroll of \$2.8 billion (Port of Seattle 2009b). Freight arrives at seaport cargo and vessel handling terminals (Terminals 5, 18, and 46), the Port of Seattle (Terminals 30, 91, and 115), the Seattle-Tacoma International (Sea-Tac) Airport, and Fishermen's Terminal.

4.1.5 Transit Facilities Serving the Central Business District

Access to businesses, services, and government facilities located in the Seattle CBD is available via multiple modes of transportation and transit. On-street parking is limited; however, parking garages are available. The Seattle Center Monorail runs between Westlake Center and Seattle Center. King County Metro Transit operates a fleet of about 1,300 vehicles, including standard and articulated coaches, electric trolleys, hybrid diesel-electric buses, and streetcars (King County Metro Transit 2008). The Downtown Seattle Transit Tunnel, retrofitted for joint operation of buses and light rail, reopened in September 2007, providing access to downtown destinations while easing street congestion (King County Metro Transit 2007). In addition, bus service in the Seattle CBD is provided at no cost between 6 a.m. and 7 p.m. daily.

Sound Transit recently constructed a light rail transit project to connect the cities of Seattle and Tukwila and Sea-Tac Airport. The 13.9-mile Seattle-Tukwila segment opened on July 18, 2009, and the 1.7-mile extension to Sea-Tac Airport opened on December 19, 2009 (Sound Transit 2009a). Construction of a 3.15-mile light rail extension from downtown Seattle north to the University of Washington began in fall 2009 and is projected to open for service in 2016. In 2008, voters approved the construction of 36 miles of extensions north, east, and south. The anticipated openings of these light rail extensions are between 2020 and 2023 (Sound Transit 2009b).

4.2 Established Business Districts and Retail/Commercial Centers

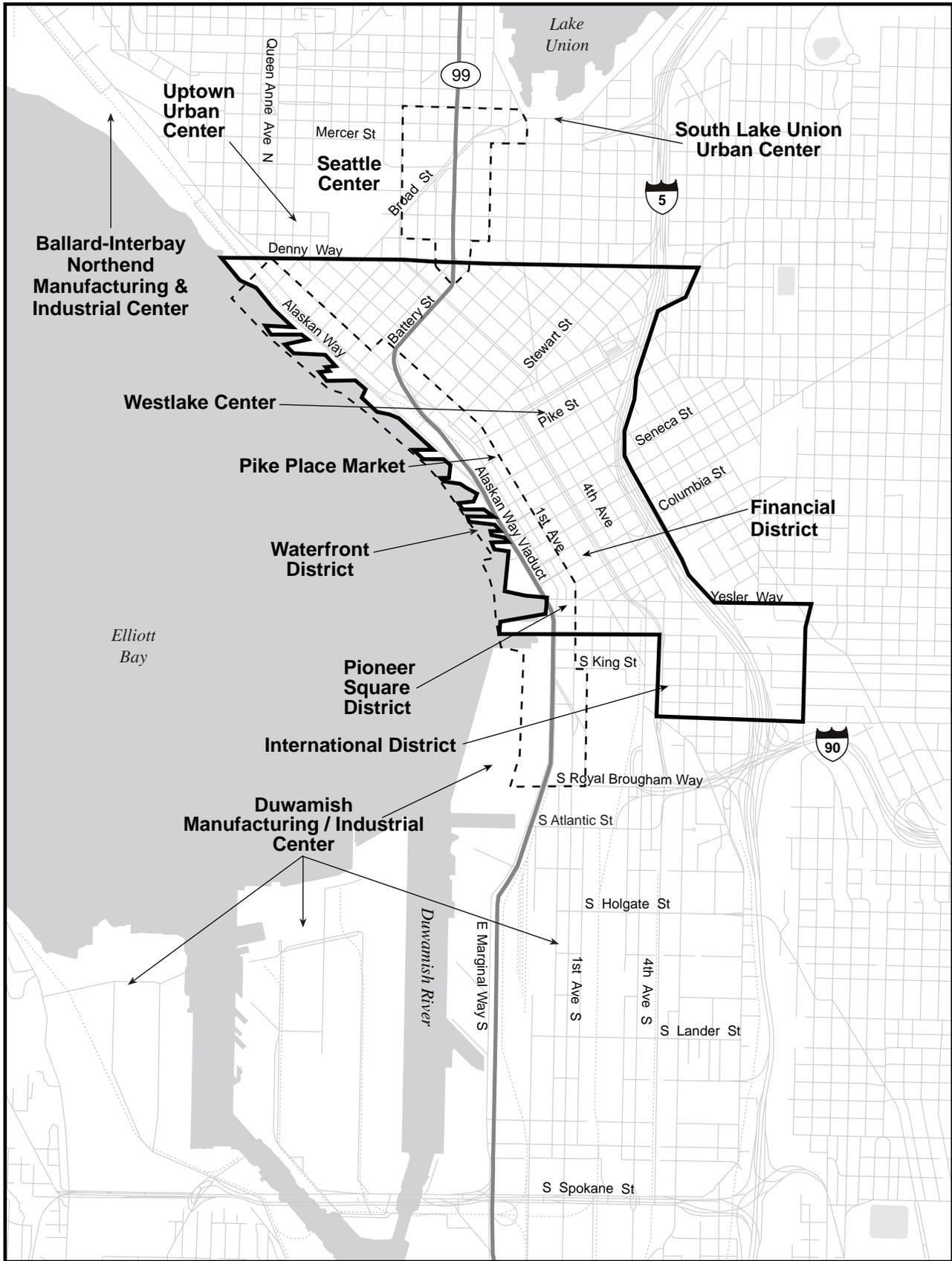
The study area is located within or near several retail/commercial centers, manufacturing/industrial centers, and urban centers (Exhibit 4-2). These districts and centers include the Duwamish MIC, International District, Pioneer Square Historic District, Financial District, Pike Place Market Historic District, central waterfront Seattle CBD and Westlake Center, Seattle Center, South Lake Union Urban Center, Uptown Urban Center, and the BINMIC. Nordstrom corporate headquarters (Nordstrom 2009) is located in the Seattle CBD.

As defined by an independent office space research and information provider, the following describes the study area:

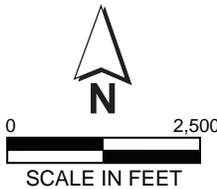
The Seattle Central Business District...is the area bounded by Yesler Way to the south, Interstate 5 to the east, Stewart Street to the north and First Avenue to the west. This area functions as the financial hub of the region and is highly concentrated comprised mainly of high rise office buildings. This is the largest submarket in the Seattle area containing 80+ buildings totaling approximately 22.5 million rentable square footage (RSF) of space. A great diversity of buildings can be found in the CBD ranging from older historic brick and mortar structures to newer highly sophisticated upscale high-rise towers. This sub-market is the hub of the region's largest service-related industries including Bank of America, Wells Fargo, Washington Mutual, Aetna Insurance, the law firms of Perkins Coie and Preston Gates & Ellis, and many others. (Commercial Office Space 2008)

4.2.1 Duwamish Manufacturing and Industrial Center

The Duwamish MIC comprises almost 5,000 acres of marine and industrial lands south of the Seattle CBD (PSRC 2002). In 1999, the Duwamish MIC represented 84 percent of the industrial lands in Seattle (Greater Duwamish Planning Committee 1999). Key assets of the Duwamish MIC include access to water for the transportation and seafood processing and storage industries, access to multimodal transportation (freeways, highways, rail, harbor facilities, and airports), proximity to Boeing facilities, and access to a large pool of highly skilled industrial workers (Greater Duwamish Planning Committee 1999). The Duwamish MIC includes two major-league sports stadiums on its northern boundary.



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— Central Business District
- - - Project Area

**Exhibit 4-2
Established Business
Districts**

4.2.2 Pioneer Square District

The Pioneer Square District, Seattle's oldest neighborhood, is located at the south end of the Seattle CBD (City of Seattle 2009c). The approximately 88-acre area is characterized by red brick buildings and is situated among art galleries, antique shops, and the Seattle Underground. This district also provides extensive nighttime entertainment, including sports bars, taverns, varying music venues, and restaurants. However, the Pioneer Square District has experienced economic challenges over the last decade resulting from sports stadium construction, damage from the 2001 Nisqually earthquake, and the regional and global economic downturn (The Seattle Times 2009).

4.2.3 Financial District

The Financial District, located in the heart of the Seattle CBD, has considerable commercial office space available, with over 29 million square feet of rentable space distributed across 112 buildings. At the end of 2008, 87.4 percent of the available office space was leased (12.6 percent vacancy rate). Most of these buildings include street-level businesses that are not commercial offices, including food service, retail sales, and services. For 2009, vacancy rates for commercial office space were projected to approach 20 percent and will likely persist at this rate through 2010 (Resolve 2009).

4.2.4 Pike Place Market

Pike Place Market is located in the commercial center of Seattle, with nearby department stores, specialty shops, hotels, theaters and cinemas, restaurants, and shopping centers. The market is a popular attraction for tourists and is the oldest continually operating farmers market in the country (City of Seattle 2009b). It provides a place for farmers, craftspeople, and artists to display their goods and contains numerous eateries.

4.2.5 Waterfront District

The waterfront district is the portion of downtown Seattle that fronts Elliott Bay. Included in the waterfront district are the piers that support the Washington State Ferries system and cruise ship terminals. The piers also support restaurants and other waterborne tourist activities (City of Seattle 2009f). Nearly 28,000 passengers and 8,000 vehicles on the ferries pass through Seattle's waterfront each day.

Seattle's waterfront is also home to major regional attractions, such as the Seattle Aquarium and the Bell Harbor International Conference Center and Maritime Events Center, which attract nearly 11 million visitors each year (2006 statistics). The recent addition of the Olympic Sculpture Park and expansion of the aquarium will likely increase this number in the future. These attractions are also vital

cultural and educational resources for students from Puget Sound and other parts of Washington.

Seattle's waterfront is a significant contributor to the regional economy. In 2008, the cruise ship industry alone produced 1,675 direct jobs, \$200 million in annual business revenue, and \$13.2 million in state and local taxes to the region's economy (Port of Seattle 2009b). The Seattle Aquarium, Bell Harbor International Conference Center and Maritime Events Center, Pike Place Market, and other attractions also generate tourist revenue for Seattle, King County, and the state of Washington. The 11 million visitors to these and other waterfront destinations are likely to spend an average of \$100 per person, resulting in approximately \$1.1 billion in annual revenue, or around 28 percent of King County's \$4 billion tourism revenue (City of Seattle 2006).

4.2.6 Seattle CBD and Westlake Center Retail Area

In the Seattle CBD, there were over 4,700 street-level shops, restaurants, and service businesses in operation in 2008 (Downtown Seattle Association 2009). There was over 5.2 million square feet of retail inventory within the Center City, with an occupancy rate of 94.7 percent in 2008 (Downtown Seattle Association 2009). Most retail markets experienced some growth from 2007 to 2008, including coffee shops, restaurants, cafes and bars, and arts and cultural businesses. Only clothing and accessory shops experienced a slight (1.5 percent) decline in numbers from 2007 to 2008 (Downtown Seattle Association 2009).

Westlake Center, a four-story retail and food pavilion located in the Seattle CBD, hosts local, national, and international retailers (Westlake Center 2009). Additional retail establishments (Nordstrom flagship store, Pacific Place, and Macy's) are located within several blocks of Westlake Center, which makes the area a destination retail center for Seattle-area residents and tourists.

4.2.7 Seattle Center

Seattle Center is an urban park and entertainment center located just north of the Seattle CBD. The 74-acre campus hosts over 5,000 events each year and is home to more than 30 cultural, educational, sports, and entertainment organizations (Seattle Center 2006a). It hosted 4.6 million visitors in 2005 and is a social gathering place of international recognition (Beyers 2006).

In 2005, Seattle Center visitors and businesses created \$1.15 billion in business activity and \$387 million in labor income in King County, and supported 15,534 jobs. In addition, state and local governments receive \$41.1 million in tax revenues from business activity at Seattle Center. An estimated 6,489 people are directly employed by businesses at Seattle Center. Most of them are part-time or

seasonal/temporary employees, but 32 percent (1,860) are full-time employees (Beyers 2006).

Key Arena's primary sports tenant is the Seattle Storm women's professional basketball team. In 2008, Seattle Center lost its other two anchor Key Arena tenants: the Seattle Sonics, who relocated to Oklahoma City, and the Seattle Thunderbirds, who relocated to Kent, Washington (City of Seattle 2009d).

Seattle Center revenue comes from parking, facility rentals, concessions, and various sales from the year-round events held on the campus. However, this revenue covered about 70 percent of Seattle Center's operating costs for 2006 (City of Seattle 2006). Operating costs do not include the costs of debt service obligations for McCaw Hall and Key Arena. The total estimated revenue for the Seattle Center fund, as stated in the 2009 adopted and 2010 endorsed budgets for the City, is just under \$37 million (City of Seattle 2009d).

The new Bill & Melinda Gates Foundation campus will open in the spring of 2011 on 12 acres adjacent to Seattle Center. The new campus will consolidate all the foundation's operations in three six-story buildings, totaling approximately 1.3 million square feet, and will be home to about 1,200 employees and partners. The site will also accommodate an 11,000-square-foot visitor center where "the public can see and learn about the foundation's work and its efforts to help people around the world live healthy and productive lives." (Bill & Melinda Gates Foundation 2010)

4.2.8 South Lake Union Urban Center

The South Lake Union Urban Center includes a 12-acre park that is designated as a cultural, educational, and recreational waterfront center. It also includes biotechnology and mixed-use office space and housing (City of Seattle 2009i). On April 20, 2009, city and state leaders gathered in the neighborhood to celebrate the groundbreaking of Amazon.com Inc.'s new headquarters campus, which could eventually span 1.7 million square feet (Puget Sound Business Journal 2009). By 2030, employment in the general Lake Union/Seattle Center area is projected to increase by over 69 percent from what it was in 2000, and households are projected to increase by 35 percent (PSRC 2006a).

In December 2007, the South Lake Union streetcar began service from the South Lake Union neighborhood to the Westlake transit hub, where riders can transfer to regional and local buses, Link light rail, and the Seattle Monorail. The streetcar served over 500,000 passengers in the first year, far exceeding the original estimates (City of Seattle 2009e). In addition, Metro routes 5, 5 Express (x), 8, 16, 17, 26, 26x, 28, 28x, 30, 60, 66, 70, and 358x serve the South Lake Union area. The all-day routes within the South Lake Union area attracted about one million boardings in 2009 (King County Metro Transit 2010).

4.2.9 Uptown Urban Center

The Uptown Urban Center includes mixed commercial and retail establishments and some residential areas. Seattle Center is the hub for the Uptown Urban Center. Local businesses provide services to Seattle Center visitors, including food and beverage establishments, entertainment facilities, and various retail outlets.

4.2.10 Ballard Interbay Northend Manufacturing and Industrial Center

The BINMIC is one of two manufacturing and industrial centers in the city. It is a 971-acre area with management goals that focus on several areas: marine, fishing, and waterfront businesses; smaller industrial manufacturing operations; and advanced technology industries (City of Seattle 2009a).

4.3 Employment

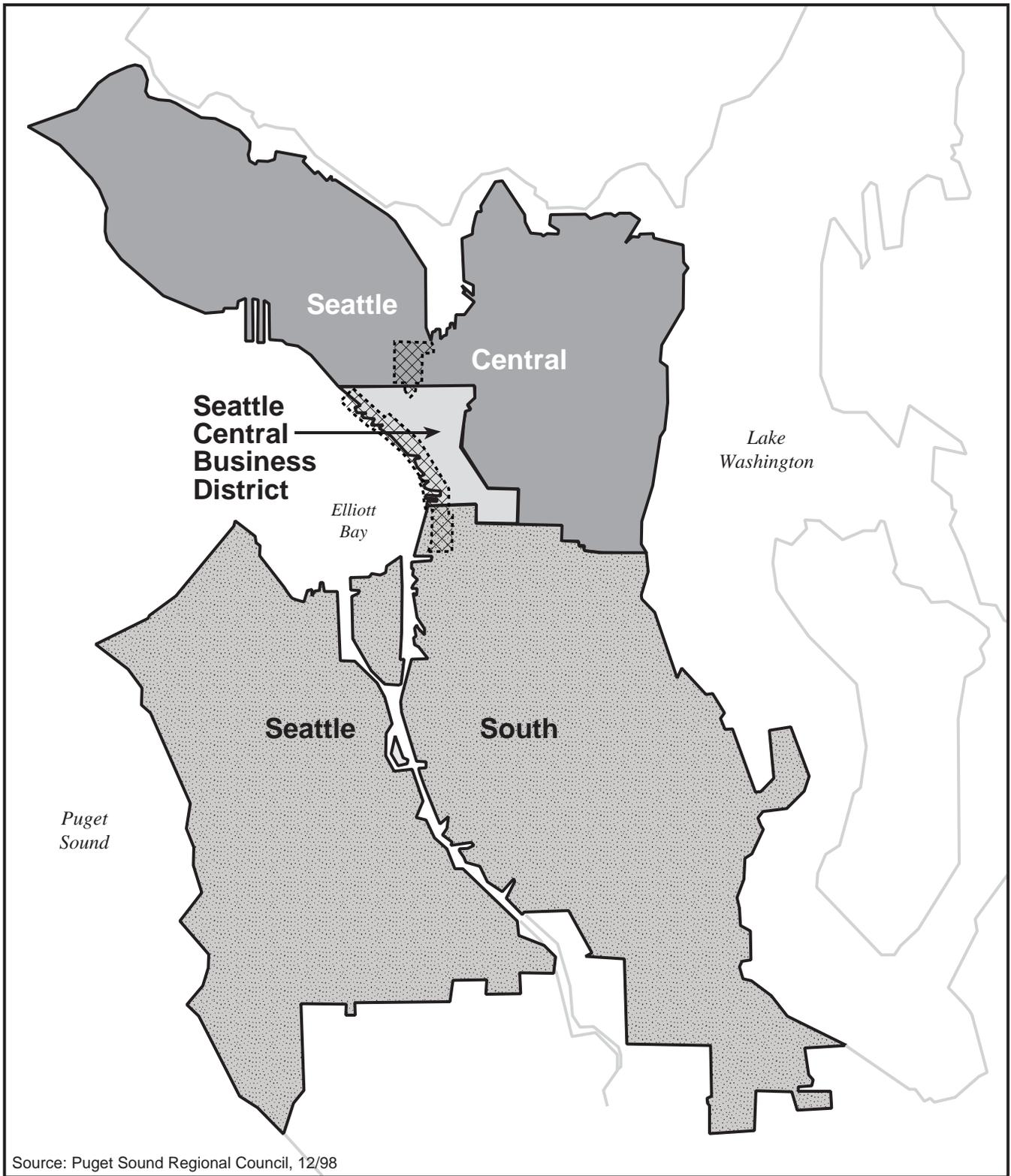
4.3.1 Employment by Industry

To characterize employment in the study area, several levels of analysis were compared. These economic elements are discussed in general terms for the region (King-Kitsap-Pierce-Snohomish Counties), King County, and the city. Three geographic areas were analyzed in more detail: the Seattle CBD,³ Seattle Central,⁴ and Seattle South⁵ (Exhibit 4-3). These geographic areas were selected based on FAZ groups that the project area crosses. An FAZ is composed of one or more census tracts and is the basic geographic unit for demographic data and forecasts; an FAZ group is an aggregation of FAZs. Local agencies, such as the Puget Sound Regional Council (PSRC), use these FAZs and census tract areas to characterize historical, existing, and projected population, housing, and employment trends and land use. The following section describes the employment component of these data; a more detailed description of population and housing data is provided in Appendix H, Social Discipline Report.

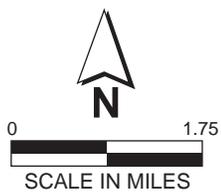
³ The Seattle CBD is defined by the Washington State Employment Security Department as the downtown area bounded by Elliott Bay to the west, Denny Way to the north, I-5 to the east, and S. Dearborn Street to the south.

⁴ Seattle Central extends north and east of the Seattle CBD. It is bounded by S. Dearborn Street/Denny Way/Interstate 90 (I-90) to the south, Lake Washington to the east, the Lake Washington Ship Canal to the north, and Elliott Bay to the west.

⁵ Seattle South is directly south of the Seattle CBD and Seattle Central; it is bounded by Lake Washington to the east; generally by Seola Beach Drive, S.W. Roxbury Street, S. 9Sixth Street, and S. Bangor Street to the south; and Elliott Bay to the west.



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**Exhibit 4-3
Forecast Analysis
Zone Groups**

The regional economy is diverse, with an emphasis on service industries. Employment derived from retail trade and the government/education sector also plays a major role in the regional economy, as shown in Exhibit 4-4.

The number of jobs has nearly doubled in the region over the last three decades, with an increasing percentage of jobs gained in service industries. In 2000, 38.9 percent of the region's jobs were in service industries. After service industries, employment sectors ranked as follows for the region: retail trade (18.2 percent), government/education (17.0 percent), manufacturing (13.6 percent), and trade/transportation/utilities (12.2 percent). Seattle's second highest employment sector is slightly less diverse, with government/education providing 17.6 percent of the jobs. The city had a higher proportion of jobs (47.5 percent) in the service industries than the region as a whole.

Employment within and near the study area differs in several ways from the regional and citywide distribution of jobs across industry sectors. Most of the employment in the Seattle CBD and Seattle Central is in the services sector (55.6 to 60.0 percent), the percentage being substantially higher than the regional, King County, and Seattle averages. Government/education is the second leading job sector in the Seattle CBD, providing only a slightly higher percentage of jobs than the services sector in Seattle Central.

In 2000, approximately 50 percent of jobs in Seattle South were distributed across three sectors: manufacturing, retail trade, and government/education. The remaining approximately 50 percent of jobs were distributed across the services and trade/transport/utilities sectors. The number of services sector jobs in Seattle South is projected to increase substantially, whereas the number of jobs in the other sectors is projected to decrease over time.

Exhibit 4-4. Employment (Number and Percentage of Jobs)

Area/Industry Sector	1980	1990	2000	2010 (Forecasted)	2020 (Forecasted)	2030 (Forecasted)	2040 (Forecasted)
Region							
King-Kitsap-Pierce-Snohomish Counties	1,033,407	1,445,243	1,760,043	1,934,713	2,224,597	2,497,678	2,789,293
Manufacturing	21.0%	18.3%	13.6%	11.3%	9.6%	8.4%	7.6%
Trade/transport/utilities ¹	12.7%	12.1%	12.2%	11.8%	11.6%	11.4%	11.3%
Retail trade	17.9%	18.0%	18.2%	18.2%	18.0%	17.8%	17.5%
Services	27.4%	33.4%	38.9%	41.3%	44.5%	47.1%	49.3%
Government/education	21.0%	18.2%	17.0%	17.5%	16.3%	15.3%	14.4%
County							
King County	697,401	972,567	1,196,043	1,311,186	1,498,043	1,664,780	1,830,535
Manufacturing	20.9%	17.8%	12.4%	9.9%	8.0%	6.8%	5.9%
Trade/transport/utilities ¹	15.1%	14.4%	14.4%	13.7%	13.2%	12.7%	12.3%
Retail trade	18.2%	17.4%	17.6%	17.3%	17.0%	16.7%	16.4%
Services	29.7%	36.3%	42.3%	45.3%	48.8%	51.7%	53.9%
Government/education	16.1%	14.0%	13.4%	13.8%	12.9%	12.1%	11.5%
City							
Seattle	386,684	469,802	540,419	580,713	653,514	708,348	762,395
Manufacturing	13.1%	10.2%	7.4%	5.9%	4.9%	4.1%	3.6%
Trade/transport/utilities ¹	15.6%	14.7%	12.6%	11.9%	11.4%	10.8%	10.3%
Retail Trade	15.8%	13.8%	14.9%	15.0%	14.9%	14.9%	14.8%
Services	35.5%	43.5%	47.5%	48.1%	50.5%	52.4%	54.2%
Government/education	20.0%	17.8%	17.6%	19.1%	18.4%	17.7%	17.2%

Exhibit 4-4. Employment (Number and Percent of Jobs) (continued)

Area/Industry Sector	1980	1990	2000	2010 (Forecasted)	2020 (Forecasted)	2030 (Forecasted)	2040 (Forecasted)
Forecast Analysis Zone Groups							
Seattle CBD	112,248	161,834	183,234	202,021	225,782	243,639	255,266
Manufacturing	4.9%	3.0%	2.1%	1.4%	0.9%	0.6%	0.5%
Trade/transport/utilities ¹	13.0%	12.7%	10.0%	9.5%	9.1%	8.4%	7.7%
Retail trade	14.8%	12.3%	11.6%	11.1%	10.8%	10.4%	10.0%
Services	44.1%	53.5%	60.0%	59.8%	61.0%	62.6%	63.7%
Government/education	23.2%	18.5%	16.3%	18.2%	18.2%	18.0%	18.1%
Seattle Central	101,213	111,390	132,883	142,380	161,767	169,875	179,294
Manufacturing	11.6%	9.9%	7.5%	5.6%	4.6%	3.8%	3.3%
Trade/transport/utilities ¹	18.3%	13.3%	10.3%	10.0%	9.5%	9.3%	9.0%
Retail trade	13.1%	10.8%	13.0%	14.1%	14.5%	15.4%	15.7%
Services	47.1%	54.8%	55.6%	55.2%	56.9%	57.2%	58.0%
Government/education	9.9%	11.2%	13.7%	15.2%	14.5%	14.3%	13.9%
Seattle South	88,976	97,737	110,718	116,099	128,461	142,885	161,010
Manufacturing	30.1%	25.9%	18.5%	16.4%	14.4%	12.5%	10.7%
Trade/transport/utilities ¹	23.5%	29.0%	26.7%	25.3%	24.1%	22.6%	21.4%
Retail trade	13.5%	11.3%	15.6%	15.1%	15.0%	14.9%	14.6%
Services	14.0%	18.7%	25.3%	28.8%	33.3%	38.2%	42.8%
Government/education	18.8%	15.1%	14.0%	14.3%	13.2%	11.7%	10.4%

Source: PSRC 2006a.

Note:

Total employment does not include workers in resources (agriculture, forestry, fishing, and mining) and construction.

CBD = Central Business District

¹ Trade/transport/utilities includes wholesale trade, transportation, communication, and utilities.

4.3.2 Unemployment Rates

Unemployment rates within the region have historically been lower than the statewide average, as shown in Exhibit 4-5. In 2009, the average civilian labor force in King County numbered 1,110,860, with approximately 88,900 (8.0 percent) unemployed (LMEA 2010). The average statewide civilian labor force was 3,858,710, with 347,300 (9.0 percent) unemployed in 2009 (LMEA 2010).

Over the next decade, nonagricultural employment in the state is forecasted to continually increase, although at a slower rate (1.4 percent) than actual growth in the previous decade (1.7 percent) (LMEA 2008). An increasing proportion of jobs are expected in the government sector. Jobs in the professional and business services sector are expected to remain as the second largest sector (LMEA 2008).

Exhibit 4-5. Unemployment Rates (Average Annual Percentage)

Area	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Washington State	4.8	5.0	6.2	7.3	7.4	6.3	5.5	5.0	4.5	5.3	9.0
King County	3.8	4.1	5.1	6.1	6.2	5.2	4.8	4.2	3.7	4.3	8.0
Kitsap County	4.6	5.0	6.0	6.8	6.8	5.8	5.2	4.7	4.3	5.0	7.6
Pierce County	4.3	5.0	6.5	8.1	8.2	7.1	5.9	5.2	4.7	5.7	9.3
Snohomish County	4.7	4.5	5.3	7.0	7.1	5.7	5.1	4.6	4.1	5.1	9.5

Source: LMEA 2010.

Note:

Unemployment rates are annual averages (not seasonally adjusted). Kitsap County data are from the Bremerton primary metropolitan statistical area. Pierce County data are from Tacoma Metropolitan Division.

4.4 Parking Inventory

Parking is categorized as on-street and off-street parking throughout the study area. The available inventory of on-street parking is provided by the City and is quantified by the number of paid parking spaces, which is the predominant on-street parking control. According to the SDOT Parking Strategic Advisor, there are more than 13,500 paid on-street parking spaces citywide. About 55 percent (nearly 26,000 total parking spaces) of these spaces are in the Seattle CBD (which for the parking inventory is bounded by Denny Way, I-5, S. Royal Brougham Way, and Elliott Bay). The total number of spaces in paid service at any time fluctuates somewhat depending on construction, temporary no-parking zones, and other measures that remove curb-space from use.

In 2004, the City began a 3-year process of converting a majority of the single-space parking meters to multispace pay and display kiosks (City of Seattle 2009g). As of mid-2009, there were only about 100 meters still deployed in the city, primarily in the north downtown area.

The available inventory of off-street parking is provided by private property owners and operators of primarily private facilities. According to the 2006 Parking Summaries provided by PSRC, there are 80,420 parking stalls in Seattle in the following districts: Seattle CBD, waterfront, International District, Lower Queen Anne, First Hill, and the Denny Regrade. The average daily occupancy rate for off-street parking in Seattle is 62.9 percent (PSRC 2006b).

There are 25,965 parking stalls within the Seattle CBD. The average daily occupancy rate for off-street parking within the Seattle CBD is 70.1 percent (PSRC 2006b).

Within the Seattle Center area, four parking lots provide 3,136 stalls (Seattle Center 2006b). This represents approximately 17 percent of the total parking stalls within the Lower Queen Anne area (PSRC 2006b). The 2006 occupancy rate for off-street parking within the Lower Queen Anne area was 47.4 percent (PSRC 2006b).

There are 560 on-street parking spaces (282 long-term and 278 short-term) and 50 off-street parking stalls within the north and south portal areas that could be affected by construction of the Bored Tunnel Alternative. Of the 560 on-street parking spaces, 429 are paid and 131 are unpaid.

4.4.1 Center City Parking Program

The Center City Parking Program is SDOT's approach to address changes and growing demand for short-term parking in the Center City over the next several years. Marketing, way-finding, and technology measures aim to improve access to off-street short-term parking beginning in 2012. This approach aims to keep the Center City moving as more jobs and people come to Seattle, and throughout the construction of the project.

One innovative component of the Center City Parking Program is e-Park, an electronic parking guidance system that uses signs to provide motorists with real-time parking space availability and direct them from main downtown access points to parking garages. The new technology will make it easy for shoppers and visitors to find parking and will reduce traffic congestion and pollution by reducing circling for vacant on-street parking. A pilot project began in the spring of 2010 to test the electronic system's technology and concept.

SDOT is developing a marketing strategy with a parking locator website, printed maps, and programs for participating garages, properties, and other organizations in the Center City. Phase I of e-Park will be launched in fall 2010. During Phase II of this project, the system will be extended to other downtown areas, including Pioneer Square and the central waterfront in 2011–2012.

4.5 Local Government Revenues

The state of Washington and the City of Seattle rely on a variety of taxes to fund state and local government programs. These taxes include a combined state and local sales and use tax; B&O tax; public utility tax; property tax; and several other excise, real estate, and estate taxes.

4.5.1 Sales and Use Tax

A combined state and local retail sales tax is collected on the sale of tangible personal property. A use tax is assessed on the market value of using tangible personal property and services for which the sales tax has not been paid. The retail sales and use tax applies to most items purchased by consumers but does not apply to food items or prescription drugs.

The amount of the retail sales and use tax varies by locality. The state tax base is 6.5 percent, but each locality can assess additional tax. The combined state and local tax rate for the study area is 9.5 percent, which also includes a Regional Transit Authority tax.

For the City's endorsed 2010 budget, retail sales tax revenues account for \$156.6 million. This is almost 21 percent of the General Subfund Revenue (City of Seattle 2009d). Utility services and most personal services (e.g., medical, dental, legal, and barber) and real estate are not subject to these taxes. However, construction services and building materials are subject to the retail sales tax.

Within King County, sales taxes account for 20 percent of the total taxes collected as revenue. According to the 2009 Executive Proposed King County Budget, King County is estimated to collect \$84.2 million in sales taxes for the 2008 fiscal year, a 3.9 percent decrease from the 2007 levels (King County Budget Office 2009).

The King County food and beverage tax is collected in addition to the state and local retail sales tax for restaurants, taverns, and bars. This adds 0.5 percent to the 9.5 percent sales tax levied at these types of establishments.

4.5.2 Business and Occupation Tax and Public Utility Tax

Most businesses operating in the state are subject to the B&O tax, which is typically assessed on the gross income, proceeds of sales, or value of doing business. Contractors performing construction for federal agencies are classified as government contractors for B&O tax purposes and are subject to the B&O tax. Typically, the measure of tax is the gross contract price (Washington Administrative Code, Section 458-20-17001).

According to the City's endorsed 2010 budget, B&O taxes account for \$169.0 million (19 percent) of the General Subfund Revenue (City of Seattle 2009d). In addition, the City levies a tax on the gross income derived from sales of utility services by

privately owned utilities within Seattle, including telephone, steam, cable communications, natural gas, and refuse collection. These business tax revenues on utilities account for \$152.9 million (17 percent) of the General Subfund Revenue (City of Seattle 2009d).

4.5.3 Property Tax

Real and personal property is subject to property tax. Real property includes land and any improvements, such as buildings, attached to the land. The primary characteristic of personal property is mobility. Examples of personal property are machinery, equipment, supplies, and furniture. Personal property tax typically applies to personal property used when conducting business.

Property tax is a combined state and local tax. The 2009 property taxes in Seattle ranged from \$7.97 to \$10.14 per thousand dollars of assessed value (King County Department of Assessments 2009). The state portion of these property taxes is \$2.51 per thousand dollars of assessed value, with the rest apportioned to many taxing districts (Washington State Department of Revenue 2008). Within King County, property taxes are projected to account for nearly 50 percent of the total taxes collected as revenue in 2009 (King County Budget Office 2009). According to the 2009 proposed budget, King County has a proposed levy of \$573.4 million in property taxes for the 2009 fiscal year (King County Budget Office 2009).

Property tax revenues in the City's endorsed 2010 budget account for \$251.1 million, which is slightly more than one-third of the General Subfund Revenue (City of Seattle 2009d). This includes general property tax and a property tax levied for the Firefighters Pension Fund in accordance with Revised Code of Washington, Section 41.16.060.

4.5.4 Other Taxes and User Fees

Various other taxes are assessed at the state and local levels, which include an excise tax on hotels and motels, admission to entertainment and recreation events, food and beverages, fuels, cigarettes, tobacco products, liquor, timber, rental cars, and other goods and services. In Seattle, a Convention and Trade Center tax (7.0 percent) is levied on all lodging establishments with 60 or more rooms. This tax is also levied in Bellevue and elsewhere in King County, with various tax rates.

Other local excise taxes include municipal business taxes and licenses. The sale of most real property is subject to a real estate tax that is paid by the seller. Other taxes levied by the state or local municipalities include an estate and transfer tax, vehicle licensing fee, and watercraft excise tax. No personal income tax is levied in the state of Washington.

4.5.5 Revenues From On-Street Parking and Public Garages

Revenues from on-street paid parking are deposited into the City's General Fund. These revenues are designated as "fees to cover the cost of installation, inspection, supervision, regulation, and maintenance involved in the control of traffic and parking upon the streets" (Seattle Municipal Code, Section 11.16.480 [SMC 11.16.480]). The Seattle Municipal Code also grants to the City's Traffic Engineer the authority to do the following:

Establish areas where parking is regulated by parking payment devices, and the time limit for parking therein; order installation or removal of parking payment devices where it is determined upon the basis of an engineering and traffic investigation that the installation or removal of such devices is necessary to aid in the regulation, control, and inspection of the parking of vehicles. (SMC 11.16.300)

Beginning in mid-2004, the City began replacing single-space parking meters with multispace pay stations to improve parking management efficiencies and address outdated meter technology (City of Seattle 2005, 2009h). There are typically one or two pay stations per block, depending on the block length and amount of paid parking. Pay stations allow users to pay with coin, credit card, or debit card. The 2009 City of Seattle adopted budget included an hourly on-street parking rate increase along with a three-tiered rate system. First implemented in the South Lake Union neighborhood in 2007, the three-tiered rate system ensures that on-street parking rates are set appropriately for the surrounding land uses, parking demand, and transportation conditions (City of Seattle 2009g). All of the on-street paid parking spaces within the study area are in the highest tier of \$2.50 per hour and are short-term parking stalls (City of Seattle 2009g).

The City evaluated the revenue associated with 525 parking spaces controlled by paid parking in the area along the waterfront between Yesler Way and the Pike Place Market. Because of the increase in hourly rates, as well as changes in behavior of motorists who use such parking, the City has realized a substantial increase in revenue per parking space per year over that for single-space meters. Based on paid parking currently in operation along the waterfront, each parking space generates approximately \$6,600 per year in revenue. The 429 paid on-street parking spaces within the south and north portal areas that could be affected by construction of the Bored Tunnel Alternative generate \$2.83 million per year in revenue using the per space revenue estimate for the waterfront spaces. This is likely the upper bound of parking revenue for the area around the portals, because these spaces do not have the same utilization rate as spaces along the waterfront.

In August 2006, the City passed an ordinance that amended the Seattle Municipal Code (SMC 5.35.030) to impose "a tax for the act or privilege of parking a motor

vehicle in a commercial lot within the city that is operated by a commercial parking business” (City of Seattle Ordinance 122192). Prior to this, the City collected an annual license fee: \$90 per 1,000 square feet of floor or ground space contained in a parking garage or lot and used for parking or storage purposes. The purpose of this tax is to “provide an equitable means of generating revenue to support the City’s transportation system, and to reduce the existing Public Garage and Parking Lot License Fee that [was] imposed by SMC Chapter 6.48” (City of Seattle Ordinance 122192). Currently, the tax rate is 10 percent of the parking fee (SMC 5.35.030). These taxes are collected by commercial parking businesses from the parking customer at the time payment is made.

4.6 Traffic Congestion and Its Cost

The Texas Transportation Institute has studied urban congestion trends for motor vehicle mobility since 1982. The study results are published annually in the *Urban Mobility Report*, which is cited nationwide for its catalog of congestion delays in the nation’s busiest cities, congestion costs, and other related topics (TTI 2009a).

Data on traffic congestion and the cost of congestion in Seattle and other urban areas were compiled from the *2009 Urban Mobility Study* (TTI 2009b) for the following congestion measures:

- Annual delay – person hours
- Number of rush hours – time when system has congestion
- Amount of congested travel – percent of peak VMT
- Total annual congestion cost
- Annual congestion cost per peak hour road traveler
- Annual congestion cost per person

In 2005, the population of the Seattle urban area breached 3 million⁶ and is now categorized, along with 13 others, as a “very large urban area.” This is defined as an area with an average of 14 individual urban areas and a population of 3 million or more. Prior to the *2007 Urban Mobility Study*, which detailed the 2005 data, Seattle was categorized, along with 25 others, as a “large urban area.” This is defined as an area with a population between 1 million and 3 million. Since the transition from “large” to “very large” is so recent, this section of the discipline report discusses Seattle’s congestion information relative to both categories. Seattle’s statistics contribute only to the “very large urban area” average.

Over the years, the costs to travelers associated with congestion in Seattle have increased each year. However, Seattle has seen a slowing trend, especially in the

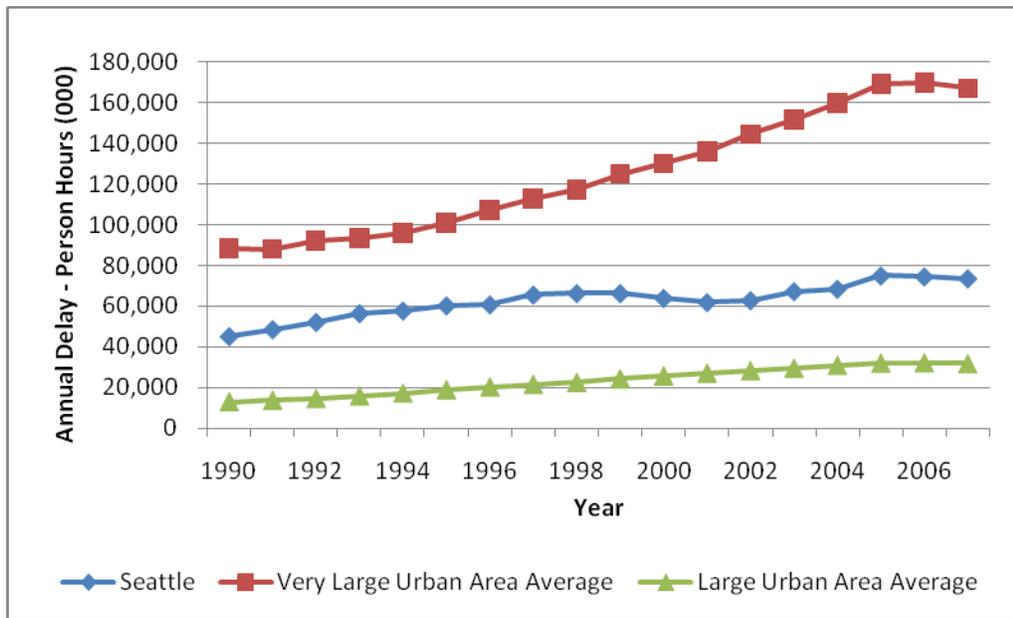
⁶ The Seattle urban area consists of the greater Puget Sound region.

beginning of this decade, whereas both large and very large urban areas have seen steady increases, particularly in annual congestion cost per peak hour road traveler and per person.

Annual Delay – Person Hours

In 2007, the total annual person-hours of delay caused by congestion in Seattle was 73,636,000 hours. This was less than half the average annual delay for other very large urban areas (166,900,000). Between 1990 and 2007, Seattle’s annual delay grew from 45,056,000 to 73,636,000 person-hours (approximately a 66 percent increase). During this time, the average annual delay for other very large urban areas grew from 88,365,000 to 166,900,000 person-hours (approximately an 89 percent increase). The average annual person-hours of delay in large urban areas caused by congestion increased by 146 percent between 1990 and 2005 (from 12,916,000 to 31,778,000). Although annual congestion-related person-hours of delay increased more quickly in large urban areas, the total number of hours of delay was much higher in Seattle and other very large urban areas in 2007, 132 and 425 percent higher, respectively. Trends in annual person-hours of delay for Seattle, other very large urban areas, and large urban areas are illustrated in Exhibit 4-6.

Exhibit 4-6. Annual Delay – Person Hours



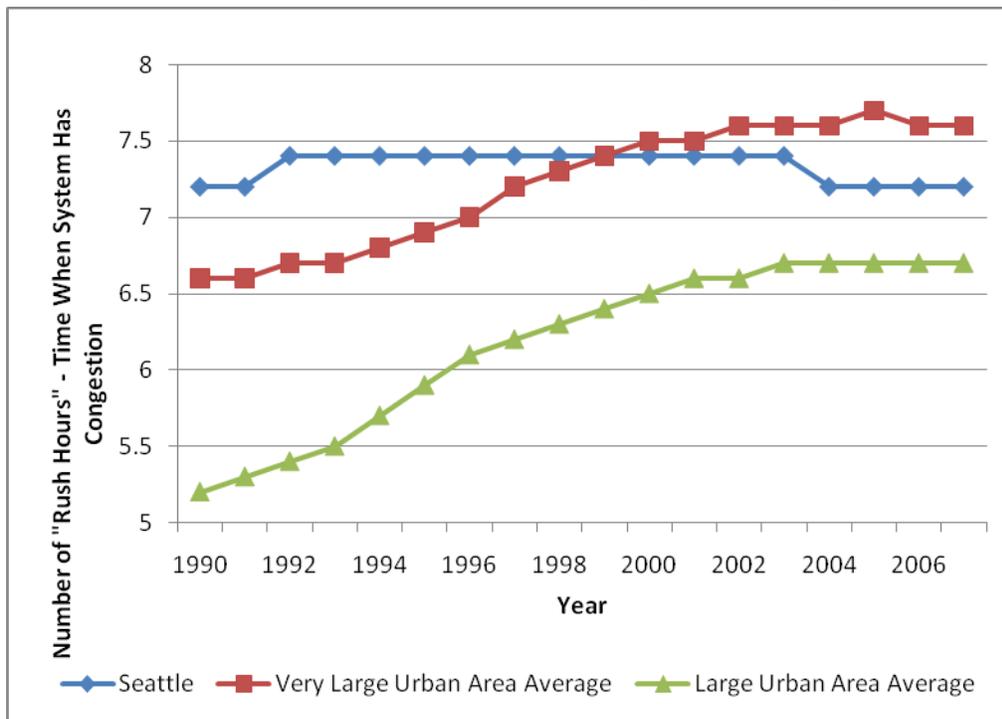
Source: TTI 2009b.

Number of Rush Hours – Time When System Has Congestion

The number of rush hours, or time when the roadway system has congestion each day, was 7.2 hours in Seattle (2007). That same year, it was 7.6 hours for other very

large urban areas. Between 1990 and 2007, the number of rush hours in Seattle remained essentially constant. It shifted from 7.2 to 7.4 in 1992, held constant for 12 years, then dropped back to 7.2 in 2004, where it remained in 2007. The number of rush hours grew from 6.6 to 7.6 hours for other very large urban areas during this same period, a 15 percent increase. The average number of rush hours in large urban areas increased from 5.2 to 6.7 hours, a 29 percent increase. Currently, Seattle has less than one rush hour more than the average for cities with less population. Seattle experienced about one rush hour more than very large urban areas in the early to mid-1990s. Patterns now reveal that Seattle has been experiencing a reduction in rush hours, while other very large urban areas continue to increase their number of rush hours over that of Seattle. Trends in number of rush hours for Seattle, other very large urban areas, and large urban areas are illustrated in Exhibit 4-7.

Exhibit 4-7. Number of Rush Hours – Time When System Has Congestion



Source: TTI 2009b.

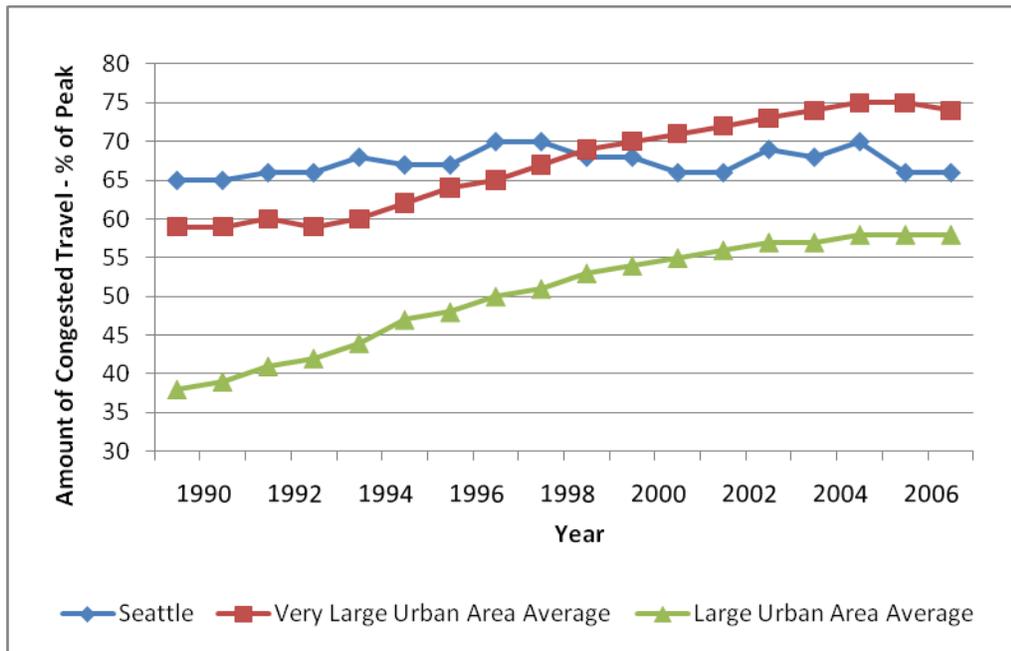
Amount of Congested Travel – Percentage of Peak VMT

In 2007, the amount of congested travel, defined as a percentage of peak VMT,⁷ was 66 percent in Seattle and 74 percent in other very large urban areas. Between 1990 and 2007, this metric has varied dramatically, but overall has only increased about 1.5 percent; in contrast, it grew from 59 to 74 percent for other very large urban areas

⁷ Percent congested travel is the congested peak period VMT divided by total VMT in the peak period. This is a relative measure of the amount of peak period travel affected by congestion.

(a 25 percent increase). However, Seattle’s average amount of congested travel is 67 percent, the same as other very large urban areas. The amount of congested travel in large urban areas grew from 38 to 58 percent during the same period (an increase of nearly 53 percent). As detailed in Exhibit 4-8, Seattle’s amount of congested travel has fluctuated between 65 and 70 percent for the past 17 years, whereas both the average of all other very large urban areas and the average of large urban areas continue to increase at a steady pace and are only just experiencing signs of slowing. Trends of the amount of congested travel as a percentage of peak VMT for Seattle, other very large urban areas, and large urban areas are illustrated in Exhibit 4-8.

Exhibit 4-8. Amount of Congested Travel – Percentage of Peak VMT



Source: TTI 2009b.

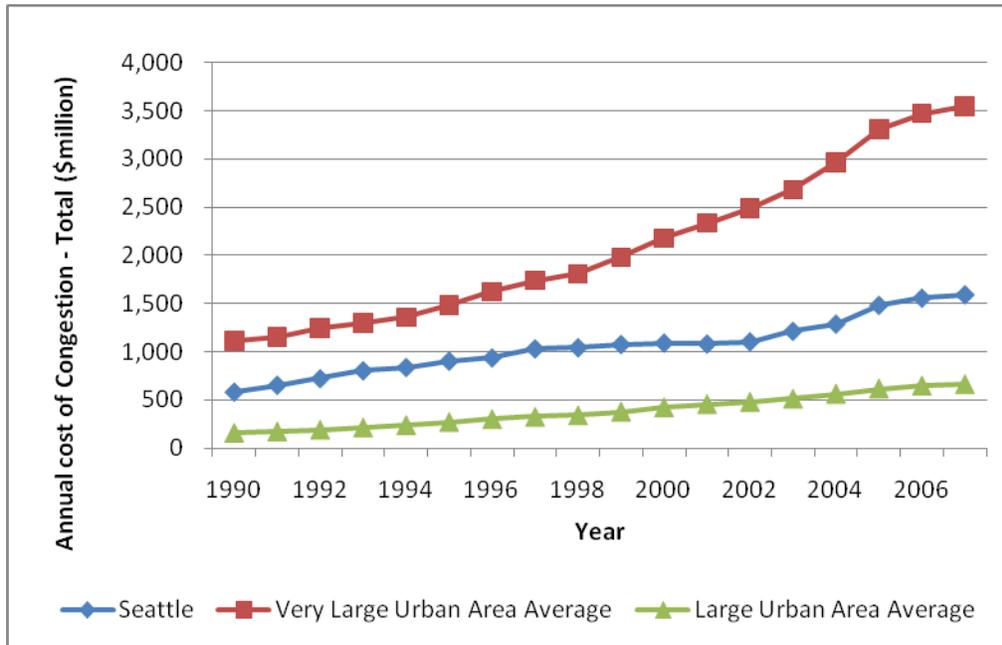
Total Annual Congestion Cost

In 2007, Seattle’s total annual congestion cost⁸ was \$1,591,000,000. The same year, the average total annual congestion cost for other very large urban areas was \$3,549,000,000. Between 1990 and 2007, Seattle’s total annual congestion cost increased from \$584,000,000 to \$1,591,000,000, a 172 percent increase. During this same time, the average total annual congestion cost for other very large urban

⁸ The annual cost of congestion resulting from incidental and recurring delays includes the costs due to travel delay and wasted fuel. The delay cost is an estimate of the value of lost time in passenger vehicles and the increased operating costs of commercial vehicles in congestion. The wasted fuel cost is due to vehicles moving at speeds slower than free-flow during peak period travel.

areas increased from \$1,113,000,000 to \$3,549,000,000, a 219 percent increase. Large urban areas experienced a 313 percent increase in the average total annual congestion costs, from \$160,000,000 to \$661,000,000. Trends in total annual congestion cost for Seattle, other very large urban areas, and large urban areas are illustrated in Exhibit 4-9.

Exhibit 4-9. Total Annual Congestion Cost

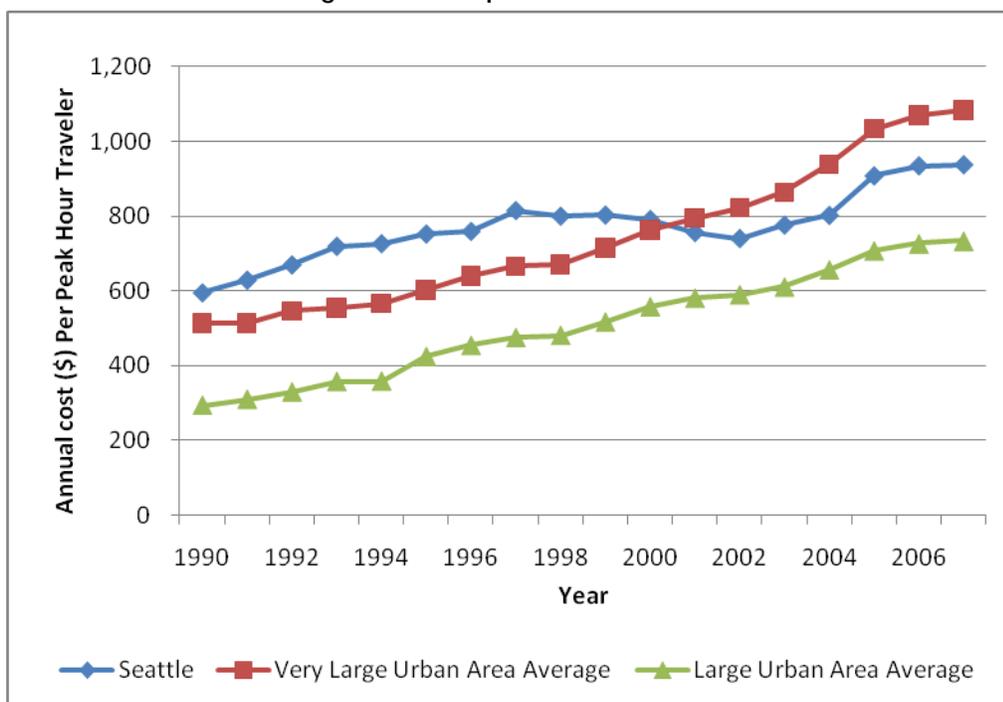


Source: TTI 2009b.

Annual Congestion Cost per Peak Hour Traveler

In 2007, the annual cost of congestion per peak hour traveler in Seattle was \$938. The same year, the annual cost of congestion per peak hour traveler for other very large urban areas was \$1,084. Between 1990 and 2007, the cost of congestion per peak hour traveler increased from \$594 to \$938 in Seattle (a 58 percent increase), and from \$513 to \$1,084 for other very large urban areas (a 111 percent increase). Large urban areas experienced an average annual cost of congestion per peak hour traveler increase of 151 percent during the same period (from \$293 to \$734). Trends in annual congestion cost per peak hour traveler for Seattle, other very large urban areas, and large urban areas are illustrated in Exhibit 4-10.

Exhibit 4-10. Annual Congestion Cost per Peak Hour Traveler

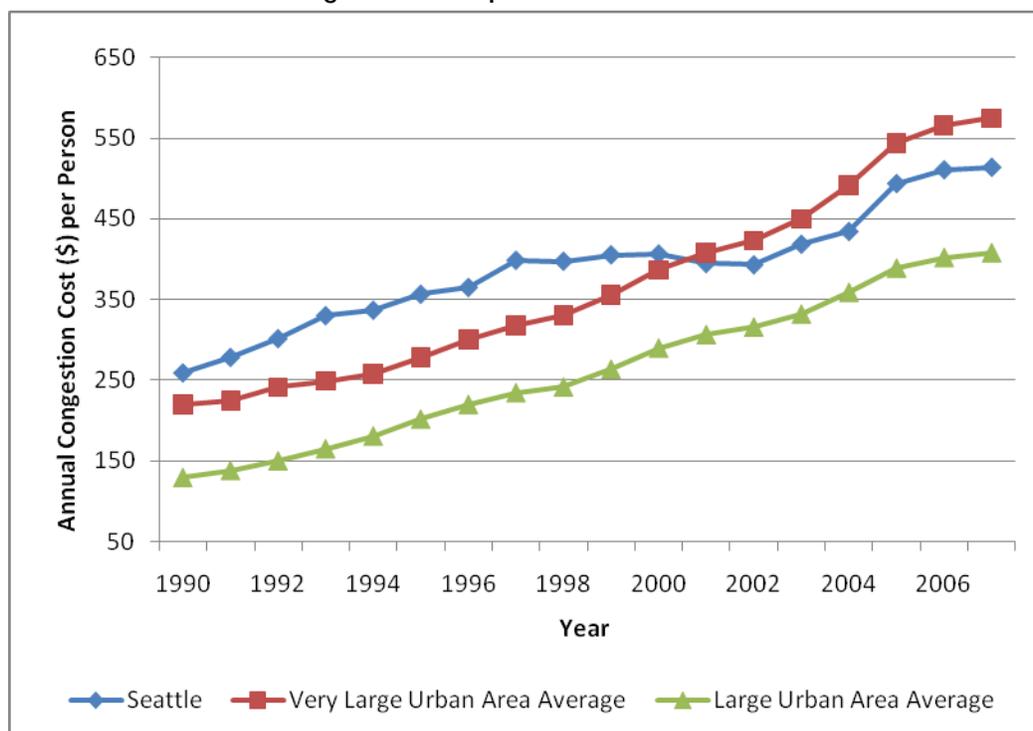


Source: TTI 2009b.

Annual Congestion Cost per Person

In 2007, the annual congestion cost per person in Seattle was \$513. The same year, the annual congestion cost per person for other very large urban areas was \$575. Between 1990 and 2007, Seattle's annual congestion cost per person increased from \$260 to \$513, a 98 percent increase, while for other very large urban areas the annual congestion cost per person increased from \$220 to \$575, a 161 percent increase. Large urban areas had an annual congestion cost per person in 1990 of \$129 and experienced an increase to \$408 during the period from 1990 to 2007 (an increase of 216 percent). In 2007, the annual cost of congestion per person in Seattle was 12 percent lower than in other very large urban areas, but 26 percent higher than the cost of congestion per person in large urban areas. Trends in annual congestion cost per person for Seattle, other very large urban areas, and other large urban areas are illustrated in Exhibit 4-11.

Exhibit 4-11. Annual Congestion Cost per Person



Source: TTI 2009b.

4.7 Ferry and Cruise Ship Facilities

Five main areas of the Seattle central waterfront are used for ferry and cruise ship operations (Port of Seattle 2009c):

1. Pier 50/52. Seattle Ferry Terminal at Colman Dock (801 Alaskan Way). These terminals provide ferry service to and from the Seattle CBD, Vashon and Bainbridge Islands, and Bremerton (Washington State Ferries 2009). Vehicles queue up for the automobile/passenger ferries on Pier 52; the Vashon passenger-only ferry operates from Pier 50. In 2006, over 6 million passengers and nearly 3 million vehicles on ferries passed through Seattle's waterfront, or about 25,000 riders per day (WSDOT 2006). There is no public parking available at the terminal; parking for Washington State Ferries employees is available at the terminal.
2. Pier 66/Bell Street Cruise Terminal (2225 Alaskan Way). This facility is located in the north waterfront area. The terminal is owned by the Port of Seattle and operated by Cruise Terminals of America. It provides berths for Norwegian Cruise Line and Celebrity Cruises between May and October. On-pier parking is not available for users of the facility; parking currently occurs at the Bell Street Pier Garage, between Alaskan Way and Elliott Avenue. However, short-term access is granted via street use

permits for taxi queuing in the southbound parking lane of Alaskan Way and provisioning trucks queuing (in a limited manner to meet pier side appointments) in the northbound outside lane. Eighty-two cruise ship vessel calls were scheduled at Pier 66 for the 2008 cruise ship sailing schedule.

3. Pier 69 (2711 Alaskan Way). This facility is in the north waterfront area and is owned by the Port of Seattle. It is home to the *Victoria Clipper*, a high-speed, passenger-only ferry operating between Seattle and Victoria, British Columbia, Canada. The facility also provides berthing for several small cruise vessels specializing in local sightseeing and expeditions to Alaska. Access to Pier 69 is gained via the North Apron. Pier 69 is also the headquarters for the Port of Seattle.
4. Terminal 91 Cruise Facility (2001 W. Garfield Street). This facility is just north of the study area. It is owned by the Port of Seattle and provides berths for Holland America Line, Princess Cruises, and Royal Caribbean. There is a parking lot just north of the terminal, with shuttle service to and from the loading docks. The completion of Terminal 91 relieved Terminal 30 from cruise ship use, which had 128 vessel calls in 2008.
5. Argosy Cruises/Piers 55 and 56. This facility is in the central waterfront area, just west of the study area. Argosy Cruise Line at Pier 55 ferries passengers to Blake Island State Park (about 5 miles offshore) and also provides tours around Elliott Bay.

Other ferry and boat services leave from a few smaller piers along the waterfront. In 2008, the Port of Seattle hosted 886,039 cruise ship passengers and 210 cruise ship vessel calls (Port of Seattle 2009a). Cruise ship passengers originating in Seattle potentially support the local economy by extending their pre- and post-cruise stays in or near the port of embarkation or by using local transportation. Port-of-call passengers potentially support the local Seattle economy by visiting local attractions.

4.8 Inventory of Existing Businesses

To support the 2004 Draft EIS, in January 2004, the environmental team performed an inventory of businesses within one block of the proposed changes to existing facilities or proposed new facilities. The boundaries of the 2004 Draft EIS inventory were Andover Street and SR 99 to the south and Roy Street and Aurora Avenue to the north. In August 2005, a minor additional area along Aurora Avenue was inventoried for businesses within one block of the proposed facility improvements from Roy Street to Lee Street (one block north of Comstock Street). In October 2006, the environmental team updated the entire existing inventory. For those areas already inventoried as part of the 2004 Draft EIS and

August 2005 inventories, the business inventory activity was limited to verifying that the previously collected data were still accurate and updating the data to reflect current conditions. A fourth inventory update was conducted to accommodate the design of the Bored Tunnel Alternative as of July 2009.

The area of direct effects during construction for the updated 2009 inventory included businesses within one block of proposed changes to existing facilities or proposed new facilities of the north and south portals; the businesses above the bored tunnel alignment were not included in the business inventory. Facilities included surface streets, aerial structures, tunnels, and the seawall. The inventory activity was limited to verifying that the data collected during the previous inventories were still accurate and updating the data to reflect current conditions. Data gathered during the previous inventories that were outside the boundaries of the subsequent inventory areas were included in the analysis where appropriate.

The south portal inventory conducted in 2009 covered the area from S. Jackson Street to S. Royal Brougham Way between Occidental Avenue S. and Alaskan Way S., including waterfront properties such as Port of Seattle facilities. The 2009 north portal inventory covered the area along Fifth Avenue N. from Roy Street to Broad Street and then east for one block along Thomas Street and south along Taylor Avenue N. The inventory area then extended along Denny Way to Sixth Avenue and then southeast to Battery Street. At Battery Street, the area extended northeast to Dexter Avenue, continuing on to Mercer Street. From there, the area extended east to Ninth Avenue N., where it continued north one block to Broad Street and Roy Street. From that point, the area extended west along Roy Street to the origination at Fifth Avenue N. The north portal inventory area included the businesses along the Broad Street decommissioning between Ninth Avenue N. and Thomas Street (see Exhibit 4-15).

The physical inventory includes only information that was observed or inferred from pedestrian reconnaissance, which included entering publicly accessible portions of buildings to inventory tenants identified in building directories.

Data on the following parameters were collected to assess direct effects on individual businesses (or groupings of individual businesses):

- Location and number of businesses within the area of direct effects
- Types of businesses
- Access and primary parking requirements for these businesses
- Estimate of size – small (fewer than 20 employees), medium (20 to 100 employees), or large (more than 100 employees)

4.8.1 Findings

Approximately 1,040 businesses were identified within the area of direct effects (within the inventory area). Exhibit 4-12 presents the breakdown of the types of businesses within one block of the project.

Businesses operating in commercial office space accounted for more than half (59.3 percent) of the businesses, while commercial retail accounted for 13.5 percent of the businesses. "Other service" accounted for 8.7 percent of businesses; almost half (47.1 percent) of the "other service" businesses were involved in food service as opposed to retail grocery. "Other" represented 8.3 percent of the businesses; most of the "other" businesses identified were parking (14.2 percent). Residential multi-family use represented 8.2 percent of the businesses. Government service⁹ represented only 2.0 percent of the businesses.

Exhibit 4-13 presents the breakdown of the sizes of businesses within one block of the project area. Most (79.4 percent) of the businesses were estimated to be small (fewer than 20 employees). Medium-sized businesses (20 to 100 employees) accounted for 14.7 percent of the businesses. The remaining businesses were split between large businesses (more than 100 employees), at 1.3 percent, and vacant businesses (no discernable business activity), at 4.5 percent.

Exhibit 4-14 presents the breakdown of primary parking availability for the businesses surveyed. The visual survey indicated that most businesses (68.6 percent) in the area of direct effects had neither on-site nor readily identifiable off-street parking for their customers and employees. More than a quarter of all businesses (25.9 percent) provided on-site parking for employees and customers. The remainder had directly identifiable off-street parking (5.5 percent).

4.8.2 Breakdown of Businesses by Geographic Area

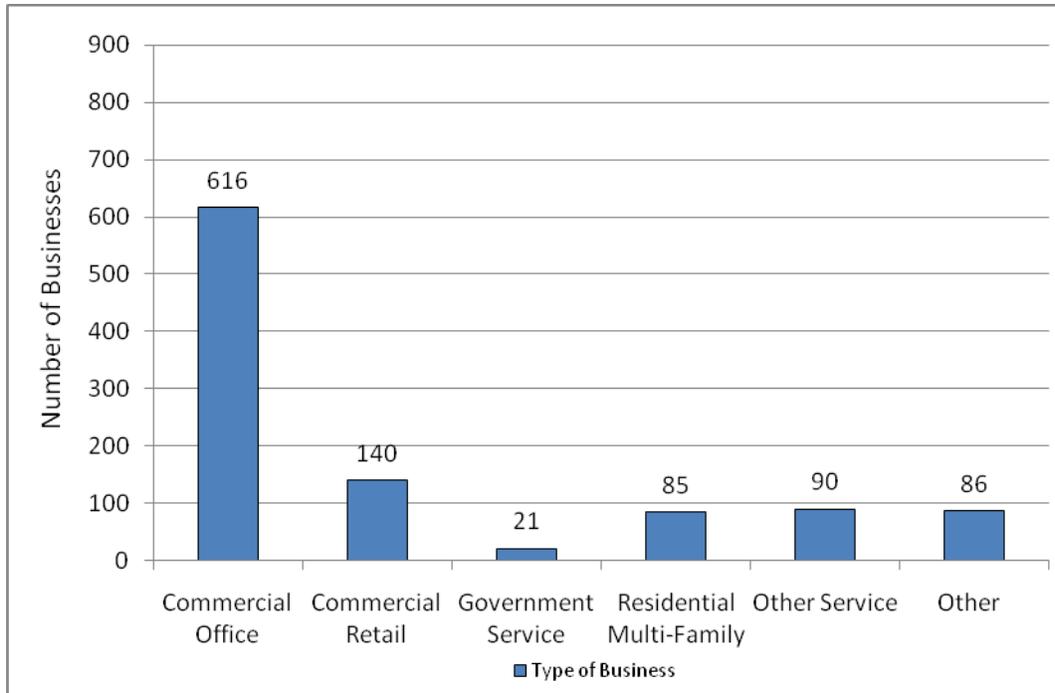
The inventory area was generally broken down into the following geographic areas, as shown on Exhibit 4-15:

- South Portal – S. Royal Brougham Way to S. King Street and Terminal 46 to Occidental Avenue S.: 95 businesses
- Pioneer Square – S. King Street to Yesler Way and Alaskan Way S. to First Avenue S.: 266 businesses

⁹ 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.

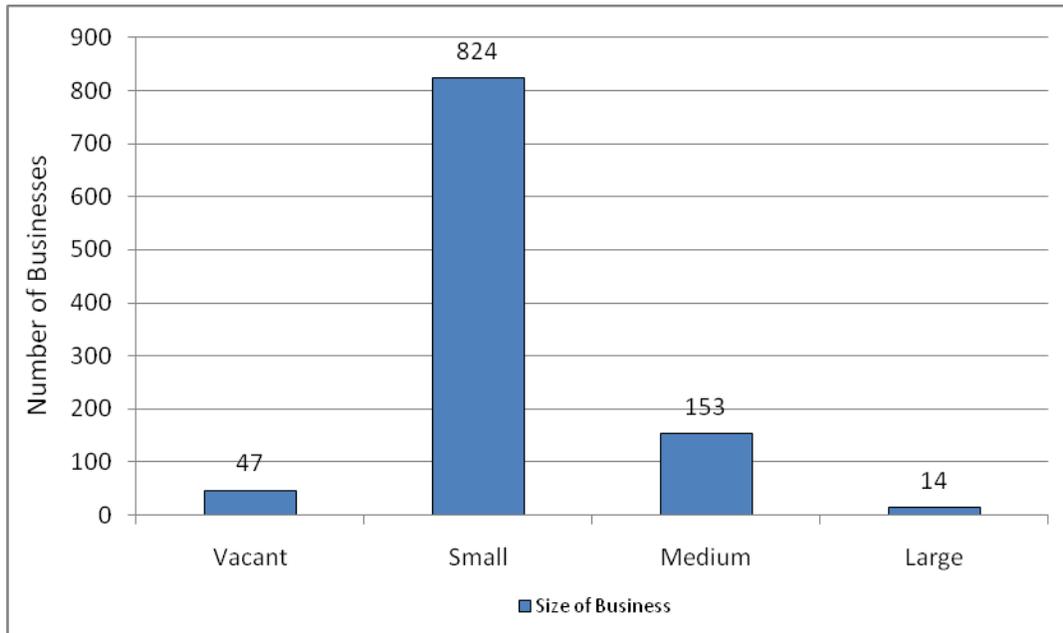
- Central – Yesler Way to Battery Street Tunnel south portal and Alaskan Way to Western Avenue: 461 businesses
- North Waterfront– Pier 46 to Pier 70 and Alaskan Way to edge of piers: 116 businesses
- North Portal – Denny Way to Roy Street and Dexter Avenue N./Ninth Avenue N. to Taylor Avenue N./Fifth Avenue N.: 100 businesses

Exhibit 4-12. Types of Businesses Within One Block of the Project Area



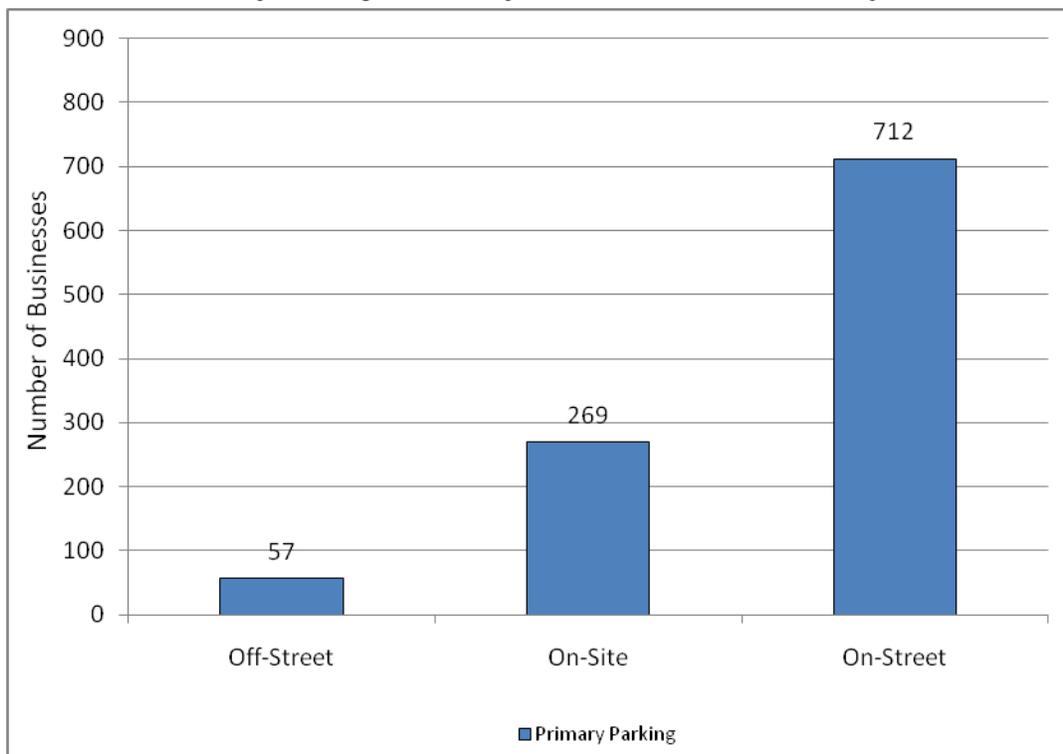
Note: Based on surveys conducted from 2006 to 2009.

Exhibit 4-13. Sizes of Businesses Within One Block of the Project Area



Note: Based on surveys conducted from 2006 to 2009.

Exhibit 4-14. Primary Parking Availability Within One Block of the Project Area



South Portal Survey Area

Within this survey area, 95 existing businesses were identified between Terminal 46 and Occidental Avenue S. and between S. Royal Brougham Way and S. King Street. Commercial office accounted for more than half of the existing businesses (63 percent), followed by “other” and commercial retail, both at 13.7 percent, and “other service” at 7.4 percent. Only one residential multi-family and one government service were identified in this area (Exhibit 4-16).

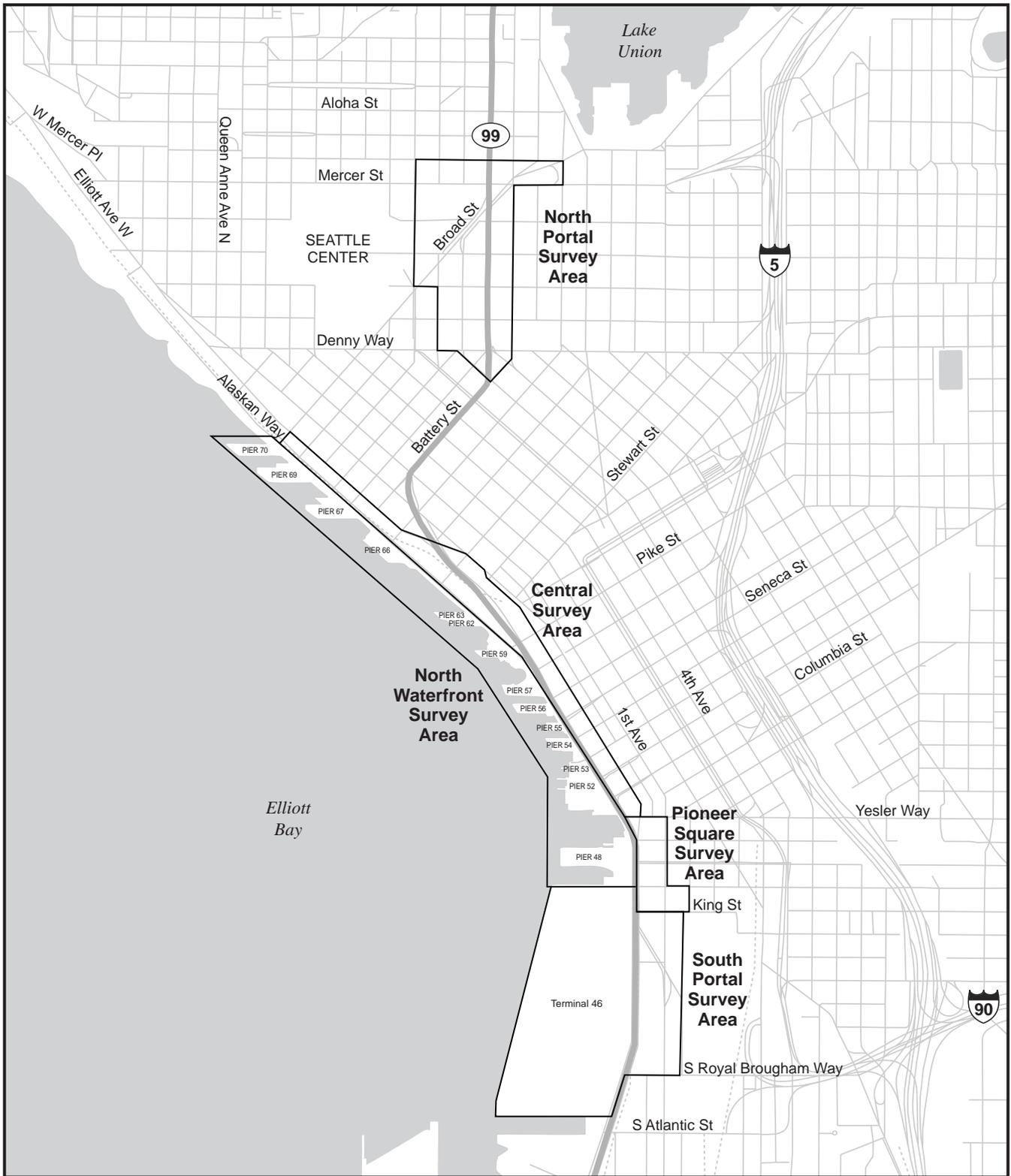
More than three-fourths of the businesses were characterized as small businesses (78.9 percent), and 9.5 percent were characterized as medium-sized. No large businesses were identified. Eleven businesses appeared to be vacant. Parking is dominated by on-street parking, followed by on-site parking.

Although many of the businesses along the east side of First Avenue S. have public access oriented toward First Avenue S., many have rear freight and public access on Occidental Avenue S.

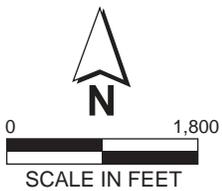
Pioneer Square Survey Area

Within this survey area, 266 existing businesses were identified along the east side of the Alaskan Way Viaduct. Existing businesses along the west side of the viaduct were inventoried as part of the north waterfront survey area. The City considers this historic area to be an area of special economic concern because of its heavy reliance on on-street parking for the retail and restaurant uses. The mix of business types is dominated by commercial office (64.7 percent), followed by “other service” (primarily non-retail food service) at 15.8 percent and commercial retail at 12.4 percent. There were 11 multi-family residential buildings in the survey area, three government services, and five “other” businesses (Exhibit 4-17).

About three-fourths of all the businesses were characterized as small (72.2 percent), and about 22 percent were characterized as medium. Two businesses appeared to be large. Vacant businesses accounted for almost 5 percent. The businesses in Pioneer Square rely on on-street parking, with only 21 businesses (7.6 percent) identified as having either on-site or off-street parking.



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**Exhibit 4-15
Business Inventory
Survey Areas**

Exhibit 4-16. Business Types Within One Block of the South Portal

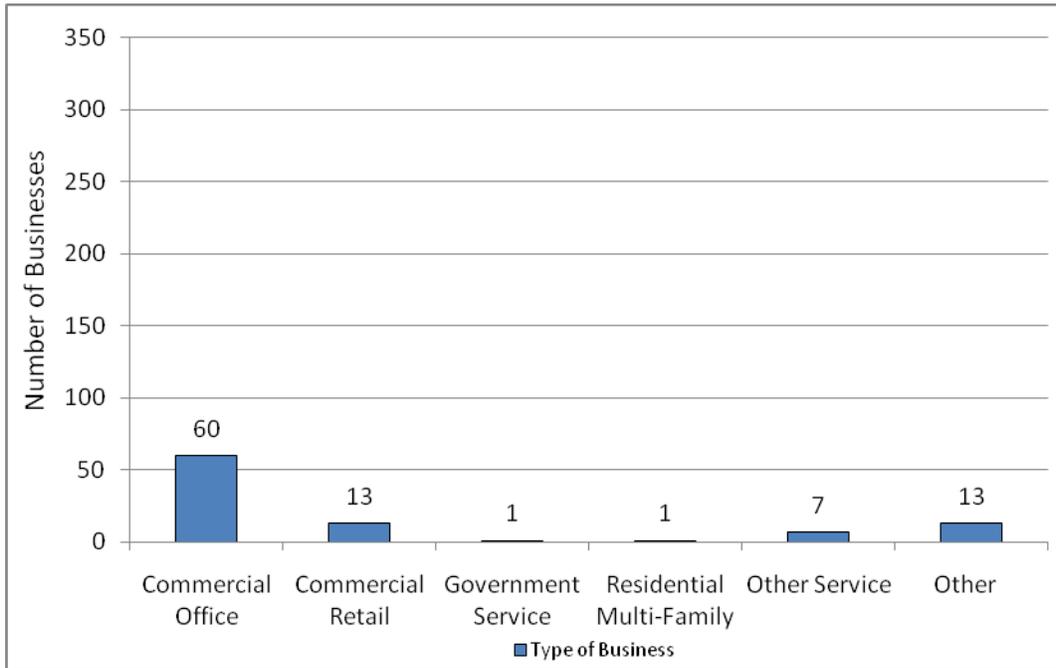
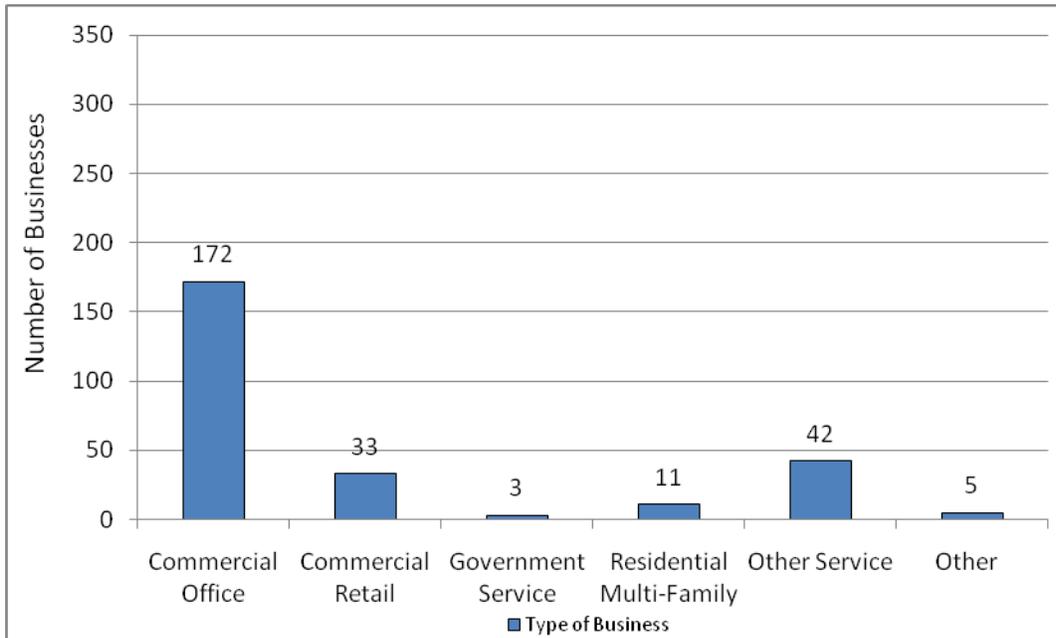


Exhibit 4-17. Businesses Types in Pioneer Square



Central Survey Area

Within this survey area, 461 existing businesses were identified along the east side of the Alaskan Way Viaduct. Existing businesses along the west side of the viaduct were inventoried as part of the north waterfront survey area. This area is near the heart of Seattle's commercial core, as demonstrated by the density of businesses encountered. The mix of business types is dominated by commercial office (more than 70 percent), followed by commercial retail at 10.8 percent and "other service" (primarily non-retail food service) at 7.4 percent. One industrial (non-marine dependent) business was identified in this survey area. There were 18 multi-family residential buildings in the area, along with 30 "other" businesses and three government services (Exhibit 4-18).

Almost all of the businesses were characterized as small (88.5 percent), with about 9 percent characterized as medium. Two businesses appeared to be large. Eleven businesses were vacant. Most businesses in this area (67 percent) rely on on-street parking, while 30 percent of businesses provide on-site parking.

North Waterfront Survey Area

Within this survey area, 116 existing businesses were identified along the west side of the Alaskan Way Viaduct and along the east side of the Alaskan Way surface street north of Pier 59 (where the viaduct begins to shift eastward toward the west portal of the Battery Street Tunnel) to Broad Street. Existing businesses along the east side of the viaduct between Yesler Street and Pier 59 were inventoried as part of the central survey area. The City considers the waterfront area to be an area of special economic concern because of its heavy reliance on tourists and on-street parking. The mix of business types is distributed among commercial office (36.2 percent, primarily north of Pier 59), "other service" (27.6 percent, primarily non-retail food service), and commercial retail (19.8 percent). No industrial (marine dependent and non-marine dependent) businesses or residential multi-family buildings were identified. There were 11 "other" businesses and 8 government services (Exhibit 4-19).

More than 75 percent of the businesses were characterized as small, and the rest were characterized as medium (just over 20 percent) or large. Four businesses (3.5 percent) appeared to be large. There were no vacant businesses. Most businesses along the waterfront rely on on-street parking (65 percent), with off-site and on-site parking sharing the remaining parking requirements.

Exhibit 4-18. Business Types in the Central Survey Area

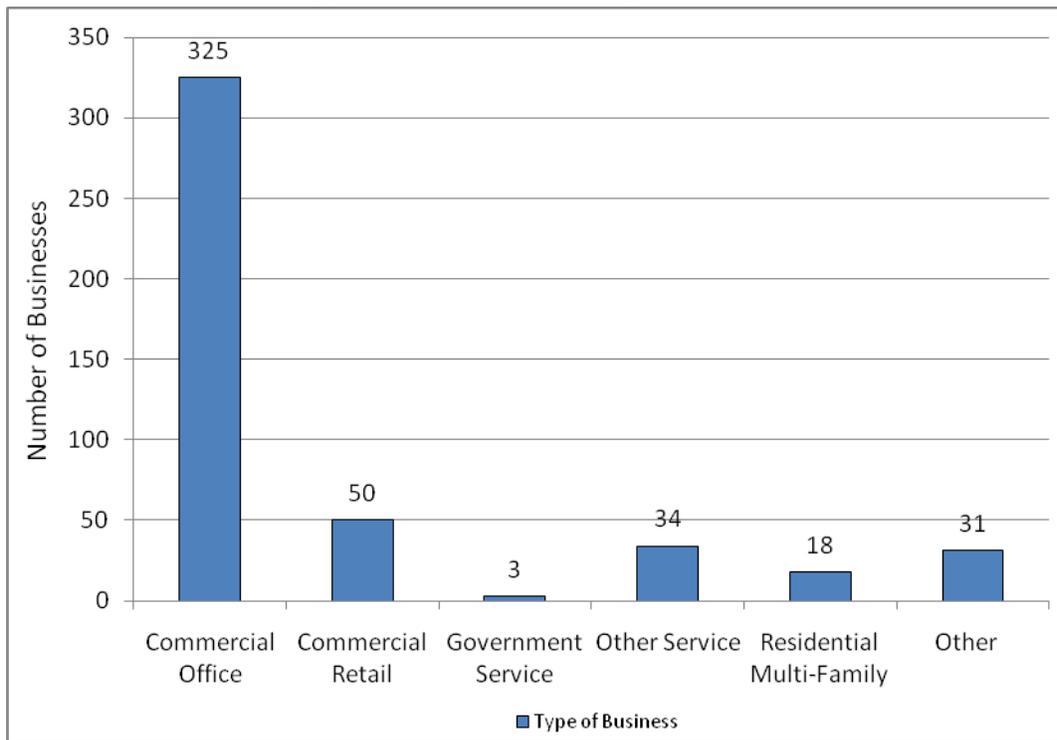
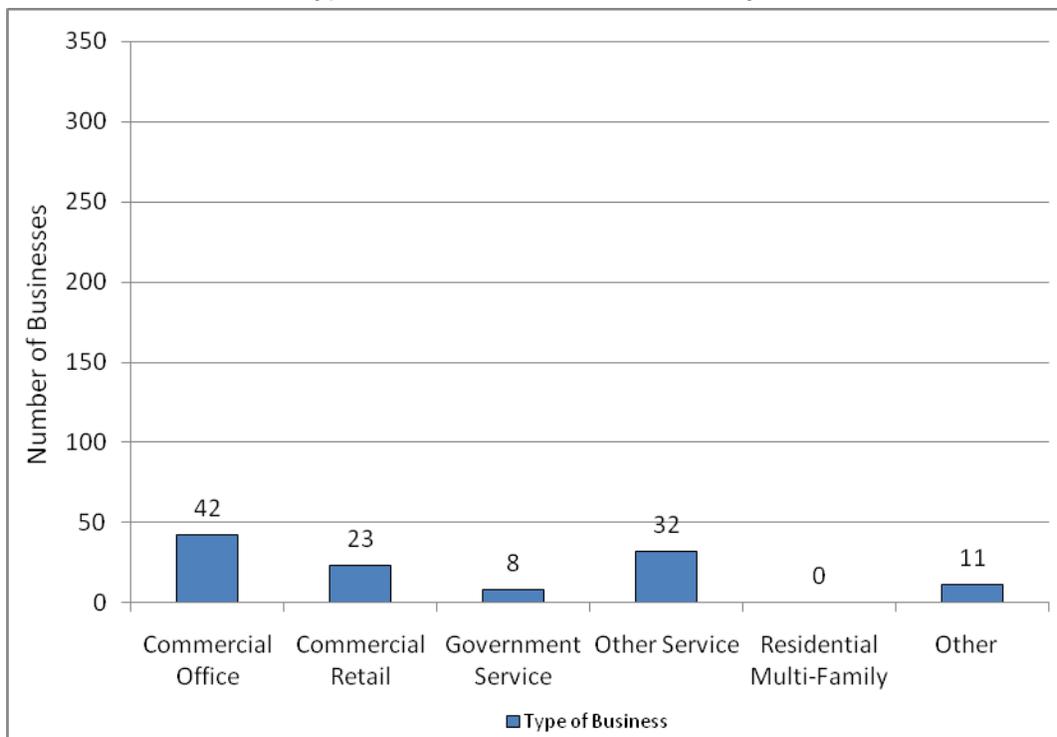


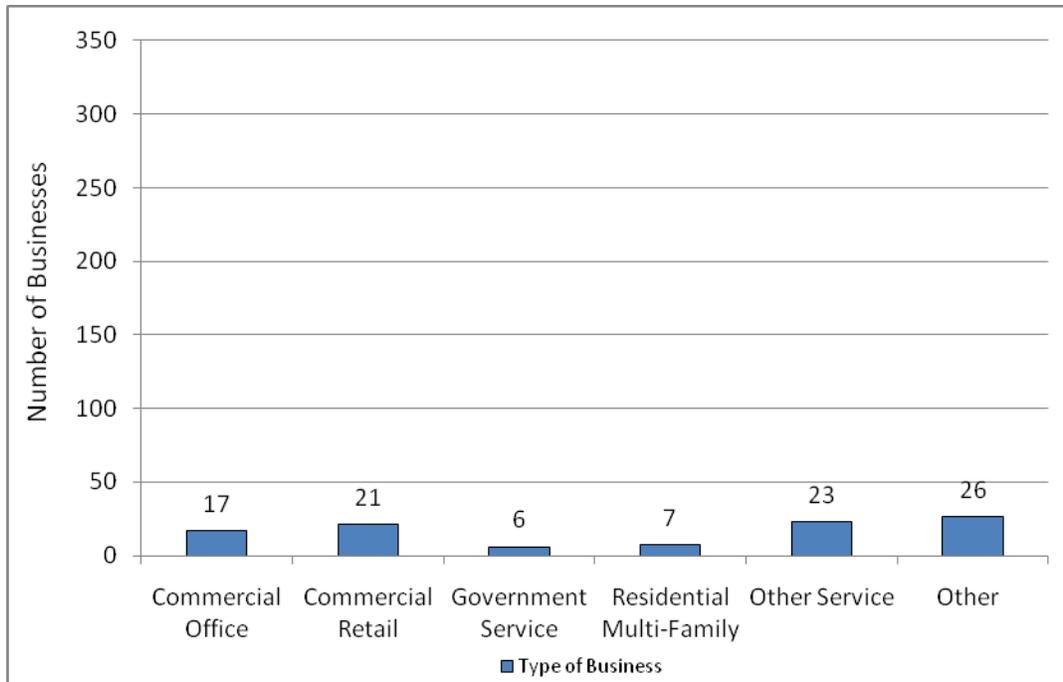
Exhibit 4-19. Business Types in the North Waterfront Survey Area



North Portal Survey Area

Within this survey area, 100 existing businesses were identified. “Other” and “other services” businesses dominate the north portal area, with a combined total of 49 percent. Typical businesses that fell into the “other” category included public parking, religious institutions, public event space, and City-owned property that was not a government service (such as a substation). “Other services” includes businesses like hotels and restaurants. Commercial retail businesses accounted for about 21 percent of the businesses within the area, and commercial office was not far behind, with 17 percent. Seven residential multi-family establishments and six government services were identified in this area. Exhibit 4-20 shows this distribution.

Exhibit 4-20. Businesses Types Within One Block of the North Portal



Most businesses were characterized as small (61 percent), with about 21 percent characterized as medium. Six businesses appeared to be large. Twelve businesses were vacant. On-site parking is the primary parking type in this area (83 percent). Businesses rely on off- and on-street parking in nearly equal amounts, 9 and 8 percent, respectively.

Chapter 5 OPERATIONAL EFFECTS, MITIGATION, AND BENEFITS

This chapter discusses the potential effects and benefits associated with the long-term operation and maintenance of each proposed alternative. Chapter 6, Construction Effects and Mitigation, discusses the effects and benefits resulting from construction activities.

The Viaduct Closed (No Build Alternative) and the Bored Tunnel Alternative were evaluated with respect to the following highway-related measures of effectiveness that have a bearing on the economic performance of the project:

- Connectivity between other streets and highways
- Pedestrian access
- Freight traffic travel time between existing industrial areas
- Visual effects
- Parking
- Property acquisitions

Presented below is a discussion of the potential visibility of existing businesses by vehicle occupants from the road.

5.1 Operational Effects of the Viaduct Closed (No Build Alternative)

Federal and Washington State environmental regulations require agencies to evaluate a No Build Alternative to provide baseline information about existing conditions in the project area. For this project, the No Build Alternative is not viable since the existing viaduct is vulnerable to earthquakes and structural failure due to ongoing deterioration. Multiple studies of the viaduct's current structural conditions, including its foundations in liquefiable soils, have determined that retrofitting or rebuilding the existing viaduct is not a reasonable alternative. At some point in the future, the roadway will need to be closed.

The Viaduct Closed (No Build Alternative) describes what would happen if the bored tunnel or another build alternative is not implemented. If the existing viaduct is not replaced, it will be closed, but it is unknown when that would happen. However, it is highly unlikely the existing structure could still be in use in 2030.

The Viaduct Closed (No Build Alternative) describes the consequences of suddenly losing the function of SR 99 along the central waterfront based on the two scenarios described below. All vehicles that would have used SR 99 would

either navigate the Seattle surface streets to their final destination or take S. Royal Brougham Way to I-5 and continue north. The consequences would be short-term and would last until transportation and other agencies could develop and implement a new, permanent solution. The planning and development of the new solution would have its own environmental review.

Two scenarios were evaluated as part of the Viaduct Closed (No Build Alternative):

- Scenario 1 – An unplanned closure of the viaduct for some structural deficiency, weakness, or damage due to a smaller earthquake event
- Scenario 2 – Catastrophic failure and collapse of the viaduct

The focus of the operational effects and benefits below assumes the first scenario, although qualitative assessments are made for Scenario 2.

5.1.1 Scenario 1 – Unplanned Closure of the Existing Facility

Under this scenario, the viaduct would be permanently out of service. As a result of complete closure, the loss of the viaduct could result in a substantial increase of traffic volumes on the surface street network and on I-5, as these roadways would have to absorb the bulk of the north-south traffic that previously used the viaduct. The flow of goods and vehicles through this area would be significantly disrupted. Depending on the severity of the damage, all use of the roadway beneath the viaduct, including parking, may be taken out of service if the structure is isolated from all access for public safety reasons. This would also restrict east-west traffic flows under the viaduct. Transportation agencies would be forced to deal with this closure as a crisis, and this response would necessarily be implemented with limited timelines and resources.

Adverse economic effects would result for the region, for all transportation modes that use the viaduct, and for the local area, with particular effects on businesses on the waterfront and in Pioneer Square that rely on the viaduct, the parking under the viaduct structure, and the Alaskan Way surface street to provide access for their patrons. Although some contingency plans may be in place for this scenario, the City, WSDOT, and FHWA would not likely be in the position to develop thorough mitigation to minimize adverse effects that would result from this unplanned loss.

5.1.2 Scenario 2 – Catastrophic Failure and Collapse of the Viaduct

A catastrophic seismic event could trigger failure and collapse of significant portions of the viaduct. This event would likely cause damage to or collapse of piers and buildings near the seawall due to movement of liquefiable soils that extend as far east as Western Avenue. The anticipated movements could disrupt

utilities, including power, sanitary and storm sewer, natural gas, oil, steam, and fiber optic utilities.

This scenario would result in the complete closure of the viaduct, as well as the isolation of all waterfront properties in terms of access. A number of the waterfront and Port of Seattle facilities could be rendered unusable due to the collapse of piers and buildings. Collateral damage to buildings and railroad facilities within and adjacent to the viaduct could occur due to falling aerial structures. Complete dismantling and removal of the entire collapsed structure would be required before access to the waterfront and use of the roadway beneath the elevated structure could be restored. The loss of the viaduct could result in a substantial increase in traffic volumes on the surface street network and on I-5, as these roadways absorb the bulk of the north-south traffic that previously used the viaduct. The movement of goods and vehicles through this area would be severely curtailed even after the removal of the collapsed structure is completed. In addition, serious personal injuries or death to people working in and visiting the area could occur during the viaduct collapse.

Adverse economic effects would occur both regionally, to all transportation modes that use the viaduct, and locally, with particular effects on waterfront and Pioneer Square businesses that rely on the viaduct and Alaskan Way surface street to provide patrons access to their businesses. The duration of this disruption and hardship on businesses would be long-term until the area is secured and stabilized and a new facility is constructed. Although some contingency plans may be in place for this scenario, the City, WSDOT, and FHWA would not likely be in the position to develop thorough mitigation to minimize adverse effects that would result from this catastrophic failure.

5.2 Operational Effects of the Bored Tunnel Alternative

The operational effects of the Bored Tunnel Alternative are considered for four project area segments:

- South Portal – S. Royal Brougham Way to S. King Street
- Bored Tunnel – Between Railroad Way S. and John Street under the Seattle CBD
- North Portal – Denny Way to Roy Street
- Viaduct Removal – S. King Street to the Battery Street Tunnel

Traffic and Access

Changes in traffic flow and access would have direct operational effects on the economic environment of the project area and the region. The efficient movement of goods between suppliers and customers would result in a net economic benefit

for the region. Access to individual businesses is critical for the economic survival of those businesses.

5.2.1 South Portal

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

The southbound on-ramp to and northbound off-ramp from SR 99 would feed directly into a reconfigured Alaskan Way S. The northbound off-ramp would have a general-purpose lane and a peak hour transit-only lane to accommodate transit coming from south or West Seattle. The reconfigured Alaskan Way S. would have three lanes in each direction up to S. King Street.

The reconfigured Alaskan Way S. would have a pedestrian and bicycle trail on the west side, called the Port Side Pedestrian/Bike Trail, and a minimum 25-foot-wide multi-use path, called the City Side Trail, on the east side. The City Side Trail would travel from S. Atlantic Street up to S. King Street and would replace the existing 15-foot-wide Waterfront Bicycle/Pedestrian Facility currently located on the east side of Alaskan Way S.

Two options are being considered for new cross streets that would be built to intersect with Alaskan Way S.:

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

The frontage road east of SR 99 would be widened slightly at S. Atlantic Street to accommodate truck turning movements. A new right-turn pocket would be added between S. Atlantic Street and S. Royal Brougham Way.

A tunnel operations building would be constructed in the block bounded by S. Dearborn Street, Alaskan Way S., and a new Railroad Way S. access road. Part of the building would be constructed underground. The remaining portion of the building is expected to be approximately 60 feet tall, with vent stacks extending up to 30 feet above the roof.

Duwamish/Harbor Island/SR 519 Connections – Overall, the new construction in the south portal area would provide improved connections to the Duwamish

area, Harbor Island, and SR 519. The south portal improvements would provide better access between the waterfront and SR 99 via more direct ramps at S. Royal Brougham Way and S. Atlantic Street. In addition, access between the waterfront and SR 519 would be improved. In the Pioneer Square/stadium area, congested conditions are still expected, although they would be somewhat improved compared to existing conditions.

Pedestrian Access – Within the south portal area, pedestrian access would be improved by the construction of the Port Side Pedestrian/Bike Trail and the City Side Trail. These trail upgrades, along with sidewalk improvements along First Avenue S., would provide improved pedestrian circulation in the south portal area.

Also, as described above, two cross street options are being considered, both of which would improve pedestrian access and connectivity in the south portal area. These improvements would also benefit adjacent businesses and homes by improving accessibility by employees, customers, and residents.

Parking – There are about 190 existing on-street parking spaces within the south portal area (about 50 long-term and about 140 short-term spaces). Of these 190 spaces, about 110 are paid short-term parking spaces. With the Bored Tunnel Alternative, all 190 on-street parking spaces would be removed, and 80 spaces would be replaced within the south portal area.

It is likely that the replacement parking spaces would be paid short-term parking, consistent with the *City of Seattle Comprehensive Plan C-3* goals TG18 and T42. Based on current paid parking along the waterfront, each parking space generates approximately \$6,600 per year in revenue. If this estimate holds true for the south portal area and 110 paid on-street parking spaces are removed, approximately \$726,000 would be lost each year from the City's General Fund. This is approximately 25 percent of the revenue currently being collected in the areas proposed for both the south and the north portals, as described in Section 4.5.5.

Property Acquisition – As shown in Exhibit 5-1, project improvements within the south portal area would require two full property acquisitions and three partial acquisitions. Parcels subject to partial acquisition would retain any existing buildings, maintain their current function, and continue to pay property taxes. The amount of property taxes paid may change for the properties subject to partial acquisition if they are reassessed by King County Department of Assessments. Because these reassessments would be on a case-by-case basis and would occur sometime after completion of the right-of-way acquisition, an estimate of the changes in property taxes is not possible at this time.

Exhibit 5-1. Effects of Property Acquisitions in the South Portal Area

Property and Business Elements	South Portal
Number of parcels subject to acquisition	5
Number of parcels subject to full acquisition	2
Number of buildings acquired	2
Approximate area of work space relocated or displaced	70,400 square feet
Estimated number of permanent jobs relocated or displaced	25
Approximate property tax paid by fully acquired parcels	\$189,300
Approximate area of fully acquired tax-paying parcels	173,200 square feet

The economic effect of full acquisition of these parcels would be their permanent conversion from private to public ownership. Parcels in public ownership are exempt from paying property taxes on the assessed value of the parcel. The total amount of non-exempt (taxable) land to be fully acquired for the south portal is approximately 173,200 square feet (4 acres). Consequently, King County and other state and local governments would lose the ability to collect taxes from properties that pay approximately \$189,300 in annual property taxes. This estimate is based on actual amounts collected in 2009 by the King County Finance and Business Operations for all of the parcels to be acquired. This estimate is for 1 year and represents less than 0.03 percent of all property tax revenue collected by King County in 2009. Construction of the south portal would slightly but permanently decrease the number of available parcels across which the property tax load is distributed.

Two buildings representing approximately 70,400 square feet of built space would have to be demolished for the south portal improvements that are part of the Bored Tunnel Alternative. In addition to the economic effect associated with the loss of property tax revenue, the loss of parcels with buildings would permanently displace an estimated 25 workers. This estimate is based on the total square footage of each individual building, the use of the building (office and warehouse), and the average square feet required per worker based on the use of the building (U.S. Department of Energy 2008). The permanent displacement of 25 workers represents less than 0.01 percent of the total 2010 (forecasted) Seattle CBD workforce (see Exhibit 4-4).

In addition to relocated or displaced businesses and workers, potential losses in sales and use and B&O tax revenues would occur. The potential loss of these tax revenues from the general tax revenue stream could be minimized if the displaced businesses relocate within the city (see Appendix G, Land Use Discipline Report), as these businesses would then continue to pay B&O taxes. The businesses and workers in these businesses would continue to pay sales and

use taxes related to the expenditure of earnings within the regional economy. Even if the relocated or displaced businesses leave the city but remain in the region, the jurisdiction of the new location would continue to collect B&O taxes that would contribute to the regional economy. The regional economy would lose B&O revenue only if the businesses close or relocate outside of the region.

After construction, WSDOT could sell the parcels that were either fully or partially acquired and are not part of the permanent roadway right-of-way as surplus property and return them to private ownership. Parcels returned to private ownership would pay property taxes and could provide opportunities as replacement properties for displaced businesses, allowing owners to remain in the community. Some remnant parcels, however, may not be sold and redeveloped after construction because of potential access constraints resulting from the proposed roadway changes under the Bored Tunnel Alternative.

5.2.2 Bored Tunnel

The bored tunnel would have two lanes in each direction. The southbound lanes would be located on the upper level of the tunnel, and the northbound lanes would be located on the lower level. The travel lanes would be approximately 11 feet wide, with 2-foot- and 6-foot-wide shoulders. The wider shoulder would provide emergency vehicle access and space for disabled vehicles to stop safely.

Traffic and Access

Downtown Seattle Connections – Under the Bored Tunnel Alternative, the downtown access ramps would no longer be in their existing locations: a southbound off-ramp and northbound on-ramp at Railroad Avenue S., a southbound SR 99 on-ramp from Columbia Street, and a northbound SR 99 off-ramp at Seneca Street. Instead, new ramps would be built in the north and south portal areas. The north and south portal ramps would provide less direct access to central and north downtown from the south than the existing ramps; therefore, trips destined for the central and northern portions of downtown would have to travel farther on arterial streets to access the ramps. Trips destined to the southern portions of downtown would find the south portal ramps closer to access. The north and south portal ramps would also offer an advantage by distributing traffic to any number of streets (off of Alaskan Way) in downtown, rather than to or from a specific, single intersection at Columbia Street or Seneca Street.

Ballard/Interbay Traffic – The Bored Tunnel Alternative would remove the northbound off-ramp to Western Avenue and the southbound on-ramp from Elliott Avenue. SR 99 trips to and from northwest Seattle communities (Ballard, Magnolia, and Belltown) would have several routing options. One option would be to exit and enter SR 99 on the Alaskan Way S. ramps and continue on Alaskan

Way or other downtown arterials to reach the Elliott/Western corridor in Belltown. Another option would be to continue through the bored tunnel to the South Lake Union exits at Republican Street or Roy Street and then use various combinations of Mercer Street, Harrison Street, Broad Street, and Denny Way to reach the Elliott/15th Avenue corridor.

Under the Bored Tunnel Alternative, travel between Ballard and S. Spokane Street via the Alaskan Way surface street is projected to be 2 to 8 minutes slower than travel via this same route with the 2015 Existing Viaduct included in the traffic analysis (Appendix C, Transportation Discipline Report), which includes the existing Elliott/Western ramps. (The 2015 Existing Viaduct assumes that the existing viaduct will continue to be part of the transportation network between S. King Street and Denny Way in the year 2015.) Under the Bored Tunnel Alternative, travel times along this route would be compromised due to the lack of a connection from Elliott/Western Avenues to the waterfront, causing traffic to use Broad Street, which includes an at-grade rail crossing. However, using Mercer Street and the bored tunnel, the Bored Tunnel Alternative is expected to be only 1 to 2 minutes slower in the AM peak hour, and less than 1 minute slower southbound and 1 minute faster northbound in the PM peak hour. For additional detail on travel times, see Chapter 5 of Appendix C, Transportation Discipline Report.

Pedestrian Access – The bored tunnel would not affect pedestrian access throughout downtown because it would be contained under the city. However, removing the Columbia and Seneca Street ramps would improve pedestrian flow on First Avenue.

Freight Travel Time – The removal of several exits from SR 99 would somewhat affect freight trucks with destinations to the downtown core and to the BINMIC and the Duwamish industrial area.

Vehicles carrying hazardous or combustible materials would be prohibited from using the tunnel; this is similar to current restrictions in the Battery Street Tunnel and on the Alaskan Way Viaduct during peak travel hours. Freight carrying hazardous or combustible materials would likely use Alaskan Way for trips between the Interbay and Duwamish industrial areas. This is discussed in more detail in the north and south portal in Sections 5.2.1 and 5.2.3 and in Appendix C, Transportation Discipline Report.

Property Acquisition – No properties would be acquired within this segment because the tunnel would be contained underground. There would be numerous permanent tieback easements along the extent of the bored tunnel. During tunnel boring, there may be temporary inconveniences to building occupants in the form of vibrations. For more information about these impacts and relocations, see Appendix G, Land Use Discipline Report.

5.2.3 North Portal

The existing on-and off-ramps at Denny Way would be closed and replaced with access ramps to and from SR 99 near Harrison and Republican Streets.

Northbound access from SR 99 and southbound access to SR 99 would be provided via new ramps at Republican Street. The northbound off-ramp to Republican Street would be provided on the east side of SR 99 and routed to an intersection at Dexter Avenue N. Drivers would access the southbound on-ramp via a new connection with Sixth Avenue N. at Republican Street on the west side of SR 99.

Surface streets would be reconfigured and improved in the north portal area. Aurora Avenue would be restored to at-grade level between Denny Way and John Street, and John, Thomas, and Harrison Streets would be connected as cross streets. This rebuilt section of Aurora Avenue would connect to the new SR 99 alignment via the ramps at Harrison Street. The new north-south section of Aurora Avenue would have two general-purpose lanes in each direction and turn pockets between Denny Way and Thomas Street. Signalized intersections would be located at Denny Way and John, Thomas, and Harrison Streets. A northbound transit lane would extend from Denny Way to John Street, with a transit queue bypass at the John Street signal. A southbound transit lane would extend from Harrison Street to Denny Way.

Mercer Street would become a two-way street and would be widened from Dexter Avenue N. to Fifth Avenue N. The rebuilt Mercer Street would have three lanes in each direction with left-hand turn pockets. Broad Street would be closed and filled between Ninth Avenue N. and Taylor Avenue N.

Two options are being considered for Sixth Avenue N. and the southbound on-ramp:

- The Curved Sixth Avenue option proposes to build a new roadway that would extend Sixth Avenue N. in a curved formation between Harrison and Mercer Streets. The new roadway would have a signalized intersection at Republican Street.
- The Straight Sixth Avenue option proposes to build a new roadway that would extend Sixth Avenue N. from Harrison Street to Mercer Street in a typical grid formation. The new roadway would have signalized intersections at Republican and Mercer Streets.

A tunnel operations building would be constructed between Thomas and Harrison Streets on the east side of Sixth Avenue N. Part of the building would be constructed underground. The remaining portion of the building is expected to be approximately 65 feet tall, with vent stacks extending up to 30 feet above the roof.

Traffic and Access

BINMIC Connections – Within the north portal area, a new northbound off-ramp and southbound on-ramp would be constructed at Republican Street. A likely travel pattern for freight traffic destined for the BINMIC from northbound SR 99 would be to exit at Republican Street and turn north on Dexter Avenue N. Freight traffic would then turn west onto Mercer Street and pass under SR 99. Freight traffic accessing SR 99 would likely navigate from Mercer Street to Sixth Avenue N. to use the Republican Street on-ramp under both Sixth Avenue N. options. Other corridors that would be used to access the BINMIC include Westlake Avenue N., Nickerson Street, Leary Way, and N. 39th Street.

An exception to these travel routes would apply to vehicles carrying hazardous or combustible materials, which would be prohibited from using the tunnel, just as they are currently prohibited from using the Battery Street Tunnel. Vehicles hauling hazardous materials would likely use I-5 or Alaskan Way.

Downtown Seattle Connections – The north portal would provide SR 99 on- and off-ramps at Republican Street and Harrison Street. Access to northbound SR 99 would be at Aurora Avenue and Harrison Street, which is also where southbound SR 99 travelers would exit the new facility before entering the bored tunnel. Southbound SR 99 access in the north portal area would be via a new on-ramp at Sixth Avenue N. and Republican Street. Northbound SR 99 travelers exiting the bored tunnel would use the Republican Street exit that would provide direct access to Dexter Avenue N. Access to these ramps via existing and improved city streets and the new SR 99 infrastructure improvements would provide access to and from downtown Seattle that is comparable to the access provided today.

Street improvements to Aurora Avenue would enhance downtown connections for southbound and northbound SR 99 travelers with a destination of South Lake Union, Seattle Center, or Uptown. Additionally, surface street improvements in the north portal area would include the following:

- Widening Mercer Street to allow two-way traffic between Dexter and Fifth Avenues N.
- Extending Sixth Avenue N. between Denny Way and Mercer Street, either straight to Mercer Street or curving northeast.
- Decommissioning the Battery Street Tunnel, which would also include improvements to the Denny Way intersection with Wall Street.
- Connecting the street grid at John, Thomas, and Harrison Streets between Fifth Avenue N. and halfway to Dexter Avenue N.

These improvements would provide downtown connections better than those currently provided by the Alaskan Way Viaduct and Battery Street Tunnel SR 99 connections.

Pedestrian Access – Currently, Mercer Street, Broad Street, and Denny Way are the only east-west crossings of Aurora Avenue within the north portal area. The described east-west and south-north street improvements would enhance pedestrian access with adequate sidewalks and pedestrian way-finding throughout the area. Although the removal of Broad Street would change pedestrian circulation patterns, it would not decrease accessibility to adjacent businesses and residences.

Parking – There are approximately 370 existing on-street parking spaces within the north portal area (about 230 long-term and 140 short-term spaces). Of these 370 existing spaces, about 320 are paid, 210 of which are long-term spaces. With the Bored Tunnel Alternative, all 370 on-street parking spaces would be removed, and 160 spaces would be replaced within the north portal area.

It is currently unknown if the replaced spaces would be paid or unpaid, or short- or long-term parking. Based on paid parking currently in operation along the waterfront, each parking space generates approximately \$6,600 per year in revenue. If this estimate holds true for the north portal area and 320 paid on-street parking spaces are removed, approximately \$1.4 million would be lost each year from the City's General Fund. This is approximately 49 percent of the existing revenue currently being collected in the areas proposed for both the south and the north portals, as described in Section 4.5.5.

Property Acquisition – As shown in Exhibit 5-2, improvements in the north portal area would require full acquisition of three parcels and partial acquisition of three parcels. Parcels subject to partial acquisition would retain any existing buildings, maintain their current function, and continue to pay property taxes. The amount of property taxes paid may change for the properties subject to partial acquisition if they are reassessed by the King County Department of Assessments. Because these reassessments would be on a case-by-case basis and would occur sometime after completion of the right-of-way acquisition, an estimate of changes in property taxes is not possible at this time.

The economic effect of full acquisition of these parcels would be their permanent conversion from private to public ownership. Parcels in public ownership are exempt from paying property taxes on the assessed value of the parcel. The total amount of non-exempt (taxable) land to be fully acquired for the north portal is approximately 39,900 square feet (0.9 acre). Consequently, King County and other state and local governments would lose the ability to collect taxes from properties that pay approximately \$74,800 in annual property taxes. This estimate is based on actual amounts collected in 2009 by the King County Finance and Business Operations for all of the parcels to be acquired. This estimate is for 1 year and represents less than 0.01 percent of all property tax revenue collected by King County in 2009. Construction of the north portal would slightly but permanently

decrease the number of available parcels across which the property tax load is distributed.

Exhibit 5-2. Effects of Property Acquisitions in the North Portal Area

Property and Business Elements	North Portal
Number of parcels subject to acquisition	6
Number of parcels subject to full acquisition	3
Number of buildings acquired	1
Approximate area of work space relocated or displaced	51,500 square feet
Estimated number of permanent jobs relocated or displaced	119
Approximate property tax paid by fully acquired parcels	\$74,800
Approximate area of fully acquired tax-paying parcels	39,900 square feet

One building representing approximately 51,500 square feet of built space would have to be demolished for the north portal improvements of the Bored Tunnel Alternative. In addition to the economic effect associated with the loss of property tax revenue, the loss of parcels with buildings would permanently displace an estimated 119 workers. This estimate is based on the total square footage of the building, the use of the building (commercial, educational, office, or lodging), and the average square feet required per worker based on the use of the building (U.S. Department of Energy 2008). The permanent displacement of 119 workers represents less than 0.06 percent of the total 2010 (forecasted) Seattle CBD workforce (see Exhibit 4-4).

In addition to relocated or displaced businesses and workers, potential losses of sales and use and B&O tax revenues would occur. The potential loss of these tax revenues from the general tax revenue stream could be minimized if the displaced businesses relocate within the city (see Appendix G, Land Use Discipline Report), as these businesses would continue to pay B&O taxes. The businesses and workers for these businesses would also continue to pay sales and use taxes related to the expenditure of earnings within the regional economy. Even if the relocated or displaced businesses leave the city but remain in the region, the jurisdiction of the new location would continue to collect B&O taxes that would contribute to the regional economy. The regional economy would lose B&O revenue only if the businesses close or relocate outside of the region.

After construction, WSDOT could sell those parcels that were either fully or partially acquired and are not part of the permanent roadway right-of-way as surplus property and return them to private ownership. Parcels returned to private ownership would pay property taxes and could provide opportunities as

replacement properties for displaced businesses, allowing owners to remain in the community.

5.2.4 Viaduct Removal

Viaduct demolition from S. King Street to the Battery Street Tunnel would begin after the bored tunnel and portal improvements are completed and open for use.

Traffic and Access

Duwamish/Harbor Island/SR 519 Connections – The viaduct removal would not significantly affect connections to Duwamish/Harbor Island/SR 519. Many of the access issues associated with these connections would be improved in association with the S. Holgate Street to S. King Street Viaduct Replacement Project. Further, the viaduct would be removed only after the bored tunnel is in use.

BINMIC Connections – The viaduct removal would not significantly affect connections to the BINMIC since it would be demolished only after the bored tunnel is completely functioning. However, freight trucks transporting hazardous or combustible materials would not be permitted to use the bored tunnel; currently these vehicles use Alaskan Way S. for local trips or I-5 for regional and interstate trips.

Downtown Seattle Connections – The viaduct removal would temporarily affect local connections between Seattle’s waterfront and downtown during construction. Chapter 6 describes the construction effects.

Pedestrian Access – The viaduct removal would temporarily affect pedestrian access between Seattle’s waterfront and downtown during construction. Chapter 6 describes the construction effects.

Travel Time – The viaduct removal would not have significant effects on travel time since the viaduct would be removed only after the bored tunnel is completely functioning.

Parking – Parking underneath the viaduct north of S. King Street would be removed in phases before the phased demolition of the viaduct; some parking near the existing viaduct might be reinstated after completion of the waterfront promenade and the new Alaskan Way surface street, but the quantity and timing of the reinstatement of parking is unknown at this time.

Property Acquisition – No properties would be acquired in association with viaduct removal.

5.2.5 Operations and Maintenance Costs

The calculation of gross or net economic effects attributable to implementation of the Bored Tunnel Alternative requires isolating the O&M expenditures specific to the alternative from current O&M expenditures. It is likely that current O&M

expenditures would be funded from local revenue sources and therefore would not contribute to net economic effects. Exhibit 5-3 presents the distribution of O&M costs for existing conditions and the Bored Tunnel Alternative.

The O&M costs are based on current WSDOT tunnel and bridge experience on the Interstate 90 (I-90) system and WSDOT/SDOT expenses on the existing viaduct. Average unit O&M costs for the bored tunnel were provided by these transportation agencies. These unit costs were converted to annual costs.

Exhibit 5-3. Operations and Maintenance Costs for the Bored Tunnel Alternative Compared to Existing Conditions (\$Millions/Year)

	O&M Cost Estimate	Increase in O&M Costs Over Existing
Existing conditions	1.9	0
Bored Tunnel Alternative	4.5 to 6.0	+2.6 to +4.1 (+237% to +462%)

5.2.6 Economic Effects

The Bored Tunnel Alternative would result in an increase in O&M costs compared to existing conditions. For the Bored Tunnel Alternative, the annual O&M expenditures would increase by \$2.6 to \$4.1 million over the O&M costs for maintaining the existing viaduct.

5.3 Operational Mitigation

The proposed mitigation measures are general. Specific mitigation measures would be determined based on the expected cost-effectiveness, specific needs of individual businesses, and ability of individual businesses to withstand the effects associated with the Bored Tunnel Alternative. A detailed mitigation plan would be developed as project design plans are finalized.

Potential mitigation measures to reduce permanent adverse economic effects include the following:

- Minimize the extent and number of businesses, jobs, and access that would be permanently affected.
- Compensate for right-of-way acquisition, displacement and relocation of businesses, and loss of property value in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act and applicable state and local policies.
- Encourage relocated businesses to remain in Seattle so that B&O taxes would continue to be collected by the City.

- Increase use of off-street parking, especially in the south and north portal areas, to mitigate the loss of on-street short-term parking in the portal areas.
- In the South Lake Union area, the most probable parking mitigation option would include increasing the use of existing parking facilities in the area. Surrounding arterials, such as Sixth Avenue N. and Harrison Street, have short-term, on-street parking.

WSDOT and the City will work closely with affected business owners to minimize the level of disruption that may result from displacements and relocations along the project alignment. Efforts will be made to help business owners find suitable replacement locations, especially those that are near the project alignment. Where businesses would be required to relocate, the lead agencies will work with owners to ensure that moves can be made in a timely manner, thereby reducing the overall expenses, inconveniences, and amount of time a business must remain closed during relocation.

5.4 Operational Benefits

Operational benefits would be experienced exclusively under the Bored Tunnel Alternative when compared to the Viaduct Closed (No Build Alternative). The benefits of the Bored Tunnel Alternative include a transformed waterfront environment, which would result in three categories of economic value: enhanced value to waterfront users, new visitor spending locally and regionally, and increased downtown property values. The new facility would have a long life—at least 75 years. Over the lifetime of the facility, the Seattle region would benefit from the avoided congestion and delay that would result from the Viaduct Closed (No Build Alternative) and no bored tunnel.

Enhanced Pedestrian Access – Pedestrian access would be enhanced in several locations, including the south portal area, the north portal area, and along the waterfront.

- **South Portal:** Within the south portal area, the Bored Tunnel Alternative would restore First Avenue S. from south of S. King Street to S. Royal Brougham Way. Landscaping, trails, and sidewalk improvements would be incorporated into the new S. Dearborn Street (and S. Charles Street, if that option is implemented) intersections between First Avenue S. and Alaskan Way S., and between S. Royal Brougham Way and S. King Street. The improvements associated with the south portal would enhance the pedestrian experience relative to existing conditions and provide better access to and from businesses, residences, and public spaces.
- **North Portal:** Within the north portal area, the Bored Tunnel Alternative would reestablish pedestrian sidewalks along both sides of Aurora Avenue and all other surface street improvements. Also, the connection of John, Thomas, and Harrison Streets across SR 99 would provide

pedestrian crossing connections in three new locations. The improvements associated with the north portal would enhance the pedestrian experience relative to existing conditions and provide better access to and from businesses, residences, and public spaces.

- **Viaduct Removal:** The Bored Tunnel Alternative would include demolition of the viaduct structure from S. King Street to the Battery Street Tunnel. Currently, the viaduct is a psychological barrier between the Seattle waterfront and downtown. The pedestrian environment beneath the viaduct is not welcoming, and the structure casts large shadows. Viaduct removal would allow the City to improve Alaskan Way, as discussed in Section 7.1, and would enhance pedestrian connections between the waterfront and downtown Seattle.

Maintenance of Regional Mobility – The Bored Tunnel Alternative would maintain local and regional mobility by replacing the existing viaduct with a facility that provides an alternative route to I-5 and Seattle's surface streets. Local connections near the south and north portals would improve mobility for drivers, pedestrians, and bicyclists, with enhanced surface street connections compared to existing conditions.

Improved Safety – The Bored Tunnel Alternative would improve safety on SR 99. The design of the bored tunnel would comply with current seismic standards and other design standards to withstand an earthquake, flooding, or other disaster. The tunnel would also include additional safety features and current technology in tunnel ventilation systems, along with fire detection and suppression, and lighting systems.

Transferring traffic from the existing viaduct to the bored tunnel would increase the safety of travelers using SR 99 because the new facility would be much safer than the existing viaduct, which is deteriorating and at risk of failing in an earthquake. The design for the SR 99 corridor would include safety improvements that would have a net positive economic benefit. The existing viaduct has design deficiencies that lead to higher crash rates on some sections of SR 99, resulting in more congestion and associated economic costs as documented in Section 4.6. The bored tunnel would be designed with features to reduce congestion. The tunnel would also have emergency passages to safety, fire suppression systems, communication with vehicles from a central station, and emergency ventilation systems that meet federal standards. WSDOT would monitor the tunnel 24 hours a day, similar to the I-90 tunnel today. These improvements would substantially enhance safety over existing conditions (see Section 5.12 of Appendix C, Transportation Discipline Report, for a more extensive discussion about the safety improvements in the Bored Tunnel Alternative design).

Chapter 6 CONSTRUCTION EFFECTS AND MITIGATION

6.1 Construction Effects

The Bored Tunnel Alternative would require about 66 months of construction. There would be eight traffic stages, starting with utility work and early construction activities prior to construction of the south portal. For more specific information about each traffic stage, see Chapter 6 of Appendix C, Transportation Discipline Report.

6.1.1 Regional Economic Activity

Beneficial regional and state economic effects would result from construction of the Bored Tunnel Alternative. The intent of this section is to assess the likely overall economic effects that would be attributed to construction of the Bored Tunnel Alternative, as measured by increases in regional and state activity, employment, and associated job earnings. The detailed analysis, including implementation of the RIMS II input-output model, is presented in Attachment A.

Construction expenditures would occur over a number of years (from 2011 to 2017), directly creating new demand for construction materials and labor. These direct effects would lead to indirect, or secondary effects, as the production of output by firms in other industries increases to supply the demand for inputs to the construction industry. Both the direct and indirect effects of construction expenditures typically cause firms in all industries to employ more workers to meet increases in demand. This increase in employment leads to induced effects because the additional wages and salaries paid to workers generally foster higher consumer spending.

Project Total Costs

Project costs for the Bored Tunnel Alternative, including right-of-way acquisition, sales tax, and construction costs, were developed in January 2010 (Exhibit 6-1). Implementation costs, including design and construction management, risk, and escalation, are grouped with the construction costs.

Exhibit 6-1. Total Project Costs of the Bored Tunnel Alternative

Total Project Cost Estimate (\$ millions)	Project Cost Component (\$ millions and share)	
	Right-of-Way Acquisition	Construction Cost ^{1,2}
1,960	172 (9%)	1,788 (91%)

Note:

¹ The sales tax portion of the construction cost is estimated to be \$100 million.

² Construction cost includes the cost of preliminary engineering, \$193 million.

Project Capital Costs

For purposes of assessing the economic effects on output, earnings, and employment, the focus is placed on the project capital costs (construction and right-of-way acquisition) of the Bored Tunnel Alternative as an accurate measure of the capital investment that would likely occur for the project. It is assumed that no project capital costs would be incurred for the Viaduct Closed (No Build Alternative) (Scenario 1 only).

Exhibit 6-2 lists the project capital cost estimates and distribution of funding sources for the Bored Tunnel Alternative. The distribution of funding sources was developed by the design team and constitutes the list of potential funding mechanisms currently available. Percentage shares of the capital cost estimates are also provided.

Exhibit 6-2. Capital Costs and Funding Sources of the Bored Tunnel Alternative

Capital Cost Estimate (\$ millions)	Funding Source (\$ millions and share)	
	Federal Committed	State Committed
1,960	130 (7%)	1,830 (93%)

For purposes of examining the regional economic effects, all of the federal earmark grants and federal general funding are assumed to be new funds that would otherwise not be spent either regionally or within the state in the absence of the project. All state and local funding sources are assumed to be expended with or without the project, because these funds are raised by taxing local and/or state residents and are specifically earmarked for transportation projects within the region or state.

Summary of Gross Economic Effects

For every dollar spent on construction capital cost for the Bored Tunnel Alternative, two dollars of additional economic activity would be generated in the Seattle-Tacoma region and slightly more than two dollars would be spent statewide. This additional economic activity would occur across all economic and labor sectors. Also, every dollar spent on capital costs translates directly into \$0.61 in new wages and salary earnings for the jobs generated outside of the construction field.

For the Bored Tunnel Alternative, new demand for construction would generate gross direct effects equal to the capital cost of \$1,788 million of the total \$1,960 million project cost. The gross multiplied effect on output would total approximately \$3,962 million for all industries that are not directly involved with construction of the project. Of this amount, \$1,133 million would be paid to

workers as wage and salary earnings for the jobs generated beyond those directly involved with project construction. The estimated average number of jobs related to construction of the Bored Tunnel Alternative would be 480 jobs per year, representing about \$64.9 million per year in wages and benefits.

These figures do not include the secondary benefits presented in Section 5.4, Operational Benefits, that may occur after construction of the bored tunnel.

Summary of Net Economic Effects

For the portion of the project funding that comes from the federal government (outside of the region or state), the net effect of this new money on the regional economy would be less than the gross effect associated with the expenditure of all of the construction capital cost. For the Bored Tunnel Alternative, the same new demand for construction expenditures would generate net direct effects equal to \$143 million (8.0 percent of \$1,788 million¹⁰) of construction dollars after accounting for local funds that would otherwise still be spent in the regional economy with similar multiplied effects. Of this amount, \$87 million would be paid to workers as wage and salary earnings for the net new jobs created beyond those directly involved with project construction. This does not include the secondary benefits presented in Section 5.4, Operational Benefits, or the indirect effects presented in Section 7.5, Indirect Effects, that may occur after construction of the bored tunnel.

Summary of Benefits for Regional Economic Activity

The cost associated with construction of the Bored Tunnel Alternative would result in additional (gross) activity throughout all economic sectors within the Puget Sound region and the state of Washington. This gross economic activity is derived from the multiplier effects on the capital expenditures for the project. Examples of capital expenditures include the direct hiring of temporary construction workers, the purchase of construction materials and equipment, and the expenditure of capital funds to acquire new rights-of-way.

The amount of new economic activity directly associated with the Bored Tunnel Alternative (for both construction and right-of-way acquisition) that is the result of new money entering the Puget Sound regional economy would be \$317 million. The amount of new earnings (wages) entering the Puget Sound regional economy would be \$91 million. The portion of new money attributable to overall construction costs is 8 percent. The amount of new money assumes that

¹⁰ As detailed in Exhibit 6-1, construction costs are only part of the total capital cost estimate. Right-of-way acquisition is estimated to cost \$172 million, and construction (including preliminary engineering) is estimated to cost \$1,788 million, for a total of \$1,960 million estimated project capital costs.

both committed and anticipated federal funds are received for this project. If the anticipated federal funding is not provided for the project, the net economic benefit associated with new money would decrease. All other funding would come from within either the state or the Puget Sound region (local sources) and would likely be spent in the local economy even in the absence of the project.

6.1.2 Temporary Economic Effects on Businesses

Disruption to Businesses and Neighborhoods

Any major construction project, public or private, inconveniences or disturbs residents, businesses, and customers of businesses adjacent to the construction project. Construction-related effects can and would vary considerably over time and in their geographic coverage. Furthermore, effects can also vary based on the methods used to stage and construct a project, especially one as large as the Bored Tunnel Alternative.

Ninety-five existing businesses were identified within the south portal area, and 100 existing businesses were identified within the north portal area. Many of the north portal businesses provide on-site parking. From the inventory of existing businesses within one block of the existing alignment (see Section 4.8), the design team has identified approximately 1,040 businesses (including multi-family residential buildings) adjacent to the alignment that would experience disruption as a result of construction. These temporary effects include the following:

- The presence of construction workers, heavy construction equipment, and materials within the construction area.
- An increase in traffic congestion around the work zone.
- Temporary road closures, traffic diversions, and alterations to property access (see Appendix C, Transportation Discipline Report).
- Loss of parking, especially on-street short-term parking (see Section 6.1.5).
- Airborne dust (see Appendix M, Air Discipline Report).
- Noise and vibrations from construction equipment (including tunnel boring equipment) and vehicles (see Appendix F, Noise Discipline Report).
- Decreased visibility and alterations of access to businesses by customers.
- Rerouted pedestrian walk-up access to primary business entrance.

Up to 157 active commercial and industrial buildings that are not candidates for acquisition under the Bored Tunnel Alternative are located within 50 feet of the existing viaduct. Many of these buildings in the central area covered by the inventory of businesses are occupied by multiple businesses. However, the period of active disruption in front of any one building is estimated to be approximately 2 months. Disruptions could be caused by utility relocations prior

to viaduct demolition, loss of use of loading areas under the viaduct, and loss of private parking areas under the viaduct. Some of these businesses may suffer little or no adverse effect, while others may experience a noticeable decline in sales, increase in costs, and/or decrease in efficiency.

The 50th anniversary of Seattle Center and the 1962 World's Fair will be in 2012. Preliminary discussions and planning for events to commemorate Seattle Center's inception are underway. These events will be anticipated during construction staging activities in the north portal area, if large crowds are expected. However, these events would be similar to other large annual events, such as the Folk Life Festival over the Memorial Day weekend and Bumbershoot over the Labor Day weekend.

Without proper planning and implementation of mitigation, these construction-related effects could adversely affect the comfort and daily life of residents and inconvenience or disrupt the flow of customers, employees, and materials and supplies to and from these businesses. Construction effects would be integrated into the project management plan, the business mitigation plan, the noise and vibration mitigation plan, the public communication plan, and the project's contract specifications and special provisions.

6.1.3 Temporary Change in Vehicle Through-Traffic on SR 99

There would be eight traffic stages over the 66-month construction period of the Bored Tunnel Alternative. For an extensive description of the traffic stages and their effects, see Chapter 6 of Appendix C, Transportation Discipline Report.

The effects of a potential closure of SR 99 for up to 3 weeks for the crossover of traffic from the viaduct to the tunnel, as well as intermittent lane restrictions or surface street closures and periods of slower travel speeds on SR 99 and surface streets, would affect travel times and traffic throughput within the project area. Congestion would be greater during infrastructure construction compared to existing conditions and could affect the timeliness of business deliveries that rely on SR 99 for transporting goods. Closures of SR 99 would not be implemented during the established construction moratorium each year between the Thanksgiving holiday and New Years Day to reduce effects on businesses and holiday travel.

6.1.4 Economic Effects on Ferries and Cruise Ships

Motorists traveling to and from the Seattle Ferry Terminal at Colman Dock may experience delays during viaduct removal and the construction of surface street improvements in the north and south ends. Access to the ferry and marine terminals may be rerouted at times but would be maintained during construction. Also, pedestrian access to and from Colman Dock, would be maintained throughout construction, but may have to be rerouted at times.

These temporary changes in access could decrease efficient performance of the ferry system, which could affect ridership if other transport options are available to those who typically opt for this mode. The loss of ridership would decrease revenue for the Washington State Ferries. Furthermore, for commuters who continue to take the ferry to reach jobs, if a ferry is delayed or missed, late arrivals or missed workdays could result in lost wages.

Vehicle and pedestrian access would be maintained at the ferry and cruise ship terminals. Locations for pedestrian access and bus and taxi cab queuing and pickups would likely vary throughout construction to accommodate construction activities. Since the ferry and cruise terminals rely on access, maintaining access for cruise ship provisioning and other related activities, or mitigating any adverse effects on access is important to the economic vitality of these terminals.

6.1.5 Economic Effects of the Potential Loss of Available Parking

In the whole project area, the maximum number of on-street spaces that would be affected at one time during construction and demolition would be about 1,160 on-street spaces and about 240 to 280 off-street spaces, for a total of up to about 1,440 spaces. However, parking effects would vary throughout the construction traffic stages. During Traffic Stages 1 through 3, about 760 on-street spaces and about 50 off-street spaces would be affected; during Traffic Stages 4 through 7, 680 on-street spaces and 50 off-street spaces would be affected; during Traffic Stage 8, 700 on-street spaces and 50 off-street spaces would be affected. Thus, for most of the construction period (except for the last year—Traffic Stage 8), 730 to 810 spaces would be affected. These spaces include a mix of short-term on-street (paid), long-term on-street, and off-street spaces. The existing spaces are broken down as follows:

- South portal area (S. Royal Brougham Way to S. King Street) – Approximately 280 total spaces would be affected during construction. Of the 230 total on-street spaces affected in the south portal area, 180 are short-term spaces and 50 are long-term spaces. Also, of the on-street spaces, 150 are paid and 80 are unpaid. About 50 off-street spaces would be affected in the south portal area.
- Central area (S. King Street to the south portal of Battery Street Tunnel) – Approximately 80 to 160 on-street parking spaces in the central area would be affected during Traffic Stages 1 through 7. Approximately 550 to 560 on-street parking spaces under the viaduct and ramps and along Alaskan Way would be removed during Traffic Stage 8, viaduct demolition. All of these are short-term spaces, with the exception of up to 10 long-term spaces. Also, of the on-street spaces, 510 are paid and 40 to 50 are unpaid. Directly following viaduct demolition and removal, Seattle

expects to begin work on the waterfront promenade and the reconfigured Alaskan Way surface street. Construction of these projects would likely affect parking availability until they are completed. Affected off-street parking would range from 140 to 180 spaces during viaduct demolition. In addition to the public parking that would be affected during viaduct demolition, up to about 140 private/business/reserved parking spaces under the viaduct could be affected at the same time.

- North portal area (north portal of Battery Street Tunnel to Aloha Street) – Approximately 370 on-street and off-street spaces would be affected during construction. Of the 370 total on-street spaces affected in the north portal area, 140 are short-term spaces and 230 are long-term spaces. Also, of the on-street spaces, 320 are paid and 50 are unpaid. No off-street spaces would be affected in the north portal area.

For most of the construction period, about 680 to 760 on-street spaces would be affected. This would result in the annual loss of approximately \$4.5 million to \$5.0 million in parking revenue for the City.

The loss of approximately 390 to 470 short-term parking spaces represents about 2 percent of the short-term parking available within the Seattle CBD. The loss of 230 off-street parking spaces represents less than 1 percent of the long-term parking available within the Seattle CBD. The *2006 Parking Inventory for the Central Puget Sound Region* (PSRC 2007) indicated that the parking occupancy rate for off-street parking in the Seattle CBD was 70.1 percent.

Businesses within one block of the existing viaduct alignment generally do not have readily identifiable short-term parking options besides on-street parking, as discussed in Section 4.8, including those businesses in Pioneer Square, along the waterfront, and in the commercial core. Almost 75 percent of the existing businesses inventoried within each of these areas rely on on-street parking for their customer needs (see Section 4.8 for a description of the Inventory of Existing Businesses). All three of these areas would be affected by the temporary loss of 70 to 150 short-term spaces from the central waterfront, as described above.

Customers and freight pick-up and delivery service providers who routinely use on-street parking, including parking under the viaduct, would have to find alternative parking. This could result in secondary economic effects on businesses along the corridor by decreasing the number of customers willing to patronize those businesses. The degree to which alternative nearby parking can be identified and used by customers and business operators in the central waterfront and Pioneer Square areas would be one factor in determining the degree of economic effect on businesses in these economically fragile districts. Other factors include the degree to which construction activities inhibit the business environment.

During construction, the project could employ up to about 500 construction workers in the central Puget Sound region, with up to 500 workers seeking parking during the busiest stages of construction. Work areas would be distributed among several locations, with concentrations near the south portal, north portal, and central waterfront as demolition occurs. Construction workers who are not able to park within the construction zone would likely seek available long-term parking in the area, first pursuing on-street spaces and then pay lots.

One option is to transport workers by bus from outlying areas into the construction area. This option would likely increase non-productive labor time and therefore project cost. However, it would allow downtown workers, business customers, and tourists continued access to parking lots and parking spaces in the CBD and near the waterfront.

6.1.6 Construction Effects and Benefits – Cost of Congestion

As described in Section 4.6, the cost of congestion is typically measured in time or dollars and has the potential to affect travelers, businesses, and the regional economy. The existing viaduct and Battery Street Tunnel would be open during most of the project-related construction, except for short-term closures to connect existing SR 99 structures to detours and open the bored tunnel. Additionally, there would be various surface street lane restrictions or periodic closures and reduced speeds. Although detour routes would be available throughout project construction, the disruption of travel speeds and traffic flow would contribute to existing congestion in the area. However, the cost of congestion associated with the construction of the Bored Tunnel Alternative is not expected to contribute substantially to the urban area statistics presented in Section 4.6.

6.1.7 Construction Effects – Staging Areas

The following staging areas are proposed for tunnel construction and excavation activities and other project construction:

- Terminal 106 – Terminal 106 is south of the S. Spokane Street Viaduct. It is a potential area for construction staging and for use as a laydown area.
- Terminal 25 – Terminal 25 is north of S. Spokane Street near the Whatcom Railyard. This site could be used for some materials fabrication, but this activity would occur outside the 200-foot shoreline boundary.
- Washington-Oregon Shippers Cooperative Association (WOSCA) site – The WOSCA site lies to the west of First Avenue S. between S. Royal Brougham Way and S. King Street. Part of the site would be used for a slurry separation plant, if needed. This site is the likely location of a concrete batch plant for construction work, if one is deemed necessary. This site would also be used for the assembly of the tunnel boring

machine (TBM) power substation, as well as for storage and laydown of construction materials.

- Pier 48, uplands only – Located along Alaskan Way between S. Jackson and S. Washington Streets, this property is owned by the state of Washington. This property may be used for construction parking.
- Pier 46 – Pier 46 (the northern edge of Terminal 46) is a possible location to accommodate the barging of excavated materials for off-site disposal. One possible location for off-site disposal would be at Mats Mats Quarry near Port Ludlow, Washington. This would include the construction of a conveyor to transfer the materials to the barge. Container activity on Terminal 46 would not be affected.
- I-90 high-occupancy vehicle (HOV) ramp site – This site lies between the E-3 Busway and Sixth Avenue. On the south, this parcel is bounded by S. Royal Brougham Way. It would be used primarily for storage.
- Alaskan Way S., S. King Street to S. Jackson Street – The Alaskan Way S. right-of-way between S. King Street and S. Jackson Street would be used to construct the south portal and launch the TBM.
- Railroad Way S. right-of-way – During much of the construction period, the right-of-way along Railroad Way S. under the First Avenue S. ramps would be used for construction staging and construction of the bored tunnel’s south portal, and tunnel operations building. During the last year of construction, the area would be used to demolish the ramps.
- Alaskan Way S., S. Royal Brougham Way to S. King Street – This project work zone and construction staging area (6-acre site) would in part become the location of the permanent roadway connecting the bored tunnel to the new SR 99 roadway.
- First Avenue S. Bridge site – This site is a triangle-shaped property bordered by W. Marginal Way, Second Avenue S.W., and S.W. Michigan Street. It would be used primarily for storage.
- Fischer site (Fourth Avenue S., formerly an SR 519 project staging site) – This site lies between Third and Fourth Avenues S. On the south and north, it lies between S. Massachusetts Street and S. Atlantic Street respectively. It would be used primarily for storage but could possibly be used for materials fabrication.
- I-90 ramp site – This site is located between Fourth Avenue S. and the BNSF railroad tracks. The southern portion of this site is bounded by S. Royal Brougham Way. It would be used primarily for storage.
- Broad Street right-of-way – Once Broad Street is closed, it could be used for construction staging and storage.

- Construction zone within City right-of-way – This strip of right-of-way along the existing viaduct would be used for demolition and removal of the viaduct structure.
- Seattle City Light parking lot south of the Battery Street Tunnel – This site is currently a triangle-shaped property just west of SR 99, near the intersection of Battery Street and Western Avenue. It would be used primarily for storage.
- North portal construction staging area – The north portal staging area is bounded by Thomas Street on the south and Broad Street on the north, between Aurora Avenue and Sixth Avenue N. This area includes the City Maintenance Yard, which is bounded by Harrison and Republican Streets, Sixth Avenue N., and SR 99. This area would be used for construction staging, closing and backfilling of Broad Street, and TBM retrieval.
- BNSF/Lenora Street construction zone – This site is WSDOT right-of-way. It would be used for material storage for viaduct demolition and resurfacing of Alaskan Way in the last phases of construction.

Effects from the use of these facilities for construction staging would primarily result from the movement of materials, equipment, and personnel between the staging areas and construction zones, primarily associated with construction of the south portal, launching of the TBM, construction of the TBM substation, and movement of tunnel excavation spoils by conveyor. This movement could cause traffic disruptions and increase the noise, dust, and vibration effects on local businesses, as previously described.

6.2 Bored Tunnel Alternative

6.2.1 South Portal

Construction of the south portal includes the construction of a tunnel operations building and ramps providing northbound on, northbound off, southbound on, and southbound off movements to and from SR 99. South portal construction would also reduce First Avenue S. and SR 99 by one lane in each direction. Both of these roadways are critical transit routes. These lane closures would likely reduce transit flow, speed, and reliability.

Businesses on the east side of First Avenue S. would continue to have access from Occidental Avenue S.; however, the primary access points for many of these establishments are from First Avenue S. Since the south portal would be the launching point for the TBM, all spoils generated during the tunnel excavation would be trucked back through the excavated portion of the tunnel to the south portal for transport and disposal. This would result in several hundred truck

trips per day. Alternative methods of transport and disposal of spoils include transport by rail or by barge.

The WOSCA detour will be constructed as part of the S. Holgate Street to S. King Street Viaduct Replacement Project and is located between SR 99 and S. Royal Brougham Way. At the south end of the detour, near S. Royal Brougham Way, northbound and southbound traffic will be at-grade. Both directions of traffic will travel on a temporary bridge across the WOSCA property. At the north end of the detour, traffic will connect to SR 99 via temporary ramps that will link up to the existing First Avenue S. ramps. This detour structure would continue to be used throughout the bored tunnel construction.

Businesses adjacent to the project construction would experience increased noise, dust, and vibrations associated with the tunnel excavation and street improvements. As the project develops and plans for construction methods become more solidified, strategies would be developed to ensure local connectivity and access to buildings and businesses by pedestrians, bicyclists, motorists, and movers of freight. In addition, methods would be developed to provide access to public facilities and utilities that are not relocated prior to construction.

6.2.2 Bored Tunnel

The launching point for the TBM would be at the south portal, and several hundred truck trips per day would be required to remove the spoils generated by tunnel excavation.

Tunnel boring may affect areas and buildings within the settlement trough of the bored tunnel. To identify and prepare for potential building and area settlement, a structural building inventory has been conducted and an assessment of existing conditions has been performed. Before the tunnel boring begins, monitoring instrumentation would be installed to detect any settlement that may occur during or after boring under sensitive buildings and structures.

Approximate areas and buildings with the highest potential to experience settlement are as follows:

- Alaskan Way S. between S. King and S. Main Streets
- Alaskan Way at Yesler Way
- Polson Building, Commuter Building, Western Building, the older Federal Office Building between Western Avenue and First Avenue, and a portion of the Harbor Steps complex

In these potential settlement areas and at-risk buildings, compensation grouting could be used to mitigate settlement. Compensation grouting techniques stabilize or stiffen the soil.

Use of these mitigation measures would require acquisition of temporary property rights from property owners to complete the work. Any acquisitions would be completed according to the federal regulations in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, and guided by Revised Code of Washington, Chapters 8.04, 8.25, 8.26, and 47.12, which are the state laws that control the appraisal, acquisition, condemnation, relocation, and property management processes.

It is possible that the settlement risks for a specific building cannot be mitigated by means of jet or compensation grouting and that a building not previously identified as at risk of settlement is later determined to have sustained structural damage. In such cases, compensation to the building owners and tenants could include repair without temporary relocation, repair with temporary relocation, repair with permanent relocation, or condemnation of the building. Displaced businesses would be relocated as discussed in Chapter 5 for permanent relocation related to full acquisition of buildings. More details about the impacts due to settlement are discussed in Appendix P, Earth Discipline Report.

6.2.3 North Portal

Tunnel boring operations would end just north of Thomas Street. The TBM would be dismantled and extracted at this location. An extraction pit would be excavated to remove the TBM. At the end of the bored tunnel, SR 99 would begin to unbraided and transition into a cut-and-cover structure between Thomas and Harrison Streets. The new SR 99 would become a side-by-side roadway at Harrison Street, connecting back to the existing SR 99 just north of Mercer Street. Southbound SR 99 would shift west outside of the existing right-of-way. The cut-and-cover access structure would then transition into an open trench before transitioning again into the at-grade surface roadway.

Businesses adjacent to project construction would experience increased noise, dust, and vibrations associated with tunnel evacuation and street improvements. Also, vehicle and pedestrian access to businesses adjacent to construction would require rerouting (discussed in detail in Appendix C, Transportation Discipline Report).

Trucks accessing streets affected by construction would be subject to the same traffic delays that general-purpose vehicles would experience. Public parking would not be available on streets throughout the designated construction zone, preventing the unrestricted use of curbside lanes for truck parking and loading or off-loading. Alternatively, trucks would have to park nearby on side streets.

6.2.4 Viaduct Removal

Demolition of the existing viaduct would require various surface street closures at several locations during the 9-month removal period. Parking underneath the viaduct north of S. King Street would be removed prior to demolition of the viaduct. Some parking near the existing viaduct may be reinstated after completion of the waterfront promenade and the new Alaskan Way surface street, but the quantity and timing of this reinstatement is currently unknown.

6.2.5 Battery Street Tunnel Decommissioning

The current proposal for decommissioning the Battery Street Tunnel would entail filling it with crushed concrete debris from the viaduct demolition. Material would be trucked into and out of the Battery Street Tunnel to fill the void, which could increase noise and dust around the south portal of the Battery Street Tunnel. Effects on businesses are expected to be limited to temporary disruptions.

6.3 Construction Benefits

The primary economic benefit from implementing the Bored Tunnel Alternative is increased employment and economic stimulation for the local economy due to construction activities and demand for construction supplies. This includes the collection of sales tax revenue by local municipalities.

6.3.1 Construction Expenditures on Sales Tax Revenue

Sales taxes would be generated through the purchase of goods and materials related to construction. The estimated amount of sales tax generated (\$100 million) by the Bored Tunnel Alternative based on construction material costs only is indicated in Exhibit 6-1. Sales tax estimates were not generated for costs unrelated to construction, such as right-of-way acquisition and engineering.

These sales tax estimates are related only to direct construction expenditures. This analysis did not include an evaluation of the change in sales tax revenue collected by businesses that could be affected by construction activities in the study area.

6.3.2 Temporary Jobs Created During Construction

Construction associated with the Bored Tunnel Alternative would create temporary jobs, the duration of which would vary according to the construction plan but is expected to be about 66 months.

An estimate of the direct labor force needed for construction associated with the Bored Tunnel Alternative was prepared in January 2010. The estimates were

calculated based on the approximate cost for construction contracts, assuming that the average labor rate in 2011 would be \$65.00 per hour.

For the Bored Tunnel Alternative, the average number of jobs directly related to construction would be 480 per year, although up to 200 workers per day could be required during the most intense period of construction. The direct jobs needed to construct the Bored Tunnel Alternative would generate approximately \$64.9 million in direct wages per year.¹¹ Assuming that the construction duration is approximately 66 months, the total construction labor for the project would be 2,600 person-year jobs.

Under the Bored Tunnel Alternative, new demand for construction would generate gross direct effects equal to the capital cost of \$1,960 million in construction dollars. The gross multiplied effect on output would total approximately \$3,688 million for all industries in the Puget Sound region not directly involved with the replacement of the viaduct. Of this amount, \$1,133 million would be paid to the 6,862 workers as wage and salary earnings for the jobs generated beyond those directly involved with the replacement of the viaduct. The amount of new indirect and induced earnings (wages) as a result of money entering the Puget Sound economy would be \$91 million.

Summary of Benefits for Employment

Compared with the existing conditions, the employment associated with construction of the Bored Tunnel Alternative would result in additional (gross) employment throughout all economic sectors within the Puget Sound region and the state. This gross employment was derived from the multiplication effects of the capital expenditures for the project. Examples of capital expenditures include direct hire of temporary construction workers, purchase of construction materials and equipment, and expenditure of capital funds to acquire new rights-of-way.

The number of new jobs directly associated with the Bored Tunnel Alternative that would be the result of new money entering the Puget Sound regional economy is 2,285 jobs, and new money would constitute 8 percent of the overall construction costs (see Exhibit 6-2). All other funding would come from the state or the Puget Sound region and would likely be spent in the local/state economy even without this project.

Sales taxes would be generated through the purchase of goods and materials related to construction. The Bored Tunnel Alternative would generate sales tax of \$100 million.

¹¹ This wage rate is a forecasted escalated rate including all benefits and insurance for a typical tunnel crew and non-manual staffing plan.

6.3.3 Surplus Parcels

After construction of the project and Program elements, WSDOT or the City could sell those parcels that were either fully or partially acquired and are not part of the permanent roadway right-of-way as surplus property, returning them to private ownership. Parcels returned to private ownership would pay property taxes and could provide opportunities as replacement properties for displaced businesses, allowing owners to remain in the community. Some remnant parcels, however, may not be sold and redeveloped after construction because of potential access constraints resulting from the proposed roadway changes under the Bored Tunnel Alternative.

6.4 Construction Mitigation

Construction of the Bored Tunnel Alternative would last approximately 66 months. This estimate includes all utility work, construction at the north and south portals, driving the TBM, and viaduct removal.

A traffic management plan will be prepared to ensure that construction effects on local streets, property owners, and businesses are minimized. For more information on the mitigation measures to be included in the plan, see Appendix C, Transportation Discipline Report.

Potential specific construction mitigation measures are described below as they relate to pedestrian access, parking and vehicle access, information, habitability, business assistance, and other factors. These mitigation measures are intended to counteract the diminished quality of the business environment for those businesses adjacent to the area of direct effects. These measures would maintain access and the general setting for businesses and potential customers that existed prior to the project-related construction.

6.4.1 Pedestrian Access

The following potential pedestrian access measures would apply only to the south and north portal areas:

- Provide pedestrian detour signage along all sidewalk routes affected by construction.
- Provide temporary and/or covered sidewalks, as needed.

The following potential pedestrian access measures may be applied during viaduct demolition:

- Provide way-finding signs for pedestrians along First Avenue between S. King Street and Bell Street, showing routes and distances (in blocks) to the waterfront. These would be updated as the project advances during viaduct removal.

- Provide east-west pedestrian access from Western Avenue to the Alaskan Way piers (Yesler Way to Pine Street) at least every other block during viaduct demolition.
- Provide pedestrian and parking maps in advance of and during construction for businesses (at no cost to the businesses) to mail to clients and vendors. Parking option information will also be available through e-Park and Seattle Parking Map websites.

6.4.2 Parking and Vehicle Access

Potential Mitigation Strategies for Construction Worker Parking

The following strategies could help minimize the use of visitor/customer parking by construction workers:

- Develop a construction worker parking plan to identify appropriate parking options for construction workers and discourage use of short-term visitor/customer parking near the project area.
- Provide strong enforcement of the short-term parking regulations in the immediate project area (two- to three-block radius). The goal is to ensure a constant supply of short-term parking for customers of central waterfront businesses and to prevent the use of these spaces by construction workers.

Potential Mitigation Strategies for Central Waterfront/Pioneer Square Areas

The following strategy could reduce construction effects on the ferry and cruise ship operations:

- Limit construction that removes or reduces pedestrian and/or vehicle access to ferry and cruise ship terminals during weekday commute hours, as well as during typical cruise home port operations, which are Fridays, Saturdays, Sundays, and some Mondays.

Several parking mitigation strategies could be implemented to address the effects of parking disruption by construction activities along the central waterfront and in Pioneer Square. The following mitigation strategies would have to be coordinated between WSDOT and the City, with input from surrounding businesses:

- Provide greater access to parking information options.
- Encourage privately held parking lots to institute pricing measures that encourage short-term parking.
- Build a new parking facility close to the waterfront to provide short-term visitor and customer parking.

- Partner with private and public facilities to implement e-Park, an electronic guidance system displaying real-time parking availability on facility signs, right-of-way signs, and the Seattle Parking Map website. Locate dynamic message signs on key access points to downtown, Pioneer Square, and the central waterfront. (This is a component of the Center City Parking Program called e-Park.)
- Encourage businesses to use parking vouchers that they could give to customers to park in designated parking lots.

6.4.3 Information

The following mitigation strategies apply to all construction zones:

- Conduct construction update meetings weekly with businesses when construction begins and less frequently or as needed over time.
- Publish a regular newsletter, as well as bulletins and e-mails on a more frequent basis, as needed.
- Maintain a construction website with a separate central waterfront content area.
- Deploy project ambassadors to answer questions and help resolve problems that arise during construction.
- Operate a 24-hour project information line for questions, concerns, and construction conflicts.

6.4.4 Habitability

The following potential mitigation strategies could be applied to all construction zones:

- Provide noise mitigation measures through the City's noise variance process.
- To the extent possible, locate temporary construction sheds, barricades, and material storage in areas that avoid or minimize the obstruction of views of area businesses.

6.4.5 Business Assistance

The following mitigation strategies apply to all construction zones:

- Minimize obstructions – minimize navigational obstructions or delays along the routes to facilitate access to businesses, homes, cruise ships, ferry terminals, and waterfront attractions.
- Adopt a shop-and-eat-locally preference program. Construction workers could be encouraged to frequent local cafes and restaurants.

- Publish a business directory showing which businesses are open and how to get there. Make it available in print and on the Web.

6.4.6 Others

The following mitigation strategies apply to all construction zones:

- Keep all temporary access routes through the construction zone clean.

Chapter 7 CUMULATIVE EFFECTS

Cumulative effects are effects on the environment that result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions. The focus of the cumulative effects analysis is the combined effects of the Bored Tunnel Alternative, the other Program elements, and other past, present, and reasonably foreseeable future projects that could contribute to economic effects in the study area.

This chapter discusses the following topics:

- Current economic trends
- Effects of the roadway elements of the Program
- Effects of the non-roadway elements of the Program
- Cumulative effects of the Bored Tunnel Alternative when combined with the effects of the other Program elements
- Cumulative effects of the Bored Tunnel Alternative when combined with the effects of the other Program elements and the effects of other past, present, and reasonably foreseeable future projects

A more detailed analysis of cumulative effects is presented in Attachment B.

7.1 Current Economic Trends

Historically, the economy of the Puget Sound region has fluctuated greatly because of the strong dependence on industries that are based on natural resources such as logging, fishing, agriculture, and, more recently, aerospace. The dependence on aerospace had major effects on the economy because that sector is influenced by national and international economic cycles. This was particularly evident in the 1960s, when Boeing was forced to make mass layoffs, and the economy of the region was greatly depressed.

According to PSRC's *VISION 2040* (PSRC 2009), "The central Puget Sound region's economy is a complex system of business, trade, and individual relationships. The region is the major center in the Pacific Northwest for information technology, aerospace, finance, insurance, health care, business and professional services, recreation, and tourism. It is also one of the most technologically advanced regions in the United States for turning cutting-edge research into products and services. These sectors are forecast to play an increasingly important role in the region's job growth."

With the growth of high-technology industries, tourism, clean technology, medical research, and other trade- and service-sector businesses, the economy has

become more diversified, and economic fluctuations are less severe. However, the region's continued economic prosperity is challenged by the increasingly competitive global economy. Washington depends on foreign trade more than any other state and the Puget Sound region is vital to this trade, with companies such as Boeing, Costco, Microsoft, Amazon, Paccar, Starbucks, and Weyerhaeuser based in the region (PSRC 2009).

Regional plans such as *VISION 2040* and local comprehensive plans support continued economic development. In these plans, there is a focus on building a sustainable economy. Other than the manufacturing sector, which is expected to decline slightly, the remaining economy is anticipated to continue to grow in the future.

7.2 Effects From Other Roadway Elements of the Program

7.2.1 Alaskan Way Surface Street Improvements – S. King to Pike Streets

The new Alaskan Way surface street would be six lanes wide between S. King and Columbia Streets (not including turn lanes), transitioning to four lanes between Marion and Pike Streets. Generally, the new Alaskan Way surface street would be located on the east side of the right-of-way where the viaduct is located today. The new street would include sidewalks, bicycle facilities, parking/loading zones, and signalized pedestrian crossings at cross streets. The new surface street would be a regional truck route providing regional access to the Duwamish/Harbor Island/SR 519 area, as well as connections to the BINMIC.

Pedestrian crosswalks would be present at every intersection to provide pedestrian access to the waterfront, similar to today. Because it is likely that the new Alaskan Way surface street would be constructed in phases, not all vehicle and pedestrian access would be blocked at any given time.

Construction of the Alaskan Way surface street improvements would include the following temporary effects:

- Increased noise, dust, and traffic congestion in the general areas where construction would occur.
- Temporary lane restrictions and loss of on-street parking and freight loading zones.
- Reconfigured access to businesses and restaurants abutting the construction areas.

The Alaskan Way surface street improvements would occur after the demolition of the existing viaduct. Temporary traffic detours would affect freight traffic that cannot use the new SR 99 bored tunnel due to cargo restrictions. This freight

traffic would rely on the surface street network along the waterfront and through downtown.

Comparable to the expenditure of construction funds described in Chapter 6, this capital improvement project would have similar multiplier effects on the regional economy. However, the magnitude of those effects would be smaller due to the decreased size of this project relative to the Bored Tunnel Alternative.

7.2.2 Elliott/Western Connector – Pike Street to Battery Street

The new roadway connecting the Alaskan Way surface street to Elliott and Western Avenues would be four lanes wide and would provide a grade-separated crossing of the BNSF mainline railroad tracks. The new roadway would include bicycle and pedestrian facilities. The Lenora Street pedestrian bridge is expected to remain as it is today. Where the bridge terminates on its east side, modifications would be made to provide an at-grade pedestrian crossing on Elliott Avenue.

The Elliott/Western Connector would provide a new connection from Pike to Battery Streets. Currently, SR 99 enters the Battery Street Tunnel south portal at First Avenue and Battery Street. There is a southbound off-ramp from SR 99 to Battery Street and a northbound off-ramp to Western Avenue. The new connector would provide both northbound and southbound local street access to Pike Street and Lenora Street and would become reintegrated with the street grid at Bell Street. Southbound traffic would use Elliott Avenue and the new Elliott/Western Connector to Alaskan Way. The new connection would provide improved local street connections and an alternative route for traffic traveling to and from the Ballard/Interbay area.

This improved connection would also benefit truck freight within the vicinity because some freight traffic would likely use the new Alaskan Way surface street for regional and local transport, as well as for industrial transportation to and from the BINMIC. Furthermore, the connector would provide a vital overpass of the BNSF track near Victor Steinbrueck Park.

Construction of the Elliott/Western Connector would include the following temporary effects:

- Increased noise, dust, and traffic congestion in the general construction areas.
- Potential difficulties associated with surface street access to Port of Seattle if a detour is implemented on Alaskan Way.

Temporary traffic detours would affect freight traffic that cannot use the new SR 99 bored tunnel due to hazardous material-related cargo restrictions. Freight

traffic would rely on the surface street network along the waterfront and through downtown.

Comparable to the expenditure of construction funds described in Chapter 6, this capital improvement project would have multiplier effects on the regional economy, although the magnitude of those effects would be smaller due to the decreased size of this project relative to the Bored Tunnel Alternative.

7.2.3 Mercer West Project – Fifth Avenue N. to Elliott Avenue

Mercer Street would be restriped and signalized between Fifth Avenue N. and Second Avenue W. to create a two-way street with turn pockets. These improvements would also include the restriping and resignalization necessary to convert Roy Street to two-way operations from Fifth Avenue N. to Queen Anne Avenue N. The Mercer Street route would be considered for redesignation by the City as a regional truck route to provide vital freight connections to the BINMIC.

Construction effects of the Mercer Street west corridor improvements would include the following temporary effects:

- Increased noise, dust, and traffic congestion in the general areas where construction would occur.
- Temporary lane restrictions and loss of on-street parking and freight loading zones.
- Reconfigured access to businesses and restaurants abutting the construction areas.

Comparable to the expenditure of construction funds described in Chapter 6, this capital improvement project would have multiplier effects on the regional economy, although the magnitude of those effects would be smaller due to the decreased size of this project relative to the Bored Tunnel Alternative.

7.3 Effects From Non-Roadway Elements of the Program

A qualitative discussion of the operational and construction effects of each non-roadway Program element is presented below.

7.3.1 Elliott Bay Seawall Project

The Elliott Bay Seawall needs to be replaced to protect the shoreline along Elliott Bay, including Alaskan Way. It is at risk of failure due to seismic and storm events. The seawall currently extends from S. Washington Street in the south to Bay Street in the north, a distance of about 8,000 feet. The Elliott Bay Seawall Project limits extend from S. Washington Street in the south to Pine Street in the north (also known as the central seawall).

Construction of the Elliott Bay Seawall Project would have the following temporary effects:

- Increased noise, dust, and traffic congestion in the general areas where construction would occur.
- Temporary traffic detours under the viaduct.
- Temporary lane restrictions and loss of on-street parking and freight loading zones.
- Reconfigured access to businesses and restaurants abutting the construction areas.
- Temporary disruption of utility service to the piers while utilities are being relocated.

The presence of heavy construction equipment immediately adjacent to the piers along the central waterfront could have a negative effect on tourism and result in loss of revenue for businesses on the piers for a relatively short period. These effects could be mitigated by many of the same mitigation strategies presented in Section 6.4.

7.3.2 Alaskan Way Promenade/Public Space

A new expanded promenade and public space would be provided to the west of the new Alaskan Way surface street between S. King Street and Pike Street. Between Marion and Pike Streets, this space would be approximately 70 to 80 feet wide. This public space will be designed at a later date. Access to the piers would be provided by service driveways. Other potential open space sites include a triangular space north of Pike Street and east of Alaskan Way and parcels created by the viaduct removal between Lenora and Battery Streets.

The waterfront promenade would serve Piers 48 through 59, which have varying uses such as cruise ship and ferry terminals, restaurants, retail shops, hotels, and regional entertainment such as the Seattle Aquarium. These uses are all tourist and local destinations that would benefit from an investment to make the Seattle waterfront more pedestrian friendly, accessible, and attractive. In all, the waterfront promenade investment would encourage more people to visit Seattle's waterfront, either for the day or overnight. Such activities would result in increased revenue for the shops and restaurants along the promenade.

Construction effects of the promenade and public space would include the following temporary effects:

- Increased noise and dust in the general areas where construction would occur.

- Reconfigured access to businesses and restaurants abutting the construction areas.

Comparable to the expenditure of construction funds described in Chapter 6, this capital improvement project would have multiplier effects on the regional economy, although the magnitude of those effects would be smaller due to the decreased size of this project relative to the Bored Tunnel Alternative.

7.3.3 First Avenue Streetcar Evaluation

The First Avenue streetcar is currently planned to run between S. Jackson Street and Republican Street along First Avenue and would include an extension to the South Lake Union streetcar line. The maintenance base would likely be at the extension of the South Lake Union streetcar line or at a new maintenance base that would be built as part of the First Hill streetcar line.

This alignment would lie within several of Seattle's densest neighborhoods, including Pioneer Square, Commercial Core, Belltown, and Uptown. The line may also link to the existing South Lake Union streetcar or the planned First Hill streetcar line. Additionally, there are many tourist and regional attractions along the alignment, such as Pike Place Market, Seattle Waterfront Piers, Seattle Art Museum, Seattle Aquarium, and Olympic Sculpture Park. Furthermore, the alignment would provide additional transit service to the Financial District within the CBD. The increased circulation provided by the First Avenue streetcar could boost economic conditions along the alignment by attracting more people to businesses in the area. Public transportation investment flows through all sectors of the economy, and the economic stimulus realized from the investment exceeds the original investment (APTA 2003).

Construction effects of the First Avenue streetcar would include the following temporary effects:

- Increased noise, dust, and traffic congestion in the general areas where construction would occur.
- Relocation of water utilities prior to streetcar construction.
- Temporary lane restrictions and loss of on-street parking and freight loading zones.
- Reconfigured access to businesses and restaurants abutting the construction areas.

Comparable to the expenditure of construction funds described in Chapter 6, this capital improvement project would have multiplier effects on the regional economy, although the magnitude of those effects would be smaller due to the decreased size of this project relative to the Bored Tunnel Alternative. This

project has the potential for a higher net economic impacts because of its potential to receive a greater portion of total construction costs from federal funds.

7.3.4 Transit Enhancements

A variety of transit enhancements would be provided to support planned transportation improvements associated with the Program and accommodate future demand. These include (1) the Delridge RapidRide line, (2) additional service hours on the West Seattle and Ballard RapidRide lines, (3) peak-hour express routes added to South Lake Union and Uptown, (4) local bus changes (such as realignments and a few additions) to several West Seattle and northwest Seattle routes, (5) transit priority on S. Main and/or S. Washington Streets between Alaskan Way and Third Avenue, and (6) simplification of the electric trolley system. RapidRide transit along the Aurora Avenue corridor would also be provided.

Development of the specific improvements is underway and is described in Appendix C, Transportation Discipline Report. Since about 31 percent¹² of all downtown workers rely on the bus to get to work, the transit boost would promote more bus ridership, resulting in less congested and safer project detour routes and city streets during construction. Furthermore, many of the additional post-construction trips to and from downtown would be accommodated by transit.

Effects from enhanced transit service could include increased noise from buses along enhanced bus routes. Any negative effects from enhanced transit service could be offset by the increase in potential customers traveling through these corridors and patronizing local businesses.

7.4 Cumulative Effects of the Project and Other Program Elements

This section describes the cumulative effects of the Bored Tunnel Alternative and the other Program elements.

The benefits of the Program elements include a transformed waterfront environment, improvements to the transit system including the Seattle Ferry Terminal, and improved Alaskan Way surface street connectivity to the Elliott and Western Avenue corridor. The improvements would be converted into three categories of economic value: enhanced value to waterfront users, new visitor spending locally and regionally, and increased freight connectivity.

¹² Based on 2005 existing conditions; the share is probably higher due to ridership growth up to 2009.

These benefits would occur over time with the revitalization and reinvestment in the study area, particularly along the central waterfront, once construction is completed. Revitalization and reinvestment could increase property values, stimulate more economic activity, allow opportunities for new or expanded business and employment, and generate more tax revenues. This revitalization and redevelopment could substantially increase economic activity compared to current conditions.

Eventually, improved connections downtown could indirectly increase business interest there, which could also lead to new commercial or retail shops. Where improved connections to the downtown core and the waterfront may facilitate commute trips from surrounding neighborhoods, some development activity and/or increased shopping visits may be stimulated by the desirability of this connection.

In the short term, there would be construction impacts on businesses near the construction zones as described for each of the Program elements. This could make for a difficult economic environment for these businesses. Many of the same mitigation strategies presented in Section 6.4 for the Bored Tunnel Alternative could be implemented for the Program elements to minimize the effects on businesses during construction.

7.5 Cumulative Effects of the Project, Other Program Elements, and Other Actions

This section describes the cumulative effects of the Bored Tunnel Alternative, other Program elements, and other past, present, and reasonably foreseeable future actions. The bored tunnel would have fewer visual and noise effects than the existing elevated viaduct. A subsurface structure would help facilitate greater use of public space and pedestrian activity along the waterfront, and a less inhibited environment for reinvestment. The economic benefits would occur in the form of increased investment, vitality, and development opportunity.

These benefits would occur over time with the revitalization and reinvestment in the study area, particularly along the central waterfront, once construction is completed. Revitalization and reinvestment could increase property values, stimulate more economic activity, allow opportunities for new or expanded business and employment, and generate more tax revenues. This revitalization and redevelopment could substantially increase economic activity compared to current conditions.

The potential overall economic influence in the Seattle area is difficult to predict. Construction of the Bored Tunnel Alternative and other Program elements would contribute to effects on adjacent businesses in addition to effects from other projects that have been implemented or may be implemented in the vicinity.

Other key development projects located within the study area include the following:

- Alaskan Way Viaduct and Seawall Replacement Moving Forward projects
- Sound Transit projects(North Link, East Link, University Link, First Hill Streetcar)
- S. Spokane Street Viaduct Widening
- SR 519 Intermodal Access Project, Phase 2 (completed in spring 2010)
- SR 520 Bridge Replacement and HOV Program
- I-5 Improvements
- South Lake Union Redevelopment
- Washington State Ferries Seattle Terminal Improvements

These key development projects are expected to add to the economic effects in the study area that would occur during project construction. In addition, other smaller, private projects in the area, such as the Belltown/Queen Anne and the Seattle Downtown proposed developments, are expected to occur during the construction period of the Bored Tunnel Alternative. Although the timelines for these projects would be staggered, taken together, adjacent businesses would likely be disrupted. What is unknown is the magnitude of the increased investment over the long term and when these projects would occur. Some of the long-term effects would depend on local and regional economic cycles of growth and downturns.

Improvements to the roadway network in the study area as a result of projects such as the Program, SR 519, S. Spokane Street Viaduct Widening, and I-5, and I-405 projects would likely have a net beneficial cumulative effect on transportation-related measures of effectiveness in the study area, as described in Chapter 5. These improvements to the roadway network should result in a net positive effect on the economic performance of the study area. For additional discussion of these transportation changes, see Appendix C, Transportation Discipline Report.

If multiple transportation projects have overlapping construction schedules, the City would lead a coordination effort to minimize construction effects on businesses, residents, and visitors to Seattle. Organizational tools such as shared databases may be used to plan and implement effective mitigation plans. These tools include developing a tracking system for mitigation efforts, defining an adaptive mitigation management structure, establishing an independent oversight committee to include affected parties in mitigation planning, and leveraging unique aspects of the project setting to offset effects.

Roadway network improvement projects in the study area such as on SR 519, the S. Spokane Street Viaduct Widening, and the I-5 and I-405 projects are expected to have a net beneficial cumulative effect on the economic performance of the study area as mobility and interregional connection functions improve.

7.6 Indirect Effects

7.6.1 Regional Economic Benefits

The Bored Tunnel Alternative could result in regional economic benefits. Pedestrians would benefit from increased access throughout the north portal area, including from the three surface streets (John, Thomas, and Harrison Streets) that would be connected over SR 99 linking South Lake Union and the Uptown Urban Center neighborhoods near the north portal and, to a lesser extent, the new street(s) in the south portal area (S. Dearborn Street and potentially S. Charles Street, depending on which option is selected) linking First Avenue S. to Alaskan Way along the waterfront. Other improvements that would increase connectivity include the extension of Sixth Avenue N., the closure of the existing Broad Street right-of-way, and reconstruction of the Mercer Street corridor, which would facilitate freight movement between the BINMIC and I-5.

Eventually, improved connections in the CBD could indirectly increase business interest there, which could also lead to new commercial or retail shops. Where improved connections to the downtown core and the waterfront may facilitate commute trips from surrounding neighborhoods, some development activity and/or increased shopping visits may be stimulated by the desirability of this connection.

The subsurface tunnel structure would likely have substantially fewer visual and noise effects than existing conditions or the Viaduct Closed (No Build Alternative) along the central waterfront. Also, air pollution and dust would be reduced with the bored tunnel. These direct effects would have an indirect effect of increasing the viability and desirability of the central waterfront, which, in turn, would increase the economic vitality of the area.

According to the *Mayor's Recommendations: Seattle's Central Waterfront Concept Plan* (City of Seattle 2006), new development provides the opportunity to create public space and other amenities that complement the public realm. For the reasons listed above, the Bored Tunnel Alternative likely would provide a substantially higher degree of investment opportunity along the central waterfront than the Viaduct Closed (No Build Alternative).

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ATTACHMENT A

RIMS II Detailed Model Analysis for Construction Effects

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Regional Economic Activity

Significant regional and state economic effects would result from the construction of the Bored Tunnel Alternative relative to the Viaduct Closed (No Build Alternative). The intent of this analysis is to assess the likely overall economic effects that would be attributed to construction, as measured by increases in regional and state activity, employment, and associated job earnings.

Terminology and Methods

To analyze the economic effects of the Alaskan Way Viaduct Replacement Project (project) capital investment, it is necessary to examine the economic reactions that result from an increase in the demand for construction goods and services.

Economists use input-output (I-O) models to analyze how changes in the production of a specific firm or industry alter the flow of funds into and out of all other industries, as well as households. By tracing how production in one economic sector consumes the output of other sectors as production inputs and how each of these other sectors in turn influences the demand for the output of yet other sectors, input-output analysis facilitates the calculation of multipliers. These multipliers provide a quantitative estimate of changes in economic activity, employment, and job earnings within the local economy (state or region) that are compounded from initial new expenditures.

Defining the terms below will aid in understanding how project construction would lead to multiplied economic effects on the economies of the central Puget Sound region and the state of Washington.

- **Direct Effects:** The increases in demand for roadway construction and related materials and services within a defined regional or state economy arising from undertaking the project. Direct effects are usually measured as construction expenditures but also can be expressed in the number of new construction jobs or job earnings.
- **Indirect Effects:** The sum of all inter-firm and inter-industry transactions that filter through the regional or state economy resulting from the purchase of material and labor inputs by the firms directly affected in the course of producing their construction-related output.
- **Induced Effects:** The increases in household consumption of goods and services of all firms within the regional or state economy by the workers who receive additional earnings resulting from either the direct or indirect effects of construction.
- **Total Effects:** The sum of the direct, indirect, and induced economic effects as measured by the overall increase in economic activity, employment, and/or earnings within the regional or state economy. Total

effects are also referred to as the total multiplied effects, where the multiplier is the factor ratio of total to direct effects.

- Gross Effects: The economic effects of total project expenditures—in terms of direct, indirect, and induced effects—prior to assessing what proportion of those expenditures and subsequent effects would likely have still occurred in some other manner in the absence of the project being evaluated.
- Net or “New Money” Effects: Only those economic effects—in terms of direct, indirect, and induced effects—attributable to funds that are uniquely available for expenditure on the subject project. These funds would otherwise not enter the regional or state economy. Economists tend to emphasize the net or new money effects as more accurate measures of the true increases in output, employment, and earnings.

Construction expenditures would occur over a number of years, directly creating new demand for construction materials and labor inputs. These direct effects would then lead to indirect, or secondary effects, as the production of output by firms in other industries increases to supply the demand for inputs to the construction industry. Both the direct and indirect effects of construction expenditures cause firms in all industries to employ more workers to meet increases in demand; this leads to induced effects as the additional wages and salaries paid to workers lead to higher consumer spending.

The economic effects at the regional and state levels due to the influx of capital construction funds are quantified as direct and indirect effects. The direct and indirect effects are calculated using multipliers provided by the U.S. Department of Commerce Bureau of Economic Analysis’ (BEA) Regional Input-Output Modeling System (RIMS II) for the central Puget Sound region and the state of Washington. The central Puget Sound region is defined as King, Pierce, and Snohomish Counties. The detailed application of these RIMS II multipliers is described below.

Economic Effects

For purposes of assessing the economic effects on output, earnings, and employment, the focus is placed on the project capital costs (construction and right-of-way acquisition) of the Bored Tunnel Alternative as an accurate measure of the capital investment that would likely occur for the project. It is assumed that no project capital costs would be incurred with the Viaduct Closed (No Build Alternative) (Scenario 1 only).

The project capital cost estimates (Exhibits A-1 and A-2) are based on possible ranges of construction and right-of-way costs based on overall risk. The process used to estimate project costs and durations for this project is called the Cost Estimate Validation Process (CEVP®). The cost estimates presented in this

attachment represent the 90th percentile of costs calculated through the CEVP. This means that 90 percent of the time, a construction activity would cost the same as or less than what is estimated. The most recent CEVP review of the project occurred in January 2010.

Exhibit A-1. Capital Costs and Funding Sources of the Bored Tunnel Alternative

Capital Cost Estimate (\$ millions)	Funding Source (\$ millions and share)	
	Federal Committed	State Committed
1,960	130 (8%)	1,830 (93%)

Exhibit A-2. Total Project Costs of the Bored Tunnel Alternative

Total Project Cost Estimate (\$ millions)	Project Cost Component (\$ millions and share)	
	Right-of-Way Acquisition	Construction Cost ¹
1,960	172 (9%)	1,788 (91%)

Note:

¹ Includes preliminary engineering cost.

Exhibit A-1 lists the project capital cost estimates, distribution of funding sources, and regional and state new money estimates for the Bored Tunnel Alternative. The distribution of funding sources was developed by the design team and is the list of potential funding mechanisms currently available. Percentage shares of the capital cost estimates are also provided. For purposes of examining the regional economic effects, all of the federal earmark grants and federal general funding sources are assumed to be new money that would otherwise not be spent either regionally or within the state in the absence of the project. All state, regional, and city funding sources are assumed to be expended with or without this project and are not considered to be new money. All state, regional, and city funding sources, including local improvement district taxes, are tax-based funding of local and/or state residents or property owners specifically earmarked for transportation projects within the region or state. The difference between the capital cost and new money net direct effect is assumed to be expended with or without the project, thereby qualifying the difference only as a gross effect.

Application of RIMS II Multipliers

Three classes of RIMS II final demand multipliers and one class of direct effect multipliers were used to estimate the gross and net effects:

1. Final demand output multipliers translate the initial project capital expenditures (demand) for construction outputs to the total multiplied

effect on the demand for output of all firms/industries (in dollars) within the regional and state economies.

2. Final demand earnings multipliers translate the same direct project expenditures into the total multiplied effect on wage and salary earnings within the regional and state economies.
3. Final demand employment multipliers convert project expenditures into the total multiplied effect on employment within the regional and state economies, expressed in person-year jobs. This is generally used when there is no estimate of direct employment available.
4. Direct effect employment multipliers translate direct employment into the total multiplied effect on employment within the regional and state economies, expressed in person-year jobs.

For application of the RIMS II final demand multipliers, capital costs were divided into two categories. Exhibit A-2 presents the capital cost distribution for the Bored Tunnel Alternative by two industry expenditure/multiplier categories. Exhibit A-3 presents final demand multipliers, as well as direct effect multipliers, for both the central Puget Sound region and the entire state of Washington. All construction labor, construction materials, and right-of-way acquisition were assumed to be obtained locally.

Exhibit A-3. Capital Costs Multipliers

Expenditure Category	BEA RIMS II Multiplier Industry Classification & Number	Final Demand Multipliers			Direct Effect Multipliers	
		Output (dollars)	Earnings (dollars)	Employment (jobs)	Earnings (dollars)	Employment (jobs)
State of Washington Multipliers						
Construction	11.0400 Highways and Streets	2.1764	0.6486	17.5	2.1609	2.7379
Right-of-way	71.0201 Real Estate Agents, Managers, Operators, and Lessors	1.5792	0.2508	10.0	2.8422	2.2966
Central Puget Sound Regional Multipliers						
Construction	11.0400 Highways and Streets	2.0627	0.6093	16.4	2.0837	2.6392
Right-of-way	71.0201 Real Estate Agents, Managers, Operators, and Lessors	1.5920	0.2517	10.1	2.8933	2.3467

The gross total (direct, indirect, and induced) effects on output and earnings can be calculated by multiplying the expenditure in millions of dollars by category in Exhibit A-2 by the appropriate final demand multiplier in Exhibit A-3. Under the Bored Tunnel Alternative, expenditures of \$1,788 million in the construction

category would yield a gross output effect on all regional economy industries of $(\$1,788 \text{ million} \times 2.0627) = \$3,688 \text{ million}$.

Some of this regional economic output would have occurred anyway without construction of this project. The more realistic measure of net effects on economic output can be assessed by multiplying the gross output effect by the average of percentages of general construction expenditures in representing new money (committed and anticipated) to the region listed in Exhibit A-1. This calculation results in \$295 million $(\$1,788 \text{ million} \times 8.0\% \times 2.0627)$, which represents the net increase in economic output attributable to new money entering the central Puget Sound region. The gross and net effects form the upper and lower boundaries within which the true effects would likely fall, with net effects being the lower bound. Though the true magnitude of the effects would be closer to the net effects in the absence of this project, some of the non-new money tax and/or consumer dollars spent elsewhere may result in smaller multipliers than with this project. Similar calculations can be performed for the other expenditure categories.

Summary of Economic Effects

The gross and net total effects on output and earnings for both the central Puget Sound region and the state are provided in Exhibits 4 and 5. The gross and net effects on employment are presented in Section 6.3.2. Exhibit A-4 presents the gross total economic effects for both the central Puget Sound region and the entire state. Under the Bored Tunnel Alternative, new demand for construction would generate gross direct effects equal to the capital cost of \$1,960 million of construction dollars. Adding in the indirect and induced effects on the output of other regional firms, the gross multiplied effect on output would total approximately \$3,688 million over the construction period. In addition, \$1,133 million would be paid to workers as wage and salary earnings for the jobs generated. By defining a larger boundary for the affected economy and therefore capturing a greater portion of the multiplied effects before the funds leak out, the statewide figures exceed the regional economic effects projected in Exhibit A-4.

Exhibit A-4. Gross Total Regional and Statewide Economic Impacts¹

Alternative & Expenditure Category	Direct Gross Expenditures (\$ millions)	Seattle-Tacoma Region Gross Total Effects		Statewide Gross Total Effects	
		Output (\$ millions)	Earnings (\$ millions)	Output (\$ millions)	Earnings (\$ millions)
Bored Tunnel Alternative	1,960	3,962	1,133	4,163	1,203
Construction	1,788	3,688	1,089	3,891	1,160
Right-of-way	172	274	43	272	43

Note:

¹ Includes only effects directly associated with the expenditure of construction and right-of-way funds and does not include secondary economic benefits presented in Section 7.5.

Exhibit A-5 presents the net total economic effects attributable to new money for both the central Puget Sound region and the entire state. Under the Bored Tunnel Alternative, the same new demand for construction expenditures would generate net direct effects equal to \$143 million (8 percent of \$1,788 million) in midyear construction dollars after accounting for local funds that would otherwise still be spent in the regional economy with similar multiplied effects. Adding in the indirect and induced effects on the output of other regional firms, the net multiplied effect on output would total \$317 million over the construction period. Of this amount, \$91 million would be paid to workers as wage and salary earnings for the net new jobs created. As with the gross economic effect, the statewide figures exceed the regional economic effects projected in Exhibit A-5.

Exhibit A-5. Net New Money Total Economic Impacts¹

Alternative & Expenditure Category	Direct Gross Expenditures (\$ millions)	Percentage of Contribution Due to New Money Funds ²	Seattle-Tacoma Region Net Total Effects		Statewide Net Total Effects	
			Output (\$ millions)	Earnings (\$ millions)	Output (\$ millions)	Earnings (\$ millions)
Bored Tunnel Alternative	1,960	8.0	317	91	333	96
Construction	1,788		295	87	311	93
Right-of-way	172		22	3	22	3

Note:

- 1. Includes only effects directly associated with the expenditure of construction and right-of-way funds and does not include secondary economic benefits presented in Section 7.5.
- 2. Includes committed new money funds (see Exhibit A-1).

While the gross total economic effects are useful for examining the overall magnitude of the project, the net total economic effect measures represent more generally accepted and appropriate estimates of the true economic effects that would arise solely from project construction. The gross and net effects form the upper and lower boundaries within which the true effects would likely fall, with net effects being the lower bound. Though the true magnitude of the effects would be closer to the net effects, in the absence of this project, some of the non-new money tax and/or consumer dollars spent elsewhere may result in smaller multipliers than with this project.

Summary of Benefits for Regional Economic Activity

This discussion of benefits includes only benefits directly associated with the expenditure of construction and right-of-way funds during the construction period and does not include indirect economic benefits after construction is completed, as presented in Section 7.5, Indirect Effects. The cost associated with construction of the Bored Tunnel Alternative would result in additional (gross) activity throughout all economic sectors within the Puget Sound region and the state of Washington. This gross economic activity is derived from the multiplication effects on the capital expenditures for the project. Examples of

capital expenditures include the direct hire of temporary construction workers, the purchase of construction materials and equipment, and the expenditure of capital funds to acquire new rights-of-way.

The amount of new economic activity directly associated with the Bored Tunnel Alternative that is the result of new money entering the Puget Sound regional economy is \$317 million. The amount of new earnings (wages) entering the Puget Sound regional economy is \$91 million.

These estimates assume that all of the committed and anticipated new money funds are received for the project; if only the committed new money funds are received, the new money net effects would be lower by roughly a factor of 2.5. The contribution of new money to overall construction costs is 8 percent. All other funding sources are located within either the state or the Puget Sound region, and the funds would likely be spent in the local economy, even in the absence of this project.

Temporary Economic Effects on Businesses, Including Construction Expenditures on Sales Tax Revenue

Sales Tax Revenue

Sales taxes would be generated through the purchase of goods and materials related to construction. Exhibit A-6 lists the estimated amount of sales tax generated for the Bored Tunnel Alternative based on construction costs only. Sales tax estimates were not generated for non-construction costs such as right-of-way acquisition and engineering.

Exhibit A-6. Total Capital Costs and Sales Tax Generated

Alternative	Total Capital Cost (\$ millions)	Total Sales Tax Generated (\$ millions)
Bored Tunnel Alternative	1,960	100

The project sales tax estimates are based on the construction cost estimates presented in Section 6.1.1. These estimates will be refined once additional information regarding project design and funding becomes available.

These sales tax estimates are related only to direct construction expenditures. This analysis does not include an evaluation of the change in sales tax revenue collected by businesses in the project area that potentially would be affected by construction activities.

Disruption to Businesses and Neighborhoods

Any major construction project, public or private, inconveniences or disturbs the residents, businesses, and business customers adjacent to that construction

project. As a result of the inventory of existing businesses (Section 4.8) within one block of the existing alignment, the design team has identified approximately 1,040 businesses (including multi-family residential buildings) adjacent to the project that would be disrupted by the construction. The temporary effects these businesses could experience include the following:

- Presence of construction workers, heavy construction equipment, and materials, both within the construction area and along haul routes.
- Temporary road closures, traffic diversions, and alterations to property access (see Appendix C, Transportation Discipline Report).
- Loss of parking, especially on-street short-term parking (see Section 6.1.5).
- Airborne dust (see Appendix M, Air Discipline Report).
- Noise and vibrations from construction equipment and vehicles (see Appendix F, Noise Discipline Report).
- Decreased visibility and loss of access to businesses by customers.

Up to 157 active commercial and industrial buildings located within 50 feet of the existing viaduct are not candidates for acquisition. Many of these buildings in the central section are occupied by multiple businesses. Some businesses located in these buildings may suffer little or no adverse effect, while others may experience a noticeable decline in sales, increase in costs, and/or decrease in efficiency.

Without proper planning and implementation of controls, these construction-related effects could adversely impact the comfort and daily life of residents through inconvenience or a disruption in the flow of customers, employees, and materials and supplies to and from businesses. construction effects would be integrated into the project management plan, the business mitigation plan, and the project's contract specifications and special provisions.

Temporary Change in Vehicle, Transit, and Pedestrian Access to Existing Businesses in the Construction Area

A detailed analysis of the effects on the existing roadway system during construction is presented in Appendix C, Transportation Discipline Report. In general, the Bored Tunnel Alternative would not result in severe traffic effects during construction in the corridor because SR 99 would remain in operation during the entire 66-month project construction timeline. However, as discussed in the Transportation Discipline Report, there would be temporary effects on access to businesses as could be anticipated with any major roadway construction in a dense metropolitan setting.

Temporary Jobs Created During Construction

Implementation of the Bored Tunnel Alternative would result in the creation of temporary construction-related jobs, the duration of which is expected to be about 66 months.

A hybrid approach was used to estimate the gross and net increases in employment attributable to new money entering the central Puget Sound region and the state of Washington. Both direct effect and final demand multipliers (see Exhibit A-3) were used to estimate the employment effects of the Bored Tunnel Alternative. Direct effect multipliers were used on the estimates of the direct labor force to be employed in project-related construction as presented in Exhibit A-7. Final demand multipliers were used to estimate capital costs for right-of-way acquisition, as no direct labor estimates have been generated by the project design team for this expenditure category.

The estimates of the direct jobs generated by the project were calculated based on the approximate cost for construction contracts and the assumption that the average labor rate in 2011 would be \$65.00 per hour. The direct effect of these temporary construction jobs on the regional and state economies would result in the indirect effect of additional job creation throughout the central Puget Sound region and state. Using the direct effect multipliers for highway and street construction presented in Exhibit A-3, we can calculate the secondary effect of regional and statewide job creation in the manner used to calculate the gross output and earnings using only the direct gross expenditures.

The project design team did not estimate the direct labor force needed to perform right-of-way acquisition; consequently, the capital costs associated with this task were used to quantify employment effects in the same manner that gross output and earnings were estimated for all capital costs using final demand multipliers presented in Exhibit A-3.

The Bored Tunnel Alternative would have direct gross expenditures of \$172 million in the right-of-way category and would yield a gross employment effect on all regional industries of 1,737 person-year jobs ($\$172 \text{ million} \times 10.1$).

Exhibit A-7. Gross Regional and Statewide Total Employment Effects and Net New Money Total Employment Effects

Alternative & Expenditure Category	Direct Gross Expenditures (\$ millions)	Central Puget Sound Region Final Demand Employment (prs-yr jobs)	Statewide Final Demand Employment (prs-yr jobs)	Annual Average Construction Employment (jobs)	Construction Duration (years)	Total Construction Labor (prs-yr jobs)	Central Puget Sound Region Direct Effect Employment (prs-yr jobs)	Statewide Direct Effect Employment (prs-yr jobs)	Central Puget Sound Region Gross Employment (prs-yr jobs)	Statewide Gross Employment (prs-yr jobs)	Average Percentage of Contribution Due to New Money Funds	Central Puget Sound Region Net Employment (prs-yr jobs)	Statewide Net Employment (prs-yr jobs)
Bored Tunnel Alternative									8,599	8,839	8.0%	688	707
Construction				480	5.5	2,600	6,862	7,119					
Right-of-way	172	1,737	1,720										

Notes:

Construction duration assumes 5.5 years for the Bored Tunnel Alternative.

Central Puget Sound Region is defined as King, Pierce, and Snohomish Counties.

Final Demand Employment shows the translation from right-of-way gross expenditures into direct, indirect, and induced employment.

Direct Effect Employment shows the translation from temporary construction employment into direct, indirect, and induced employment.

Gross Employment is the sum of Final Demand Employment and Direct Effect Employment. Gross Employment is all direct, indirect, and induced employment.

Net Employment is that fraction of Gross Employment that represents all direct, indirect, and induced employment associated with new money (committed and anticipated).

prs-yr jobs = person-year jobs

For the construction expenditure category, a direct generation of 2,600 person-year jobs would yield a gross employment effect on all regional economies of 6,862 person-year jobs (2,600 person-year jobs × 2.6392). Summing these gross employment effects together yields the total gross employment effect on the central Puget Sound regional economy of 8,599 person-year jobs.

Some of these jobs would occur without construction of the Bored Tunnel Alternative. The more realistic measure of net effects on employment can be assessed by multiplying the gross total employment effect by the percentage of capital expenditures representing new money (committed and anticipated) for the region listed in Exhibit A-1. This calculation results in 2,285 person-year jobs ($[\$172 \text{ million} \times 10.1] + [2,600 \text{ person-year jobs} \times 2.6392] \times 8.0\%$), which represents the net increase in employment attributable to new money entering the central Puget Sound region.

Summary of Benefits for Employment

Compared with existing conditions, the employment associated with the construction the Bored Tunnel Alternative would result in additional (gross) employment throughout all economic sectors within the Puget Sound region and the state of Washington. This gross employment is derived from the multiplication effects on capital expenditures for the project. Examples of capital expenditures include the direct hire of temporary construction workers, the purchase of construction materials and equipment, and the expenditure of capital funds to acquire new rights-of-way. Therefore, the higher the capital cost, the more direct, indirect, and induced jobs are generated within the Puget Sound region.

The number of new jobs directly associated with the Bored Tunnel Alternative is the result of new money (committed and anticipated) entering the Puget Sound regional economy and is estimated at 2,285 jobs. The portion of overall construction costs that would be new money is 8 percent. All other funding sources would be within either the state or the Puget Sound region, and the funds would likely be spent in the local economy even without this project.

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ATTACHMENT B

Cumulative Effects Analysis

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CUMULATIVE EFFECTS ANALYSIS

This cumulative effects analysis follows *Guidance on Preparing Cumulative Impact Analyses*, published by Washington State Department of Transportation (WSDOT) in February 2008. The guidance document was developed jointly by WSDOT, Federal Highway Administration (FHWA) – Washington Division, and U.S. Environmental Protection Agency – Region 10. The guidance can be used for FHWA’s National Environmental Policy Act (NEPA) compliance (Code of Federal Regulation, Title 23, Part 771) and fulfillment of Washington State Environmental Policy Act (SEPA) requirements for evaluation of cumulative effects (Washington Administrative Code, Section 197-11-792).

The approach provided in the WSDOT guidance calls for early consideration of cumulative impacts while direct and indirect effects are being identified, preferably as part of the scoping process. For analysis, the guidance recommends the use of environmental documents such as discipline reports, as well as other relevant information such as local comprehensive plans, zoning, recent building permits, and interviews with local government. The guidance also advocates a partnership approach among agencies that includes early collaboration and integrated planning activities.

The guidance established eight steps to serve as guidelines for identifying and assessing cumulative impacts. These eight steps have been used in the following cumulative effects evaluation for the Bored Tunnel Alternative of the Alaskan Way Viaduct Replacement Project (the project). A matrix that identifies projects with the potential for cumulative effects with this project and an assessment of likely contributions to cumulative effects is also included.

Step 1. Identify the resource that may have cumulative impacts to consider in the analysis

Economics

Step 2. Define the study area and timeframe for the affected resource

Operational economic benefits and effects are assessed as they relate to the economic health of Seattle and the Puget Sound region.

- During construction, the area of direct effects is one city block around all sides of the portal construction areas (south and north), all access ramps, and all surface street modifications, as well as one block to either side of the existing viaduct alignment.
- Regional economic effects associated with traffic effects from construction activity are evaluated at the neighborhood, district, or industrial area level.
- Regional economic benefits for the economic multipliers associated with construction are evaluated at the Puget Sound regional level and at the state level.
- The timeframe for the cumulative effects analysis is the period from about 1850, which is the beginning of significant European settlement, up to the year 2030. Before construction, the timeframe for the affected environment discussion is from 1980 to the present. The timeframe for construction-related (temporary) impacts is the

approximately 5.5-year (66-month) construction duration for the Bored Tunnel Alternative (2011 through 2017). After construction, the timeframe for operational impacts is from the year of opening (2015) to the design year of the project (2030).

Step 3. Describe the current health and historical context for each affected resource

Historically, the economy of the Puget Sound fluctuated greatly because of the dependence on resource-based industries such as agriculture, fishing, and logging, as well as the aerospace industry. In the past few decades, the economy has diversified into other areas such as clean technology, medical care, computer software, and other trade and service sector businesses, which has helped to create a more stable economy. The economy today is heavily reliant on foreign trade and thus competes on a global scale.

While the Puget Sound regional economy grew by approximately 90 percent over the 30-year period between 1980 and 2010 (based on number of jobs in the region) and is forecasted to continue to grow through 2030 (albeit at a slower rate), the current economic conditions reflect the effects of the nationwide recession. Unemployment rates are currently at a 10-year high for the state of Washington, as well as for each county within the region.

Step 4. Identify the direct and indirect impacts that may contribute to a cumulative impact

- Benefits and effects on traffic, access, and visibility were qualitatively assessed as they relate to the economic health of the City of Seattle and the Puget Sound region.
- Changes in traffic circulation patterns were correlated to adaptations by commercial vehicles required to make connections to the designated freight corridors and to make deliveries between the industrial centers.
- The economic benefits of improved pedestrian access and circulation were evaluated qualitatively.
- Economic effects of the potential loss of available parking were assessed as they relate to government revenue, established business districts, and individual businesses dependent on nearby on-street parking.
- The number of properties to be acquired was identified to calculate the corresponding reduction of property tax revenue.
- Benefits and effects of property acquisitions were discussed as they relate to changes in government revenues.
- Estimates of the number of employees displaced through property acquisition were calculated.
- Benefits and effects on regional economic activity as a result of expenditures on the project were estimated using Bureau of Economic Analysis RIMS II multipliers (BEA 1997).
- The construction footprint was evaluated for its disruptive effects on businesses and neighborhoods, especially for those businesses immediately adjacent to the construction.

- Disruption factors evaluated include loss of short-term on-street parking, loss of sidewalk access and visibility, and loss of freight delivery parking.
- Temporary changes in vehicle through-traffic on SR 99 were assessed.
- Temporary economic effects on Port of Seattle, ferry, and cruise ship facilities were assessed.
- Construction effects and cost of congestion were evaluated.
- Construction expenditures and their effect on sales tax revenue were assessed.
- Temporary jobs created during construction were estimated using Bureau of Economic Analysis RIMS II multipliers.
- The indirect stimulation, revitalization, and reinvestment associated with removal of a visual and psychological barrier and facilitation of pedestrian activity is discussed.

Step 5. Identify other historic, current, or reasonably foreseeable actions that may affect resources

The project team considered 39 projects (shown in the cumulative effects matrix at the end of this attachment) for potential activities that could have a cumulative effect on the economic setting of Seattle and the Puget Sound region. The following five projects are anticipated to result in cumulative effects:

- **A1.** Alaskan Way Surface Street Improvements – S. King Street to Pike Street
- **A2.** Elliott/Western Connector – Pike Street to Battery Street
- **B1.** Elliott Bay Seawall Project
- **B2.** Alaskan Way Promenade/Public Space
- **H6.** Washington State Ferries Seattle Terminal Improvements

Step 6. Assess potential cumulative impacts to the resource; determine the magnitude and significance

Construction effects of the projects would include the following temporary effects:

- Increased noise, dust, and traffic congestion in the general areas where construction would occur.
- Temporary lane restrictions and loss of on-street parking and freight loading zones.
- Reconfigured or lost access to businesses, restaurants, and stores abutting the construction areas.

There could be a lot of simultaneous construction activity in the same areas in which the project is being constructed. Temporary traffic detours would further affect freight traffic that cannot use the new SR 99 bored tunnel due to cargo restrictions and would rely on the surface street network along the waterfront and through downtown. These impacts would be highly localized and would not likely affect most of Seattle or the Puget Sound region.

Comparable to the expenditure of construction funds described in Chapter 6, this capital improvement project would have multiplier effects on the regional economy, although the magnitude of those effects would be smaller due to the decreased size of these projects relative to the Bored Tunnel Alternative.

It is expected that improvements to the roadway network in the study area as a result of completion of roadway projects would have a net beneficial cumulative effect on transportation-related measures of effectiveness in the study area. These improvements to the roadway network should also result in a net positive effect on the economic performance of the study area. In addition, the new Alaskan Way Promenade/Public Space would encourage more people to visit Seattle's waterfront, which would result in increased revenue for businesses in the area.

Step 7. Report the results

The cumulative effects would be highly localized around the area of direct effects but would not have a significant cumulative effect on most of Seattle or the Puget Sound region.

Improvements to the roadway network should have a net positive effect on the economic performance of the region.

Economic benefits could result from implementing the Bored Tunnel Alternative along with other Program elements along the central waterfront, including the Alaskan Way Promenade/Public Space project. The removal of the existing viaduct structure would eliminate a visual impact and could help facilitate more pedestrian activity along the central waterfront and, all else being equal, create a less inhibited environment for reinvestment. The economic benefits would occur in the form of increased investment, vitality, and development opportunity; however, factors outside of the project and Program elements will greatly influence the nature and extent of local investment.

These benefits would occur over time with the revitalization and reinvestment in the project area once construction is completed. Market conditions and the overall economic climate will have a substantial effect on the extent and nature of revitalization and reinvestment that may take place. Revitalization and reinvestment could stimulate more economic activity, allow opportunities for new or expanded business and employment, and generate more tax revenues. This revitalization and redevelopment could substantially increase economic activity compared to the Viaduct Closed (No Build Alternative).

Step 8. Assess and discuss potential mitigation issues for all adverse impacts

Mitigation for the localized effects on businesses in the area of direct effects around the projects during construction would be similar to the measures discussed for the Bored Tunnel Alternative during construction. No other mitigation is proposed for the cumulative effects.

The following matrix identifies project-specific potential cumulative effects.

PROJECT-SPECIFIC CUMULATIVE EFFECTS MATRIX

PROJECT	POTENTIAL CUMULATIVE EFFECTS
A. Roadway Elements	
A1. Alaskan Way Surface Street Improvements – S. King Street to Pike Street	Some adverse effects, though localized and temporary. Construction of the Alaskan Way surface street improvements may overlap with construction associated with the Bored Tunnel Alternative.
A2. Elliott/Western Connector – Pike Street to Battery Street	Some adverse effects, though localized and temporary. Construction of the Elliott/Western Connector may overlap with construction associated with the Bored Tunnel Alternative, particularly near the south portal of the Battery Street Tunnel.
A3. Mercer West Project – Mercer Street becomes two-way from Fifth Avenue N. to Elliott Avenue, and Roy Street becomes two-way from Aurora Avenue to Queen Anne Avenue N.	No effect; not in the area of direct effects for the Bored Tunnel Alternative.
B. Non-Roadway Elements	
B1. Elliott Bay Seawall Project	Some adverse effects, though localized and temporary. The presence of heavy construction equipment immediately adjacent to the piers along the central waterfront could have a negative effect on tourism and result in loss of revenue for businesses on the piers.
B2. Alaskan Way Promenade/Public Space	<p>Some adverse effects, though localized and temporary. The presence of heavy construction equipment immediately adjacent to the piers along the central waterfront could have a negative effect on tourism and result in loss of revenue for business on the piers.</p> <p>Benefits would occur over time with the revitalization and reinvestment in the project area once construction is completed. Revitalization and reinvestment could stimulate more economic activity, allow opportunities for new or expanded business and employment, and generate more tax revenues.</p>
B3. Transit Enhancements - 1) Delridge RapidRide 2) Additional service hours on West Seattle and Ballard RapidRide lines 3) Peak hour express routes added to South Lake Union and Uptown 4) Local bus changes to several West Seattle and northwest Seattle routes 5) Transit priority on S. Main and/or S. Washington Streets between Alaskan Way and Third Avenue 6) Simplification of the electric trolley system	No effect; not of a size or scale to have an economic effect on the region.
B4. First Avenue Streetcar Evaluation	No effect; not of a size or scale to have an economic effect on the region.

PROJECT-SPECIFIC CUMULATIVE EFFECTS MATRIX (CONTINUED)

PROJECT	POTENTIAL CUMULATIVE EFFECTS
<i>C. Projects Under Construction</i>	
C1. S. Holgate Street to S. King Street Viaduct Replacement Project	Some adverse effects, though localized and temporary. Construction of the S. Holgate Street to S. King Street Viaduct Replacement Project will overlap with construction associated with the south portal of the Bored Tunnel Alternative.
C2. Transportation Improvements to Minimize Traffic Effects During Construction	No effect; not of a size or scale to have an economic effect on the region.
<i>D. Completed Projects</i>	
D1. SR 99 Yesler Way Vicinity Foundation Stabilization (Column Safety Repairs)	No effect; not of a size or scale to have an economic effect on the region.
D2. S. Massachusetts Street to Railroad Way S. Electrical Line Relocation Project (Electrical Line Relocation Along the Viaduct's South End)	No effect; not of a size or scale to have an economic effect on the region.
<i>E. Seattle Planned Urban Development</i>	
E1. Gull Industries on First Avenue S.	No effect; not of a size or scale to have an economic effect on the region.
E2. North Parking Lot Development at Qwest Field	No effect; not of a size or scale to have an economic effect on the region.
E3. Seattle Center Master Plan (EIS) (Century 21 Master Plan)	No effect; not of a size or scale to have an economic effect on the region.
E4. Bill and Melinda Gates Foundation Campus Master Plan	No effect; not of a size or scale to have an economic effect on the region.
E5. South Lake Union Redevelopment	No effect; not of a size or scale to have an economic effect on the region.
E6. U.S. Coast Guard Integrated Support Command	No effect; not of a size or scale to have an economic effect on the region.
E7. Seattle Aquarium and Waterfront Park	No effect; not of a size or scale to have an economic effect on the region.
E8. Seattle Combined Sewer System Upgrades	No effect; not of a size or scale to have an economic effect on the region.
<i>F. Local Roadway Improvements</i>	
F1. Bridging the Gap Projects	No effect; not of a size or scale to have an economic effect on the region.
F2. S. Spokane Street Viaduct Widening	No effect; not of a size or scale to have an economic effect on the region.
F3. SR 99/East Marginal Way Grade Separation	No effect; not of a size or scale to have an economic effect on the region.
F4. Mercer East Project from Dexter Avenue N. to I-5	No effect; not of a size or scale to have an economic effect on the region.

PROJECT-SPECIFIC CUMULATIVE EFFECTS MATRIX (CONTINUED)

PROJECT	POTENTIAL CUMULATIVE EFFECTS
<i>G. Regional Roadway Improvements</i>	
G1. I-5 Improvements	No effect; not in the area of direct effects for the Bored Tunnel Alternative.
G2. SR 520 Bridge Replacement and HOV Program	No effect; not in the area of direct effects for the Bored Tunnel Alternative.
G3. I-405 Corridor Program	No effect; not in the area of direct effects for the Bored Tunnel Alternative.
G4. I-90 Two-Way Transit and HOV Operations Stages 1 and 2	No effect; not in the area of direct effects for the Bored Tunnel Alternative.
<i>H. Transit Improvements</i>	
H1. First Hill Streetcar	No effect; not of a size or scale to have an economic effect on the region.
H2. Sound Transit University Link Light Rail Project	No effect; not of a size or scale to have an economic effect on the region.
H3. RapidRide	No effect; not of a size or scale to have an economic effect on the region.
H4. Sound Transit North Link Light Rail	No effect; not in the area of direct effects for the Bored Tunnel Alternative.
H5. Sound Transit East Link Light Rail	No effect; not in the area of direct effects for the Bored Tunnel Alternative.
H6. Washington State Ferries Seattle Terminal Improvements	Benefits would be similar to B2.
<i>I. Transportation Network Assumptions</i>	
I1. HOV definition changes to 3+ Throughout the Puget Sound Region	No effect; not in the area of direct effects for the Bored Tunnel Alternative.
I2. Sound Transit Phases 1 and 2	No effect; not in the area of direct effects for the Bored Tunnel Alternative.
I3. Other Transit Improvements	No effect; not in the area of direct effects for the Bored Tunnel Alternative.
<i>J. Completed but Relevant Projects</i>	
J1. Sound Transit Central Link Light Rail (including the Sea-Tac Airport extension)	No effect; already accounted for in the discussion of the affected environment.
J2. South Lake Union Streetcar	No effect; already accounted for in the discussion of the affected environment.
J3. SR 519 Intermodal Access Project, Phase 2	No effect; already accounted for in the discussion of the affected environment.

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