SOUTH PARK BRIDGE PROJECT

Draft Environmental Impact Statement and Section 4(f) Evaluation

September 2005

U.S. Department of Transportation
Federal Highway Administration

Washington State
Department of Transportation

King County
Department of Transportation

printed on recycled paper

SOUTH PARK BRIDGE PROJECT

Draft Environmental Impact Statement and Section 4(f) Evaluation

September 2005

U.S. Department of Transportation
Federal Highway Administration

Washington State
Department of Transportation

King County
Department of Transportation

printed on recycled paper

This page intentionally blank

FHWA-WA-EIS-05-02-D

South Park Bridge Project
Seattle, King County, Washington

Draft Environmental Impact Statement and Section 4(f) Evaluation

Submitted pursuant to the National Environmental Policy Act, 42 U.S.C. 4321, 49 U.S.C. 1651 Sec. 4(f), 16 U.S.C. 470 Sec. 106, and the Washington State Environmental Policy Act, RCW 43.21C

This action complies with Executive Order 11988, Floodplain Management; Executive Order 12898, Environmental Justice; and Executive Order 13166, Limited English Proficiency

Submitted by
U.S. Department of Transportation, Federal Highway Administration
Washington State Department of Transportation
King County Department of Transportation
U.S. Coast Guard, 13th District, as a Cooperating Agency

9/15/05
Date of Approval

James A. Leonard, P.E.
Federal Highway Administration
Washington Division

9/19/05
Date of Approval

Megan White, Director
Environmental Services Office
Washington State Department of Transportation

9/15/2005
Date of Approval

Harold Taniguchi, Director
King County Department of Transportation

The following persons may be contacted for additional information:

Jim Leonard
Federal Highway Administration
711 South Capital Way, Suite 501
Olympia, WA 98501
Telephone (360) 753-9408

Phil Segami
Washington State Department of Transportation
Northwest Region
15700 Dayton Avenue North
Shoreline, WA 98133-9710
Telephone: (206) 440-4736

Jim Sussex
King County Department of Transportation
Road Services Division
201 South Jackson Street
Seattle, WA 98104-3856
Telephone (206) 296-8737

Abstract

King County proposes to rehabilitate or replace the historic South Park Bridge over the Duwamish Waterway at 14th/16th Avenue S. in Seattle, Washington. Alternatives considered include no action, rehabilitation, and construction of a new bascule or two different-height fixed-span bridges. The purpose of the project is to find the most feasible long-term solution to address the deteriorating condition and increasing seismic vulnerability of this vital link in the regional transportation system.

Comments on this Draft EIS are due no later than November 21, 2005, and should be sent to Jim Sussex, King County Department of Transportation, Road Services Division, MS KSC-TR-0231, 201 South Jackson Street, Seattle, WA 98104-3856. Printed copies of the Draft EIS (including a CD-ROM of the Technical Appendices) can be purchased at the King County Map and Records Center, King County Department of Transportation, Road Services Division, 201 South Jackson Street, Suite 0106, Seattle, WA 98104-3855, for $15.00 (plus $5.00, if shipped). Printed copies of the six volumes of the Technical Appendices can be purchased separately at cost plus tax, with the total cost depending on which volumes are requested (plus shipping, if required). A CD-ROM of the Draft EIS and technical appendices is also available at no charge.

ADA, Title VI Notice, Translation Assistance, Measurements, and Blank Pages

Persons with disabilities may request that this information be prepared and supplied in alternate forms by calling collect (360) 664-9009 or (360) 705-6980 for Olympia residents. Persons with hearing impairment may call 1-800-486-8392 (TTY relay service).

Washington State Department of Transportation Title VI Notice to Public

The Washington State Department of Transportation hereby gives public notice that it is the policy of the department to assure full compliance with Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987, and related statutes and regulations in all programs and activities. Title VI requires that no person in the United States of America shall, on the grounds of race, color, sex, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Washington State Department of Transportation receives federal financial assistance.

Translation Assistance

For translation assistance providing comments on this Draft EIS, or for questions regarding the Draft EIS South Park Bridge Project, please call (206) 684-1955 (for Spanish) or (206) 205-9185 (for Vietnamese).

Si tiene preguntas sobre el estudio del Puente de South Park, o para hacer comentarios sobre este documento (Draft EIS South Park Bridge Project), por favor llame al (206) 684-1955.

Mọi sự thắc mắc về Dự Án Kế Hoạch Môi Sinh của Cầu South Park (Draft EIS South Park Bridge Project), xin quí vị vui lòng liên lạc với chúng tôi qua điện thoại (206) 205-9185.

Measurements

Measurements in this document are written in English units only.

Blank Pages

Blank pages have been inserted in some locations so that this document will be correct when printed or copied double-sided.

SEPA Fact Sheet

Nature and Location of Proposal

King County proposes to rehabilitate or replace the historic South Park Bridge near Seattle, Washington. This 74-year-old bridge is located in an industrial area south of downtown Seattle. The bridge is located at the upstream limits of heavy industrial uses along the Duwamish Waterway, which is a navigation channel maintained by the U.S. Army Corps of Engineers. The two-leaf bascule bridge (a type of drawbridge) crosses the Duwamish Waterway at 14th/16th Avenue S. The north bridge approach is adjacent to The Boeing Company Plant 2 complex south of East Marginal Way S. and the south bridge approach terminates in the commercial district of the South Park community. The purpose of this project is to find the most reasonable long-term solution to address the deteriorating condition and increasing seismic vulnerability of the bridge. Rehabilitation or replacement of the bridge would maintain a vital transportation linkage for cars, trucks, buses, bicyclists, and pedestrians across the Duwamish Waterway.

Date of Implementation

Construction of the project would begin following completion of the environmental review process, final engineering and design, acquisition of project construction permits, and purchase of required right of way. Construction duration would be approximately two to three years subject to state and local budgeting and appropriation procedures. For the analysis in this document, the proposed project is assumed to be completed by 2009. The funding of some alternatives, however, is uncertain and construction could be delayed.

Proponent and Lead Agency

King County Department of Transportation

Responsible Official

Harold Tanaguchi, Director, King County Department of Transportation

Contact Person

Jim Sussex, Environmental Engineer
King County Department of Transportation, Road Services Division
MS KSC-TR-0231
201 South Jackson Street
Seattle, WA 98104-3856
Telephone: (206) 296-8737
E-mail: jim.sussex@metrokc.gov

Permits and Approvals Required

A preliminary list of required federal, state, and local construction permits and approvals for the proposed project includes the following:

U.S. Army Corps of Engineers

Section 10 Permit (navigation construction)
Section 404 Nationwide Permit

U.S. Coast Guard

General Bridge Act of 1946 (for bridge repair or replacement)

U. S. Fish and Wildlife Service

ESA, Section 7 Consultation

U.S. National Marine Fisheries Service

ESA, Section 7 Consultation

Washington Department of Ecology

Water Quality 401 Certification
NPDES general permit for stormwater discharges
NPDES permit for construction activities
Coastal Zone Management Certification

Washington Department of Fish and Wildlife

Hydraulic Project Approval

Washington Office of Archaeology and Historic Preservation

Section 106 Review Consultation

Puget Sound Clean Air Agency

Demolition Notification (for structures containing asbestos)

King County

Shoreline Substantial Development Permit
Sensitive Areas Review
Public Agency and Utility Exception
Clearing and Grading Permit
Demolition Permit
Haul Road Agreement
Street Use Permit
Noise Variance for Nighttime Construction

City of Seattle

Public Agency and Utility Exception
Drainage Approval/Permit
Clearing and Grading Permit
Demolition Permit
Haul Road Agreement
Street Use Permit
Noise Variance for Nighttime Construction

City of Tukwila

Shoreline Substantial Development Permit
Sensitive Areas Review
Public Agency and Utility Exception
Clearing and Grading Permit
Haul Road Agreement
Street Use Permit
Noise Variance for Nighttime Construction

Port of Seattle

Easement to Construct over Duwamish Waterway Bedlands

Authors and Principal Contributors

This document has been prepared under the direction of the Federal Highway Administration and the Washington State Department of Transportation. Research and analysis were provided by:

Principal Author	Parsons Brinckerhoff Quade & Douglas, Inc.
Land Use	Parsons Brinckerhoff Quade & Douglas, Inc.
Relocations	Parsons Brinckerhoff Quade & Douglas, Inc.
Economics	Parsons Brinckerhoff Quade & Douglas, Inc.
Social Elements	Parsons Brinckerhoff Quade & Douglas, Inc.
Air Quality	Parsons Brinckerhoff Quade & Douglas, Inc.
Noise & Vibration	Parsons Brinckerhoff Quade & Douglas, Inc.
Transportation	Parsons Brinckerhoff Quade & Douglas, Inc.
Utilities	RoseWater Engineering, Inc.
Cultural and Historical Resources	Historical Research Associates, Inc.
Visual Assessment	Osborn Pacific Group, Inc.
Fish, Wildlife, and Vegetation	Parametrix, Inc.
Water Resources	Parametrix, Inc.
Geology and Soils	Shannon & Wilson, Inc.
Hazardous Materials	Wilbur Consulting, Inc.
Review and Guidance	Federal Highway Administration Washington State Department of Transportation King County Department of Transportation

Date of Issue

October 7, 2005

Please send comments on this Draft EIS to Jim Sussex, Environmental Engineer, King County Department of Transportation, Road Services Division, MS KSC-TR-0231, 201 South Jackson Street, Seattle, WA 98104-3856.

Date Comments are Due for the Draft EIS

November 21, 2005

Time and Place of the Public Hearing

A public hearing to receive oral and written comments on the Draft EIS will be held on Thursday, November 3, 2005, from 5:00 to 8:00 p.m., at the Concord Elementary School Gymnasium, 723 South Concord Street, Seattle, Washington.

Date of Final Action

A final EIS is expected to be issued during the spring of 2007.

Subsequent Environmental Review

None anticipated.

Location of EIS Background Data

The Draft EIS and other related technical reports and documents are available for review and photocopying during business hours at the following location:

Map and Records Center
King County Department of Transportation
Road Services Division
King County Center Building
201 South Jackson Street, Suite 0106
Seattle, WA 98104-3855
Telephone: (206) 296-6548
Hours: 8:30 a.m. to 4:30 p.m. Monday–Friday

In addition, general project information and downloadable project documents are available at the project website at http://www.metrokc.gov/kcdot/roads/cip (click on the South Park Bridge link).

Cost to the Public for Copy of EIS

Printed copies of the Draft EIS (including a CD-ROM of the Technical Appendices) can be purchased at the King County Map and Records Center listed above for $15.00 (plus $5.00, if shipped). Printed copies of the six volumes of the Technical Appendices can be purchased separately at cost plus tax, with the total cost depending on which volumes are requested (plus shipping, if required). A CD-ROM of the Draft EIS and technical appendices is also available at no charge.

The Draft EIS is also available for review at the following libraries:

King County Library System
1111 110th Avenue NE
Bellevue, WA 98004

White Center Library
11220 16th Avenue SW
Seattle, WA 98146

Seattle Public Library
1000 4th Avenue
Seattle, WA 98104

Delridge Library
5423 Delridge Way SW
Seattle, WA 98106

Highpoint Library
3411 SW Raymond Street
Seattle, WA 98188

This page intentionally blank

Table of Contents

Signatures and Abstract iii

ADA, Title VI Notice, Translation Assistance, Measurements, and Blank Pages v

SEPA Fact Sheet vii

List of Figures xvii

List of Tables xix

List of Acronyms xxi

Glossary xxv

Summary S-1

S.1 Overview S-1
S.2 Regulatory Context S-4
S.3 Purpose of the Project S-5
S.4 Need for the Project S-6
S.5 Project Goals and Objectives S-7
S.6 Related Actions S-7
S.7 Alternatives Previously Considered But Rejected S-7
S.8 Proposed Project Alternatives S-9
S.9 Preferred Alternative S-12
S.10 Estimated Project Cost and Construction Schedule S-12
S.11 Needed Right of Way and Property Acquisition S-14
S.12 Potential Environmental Impacts and Mitigation Measures S-15
S.13 Major Adverse Impacts That Can Not Be Avoided S-16
S.14 Areas of Controversy and Uncertainty S-19
S.15 Unresolved Issue S-19
S.16 Permits, Licenses, and Other Required Approvals S-20
S.17 Summary of Environmental Impacts and Proposed Mitigation Measures S-22

Chapter 1 Purpose and Need for the Project 1-1

1.1 Purpose of the Proposed Project 1-1
1.2 Need for the South Park Bridge Project 1-3
1.2.1 Poor Condition and Continuing Deterioration 1-3
1.2.2 Recent Earthquake Damage 1-6
1.2.3 High Maintenance Costs 1-6
1.2.4 Existing Design 1-8
1.3 The South Park Project Area 1-8
1.4 The Existing South Park Bridge 1-10
1.4.1 Bridge Design 1-11
1.4.2 Bridge Operation and Navigation Clearances 1-11

1.4.3 Bridge Traffic 1-11
1.4.4 The Transportation Network and Mobility..... 1-13
1.5 History of the Project..... 1-14
1.6 Organization of this Document..... 1-15

Chapter 2 The Project Alternatives 2-1

2.1 Bridge Design Criteria..... 2-1
2.1.1 Engineering Roadway Cross-Section Standards 2-1
2.1.2 Engineering Design Speeds and Grades 2-3
2.1.3 ADA Compliance 2-3
2.1.4 Bridge Pier Protection..... 2-4
2.2 Project Termini..... 2-4
2.3 Alternatives Selection Process 2-5
2.4 Alternatives Considered But Rejected 2-6
2.4.1 The Initial Nine Alternatives..... 2-6
2.4.2 Rehabilitation Alternative Options 2-10
2.5 Alternatives Analyzed in the EIS..... 2-11
2.5.1 No Action Alternative 2-11
2.5.2 Rehabilitation Alternative..... 2-12
2.5.3 Bascule Bridge Alternative 2-18
2.5.4 Mid-Level Fixed-Span Bridge Alternative 2-22
2.5.5 High-Level Fixed-Span Bridge Alternative 2-26
2.6 Construction Schedule, Duration, and Activities..... 2-30
2.6.1 Construction Schedule 2-30
2.6.2 Construction Durations 2-31
2.6.3 Major Construction Activities 2-31
2.6.4 Construction Sequencing 2-32
2.7 Estimated Costs for the Alternatives..... 2-36

Chapter 3 Affected Environment and Environmental Consequences.....3-1

3.1 Introduction 3-1
3.1.1 Overview of Impacts 3-1
3.1.2 Potential Impacts from Other Foreseeable Projects 3-1
3.2 Transportation and Mobility..... 3-4
3.2.1 Methodology 3-4
3.2.2 Existing Conditions 3-5
3.2.3 Environmental Impacts 3-15
3.2.4 Secondary and Cumulative Impacts..... 3-24
3.2.5 Mitigation of Impacts..... 3-24
3.3 Relocations 3-28
3.3.1 Affected Environment 3-28
3.3.2 Environmental Impacts 3-30
3.3.3 Secondary and Cumulative Impacts..... 3-38
3.3.4 Mitigation Measures 3-40
3.4 Land Use..... 3-43
3.4.1 Affected Environment 3-43
3.4.2 Environmental Impacts 3-45
3.4.3 Secondary and Cumulative Impacts..... 3-49
3.4.4 Mitigation Measures 3-50

3.5 Economics ... 3-52
3.5.1 Affected Environment ... 3-52
3.5.2 Environmental Impacts ... 3-59
3.5.3 Secondary and Cumulative Impacts ... 3-62
3.5.4 Mitigation Measures ... 3-64
3.6 Social Elements ... 3-67
3.6.1 Affected Environment ... 3-67
3.6.2 Environmental Impacts ... 3-74
3.6.3 Secondary and Cumulative Impacts ... 3-83
3.6.4 Mitigation Measures ... 3-85
3.7 Cultural Resources ... 3-89
3.7.1 Affected Environment ... 3-89
3.7.2 Environmental Impacts ... 3-95
3.7.3 Secondary and Cumulative Impacts ... 3-100
3.7.4 Mitigation Measures ... 3-102
3.8 Visual Assessment ... 3-105
3.8.1 Affected Environment ... 3-105
3.8.2 Environmental Impacts ... 3-108
3.8.3 Secondary and Cumulative Impacts ... 3-122
3.8.4 Mitigation Measures ... 3-124
3.9 Air Quality ... 3-127
3.9.1 Affected Environment ... 3-127
3.9.2 Environmental Impacts ... 3-128
3.9.3 Secondary and Cumulative Impacts ... 3-130
3.9.4 Mitigation Measures ... 3-130
3.10 Noise and Vibration ... 3-132
3.10.1 Affected Environment ... 3-132
3.10.2 Environmental Impacts ... 3-138
3.10.3 Secondary and Cumulative Impacts ... 3-140
3.10.4 Mitigation Measures ... 3-140
3.11 Utilities ... 3-143
3.11.1 Affected Environment ... 3-143
3.11.2 Environmental Impacts ... 3-144
3.11.3 Secondary and Cumulative Impacts ... 3-147
3.11.4 Mitigation Measures ... 3-147
3.12 Water Resources ... 3-150
3.12.1 Affected Environment ... 3-150
3.12.2 Environmental Impacts ... 3-152
3.12.3 Secondary and Cumulative Impacts ... 3-158
3.12.4 Mitigation Measures ... 3-158
3.13 Fish, Wildlife, and Vegetation ... 3-162
3.13.1 Affected Environment ... 3-162
3.13.2 Fish Species of Local Concern ... 3-168
3.13.3 Environmental Impacts ... 3-168
3.13.4 Secondary and Cumulative Impacts ... 3-172
3.13.5 Impact Minimization Measures ... 3-173
3.14 Geology and Soils ... 3-175
3.14.1 Affected Environment ... 3-175
3.14.2 Environmental Impacts ... 3-175
3.14.3 Secondary and Cumulative Impacts ... 3-180
3.14.4 Mitigation Measures ... 3-181

3.15 Hazardous Materials 3-183
3.15.1 Affected Environment 3-183
3.15.2 Environmental Impacts 3-188
3.15.3 Secondary and Cumulative Impacts 3-193
3.15.4 Mitigation Measures 3-193
3.16 Major Unavoidable Adverse Impacts 3-196
3.17 Irreversible and Irretrievable Commitment of Resources 3-198
3.18 Relationship of Short-Term Uses of Environment and Long-Term Productivity 3-199

Chapter 4 Public and Agency Coordination 4-1

4.1 Public and Agency Scoping 4-1
4.2 Public Meetings 4-2
4.3 Community Advisory Group (CAG) 4-4
4.4 Agency Project Advisory Committee (PAC) 4-7
4.5 Additional Miscellaneous Coordination Activities 4-7
4.5.1 Meeting with 14th Avenue S. Property Owners 4-7
4.5.2 Survey of South Park Businesses 4-8
4.6 Summary 4-10

Chapter 5 Draft Section 4(f) Evaluation 5-1

5.1 Introduction 5-1
5.2 Proposed Action 5-1
5.3 Project Alternatives 5-1
5.3.1 No Action 5-2
5.3.2 Rehabilitation Alternative 5-2
5.3.3 Bascule Bridge Alternative 5-2
5.3.4 Mid-Level Fixed-Span Bridge Alternative 5-3
5.3.5 High-Level Fixed-Span Bridge Alternative 5-4
5.4 Section 4(f) Resources 5-4
5.5 Impacts on Section 4(f) Resources 5-8
5.6 Rationale for Removal of Existing Bridge 5-8
5.6.1 Existing Conditions 5-8
5.6.2 Rehabilitation Alternative 5-11
5.6.3 No Action and Replacement Bridge Alternatives 5-11
5.7 Avoidance Alternatives 5-12
5.8 Coordination 5-13
5.9 Conclusion 5-14

References

Index

Appendices

Appendix A Principal Contributors
Appendix B Studies Performed
Appendix C Draft EIS Distribution List
Appendix D Miscellaneous
Appendix E Agency Coordination
Appendix F Appendix Volumes I-VI (CD)

List of Figures

Summary

Figure S-1 Vicinity Map S-2
Figure S-2 South Park Bridge S-3
Figure S-3 South Park Bridge Navigation Clearances S-3
Figure S-4 Example of a Fixed-Span Bridge: West Seattle Bridge S-11

Chapter 1

Figure 1-1 Project Area and Vicinity Map 1-2
Figure 1-2 North Bascule Pier Shallow Timber Piles 1-4
Figure 1-3 North Bascule Pier Wall Cracks 1-4
Figure 1-4 North Bascule Pier Spalling 1-5
Figure 1-5 North Bascule Pier Spalling Detail 1-5
Figure 1-6 Nisqually Earthquake Rail Damage (East Side of South Approach) 1-7
Figure 1-7 Nisqually Earthquake Approach Repair 1-7
Figure 1-8 Project Area Street Map 1-9
Figure 1-9 Original South Park Bridge Drawings 1-12
Figure 1-10 Existing Bridge Navigational Clearances 1-13

Chapter 2

Figure 2-1 Existing and Proposed Bridge Cross-Section Designs 2-2
Figure 2-2 Typical Fixed-Span Design: West Seattle Bridge 2-7
Figure 2-3 Typical Vertical Lift Design (not local) 2-8
Figure 2-4 Typical Swing Design: Seattle Swing Bridge 2-8
Figure 2-5 Comparison of the Local Street Network by Alternative 2-13
Figure 2-6 Rehabilitation Alternative: Plan and Profile 2-15
Figure 2-7 Bascule Bridge Alternative: Plan and Profile 2-19
Figure 2-8 Bascule Bridge Alternative: Aerial View 2-21
Figure 2-9 Mid-Level Fixed-Span Bridge Alternative: Plan and Profile 2-23
Figure 2-10 Mid-Level Fixed-Span Bridge Alternative: Aerial View 2-25
Figure 2-11 High-Level Fixed-Span Bridge Alternative: Plan and Profile 2-27
Figure 2-12 High-Level Fixed-Span Bridge Alternative: Aerial View 2-29
Figure 2-13 Proposed Construction Impact Areas 2-33

Chapter 3

Figure 3-1 Existing Road Network 3-6
Figure 3-2 Existing Lane Geometry 3-7
Figure 3-3 Existing AM Peak-Hour Conditions 3-9
Figure 3-4 Existing PM Peak-Hour Conditions 3-10
Figure 3-5 Bus Routes and Bus Stop Locations in South Park 3-14
Figure 3-6 Future 2027 No Action Alternative AM Peak-Hour Conditions 3-18
Figure 3-7 Future 2027 Build Alternatives AM Peak-Hour Conditions 3-19
Figure 3-8 Potential Parcels to Be Acquired 3-36
Figure 3-9 Existing Land Use Zoning 3-44
Figure 3-10 Comprehensive Plan Land Use Designations 3-46
Figure 3-11 South Park Bridge Openings by Month for All Vessels (April 2001–April 2002) 3-57

Figure 3-12 South Park Community Study Area ... 3-68
Figure 3-13 Community Facilities in South Park ... 3-69
Figure 3-14 Census Tract 112 Map ... 3-71
Figure 3-15 South Park Marina ... 3-78
Figure 3-16 Duwamish Waterway Recreational Boating ... 3-78
Figure 3-17 Sea Mar Community Health Center ... 3-82
Figure 3-18 Business District Hispanic/Latino Restaurants ... 3-82
Figure 3-19 Location of NRHP-Eligible and -Listed Historic Resources in the Study Area ... 3-96
Figure 3-20 South Park Bridge ... 3-98
Figure 3-21 14th Avenue S. Red Brick Road Remnant ... 3-98
Figure 3-22 1251 S. Cloverdale Street/8611/13 14th Avenue S. ... 3-99
Figure 3-23 Landscape Districts ... 3-106
Figure 3-24 Location of Viewpoints Construction and Demolition Impacts ... 3-109
Figure 3-25 Viewpoint C-1 No Action Alternative ... 3-112
Figure 3-26 Viewpoint C-1 Rehabilitation Alternative ... 3-112
Figure 3-27 Viewpoint C-1 Bascule Bridge Alternative ... 3-113
Figure 3-28 Viewpoint C-1 Mid-Level Fixed-Span Bridge Alternative ... 3-113
Figure 3-29 Viewpoint C-1 High-Level Fixed-Span Bridge Alternative ... 3-114
Figure 3-30 Viewpoint E-2 No Action Alternative ... 3-114
Figure 3-31 Viewpoint E-2 Rehabilitation Alternative ... 3-115
Figure 3-32 Viewpoint E-2 Bascule Bridge Alternative ... 3-115
Figure 3-33 Viewpoint E-2 Mid-Level Fixed-Span Bridge Alternative ... 3-116
Figure 3-34 Viewpoint E-2 High-Level Fixed-Span Bridge Alternative ... 3-116
Figure 3-35 Northbound View from Viewpoint D-1—Rehabilitation Alternative ... 3-117
Figure 3-36 Northbound View from Viewpoint D-1—Bascule Bridge Alternative ... 3-117
Figure 3-37 Northbound View from Viewpoint D-1—Mid-Level Fixed-Span Bridge Alternative ... 3-118
Figure 3-38 Northbound View from Viewpoint D-1—High-Level Fixed-Span Bridge Alternative ... 3-118
Figure 3-39 Southbound View from Existing Bridge—Rehabilitation and Bascule Bridge Alternatives ... 3-119
Figure 3-40 Southbound View from Dallas Avenue S.—Mid-Level Fixed-Span Bridge Alternative ... 3-119
Figure 3-41 Southbound View—High-Level Fixed-Span Bridge Alternative ... 3-120
Figure 3-42 Noise Measurement and Mode ... 3-137
Figure 3-43 Potential Impacts to Utilities ... 3-145
Figure 3-44 Habitat Features ... 3-163
Figure 3-45 Tideflats Downstream of Bridge ... 3-164
Figure 3-46 Muddy Sand Habitat Downstream of Bridge ... 3-165
Figure 3-47 Critical Areas Map ... 3-176
Figure 3-48 Hazardous Materials Site Number Locations ... 3-185
Figure 3-49 Hazardous Materials Substantially Contaminated and Reasonably Predictable Sites ... 3-186

Chapter 4

Figure 4-1 Workshop #1—Public Discussion of Preliminary Alternatives 4-3
Figure 4-2 CAG Meeting—April 6, 2004 4-5
Figure 4-3 CAG Members Discussing Potential Impacts of Alternatives 4-6

Chapter 5

Figure 5-1 Location of Section 4(f) Resources in the Study Area 5-5

List of Tables

Summary

Table S-1 Cost Estimates of the Project Alternatives S-13
Table S-2 Construction/Demolition Duration for the Project Alternatives S-14
Table S-3 Right of Way and Property Acquisition by Alternative S-15
Table S-4 Comparison of Impacts by Alternative S-23

Chapter 2

Table 2-1 Construction Durations for the Project Alternatives 2-31
Table 2-2 Cost Estimates of the Project Alternatives 2-37

Chapter 3

Table 3-1 Level of Service Criteria 3-11
Table 3-2 Summary Table of Affected Parcels in the South Park Neighborhood 3-31
Table 3-3 Potential Parcel Acquisitions 3-32
Table 3-4 Key Findings from the Local Business Survey 3-54
Table 3-5 Local Businesses Using the Duwamish Waterway 3-56
Table 3-6 Employment by Industry (Number/Percent of Jobs) 3-58
Table 3-7 Number of Estimated Businesses and Jobs Affected by Alternative 3-60
Table 3-8 Population Race and Hispanic/Latino Characteristics, 1990 and 2000 3-72
Table 3-9 Summary of NRHP-Listed or -Eligible Resources within the APE 3-95
Table 3-10 Estimated Archaeological Impact Areas for the Proposed Alternatives 3-97
Table 3-11 Comparison of the Visual Impacts of the Project Alternatives 3-108
Table 3-12 Summary of Ambient Air Quality Standards 3-128
Table 3-13 Summary of Air Quality Impacts and Mitigation 3-129
Table 3-14 Typical Noise Levels 3-133
Table 3-15 King County Maximum Permissible Sound Levels (dBA) 3-134
Table 3-16 FHWA Noise Abatement Criteria 3-136
Table 3-17 Noise Modeling Results by Project Alternative 3-139
Table 3-18 Existing Utilities and Agencies 3-143
Table 3-19 Total New and Improved Impervious Area 3-153
Table 3-20 Pollutant Loading Summary 3-155
Table 3-21 Total Average Channel Velocity at Bridge for 100-Year Peak Flow Rate 3-157
Table 3-22 Total Average Shear Stress at Bridge for 100-Year Peak Flow Rate 3-157
Table 3-23 Fish Species Likely to Occur at the South Park Bridge Site 3-166
Table 3-24 Substantially and Suspected Contaminated Sites by Bridge Alternative 3-189

Chapter 5

Table 5-1 Section 4(f) Resources 5-6
Table 5-2 Effects on Section 4(f) Resources 5-9

LIST OF ACRONYMS AND GLOSSARY

List of Acronyms

AASHTO .....American Association of State Highway and Transportation Officials

ac .....acres

ACHP .....Advisory Council on Historic Preservation

ACM .....asbestos containing material

ADA .....Americans with Disabilities Act of 1990

AGCW .....Associated General Contractors of Washington

AM .....morning driving times (e.g., 7 to 9 AM)

APE .....area of potential effect

BMPs.....best management practices

CAA .....Clean Air Act

CAG .....South Park Community Advisory Group

CERCLA.....Comprehensive Environmental Response, Compensation, and Liability Act of 1980

CFR .....Code of Federal Regulations

cfs .....cubic feet per second

CO .....carbon monoxide

CO_2.....carbon dioxide

CSO.....combined sewer outflow

dB .....decibels

dBA .....A-weighted decibels

DCLU.....Seattle Department of Design, Construction and Land Use

Draft EIS .....Draft Environmental Impact Statement

DNR .....King County Department of Natural Resources

DO.....dissolved oxygen

DOI .....United States Department of the Interior

Ecology .....Washington State Department of Ecology

ECOSS .....Environmental Coalition of South Seattle

EIS.....Environmental Impact Statement

EPA .....United States Environmental Protection Agency

ESA .....Endangered Species Act

FEMA .....Federal Emergency Management Agency

FHWA.....Federal Highway Administration, United States Department of Transportation (USDOT)

ft^2 .....square feet

HABS.....Historic American Building Survey

HAER.....Historic American Engineering Record

HRA .....Historical Research Associates, Inc.

I-5.....Interstate 5

IDT.....Interdisciplinary Team

ITS.....Intelligent Transportation Systems

KCDOT.....King County Department of Transportation

LBP .....lead-based paint

L_{dn} .....day/night sound level

LDW .....Lower Duwamish Waterway Superfund Site

L_{eq}.....equivalent sound level

L_{max} .....maximum sound level

L_{min}.....minimum sound level

LOS .....level of service

MHW .....mean high water

MLLW .....mean lower low-water

MOA .....memorandum of agreement

mph .....miles per hour

MPO.....metropolitan planning organization

MTCA.....Ecology's Model Toxics Control Act

MTP .....Metropolitan Transportation Plan

NAAQS.....National Ambient Air Quality Standards

NAC .....noise abatement criteria

NEPA .....National Environmental Policy Act

NHPA.....National Historic Preservation Act

NO_x .....nitrogen oxide

NRHP.....National Register of Historic Places

OAHP.....Washington State Office of Archaeology and Historic Preservation

O&M.....operation and maintenance

OSHA.....United States Occupational Safety and Health Administration

PA .....programmatic agreement

PAC.....South Park Bridge Project Advisory Committee

PGA.....peak ground acceleration

PGIS.....pollutant-generating impervious surface

PM.....afternoon driving times (e.g., 4 to 6 PM)

PM.....particulate matter (e.g., PM_{10} = fine pariculate matter)

POTW .....publicly owned treatment works

ppm .....parts per million

PS&E.....plans, specifications, and estimates

PSCAA.....Puget Sound Clean Air Agency

PSI.....preliminary site investigation

PSRC.....Puget Sound Regional Council

RCRA.....Resource Conservation and Recovery Act

RCW .....Revised Code of Washington

ROD .....Record of Decision

RM .....river mile

SDOT .....Seattle Department of Transportation

SEPA.....Washington State Environmental Policy Act

SHPO .....State Historic Preservation Officer

SIP.....State Implementation Plan

SMS.....Sediment Management Standards

SR-509 .....State Route 509

SR-99 .....State Route 99

SWPP .....Surface Water Protection Plan

TESC.....temporary erosion and sediment control

TIP.....Transportation Improvement Plan

TRB.....Transportation Review Board

TSP.....total suspended particulates

TSS.....total suspended solids

$\mu g/m^3$.....micrograms per cubic meter

UDP.....Unanticipated Discovery Plan

USC.....United States Code

USDOT .....United States Department of Transportation

VdB.....velocity decibels

WAC .....Washington Administrative Code

WSDOT .....Washington State Department of Transportation

Glossary

Abutment	Reinforced concrete structures that support the ends of the first (lowest) span of each concrete bridge approach.
Administrative Order of Consent	Any legal agreement to undertake required actions.
Alignment	Center of roadway; used to design road.
Approach	A filled embankment connecting the bridge ends to the existing ground or the portions of a bridge leading up to the main span.
Bascule bridge	A type of movable bridge that consists of two leaves that mechanically lift open to provide unlimited vertical clearance for navigation.
Bascule leaves (see also *double leaf)*	The movable span portions of the bridge. This includes the steel truss superstructure (which supports the deck and sidewalks), the steel rolling girders (which are part of the lift mechanism), and the counterweights. The motor rooms that drive the lift mechanism are also contained on each bascule leaf near the counterweights.
Best management practices (BMPs)	Used during construction, methods that have been determined to be the most effective, practical means of preventing or reducing environmental impacts.
Block group	A subdivision of a census tract, a block group is the smallest geographic unit for which the Census Bureau tabulates sample data.
Boeing Field	King County International Airport.
Build Alternatives	Term that includes the following four alternatives: Rehabilitation, Bascule Bridge, Mid-Level Fixed-Span Bridge, and High-Level Fixed-Span Bridge.
Built environment	The elements of the environment which are generally built or made by people as contrasted with natural processes.
Caisson	A permanent watertight structure, typically a pipe, used in construction to work under water, such as to build a foundation.
Census	The census of population and housing is taken by the Census Bureau in years ending in zero. The census form includes both a short form (100% survey) and a long form (sample survey of one in six households).

Census tract	This is a small, relatively permanent statistical subdivision for the purpose of presenting data. Census tract boundaries normally follow visible features, but may follow governmental unit boundaries or other non-visible features. Census tracts average about 4,000 inhabitants.
Channelization	Lane configuration for streets and arterials reflecting number of lanes, number/length of turn pockets, turn arrows, etc.
Cofferdam	A temporary watertight enclosure from which water is pumped to expose the bottom of a body of water and allow construction to occur (as of a pier).
Community cohesion	The social relationships, patterns, and interaction among persons and groups within a community that allows for the recognition and coalescence of common values and goals for the community.
Construction impact (see also *effect, impact)*	Temporary impact that would occur over a short period of time while a project is under construction.
Corrective Action cleanup	Site remediation performed under the cleanup policies for RCRA Corrective Action.
Cumulative impact (see also *effect, impact)*	Impact that "results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions..." [40 CFR 1508.7 (NEPA)]. The cumulative effects of an action may be undetectable when viewed in the individual context of direct and even indirect impacts but can, nonetheless, add to other disturbances and eventually lead to a measurable environmental change.
Determination of Significance	The written decision by the responsible SEPA official of the lead agency that a proposal is likely to have a significant adverse environmental impact and, therefore, preparation of an EIS is required.
Diatom	Any of a class of minute planktonic unicellular or colonial algae with silicified skeletons.
Double leaf (see also *bascule leaves)*	The two moveable portions of the bridge over the navigable waterway.
Downgradient	The subsurface directional flow of liquids, i.e., groundwater.

Effect (see also *impact, construction impact, cumulative impact, operational impact, secondary impact)*	"Effect" and "impact" are synonymous. Effects include ecological, aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial. Effects include: (1) *direct effects* that "are caused by the action and occur at the same time and place," and (2) *indirect effects* that "are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable." [40 CFR 1508.8 (NEPA)].
EIS phased review	The coverage of general matters in broader environmental documents, with subsequent narrower documents concentrating solely on the issues specific to the later analysis. For example, for large multi-phased subdivision, both programmatic (overview) and subsequent project-level review are required to complete the environmental review process.
EIS project-level review	Environmental impact assessment required for construction permit acquisition.
EMME/2	Travel demand modeling software used as the basis for developing traffic forecasts and volumes.
Environmental Impact Statement (EIS)	A document required by federal and state agencies under the National Environmental Policy Act (NEPA) and the Washington State Environmental Policy Act (SEPA). An EIS is required for major projects or legislative proposals that may significantly affect the environment. A tool for decision making, it describes the positive and negative effects of an undertaking and evaluates alternative actions. Required by 42 USC 4332 (NEPA) or WAC 197-11-405 (SEPA).
Environmental justice	A federal and Washington State policy that provides equitable outreach benefits to minorities and low-income populations and that any adverse environmental effects are not disproportionate to these historically underserved groups.
Fixed-span bridge	A bridge with a solid, non-moveable deck between support piers.
Gentrification	The restoration and upgrading of deteriorated urban property by affluent people, often resulting in displacement of lower-income people.
Groundwater	Supply of fresh water found beneath the earth's surface, usually in aquifers, that supply wells and springs.

Guide bank	A dike extending upstream from the approach embankment to direct the flow through the bridge opening.
Hazardous materials	Material, often waste, that poses a threat to human health and/or the environment. Typical hazardous substances are toxic, corrosive, explosive, or chemically reactive. In general, any materials which poses harmful risks to human health and/or the environment.
Hispanic/Latino	A self-designated classification of people whose origins are from Spain, the Spanish-speaking countries of Central or South America, the Caribbean, or those identifying themselves generally as Spanish, Spanish-American, etc. Origin can be viewed as ancestry, nationality, or country of birth of the person or person's parents or ancestors. Hispanic/Latino persons may be of any race, White and Non-White (Persons of Color).
Impact (see also *effect, construction impact, cumulative impact, operational impact, secondary impact)*	The effect or consequence of actions. Environmental impacts are effects upon the elements of the environments listed in WAC 197-11-444 (SEPA).
Impervious area	An area where water cannot flow down to groundwater resources.
Intactness	Measures the integrity of the natural and human-built landscape, and their freedom from encroaching elements. Intactness is subdivided into two categories: the level of human development and the degree of visual encroachment. Human development is the level of built environment within a view. Encroachment is a measure of the presence or absence of visually unpleasant or dominant elements in a landscape.
Landscape districts	Geographic areas which are recognizable as having some common, identifying character.
Lead agency	The agency with the main responsibility for complying with NEPA or SEPA procedural requirements.
Levee	A man-made structure that contains the shores of a river.

Level of Service (LOS)	(1) A qualitative rating of the effectiveness of a highway in serving traffic, measured in terms of operating conditions. (2) The quality and quantity of transportation service provided, including characteristics that are quantifiable (safety, travel time, frequency, travel cost, number of transfers) and those that are difficult to quantify (comfort, availability, convenience, modal image).
Lower Duwamish Waterway (LDW)	A six-mile section of the Duwamish River that extends south from Harbor Island through Georgetown, Highland Park, and South Park. The Army Corps of Engineers straightened, deepened, and shortened this waterway's path to Puget Sound, transforming it into a shipping canal.
Mean high water (MHW)	Tidal datum in which the means of the high water heights are observed over a specific "epoch" or a 19-year metonic period.
Mean lower low-water (MLLW)	Tidal datum defined by the mean of the lower low water heights, observed over a specific "epoch" or a 19-year metonic cycle over which tidal height observations are means to establish a reference datum.
Median	A value in an ordered set of values below and above which there is an equal number of values.
Mitigation	Measures taken to reduce adverse impacts on the environment. "Mitigation" includes in order of sequence: (1) Avoiding the impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or taking affirmative steps to avoid or reduce impacts; (3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; (5) compensating for the impact by replacing, enhancing, or providing substitute resources or environments; and/or (6) monitoring the impact and taking appropriate corrective measures [40 CFR 1508.20 (NEPA) and WAC 197-11-768 (SEPA)].
Monitoring wells	Permanent wells drilled down to groundwater levels where water quality sampling can be conducted on an ongoing basis.

National Register of Historic Places (NRHP)	The nation's official list of cultural resources worthy of preservation. Properties include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture.
Natural environment	Those aspects of the environment frequently referred to as natural elements, or resources, such as earth, air, water, and wildlife, as specified in WAC 197-11-444(1) (SEPA).
Notice of Intent	The written decision by the federal NEPA lead agency that a proposal is likely to have a significant adverse environmental impact and, therefore, preparation of an EIS is required.
Operational impact (see also *effect, impact)*	Environmental impact that could occur long term following the construction of a project.
Peel-off ramp	A ramp that takes a lane of traffic off the main line.
pH	A scientific measurement of hydrogen ion concentration used to express acidity (0.0 to <7.0 values) or alkalinity (>7.0 to 14.0 values).
Pier	The substructure that supports the girders and deck of a bridge.
Pier columns	The vertical columns of a pier.
Project area	The South Park Bridge project area extends along 14th/16th Avenue S. from the intersection of East Marginal Way S. and 16th Avenue S. south to the intersection of 14th Avenue S. and S. Trenton Street. The project area continues west along S. Trenton Street to 12th Avenue S. and north again to S. Cloverdale Street. The project area is also referred to as the project corridor.
Public hearing	A public proceeding conducted for the purpose of acquiring information or evidence that will be considered in evaluating a proposed transportation project and that affords the public an opportunity to present for the record their views, opinions, and information on such projects. [CFR 327.3(a)]
Race	Race is a self-identification characteristic of population and the 2000 census included White and Non-White (Persons of Color). Non-White includes Black or African-American alone, American Indian or Alaska Native alone, Asian alone, Native Hawaiian or other Pacific Islander alone, some other race alone, or a mixture of two or more races. Non-White can include persons of Hispanic/Latino heritage. Some Hispanic/Latinos, however, are White.

Rehabilitation	To put back into good condition (reconstruct the existing structure).
Replacement Bridge Alternatives	Term that includes the following three alternatives: Bascule Bridge, Mid-Level Fixed-Span Bridge, and High-Level Fixed-Span Bridge.
Riparian	Relating to or living or located on the bank of a watercourse (as a river) or sometimes of a lake or a tidewater.
Riprap	Artificial means of stabilizing erosion along shorelines (e.g., concrete slabs, boulders, large rocks, etc.).
Scoping	Determining the range of proposed actions, alternatives, and impacts to be discussed in an EIS. The required scoping process provides agencies and the public opportunity to comment. Scoping is used to encourage cooperation and early resolutions of potential conflicts, to improve decisions, and to reduce paperwork and delay.
Scour	The flow of water in a river that erodes the bottom of the river.
Secondary impact (see also *effect, impact)*	Impacts that "are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use; population density or growth rate; and related effects on air and water and other natural systems, including ecosystems" [40 CFR 1508.8 (NEPA)].
Section 4(f)	A provision of the U.S. Department of Transportation providing protection for publicly owned public parks, recreation areas, wildlife and waterfowl refuges, or historic sites on or eligible for the National Register of Historic Places [49 USC 303 and 23 USC 138, 23 CFR 771.107(e) and 771.135].
Sensitive noise receptor	Sites such as schools or neighborhoods where people would be exposed to substantially increased noise levels that approach abatement criteria due to a project.
Social resources	Social elements of the environment, including population, housing, community facilities, religious institutions, social and employment services, cultural and social institutions, government institutions, military installations, and neighborhood cohesion.
Spalling	The flaking of concrete pieces from a concrete surface caused by corrosion of underlying rebar, cracking, or chemical reactions in the concrete on the South Park Bridge.

Span	A girder or truss stretched between two limits (piers or columns).
Staging area	An area near construction activities that is temporarily used by contractors to store equipment, vehicles, and construction materials. It may also include areas used to temporarily contain potentially contaminated soil or water until treated and/or disposed off-site.
Stormwater	That part of precipitation, snow melt, or irrigation water that runs off the land into streams or other surface water. It can carry pollutants from the air and land into receiving waters.
Superfund Site	Site on the EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under the CERCLA and SARA.
Tribe (also *affected tribe)*	Any Indian tribe, band, nation, or community in the state of Washington that is federally recognized by the U.S. Secretary of the Interior and that will or may be affected by the proposal.
Trunion bridge (also *trunion-type bascule bridge)*	A type of bascule bridge design which incorporates a "hinge" to allow for rotation (opening) of the bascule leaves.
Truss	A framework of steel beams connected in triangular patterns that support a bridge deck.
Turbidity	Describes the amount of suspended materials in water.
Unity	Measures the visual coherence and compositional harmony of the landscape considered as a whole. Human and natural unity considers how the human development in a view blends with the surrounding landscape. Overall unity is the degree to which there is overall coherence and harmony between viewscape elements.
View distance	Defined by actual distance as follows: • Foreground–up to ¼ mile • Middleground–¼ to 3 miles • Background–beyond 3 miles
Viewer position	Defined by the level of the viewer with respect to the object being viewed: • Superior–viewer positioned above level of bridge • Normal–viewer positioned at level of bridge • Inferior–viewer positioned below level of bridge

Viewpoint	A network of permanently established observation sites which provide the means of studying the visual impact of alterations to the landscape (similar term—“observation points”).
Viewshed	All surface area visible from an observer’s viewpoint.
Visual impact	The degree in change in visual resources and viewer response to those resources caused by highway development and operations.
Vividness	Measure to assess the memorable aspects of landscape components as they combine in striking and distinctive patterns. There are four elements of vividness (landform, water form, vegetative form, and human-made form) that may be present and affect landscape views. This criterion is defined by the distinctiveness, memorable aspect, and quality of a specific element or group of elements within a landscape scene.

This page intentionally blank

SUMMARY

Summary

S.1 Overview

King County proposes to rehabilitate or replace the existing South Park Bridge. This 74-year-old bridge is located in an industrial area south of downtown Seattle, Washington. It spans the Duwamish Waterway, which is the dredged portion of the river used by large commercial vessels. It links primarily industrial land uses on the north to the residential South Park community south of the waterway. The Boeing Company has manufacturing plants located to either side of 16th Avenue S. north of the Duwamish Waterway. In contrast, South Park is known as a diversified community with large Hispanic/Latino and Asian populations. The bridge is a critical link in the regional transportation system and is a direct route for residents of the South Park community to travel north to Seattle and east to I-5. Figure S-1 is a map of the project vicinity and major roadways of the area's transportation network.

The engineering design of the South Park Bridge is special. It is a double-leaf bascule bridge, or "drawbridge" (see Figure S-2). This particular bascule bridge design is called a Scherzer rolling-lift bridge because the two sides of the bridge open in a rolling motion allowing the bridge to rise vertically, while simultaneously rolling away from the waterway. In contrast, the typical drawbridge opens on simple "hinges." Figure S-3 is a schematic drawing of the central portion of the South Park Bridge in both the open and closed positions. Because the bridge is the only operational example of a Scherzer rolling-lift bridge in Washington, the 74-year-old bridge is listed on the National Register of Historic Places, the Washington Heritage Register, and the King County Landmark Register. The bridge currently has two northbound and two southbound lanes and sidewalks on both sides.

Developing alternatives to rehabilitate or replace the South Park Bridge has not been easy for the following reasons:

- The South Park community initially voiced a preference to repair the existing bridge. The poor condition of the bridge, though, would need substantial re-construction that could require bridge closure for more than two years.

- The community is very concerned about the nature and duration of construction impacts, including closure of the existing bridge and how that may affect businesses on 14th Avenue S.

- The Duwamish Waterway is a navigation channel used by commercial vessels, barges, tugs, as well as recreational boats. A major luxury boat builder is also located upstream of the bridge. Proposed bridge alternatives would need to have sufficient vertical clearance to allow this marine traffic to continue to travel upstream and downstream of the bridge.

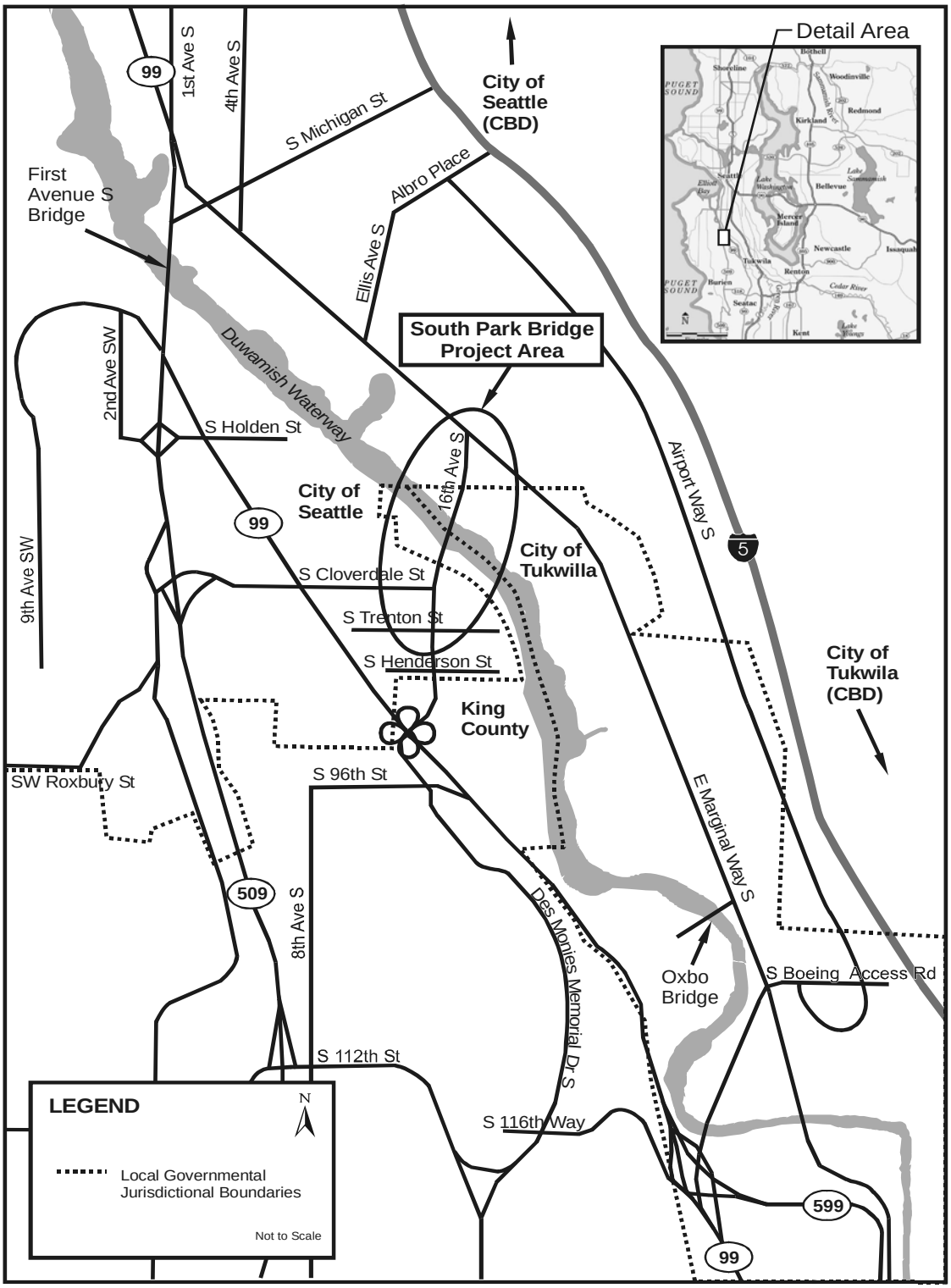


Figure S-1
Vicinity Map

Figure S-2
South Park Bridge

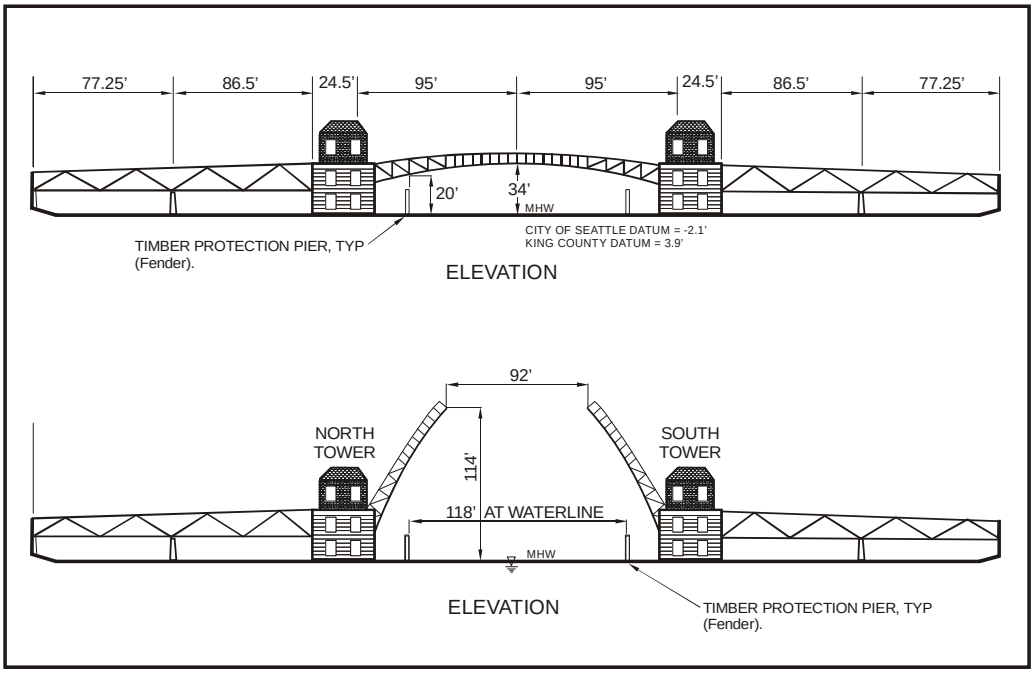


Figure S-3
South Park Bridge Navigation Clearances

- Design of a fixed-span bridge to accommodate large-sized vessels would require construction of a very high and long bridge that would affect property on 14th Avenue S. A lower-level bridge would restrict the vertical clearance for some existing marine vessel use and would impact marine-dependent businesses located upstream of the bridge. A fixed-span bridge could also limit future development of marine-dependent businesses on properties along the navigable waterway upstream of the bridge.

- The South Park business district is located on 14th Avenue S. south of the waterway, and some of the properties on this street would be acquired for construction of some alternatives. If a substantial number of businesses are displaced, the viability of the commercial district could be at risk.

- Moreover, construction of any type of alternative would most likely necessitate construction when young and adult endangered Chinook salmon are migrating. In addition, the in-water construction would temporarily disturb hazardous-material-contaminated sediments in the Duwamish Waterway.

During the alternatives selection process, King County developed five alternatives to evaluate in detail. These include doing nothing (No Action Alternative), rehabilitating the existing bridge (Rehabilitation Alternative), constructing a new bascule bridge (Bascule Bridge Alternative), or constructing a 65-foot (Mid-Level Fixed-Span Bridge Alternative) or a 100-foot (High-Level Fixed-Span Bridge Alternative) bridge.

This document has been prepared to help government agencies make a decision on this project. It describes the potential environmental impacts, both good and bad, for each of the alternatives. It does not present a recommendation to government decision-makers on which alternative is “best” or should be selected. As a public document, it is available to anyone who requests a copy.

This chapter summarizes the environmental impacts and the conclusions of the analysis contained in the document. The potential environmental impacts are shown in a table at the end of this chapter. The Glossary preceding this chapter provides definitions to technical terms used in this document.

S.2 Regulatory Context

This document is the Draft Environmental Impact Statement (Draft EIS) for the proposed South Park Bridge Project. This project to take no action, to rehabilitate, or to replace the South Park Bridge is evaluated in detail in this document. The King County Department of Transportation is the project proponent and local lead agency. Because the project involves federal funding, the state and federal lead agencies for the purposes of the environmental review process are the Washington State Department of Transportation and the Federal Highway Administration, respectively.

The information and analyses presented in this document satisfy the applicable requirements of the following: the National Environmental Policy Act [United States Code, Chapter 42, Part 4321, et seq]; the federal Council on Environmental Quality regulations that implement NEPA [Code of Federal Regulations, Chapter 40, Parts 1500–1508]; the Federal Highway Administration's NEPA implementation regulations [Code of Federal Regulations, Chapter 23, Part 771]; and Washington's State Environmental Policy Act [Revised Code of Washington, Chapter 43.21C, and Washington Administrative Code, Chapter 197-11].

These regulations ensure members of the public, as well as local, state, and federal agencies, will be given an opportunity to review and comment on the project alternatives and the environmental impact analysis presented in this Draft EIS. Following the publication of the Draft EIS and the comment period, King County, in conjunction with the Washington State Department of Transportation and the Federal Highway Administration, will select the project preferred alternative. Subsequently, a Final EIS and Record of Decision will be prepared and issued on the preferred alternative. Once the Record of Decision is signed by FHWA, then King County will be able to move forward with final design and engineering.

This chapter summarizes the 14 key topics discussed in detail in this document. These topics include:

- Purpose of the project
- Need for the project
- Project goals and objectives
- Related actions
- Alternatives previously considered but rejected
- Proposed project alternatives
- Preferred alternative
- Estimated project cost and construction schedule
- Needed right of way and property acquisition
- Potential environmental impacts and mitigation measures
- Major adverse impacts that can not be avoided
- Areas of controversy and uncertainty
- Unresolved issues
- Permits, licenses, and other approvals required

S.3 Purpose of the Project

The purpose of the South Park Bridge Project is to find the most reasonable long-term solution to address the deteriorated condition and increasing seismic vulnerability of the historic South Park Bridge and to maintain the transportation link provided by the existing bridge.

S.4 Need for the Project

The South Park Bridge is a major link in the regional transportation network. It connects East Marginal Way S. and SR-99, two key north-south arterials in Seattle's Duwamish industrial area. The bridge and S. Cloverdale Street are designated as heavy truck routes by King County. They are not designated as Major Truck Streets in the City of Seattle Comprehensive Plan or Freight Mobility Strategic Action Plan, however, the City of Seattle allows for the occasional use of the bridge for "over-legal trips" when a truck weight or size exceeds normal roadway restrictions. The commercial freight trucks service the area industries and businesses. The bridge is also a critical route for fire and emergency medical services for the South Park community, the Boeing complex in the City of Tukwila, and Seattle's Georgetown neighborhood. Furthermore, transportation studies determined that residents of the South Park community, as well as a significant number of residents of Burien, Tukwila, and Renton, use the bridge to travel north across the Duwamish waterway to both jobs and retail commercial districts in south Seattle.

But, the stability of the South Park Bridge and its ability to open and close properly are increasingly at risk. The primary cause of this problem dates back to how the bridge was constructed. At that time, the piles (long wooden posts) that support the north large foundation pier in the Duwamish Waterway were not driven deep enough into the riverbed to ensure the maximum support for that pier. This inadequacy has resulted in gradual movement of the bridge piers over the decades. In turn, this has caused misalignment of the movable bascule leaves and cracking in the concrete bascule piers, both of which have resulted in operational difficulties.

Poor quality concrete used in the original construction of the bridge also is causing chemical deterioration of structural elements. In particular, substantial concrete deterioration is occurring below the waterline of the in-water concrete pier columns.

Furthermore, the bridge has been damaged by several earthquakes. The most recent was the 2001 Nisqually Earthquake, which required major repairs to the bridge that cost over $740,000. The inadequate depth of the existing bridge piles also places the bridge at great risk of substantial damage from future earthquakes.

Therefore, the overall condition of the existing South Park Bridge is very poor. The 2002 bridge inspection conducted by King County recorded an existing condition rating of 6.0 out of a possible score of 100 based on Federal Highway Administration criteria (King County 2002c). This was among the lowest ratings given any bridge structure in the State of Washington. Thus, despite substantial ongoing maintenance and repairs for this bridge, it is a critical link in the regional transportation network that has suffered considerable deterioration over the past 74 years. Furthermore, its condition will continue to decline.

S.5 Project Goals and Objectives

The goal of the South Park Bridge Project is to select the most reasonable alternative that would maintain the vital regional transportation link the bridge currently provides. Key objectives include the following:

- Use current roadway design standards.
- Design the roadway and bridge to meet future roadway capacity needs for vehicles as well as heavy and oversized trucks.
- Provide a facility for both pedestrians and bicyclists to cross the Duwamish Waterway.
- Minimize right of way, property acquisition, and land use impacts in the South Park community.
- Maintain or improve the vertical and/or horizontal clearance of the Duwamish Waterway navigation channel (dredged portion of the river for use by large commercial vessels).

S.6 Related Actions

There are no related actions to the proposed South Park Bridge Project. No other roadway project must be constructed either before or after the South Park Bridge Project is constructed in order that the benefits of the project can be realized. No other environmental review is anticipated for the project except that required for the completion of this EIS, the issuance of the Record of Decision, and project permitting.

S.7 Alternatives Previously Considered But Rejected

Over the past 10 years, King County has evaluated a number of engineering concepts to rehabilitate or replace the South Park Bridge. Several alignments (centerline of a specific route) and conceptual engineering designs have been evaluated. Based on technical evaluations comparing and contrasting these alternatives, King County determined that some of the alternatives were less reasonable than others.

In 1994, King County investigated potential alignments for a replacement bridge. Several alignments were considered, including alignments to both the east and west of the existing bridge alignment. The *14th/16th Avenue South Bridge Rehabilitation/Design Report* (Sverdrup 1994) determined that alignments to the east of the existing bridge would have substantial land use impacts, especially considering the close proximity of several Boeing Plant 2 buildings. This study

recommended that the alignment of a replacement bridge should be approximately 80 feet west of the existing bridge centerline. This close proximity would minimize land use impacts to both Boeing properties as well as small commercial and industrial properties in the South Park community. In addition, it would allow traffic to continue to use the existing bridge during construction of a replacement bridge.

As part of the current project effort, King County developed and evaluated several preliminary alternatives for bridge replacement. The *Summary Technical Memo—Alternatives Development and Screening* (Parsons Brinckerhoff 2002) compared and contrasted these preliminary alternatives. Key design criteria included incorporation of current transportation engineering standards for the cross-section, alignment, design speed, maximum grade, and transition segment. These preliminary alternatives included both movable-span bridges and fixed-span bridges as listed below:

- Fixed-Span Bridges
  - Low level—approximately 35 feet vertical clearance above the water
  - Mid level—approximately 65 feet vertical clearance above the water
  - High level—approximately 100 feet vertical clearance above the water

- Movable-Span Bridges
  - Bascule bridge
  - Vertical lift bridge
  - Swing bridge

- Tunnel Concept

Four of these preliminary alternatives were determined to be less reasonable than the others. Screening criteria used to reject these four preliminary alternatives included the following: regional mobility, local access, waterway navigation, community impacts, aquatic habitat protection, construction impacts, and cost.

Among the fixed-span bridges, the low-level fixed-span bridge was not desirable because its vertical clearance of approximately 35 feet would severely limit the height of commercial and recreational boats that currently travel upstream of the South Park Bridge.

Two of the movable bridges were dropped from further consideration. The vertical-lift bridge was determined to have substantial visual (support structures extending 150–200 feet above the water) and traffic (10–15 minutes to operate) impacts. In comparison, the operation of a bascule bridge would require an estimated 4–6 minutes to open and close the bridge for marine traffic. The operation of the swing bridge also would be slow and would increase traffic delays when the bridge is opened for navigation traffic (10–15 minutes to operate). The height of the support structures and/or bridge control towers required to operate this movable bridge

would be taller than surrounding buildings in South Park. The operation of this type of bridge also would require the alignment of the bridge to be located an estimated 150 feet downstream of the existing bridge to allow use of the existing bridge during construction, thus substantially impacting the residential neighborhood west of the existing bridge as well as the Boeing complex on the north side of the Duwamish Waterway.

The tunnel concept was eliminated because the construction activities would cause potentially severe disturbance to known contaminated river bottom soils and sediments, irrespective of using the cut-and-cover or boring construction methods. The cut-and-cover method of construction could affect migration of endangered salmon species. In addition, construction of the tunnel would affect a substantial number of properties in the South Park community considering the length required to construct the tunnel below the depth of the waterway without exceeding maximum roadway grades. This aspect of the tunnel design would extend the south portal of the tunnel to the south of S. Henderson Street and the north terminus would extend into Boeing Field.

King County also evaluated methods to rehabilitate the existing bridge in a manner that would preserve and restore the historic features of the bridge. The *Rehabilitation Feasibility Study Technical Memorandum* (Parsons Brinckerhoff 2003a) investigated methods to rehabilitate the bridge in compliance with federal and state historic preservation laws and community interest to maintain the historic bridge gateway to the community. However, the effort to design a rehabilitation alternative was complicated by the very poor condition of key structural features, particularly the bascule piers. A study compared and contrasted reinforcing the existing piers and constructing new replacement piers. The study concluded that reinforcement of the existing structures would be less reasonable for the long-term life of the bridge structure, and constructing new replacement piers is not consistent with federal rehabilitation guidelines.

S.8 Proposed Project Alternatives

Based on the evaluation of the preliminary alternatives and consideration of agency and public comment, a total of five alternatives were selected for detailed environmental review in this Draft EIS. Two of the alternatives are bascule bridges (like the existing bridge) and two are fixed-span bridges. These alternatives include the No Action Alternative and the following Build Alternatives:

- Rehabilitation Alternative
- Bascule Bridge Alternative
- Mid-Level Fixed-Span Bridge Alternative (65 feet vertical clearance)
- High-Level Fixed-Span Bridge Alternative (100 feet vertical clearance)

No Action Alternative

The evaluation of the No Action Alternative is required by both federal and state environmental regulations. For this project, this alternative assumes the existing bridge would need to be closed in the future. Due to the existing poor condition of the bridge and earthquake vulnerability, this is assumed to occur sometime before 2027. Bridge closure and removal would occur (1) when the bridge could no longer operate reliably, (2) if maintenance costs become more than King County is willing or able to expend, or (3) if the bridge is damaged beyond repair due to an earthquake or other unforeseen event. Once closed, U.S. Coast Guard regulations would require that the inoperable bridge be removed.

Rehabilitation Alternative

The Rehabilitation Alternative would retain the historic character of the four-non-standard-lane existing bridge, while ensuring the life of the rehabilitated bridge would be comparable to the anticipated 75-year life of a newly constructed bridge. New bascule piers would be constructed. Other bridge structural elements would be refurbished, repaired, or reconstructed. Existing historic bridge features of the bridge would be preserved to the greatest extent possible. The grade of the bridge deck would remain approximately 5 percent for two standard southbound lanes and one standard northbound lane. Sidewalks would be reconstructed on either side of the roadway pavement. The bridge touchdown would be north of Dallas Avenue S., but road improvements would extend south of S. Sullivan Street. New pier protection structures would be constructed to prevent vessels from hitting the bascule piers and to demarcate the 118-foot width of the Duwamish Waterway navigation channel under the bridge.

Bascule Bridge Alternative

The Bascule Bridge Alternative would involve construction of a new movable bridge that would be similar to the design of the existing bridge. At an estimated 935 feet abutment-to-abutment, this bridge would be only slightly longer than the existing bridge. The new bridge would have two bascule leaves that would open and close like a “drawbridge.” The new bridge deck would be concrete, not a grated deck (current bridge design). When closed, the bridge deck would be approximately 34 feet above the water. The grade of the bridge deck would be approximately 5 percent for the two standard northbound and two standard southbound lanes. A combined 13-foot bike/pedestrian path would be constructed on the west side of the bridge. The bridge touchdown would be at S. Sullivan Street, but road improvements would extend to S. Cloverdale Street. New pier protection structures would be constructed defining a 125-foot navigation channel under the bridge.

Mid-Level Fixed-Span Bridge Alternative

The Mid-Level Fixed-Span Bridge Alternative would have a concrete bridge deck supported by a number of bridge piers. (Figure S-4 is a photo of a typical fixed-span bridge.) Some of the piers would be on land, but two would be in the water. The height of the bridge deck would be approximately 65 feet above the water and the length would be an estimated 1,660 feet abutment-to-abutment. The grade of the bridge deck would be approximately 8 percent for the two standard northbound and two standard southbound lanes. A combined 13-foot bike/pedestrian path would be constructed on the west side of the bridge but would connect with a zigzag design ramp at approximately S. Orr Street to allow bicyclists and pedestrians to descend quickly to the street level below. The bridge touchdown would extend south of S. Cloverdale Street such that the grade of the new roadway would be slightly above the existing level. Road improvements, however, would continue to allow direct access to the bridge from S. Cloverdale Street. Like the Bascule Bridge Alternative, new pier protection structures would be constructed to define a 125-foot navigation channel under the bridge.

Figure S-4
Example of a Fixed-Span Bridge: West Seattle Bridge

High-Level Fixed-Span Bridge Alternative

The High-Level Fixed-Span Bridge Alternative would have a solid bridge deck supported by a number of bridge piers, similar in design to the Mid-Level Fixed-Span Bridge Alternative. The maximum height of the bridge deck would be approximately 100 feet above the water and the length would be an estimated 2,332 feet abutment-to-abutment. The U.S. Coast Guard maintains the Duwamish Waterway as a navigable channel and, in a letter to King County dated June 10, 2002, they acknowledged that a fixed-span bridge alternative with a vertical clearance of a minimum of 100 feet to accommodate existing commercial and

recreational boat traffic using the Duwamish Waterway would be acceptable. In addition, this fixed-span bridge alternative is required for comparative analysis to the movable Bascule Bridge Alternative per Federal Highway Administration regulations [Code of Federal Regulations, Chapter 23, Part 650.809]. This comparison is important especially considering the substantial difference in construction and operation costs between bascule and fixed-span bridges.

The design of the High-Level Fixed-Span Bridge Alternative is similar to the 65-foot vertical clearance bridge. The grade of the bridge deck,however, would slightly exceed 8 percent for the two standard northbound and two standard southbound lanes. A 13-foot combined bike/pedestrian path would be constructed on the west side of the bridge for the entire length of the elevated portion of the bridge. Touchdown of the alternative would be just north of S. Trenton Street. To continue to provide access to the bridge for the community, road improvements would extend on S. Trenton Street west to 12th Avenue S. and north to S. Cloverdale Street. Finally, new pier protection structures would be constructed for the 125-foot channel in the same fashion as described for both the Bascule Bridge and Mid-Level Fixed-Span Bridge alternatives.

S.9 Preferred Alternative

At this time, King County does not have a preferred alternative for the South Park Bridge Project. The County will select a preferred alternative in conjunction with the Federal Highway Administration and Washington State Department of Transportation after review of comments on the Draft EIS received from the public, government agencies, and tribes. The preferred alternative will be presented in the Final EIS along with additional analysis of potential environmental impacts for any of the alternatives. The Final EIS will also have responses to the comments on the Draft EIS that were received during the public comment period.

S.10 Estimated Project Cost and Construction Schedule

In the *Structural Alternatives Study* (Parsons Brinckerhoff 2003d), King County developed estimated costs for the proposed project alternatives and a conceptual construction sequencing plan and schedule. The estimated construction costs include the costs for additional engineering work required to prepare the final plans, specifications, and estimates; purchase of needed right of way; and the labor and materials for the construction of each alternative. These cost estimates are shown in 2003 dollars and in 2008 dollars (mid-point of the assumed construction period) in Table S-1. The demolition activities associated with the No Action Alternative would cost the least amount of all of the alternatives at approximately $7 million (2003 dollars). The most expensive of the Build Alternatives would be the Bascule Bridge Alternative, which would cost approximately $77 million (2003 dollars).

Table S-1. Cost Estimates of the Project Alternatives

Alternative	Total Construction Cost (2003 dollars)	Total Construction Cost (2008 dollars)	75-Year Total Operation & Maintenance Costs (2003 dollars)[1]
No Action	$7,000,000	$9 million	$0 [1]
Rehabilitation	$63,930,000	$74 million	$11 million
Bascule Bridge	$77,334,000	$90 million	$11 million
Mid-Level Fixed-Span Bridge	$61,523,000	$71 million	$2 million
High-Level Fixed-Span Bridge	$70,460,000	$82 million	$3 million

Note:
[1]The operation and maintenance costs are the total amounts over the 75-year life of each of the bridge alternatives. These costs do not include the future annual operation and maintenance costs (averaging approximately $286,000 per year) for the existing bridge (from present until the existing bridge is demolished, or until construction were to start for the Rehabilitation Alternative).

Source: Structural Alternatives Study (Parsons Brinckerhoff 2003d).

This table also shows the total long-term estimated operation and maintenance costs for the 75-year life of the bridge alternatives. These cost estimates do not include the current operation and maintenance costs of approximately $200,000 to $300,000 per year. These costs associated with the existing bridge would continue until the time that the existing bridge is under construction for rehabilitation or the existing bridge is demolished following completion of one of the Replacement Bridge Alternatives. As shown in the table, there is no long-term operation and maintenance cost associated with the No Action Alternative following demolition of the existing bridge. The cost of operating and maintaining a movable bridge, however, is substantial at $11 million and is estimated to be approximately four to five times the operation and maintenance cost of a fixed-span bridge alternative.

The construction activities vary for each of the proposed project alternatives. The No Action Alternative only involves demolition and removal of the existing bridge. Each of the replacement bridge alternatives involves both construction of a new bridge as well as demolition and removal of the existing bridge. Construction activities associated with the Rehabilitation Alternative include repair, refurbishment, and reconstruction. These reconstruction activities would include some structural elements and the installation of new electrical and mechanical components.

The duration of construction and/or demolition activities for the Build Alternatives would last approximately two to three years. Table S-2 shows the anticipated construction period for each of the project alternatives. The

construction period associated with the No Action Alternative would last approximately eight months. The construction of the Bascule Bridge Alternative would take the longest, but would be less than three years. This table also shows the anticipated duration of closure of the existing bridge for each alternative. Bridge closure for the Rehabilitation Alternative would be the worst situation with closure taking an estimated 30 of the 32 months of the construction period. Bridge closure for the other alternatives would total approximately four weeks.

Table S-2. Construction/Demolition Duration for the Project Alternatives

Alternative	Construction/ Demolition Duration	Existing Bridge Closure
No Action	8 months	Bridge closed, then demolished and removed.
Rehabilitation	32 months	Bridge closed for 30 months and open for about two months.
Bascule Bridge	33 months	Bridge closed for short-term temporary periods (about four weeks total).
Mid-Level Fixed-Span Bridge	20 months	Bridge closed for short-term temporary periods (about four weeks total).
High-Level Fixed-Span Bridge	24 months	Bridge closed for short-term temporary period (about four weeks total).

Source: *Structural Alternatives Study* (Parsons Brinckerhoff 2003d).

Construction of the selected bridge alternative is anticipated to start within the next several years. For the analysis in this document, the bridge is assumed to be completed by 2009. The funding of some alternatives, however, is uncertain and construction could be delayed several years.

S.11 Needed Right of Way and Property Acquisition

Additional property must be purchased for construction of all of the Build Alternatives. This land is needed for right of way for construction of the bridge and road improvements. In addition, property is needed for a construction staging area (temporary material and equipment storage area during construction). It is also assumed some properties would be acquired due to loss of access to 14th Avenue S. No property would need to be purchased for the No Action Alternative.

The number of parcels affected by partial or total acquisition increases based primarily on the bridge length of each project alternative (see Section S.8). The

same is true for the total area that would be acquired. Of the Build Alternatives, the Rehabilitation Alternative would affect the fewest number of parcels and the smallest land area. The High-Level Fixed-Span Bridge Alternative would affect the greatest number of parcels and the largest area. Table S-3 shows the number of parcels and total area affected for each of the project alternatives.

Table S-3. Right of Way and Property Acquisition by Alternative

Alternative	Parcels	Total Area
No Action	0	0.0 acres
Rehabilitation	3	0.67 acres
Bascule Bridge	7	2.11 acres
Mid-Level Fixed-Span Bridge	14	3.04 acres
High-Level Fixed-Span Bridge	39	7.15 acres

Source: *Relocations Technical Report* (Parsons Brinckerhoff 2004e).

S.12 Potential Environmental Impacts and Mitigation Measures

The Draft EIS summarizes the major environmental impacts and recommended mitigation measures associated with each of the proposed project alternatives. The potential environmental impact issues addressed in the document are listed below. Table S-4 at the end of this chapter is a summary of key construction and operation impacts that distinguish the alternatives.

- Transportation
- Relocations
- Land use
- Economics
- Social elements
- Cultural resources
- Visual assessment
- Air quality
- Noise and vibration
- Utilities
- Water resources
- Fish, wildlife, and vegetation
- Geology and soils
- Hazardous materials

S.13 Major Adverse Impacts That Can Not Be Avoided

Most of the potential environmental impacts arising from the construction and operation of the project alternatives would not result in major adverse impacts. Proposed mitigation measures would avoid, reduce, or minimize the effects of these potential impacts. Each of the alternatives, however, would result in some major unavoidable impacts.

No Action Alternative

For the No Action Alternative, the existing South Park Bridge would be demolished and removed some time before 2027. The demolition of this alternative would cause temporary localized disturbance of the substrate and turbidity in the Duwamish Waterway. The project area is located within the area proposed as critical habitat for both the Chinook salmon and bull trout. These construction effects may temporarily affect estuarine fishes, including migrating adult and juvenile threatened Chinook salmon, threatened bull trout, and a species of concern, the coho salmon.

This alternative also would result in the permanent loss of the bridge, which is a listed resource on the National Register of Historic Places, the Washington Heritage Register, and the King County Landmark Register. This alternative would not be consistent with local or regional transportation, land use, or South Park neighborhood planning goals and policies. The removal of the bridge would affect the long-term ability to provide fire protection and emergency medical services to the South Park community as well as other nearby industrial and residential neighborhoods. This alternative would result in disproportionate though not high indirect impacts on minority, Hispanic/Latino, or low-income populations who reside, work, or operate businesses in the community and region following bridge demolition. These impacts would include both negative impacts as well as benefits to the community. As such, this alternative would be in compliance with federal and State anti-discrimination laws, regulations, and guidance (including Title VI of the Civil Rights Act of 1964 and Presidential Executive Order 12898 on environmental justice).

Rehabilitation Alternative

The proposed Rehabilitation Alternative would restore the existing historic character of the South Park Bridge. The project area is located within the area proposed as critical habitat for both the Chinook salmon and bull trout. The construction activities would cause temporary localized disturbance of the substrate and turbidity in the Duwamish Waterway. These construction effects may temporarily affect estuarine fishes, including migrating adult and juvenile threatened Chinook salmon, threatened bull trout, and a species of concern, the coho salmon. The duration of the in-water impacts, however, would be substantially longer than the anticipated duration for the demolition activities

associated with the No Action Alternative due to the extensive reconstruction required of the existing bridge bascule piers.

The proposed repairs, refurbishments, and reconstruction, however, would not meet the Secretary of Interior's standards for rehabilitation for historic resources. As such, the historic elements that make the bridge eligible for National Register of Historic Places listing would be lost and would result in a high adverse effect on this historic resource. The proposed construction of the bridge also requires bridge closure for approximately 30 months, which could jeopardize the economic long-term viability of the business district and the community. These disproportional indirect effects on minority populations during the construction period could be reduced in severity with substantial mitigation. As such, this alternative would be consistent with federal and State anti-discrimination laws, regulations, and guidance (including Title VI of the Civil Rights Act of 1964 and Presidential Executive Order 12898 on environmental justice).

Bascule Bridge Alternative

The Bascule Bridge Alternative would result in the permanent loss of the historic bridge structure as well as demolition/removal of the historic 14th Avenue S. Red Brick Road Remnant adjacent to the bridge. The construction effects (disturbance of Duwamish Waterway substrates and turbidity) associated with this alternative would be very similar to those described for the Rehabilitation Alternative. Required property acquisition would affect seven properties. This would affect some minority property owners, business owners, low-income employees, and residents. These impacts, however, would not be high, so this alternative would be consistent with federal and State anti-discrimination laws, regulations, and guidance (including Title VI of the Civil Rights Act of 1964 and Presidential Executive Order 12898 on environmental justice).

Mid-Level Fixed-Span Bridge Alternative

The Mid-Level Fixed-Span Bridge Alternative would result in the permanent loss of the historic bridge structure, demolition/removal of the 14th Avenue S. Red Brick Road Remnant adjacent to the bridge, as well as loss of context to the historic South Park Hall located at 8611/13 14th Avenue S. The construction effects associated with this alternative would be nearly the same as those described for the Bascule Bridge Alternative, except the duration of the in-water construction activities would be considerably shorter. This alternative would not be consistent with the South Park neighborhood land use planning goals and policies. The length of the bridge and its structure and new bridge lighting would introduce new barriers into the community and would affect community cohesion. The 65-foot vertical clearance of the bridge would affect upstream marine-dependent businesses, including Delta Marine Industries. A total of 14 properties would be acquired, which would disproportionately affect minority property owners, business owners, low-income employees, and residents in South Park and the Seattle metropolitan area. These effects would be disproportionate and high to

minority populations. As such, this alternative would not be in compliance with federal and State anti-discrimination laws, regulations, and guidance (including Title VI of the Civil Rights Act of 1964 and Presidential Executive Order 12898 on environmental justice).

High-Level Fixed-Span Bridge Alternative

The High-Level Fixed-Span Bridge Alternative would result in a number of substantial unavoidable adverse impacts. The in-water effects to the substrate and turbidity of the Duwamish Waterway would be the same as described for the Mid-Level Fixed-Span Bridge Alternative. Like the Mid-Level Fixed-Span Bridge Alternative, the construction of this alternative also would result in the permanent loss of the existing National Register of Historic Places listing of the historic South Park Bridge and demolition/removal of the 14th Avenue S. Red Brick Road Remnant. In addition, the context and viability of the South Park Hall, which is eligible for listing on the NRHP, would be adversely affected by the very close proximity of the 20-foot bridge abutment and, as such, acquisition of this building is assumed.

This alternative would introduce a very high structure and associated light and glare from the new bridge into the community. These effects and the construction of a new connector roadway on S. Trenton Street would create new barriers in the community. This would adversely affect the visual quality of the community. This action would not be consistent with adopted land use planning goals and policies due to the substantial displacement of land uses. In total, an estimated 39 properties would be acquired.

This alternative would adversely affect the social fabric and cohesion of the South Park minority community. The required acquisition of commercial properties and the many businesses located in buildings on these properties on 14th Avenue S. would affect six out of eight blocks of this Hispanic/Latino business district and would displace three-quarters of the businesses in the district. This alternative would also require acquisition of buildings owned by the Sea Mar Community Health Center, a non-profit organization dedicated to serving the Hispanic/Latino, minority, and low-income populations. These effects would affect the South Park community as well as the larger Hispanic/Latino community in the Seattle metropolitan area. This alternative would cause high and disproportionate impacts on members of minority and low-income populations residing, working, and operating businesses in South Park. As such, this alternative would not comply with federal and State anti-discrimination laws, regulations, and guidance (including Title VI of the Civil Rights Act of 1964 and Presidential Executive Order 12898 on environmental justice).

S.14 Areas of Controversy and Uncertainty

At this stage of studying the proposed project alternatives, there still remain some issues of controversy and uncertainty. These are listed below.

- Construction of several of the project alternatives would displace many businesses on 14th Avenue S. as well as access to businesses. There is concern that the aggregated effects on the South Park business district could affect the long-term stability of the remaining businesses in the commercial district as well as the stability of the entire community.
- Construction of the Mid-Level Fixed-Span Bridge Alternative and the High-Level Fixed-Span Bridge Alternative is expected to result in acquisition of a number of properties. Some properties (land and possibly buildings) would be acquired either for construction staging areas or roadway right of way. In addition, it is assumed other properties on 14th Avenue S. would be acquired because the business would lose access to the roadway. Some of these land uses or potentially different land uses, however, may be able to continue successfully on such properties and may not necessitate acquisition. The extent that properties actually need to be acquired due to loss of access is unknown.
- The existing South Park Bridge does not limit the vertical navigation clearance on the Duwamish Waterway. The proposed Mid-Level Fixed-Span Bridge Alternative (65 feet) and High-Level Fixed-Span Bridge Alternatives (100 feet), however, would restrict some existing and/or potentially some future boat traffic in the Duwamish Waterway, including large commercial and recreational boats and luxury boats manufactured upstream of the bridge. These vertical clearance restrictions could also affect other marine-dependent businesses and potential future development of such uses on upstream properties of the navigation channel.

S.15 Unresolved Issue

At this stage, there appears to be one major unresolved issue related to the proposed South Park Bridge Project. Following construction of the project alternatives, King County proposes to dispose of unneeded properties or portions of parcels that were acquired for project right of way or the construction staging areas. Any such disposal of property must be made in accordance with the Code of Federal Regulations, Chapter 23, Part 710.409. Furthermore, analysis of existing parcel sizes indicates that except for two parcels affected only by the High-Level Fixed-Span Bridge Alternative, the remnant parcels would be expected to meet minimum requirements for lot sizes based on current zoning. However, there remains considerable public concern over how these parcels would be redeveloped, whether or not lot line adjustment would allow combining of remnant parcels, and if future development would be consistent with the

neighborhood plan, local government comprehensive plans, and applicable zoning codes.

S.16 Permits, Licenses, and Other Required Approvals

Prior to the start of construction of the preferred alternative, the environmental review process must be completed. This document is a combined document that meets both federal and state environmental regulations. The final step in the National Environmental Policy Act environmental review process will be a Record of Decision, which will be issued by the Federal Highway Administration. The final step in the Washington State Environmental Policy Act environmental review process will be a Notice of Action published in the Washington State Department of Ecology Register. Once both of these actions have occurred, the project proponent, King County Department of Transportation, will be able to make a final decision to design and construct the preferred alternative.

Construction of the project would require King County to obtain a number of permits and other required approvals from several local government jurisdictions (City of Seattle, City of Tukwila, and King County), state agencies, and federal government regulatory agencies. The preliminary engineering plans for the project would be shared with government regulatory agencies to assess the specific list of permits, licenses, and/or approvals that would be required. A preliminary list of required federal, state, and local permits and approvals for construction of the proposed project may include the following:

U.S. Army Corps of Engineers

Section 10 Permit (navigation construction)
Section 404 Nationwide Permit

U.S. Coast Guard

General Bridge Act of 1946 (for bridge repair or replacement)

U.S. Fish and Wildlife Service

ESA, Section 7 Consultation

U.S. National Marine Fisheries Service

ESA, Section 7 Consultations

Washington Department of Ecology

Water Quality 401 Certification
NPDES general permit for stormwater discharges
NPDES permit for construction activities
Coastal Zone Management Certification

Washington Department of Fish and Wildlife

Hydraulic Project Approval

Washington Office of Archaeology and Historic Preservation

Section 106 Consultation

Puget Sound Clean Air Agency

Demolition notification (for any structure that might contain asbestos)

King County

Shoreline Substantial Development Permit
Sensitive Areas Review
Public Agency and Utility Exception
Clearing and Grading Permit
Demolition Permit
Haul Road Agreement
Street Use Permit
Noise Variance for Nighttime Construction

City of Seattle

Public Agency and Utility Exception
Drainage Approval/Permit
Clearing and Grading Permit
Demolition Permit
Haul Road Agreement
Street Use Permit
Noise Variance for Nighttime Construction

City of Tukwila

Shoreline Substantial Development Permit
Sensitive Areas Review
Public Agency and Utility Exception
Clearing and Grading Permit
Haul Road Agreement
Street Use Permit
Noise Variance for Nighttime Construction

Port of Seattle

Easement to construct over Duwamish Waterway bedlands

Lastly, King County will need to acquire property before any construction activities may begin on private property. For this project, property will be needed for right of way based on the final design of the project. In addition, property will need to be acquired for temporary construction staging areas. The acquisition or purchase of all private property will be conducted in compliance with the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended [United States Code, Chapter 42, Part 4601, et seq,, and the Code of Federal Regulations, Chapter 49, Part 24] and the Washington Relocation Assistance-Real Property Acquisition Policy Act of 1971, as amended [Revised Code of Washington, Chapter 8.26, and Washington Administrative Code, Chapter 468-100].

Following the completion of the federal and State environmental review processes, acquisition of all required construction permits and approvals, and acquisition of all needed private property, construction activities will begin on rehabilitation or replacement of the South Park Bridge.

S.17 Summary of Environmental Impacts and Proposed Mitigation Measures

Table S-4 compares and summarizes the major environmental impacts associated with the alternatives evaluated in this Draft EIS. This table will be helpful to compare and contrast the advantages and disadvantages of each of the alternatives for all types of potential construction and operation environmental impacts.

Table S-4. Comparison of Impacts by Alternative

Alternative	No Action	Rehabilitation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge
Transportation and Mobility					
Construction Impacts	Start of permanent reroute of all traffic due to bridge closure and demolition	30-month bridge closure during 32-month construction period	Bridge closure limited to only 4 weeks	Bridge closure limited to only 4 weeks	Bridge closure limited to only 4 weeks
Transportation Facilities	No bridge No restriction of navigational channel	Roadway with 3 wider traffic lanes and slightly improved sidewalks Navigation channel same as existing (118 feet)	Roadway with 4 wider traffic lanes and a 13-foot ped/bike path Wider navigation channel (125 feet)	Roadway with 4 wider traffic lanes, 8% grade, and a 13-foot ped/bike path and zigzag ramp Wider navigation channel (125 feet), but maximum 65-foot vertical clearance	Roadway with 4 wider traffic lanes, 8+% grade, and a 13-foot ped/bike path Wider navigation channel (125 feet), but maximum 100-foot vertical clearance
Transportation Network Changes	14th Ave S./16th Ave S. would become a dead-end street on both the north and south shore of the Duwamish Waterway	Improved intersection of 14th Ave. S., Dallas Ave. S., and S. Sullivan St.	Both S. Sullivan St. and Dallas Ave. S. would have direct access to the new South Park Bridge through an improved intersection	S. Sullivan St. and Dallas Ave. S. would become underpasses Traffic could access bridge at S. Cloverdale St., which would be raised to meet the descending grade S. Orr St. would dead-end at 14th Ave. S. due to zigzag ramp	Reroute all bridge traffic to S. Trenton St. and 12th Ave. S. to S. Cloverdale St. Dallas Ave. S., S. Sullivan St., and S. Cloverdale St. would become underpasses S. Donovan St. would dead-end at 14th Ave. S. due to bridge abutment
Relocations					
Construction and Operation Impacts	No parcels acquired No displacement of businesses, jobs, or residents	3 parcels acquired Displacement of 3 buildings, 3 businesses, 16 jobs, 2 dwellings, and 7 residents	7 parcels acquired Displacement of 5 buildings, 5 businesses, 29 jobs, 2 dwellings, and 7 residents	14 parcels acquired Displacement of 13 buildings, 17 businesses, 89 jobs, 3+ dwellings, and 10 residents	39 parcels acquired Displacement of 36 buildings, 26 businesses, 124+ jobs (and potentially an additional 180 jobs), 19+ dwellings, and 50 residents

Table S-4. Comparison of Impacts by Alternative (continued)

Alternative	No Action	Rehabilitation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge
Land Use					
Construction Impacts	No land acquired	0.67 acres acquired—residential and retail land uses	2.11 acres acquired—residential, retail, and restaurant land uses	3.04 acres acquired—residential, retail, and restaurant land uses	7.15 acres acquired—residential, retail, restaurant, health clinic, and wholesale distribution land uses
Plan Consistency and Land Use Changes	Not consistent with plans, but little change in land use	Consistent with plans and no change in land use	Same as Rehabilitation Alternative	Generally consistent with plans, but commercial district would be reduced	Not consistent with plans and commercial district substantially reduced, which could affect community character
Economics (also see Relocations)					
Access to Businesses	Permanent reroute due to loss of bridge, increased travel time, no change in on-street parking	Bridge operational, no change in travel time, no change in on-street parking	Bridge operational, no change in travel time, minor change in availability of on-street parking	Bridge operational, slight increase in travel time, substantial loss in available on-street parking	Bridge operational, increased travel time due to permanent reroute on S. Trenton St. and 12th Ave. S., majority of on-street parking is unavailable
Business District	Harmful to businesses dependent upon through-traffic; some businesses could fail and displace jobs	Good outlook for businesses that survive the construction period bridge closure	Good outlook for businesses	Good outlook for businesses, but business patterns could shift or relocate with smaller business district	Three-quarters of existing businesses displaced, viability of business district in question
Marine Businesses	No vertical or horizontal clearance restrictions, substantial benefits to marine businesses	Vertical and horizontal clearances continue to be less than permitted, but no change for marine businesses	Vertical and horizontal clearances meet permit guidelines, slight benefits to marine businesses	Vertical clearances substantially less than permitted, substantial adverse effects on barge operators and upstream businesses, i.e. Delta Marine Industries	Vertical and horizontal clearances meet permit guidelines, but may still affect barge operators and upstream businesses in the future due to increasing vessel sizes
Property Values	Commercial values could decline, but residential values could increase	Little to no changes to property values	Little to no changes to property values	Some commercial properties may lose some value	Substantial reduction in commercial property values expected, but depends on redevelopment opportunities

Table S-4. Comparison of Impacts by Alternative (continued)

Alternative	No Action	Rehabilitation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge
Social Elements and Environmental Justice (also see Transportation & Relocations)					
Construction Impacts	Temporary deterioration in quality of life due to local noise and air pollution and traffic detours for 8 months in immediate project area	Similar to No Action Alternative except 30-month bridge closure; would affect vehicle and transit access to/from the community; would also effect fire, police, emergency medical services access and response time	Bridge closure would affect vehicle and transit access to/from the community as well as the fire, police, and emergency medical services access and response time only an estimated 4 weeks	Similar to the Bascule Bridge Alternative except duration 20 months and larger area affected by construction disruption	Similar to the Bascule Bridge Alternative except construction period duration 24 months and substantially larger area affected by construction disruption
Community, Social, and Public Services	Would permanently changed fire, police, and emergency medical services access and use of alternative bridges would increase response times	No change in long-term access to South Park for community, social, or public services	Same as Rehabilitation Alternative	Fire, police, and emergency access and/or response time could be affected by changes in street network or bridge roadway grade	Two Sea Mar Community Health Center buildings displaced Fire, police, and emergency access and/or response time would increase due to traffic reroute to S. Trenton St. and bridge roadway grade
Pedestrian, Bicycle, and Transit	No long-term access across Duwamish Waterway at 14th/16th Ave. S. due to permanent reroute Use of reroute may not be reasonable for pedestrians/bicyclists Some transit routes to nearby neighborhood would be eliminated	Continued long-term access across the Duwamish Waterway Very limited change to ped/bike access and no change in transit routes Continue use of non-standard ped/bike path on bridge	Similar to Rehabilitation Alternative but improved 13-foot ped/bike path on bridge and street network facilities	Similar to Bascule Bridge Alternative except minor changes to some transit routes and shelters and 8% grade and ped/bike zigzag ramp may discourage use	Substantial changes to ped/bike access due to permanent reroute on S. Trenton St. Several transit routes permanently rerouted due to no bridge access to/from 14th Ave. S. and S. Cloverdale St., bus shelters relocated Improved 13-foot ped/bike path on bridge, but 8+% grade may discourage use

Table S-4. Comparison of Impacts by Alternative (continued)

Alternative	No Action	Rehabilitation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge
Community Cohesion	Permanent traffic reroutes increasing isolation of community and potentially increasing cohesion due to reduced through-traffic and associated noise and air pollution	No change in community cohesion expected	Little change in community cohesion anticipated	Intrusion of new elevated bridge structure would degrade community cohesion	Major intrusion of new elevated bridge and permanent rerouting of traffic on S. Trenton St. would substantially deteriorate community cohesion.
Environmental Justice	Mixed effects on local minority and low-income residents and businesses Action would be consistent with federal and state anti-discrimination laws, regulations, and guidance	Temporary indirect impacts to local and regional minority and low-income residents, business and property owners would be disproportional and high With substantial mitigation measures, this action would be consistent with federal and state anti-discrimination laws, regulations, and guidance	Direct impacts to some local minority and low-income residents, business and property owners, but would not be severe Action would be consistent with federal and state anti-discrimination laws, regulations, and guidance	Direct impacts to local minority and low-income business and property owners, workers, and residents and effects would be disproportional and high Action would not be in compliance with federal and state anti-discrimination laws, regulations, and guidance	Direct impacts to local and regional minority and low-income business and property owners, workers, residents, and medical clinic and effects would be disproportional and high. Action would not comply with federal and state anti-discrimination laws, regulations, and guidance
Cultural Resources					
Construction Impacts	No impacts to Red Brick Road Remnant One season effect on Muckleshoot and Suquamish tribal fishing	Temporary direct impacts to the Red Brick Road Remnant Tribal fishing affected for two seasons	Demolition/removal of the Red Brick Road Remnant Tribal fishing affected for two seasons	Demolition/removal of the Red Brick Road Remnant and temporary indirect impacts to South Park Hall Tribal fishing affected for one to two seasons	Same as the Mid-Level Fixed-Span Bridge Alternative, except direct impacts to South Park Hall and indirect impacts to 1215 S. Cloverdale St.
Archaeological Resources	No effects	Unknown, but adverse effects could be high	Same as the Rehabilitation Alternative	Same as the Rehabilitation Alternative	Same as the Rehabilitation Alternative
Historic Bridge	Loss of NRHP-listed bridge	Does not meet Secretary of Interior's rehabilitation standards, bridge no longer eligible for NRHP listing	Loss of NRHP-listed bridge	Loss of NRHP-listed bridge	Loss of NRHP-listed bridge

Table S-4. Comparison of Impacts by Alternative (continued)

Alternative	No Action	Rehabilitation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge
Area Historic Resources	Potential minor indirect effects to historic resources in the study area due to long-term effects of bridge removal on community	Negligible indirect effects on study area historic resources	Negligible indirect effects on study area historic resources	Adverse indirect effects on the context of the South Park Hall and minor indirect effects on Boeing Plant 2	Adverse direct effects to the South Park Hall due to assumed acquisition, and minor indirect effects to other area historic resources due to the overall scope of the alternative
Visual Assessment					
Visual Changes and Light/Glare	Distant views of the city and mountains from bridge deck would be eliminated Reduced views from the bridge to the adjacent districts Absence of operational impacts would result in increased intactness	No substantial visual changes Little to no change in visual vividness, intactness, unity, or light and glare from the bridge	No substantial visual changes, especially if new bridge includes historical details Increased visual vividness, but little change to intactness, unity, or light and glare from the bridge	Slight increased exposure of residential neighborhood to the view of increased elevation of passing motorists New structure alignment encroaches residential areas west of the bridge Increased light and glare from the bridge and into adjacent land uses	Views of city skyline would be significantly enhanced, though very short and from distant viewpoint New structure encroaches residential areas west of the bridge and south along the alignment as it soars high above existing homes Older character of the few existing buildings would be too sparse to look like a viable commercial district Substantially increased light and glare from the bridge along the existing alignment and through residential neighborhood on S. Trenton St. and 12th Ave. S.

Table S-4. Comparison of Impacts by Alternative (continued)

Alternative	No Action	Rehabilitation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge
Air Quality					
Predicted Long-term CO Concentrations	Predicted concentrations substantially lower than NAAQS emission standards (CO 9 ppm)	Same as No Action	Same as No Action	Same as No Action	Same as No Action
Noise and Vibration					
Operation Noise Levels	Noise level for 10 residences could exceed FHWA mitigation criteria Less than existing conditions (14 residences)	Noise level for 20 residences could exceed FHWA mitigation criteria More than existing conditions	Noise level on 21 residences could exceed FHWA mitigation criteria More than existing conditions	Noise levels on 21 residences could exceed FHWA mitigation criteria More than existing conditions	Noise levels for 16 residences could exceed FHWA mitigation criteria Slightly more than existing conditions
Utilities					
Construction Impacts	Utilities generally unaffected or abandoned in place, some utilities could be damaged Demolition activities could damage utilities Very minor impacts due to small disturbed area	Similar to No Action Alternative plus existing utilities serving the bridge would need to be upgraded or replaced Minor impacts due to relatively small disturbed area	Similar to the Rehabilitation Alternative except new utilities would need to be constructed for bridge operation Moderate impacts with disturbed area extending south to S. Cloverdale St.	Similar to the Bascule Bridge Alternative Moderate impacts with disturbed area extending south to S. Donovan St.	Similar to the Bascule Bridge Alternative Substantial impacts with disturbed area extending south to S. Trenton St., along S. Trenton St., and north on 12th Ave. S. to S. Cloverdale St.
Water Resources					
Stormwater Quantity	Reduced impervious surface, but site restoration would change surface water flows and require new stormwater facilities	No new impervious surface, but would require new stormwater facilities	Slight increase in new impervious surface, would require new stormwater facilities	Increase in new impervious surface, would require new stormwater facilities	Increase in new impervious surface, would require new stormwater facilities
Waterway (100-year peak flow rate)	Moderate reduction in water surface elevation	No change in water surface elevation	Slight Increase in water surface elevation	Decreased water surface elevation	Decreased water surface elevation

Table S-4. Comparison of Impacts by Alternative (continued)

Alternative	No Action	Rehabilitation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge
Fisheries, Wildlife and Vegetation					
Construction/Demolition Impacts	Birds, including foraging endangered bald eagles and osprey, would not be affected due to relative high ambient noise levels Estuarine fishes using the waterway habitat for juvenile rearing may be affected by temporary turbidity and disturbance of substrate Migrating adult and juvenile threatened Chinook salmon and threatened bull trout, and a species of concern, the coho salmon, could be affected by in-water activities 8-month duration of construction	Similar to No Action Alternative except impact area expanded to include temporary docks & temporary adjacent construction trestles, and the construction duration lengthened to 32 months	Similar to Rehabilitation Alternative except impact area expanded to adjacent new alignment and the duration of the construction activities 33 months	Very similar to Bascule Bridge Alternative except duration 20 months	Very similar to Bascule Bridge Alternative except duration 24 months
Pier Displacement	No pier displacement of habitat	Same pier displacement of habitat as existing bridge	Increased pier displacement of habitat	Reduced pier displacement of habitat	Reduced pier displacement of habitat
Overall Habitat Quality	Substantially improved habitat quality due to site restoration, newly created habitat, removal of creosote-treated timbers and piles, and no displacement of in-water habitat	Somewhat improved habitat quality due to site restoration, newly created habitat, and use of non-toxic materials for new pilings and fenders	Similar to Rehabilitation Alternative except more deteriorated habitat quality due to displacement of previously undisturbed habitat on new alignment and increased displacement area over existing conditions	Similar to Rehabilitation Alternative except overall improved habitat quality considering substantially reduced displacement by in-water piers	Same as Mid-Level Fixed-span Bridge Alternative

Table S-4. Comparison of Impacts by Alternative (continued)

Alternative	No Action	Rehabilitation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge
Geology and Soils					
Construction Impacts	Temporary erosion and sedimentation from demolition New fill could cause settlement, affecting utilities and structures Mud could be tracked onto public roads	Similar to No Action Alternative plus pile driving for the temporary construction of new staging docks would result in vibration	Similar to Rehabilitation Alternative plus new right of way work area would be cleared, grubbed, and topsoil stockpiled	Same as the Bascule Bridge Alternative	Same as the Bascule Bridge Alternative
Hazardous Materials					
Construction Impacts	Contaminated soil, groundwater, and sediment could be encountered during demolition Workers could be exposed to hazardous materials from 2 sites Area of risk would be very modest in size	Contaminated soil, groundwater, and sediment could be encountered during demolition Workers could encounter underground storage tanks, asbestos, and lead-based paints during building demolition Workers could be exposed to hazardous materials from 9 sites Area of risk would be very moderate in size	Similar to Rehabilitation Alternative except workers could be exposed to hazardous materials from 11 sites and area of risk would be modest in size	Similar to Rehabilitation Alternative except workers could be exposed to hazardous materials from 13 sites and area of risk would be substantial in size	Similar to Rehabilitation Alternative except workers could be exposed to hazardous materials from 15 sites and area of risk would be substantial in size

CHAPTER 1

PURPOSE AND NEED FOR THE PROJECT

Chapter 1 Purpose and Need for the Project

This chapter discusses the reasons why King County is proposing to rehabilitate or replace the South Park Bridge. This bridge is located in unincorporated King County adjacent to the South Park neighborhood in Seattle, Washington. Sections in this chapter describe the purpose of the project, the South Park area, the existing South Park Bridge design and use, and the long-term solutions provided by the proposed South Park Bridge Project. The specific issues associated with the existing bridge are also described in detail. The chapter concludes with a description of the organization of this Draft EIS document.

1.1 Purpose of the Proposed Project

King County proposes to rehabilitate or replace the 74-year-old South Park Bridge located south of downtown Seattle, Washington (see Figure 1-1). The purpose of the project is to find the most reasonable long-term solution to address the deteriorated condition and the seismic vulnerability of the South Park Bridge. The bridge is located in the Seattle Fault Zone and has been subject to several strong shocks and liquefaction from past earthquakes.

The South Park Bridge spans the Duwamish Waterway. This is the man-made portion of the Duwamish River as it enters Puget Sound's Elliott Bay. The project site is located in the upstream limit of heavy industrial uses in the Duwamish Waterway. Since channelization of the Duwamish Waterway started in 1913, federal government agencies have regulated this portion of the waterway as a navigable channel, and historic water-right uses have been protected. Today, it continues to be used by commercial tugs and barges, vessels serving marine-dependent businesses located upstream of the bridge, as well as recreational motor boats and sail boats. In addition, the Duwamish Waterway is an important route for juvenile and adult salmon, including the threatened Chinook salmon, migrating between the upper Green River (a tributary of the Duwamish River), Elliott Bay, and the Pacific Ocean.

One of the major challenges of designing the conceptual project Build Alternatives has been balancing the needs of the waterway users and the potential effects on the South Park community. A low-profile bridge can result in a relatively short distance between the north and south bridge touch-down points. As such, a low bridge would have minimal impacts on the South Park community, particularly the businesses fronting 14th Avenue S. A low-profile bridge, however, could totally block upstream travel of marine vessels (commercial and recreational vessels) depending on vessel vertical clearance requirements. In contrast, a high-profile fixed-span bridge that fully accommodates marine vessels would have long approach structures due to maximum allowable roadway slopes. Consequently, satisfying the vertical clearance needs of waterway users with a fixed-span structure would be at the expense of

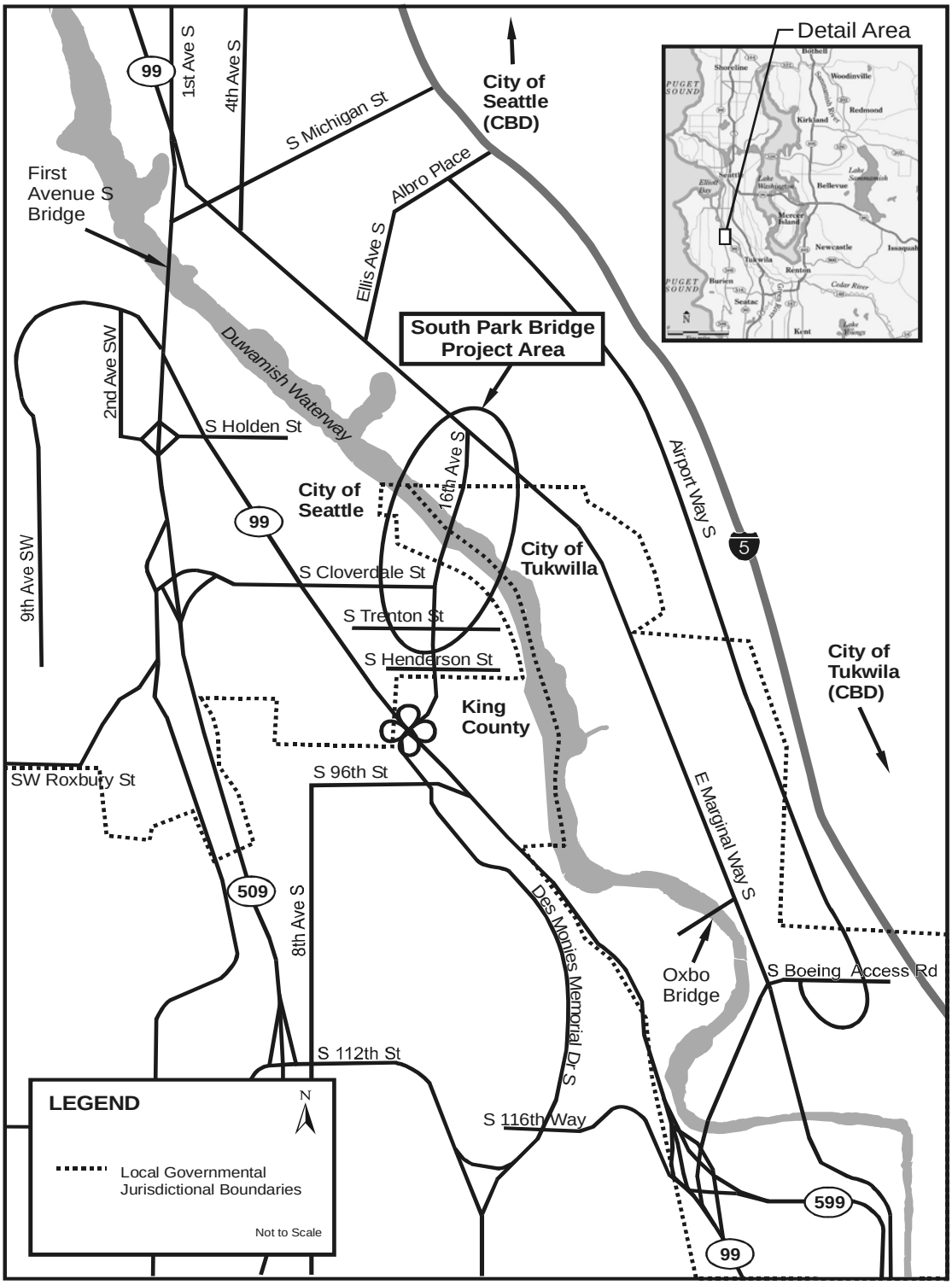


Figure 1-1
Project Area and Vicinity Map

numerous businesses along 14th Avenue S. As such, a key objective of the proposed project is to preserve, to the extent possible, the existing South Park community and 14th Avenue S. businesses while meeting U.S. Coast Guard clearance requirements for the waterway.

The bridge also is part of a regional principle arterial linking key travel routes in the south Seattle area and through the South Park community. The bridge and 14th/16th Avenue S. connect E. Marginal Way S. to the north and SR-99 to the south of the South Park community. This roadway is designated a truck route by King County, although it is not designated as a Major Truck Street in the City of Seattle Comprehensive Plan or Freight Mobility Strategic Action Plan. It also is used by several bus routes. In the South Park community, another principle arterial turns off 14th Avenue S. onto S. Cloverdale Street and continues west to SR-509 (see Figure 1-1).

As such, the proposed action must maintain this vital South Park and regional transportation route. Cars, trucks, buses, bicyclists, and pedestrians use the route to cross the Duwamish Waterway. The proposed action must not adversely affect the commercial and recreational marine traffic and endangered salmon that use the waterway. In addition, potential adverse effects on the South Park community, particularly the commercial district, must be minimized.

1.2 Need for the South Park Bridge Project

Rehabilitation or replacement of the South Park Bridge is proposed because it is a vital link in the regional transportation network and because the existing bridge structure is in poor condition and does not meet current design standards. Moreover, the condition of the bridge will continue to deteriorate, which will increasingly require costly maintenance and repair and eventual closure. The following sections describe these issues in detail.

1.2.1 Poor Condition and Continuing Deterioration

In spite of substantial ongoing maintenance and repairs, the South Park Bridge has suffered considerable deterioration over the past 74 years. Long-term, the stability of the entire bridge is at risk due to the original shallow placement of the supporting piles of the north bascule pier (see Figure 1-2). This condition has resulted in movement of both of the bridge piers relative to each other over the decades. This condition has caused misalignment of the movable bascule leaves. Consequently, the center lock and guide tracks require ongoing modifications and adjustments to allow the bridge to continue to operate properly. This movement has also caused cracking in the bascule piers (see Figure 1-3). In addition, poor quality concrete used in the original construction of the bridge is causing chemical deterioration of structural elements (see Figure 1-4 and Figure 1-5).

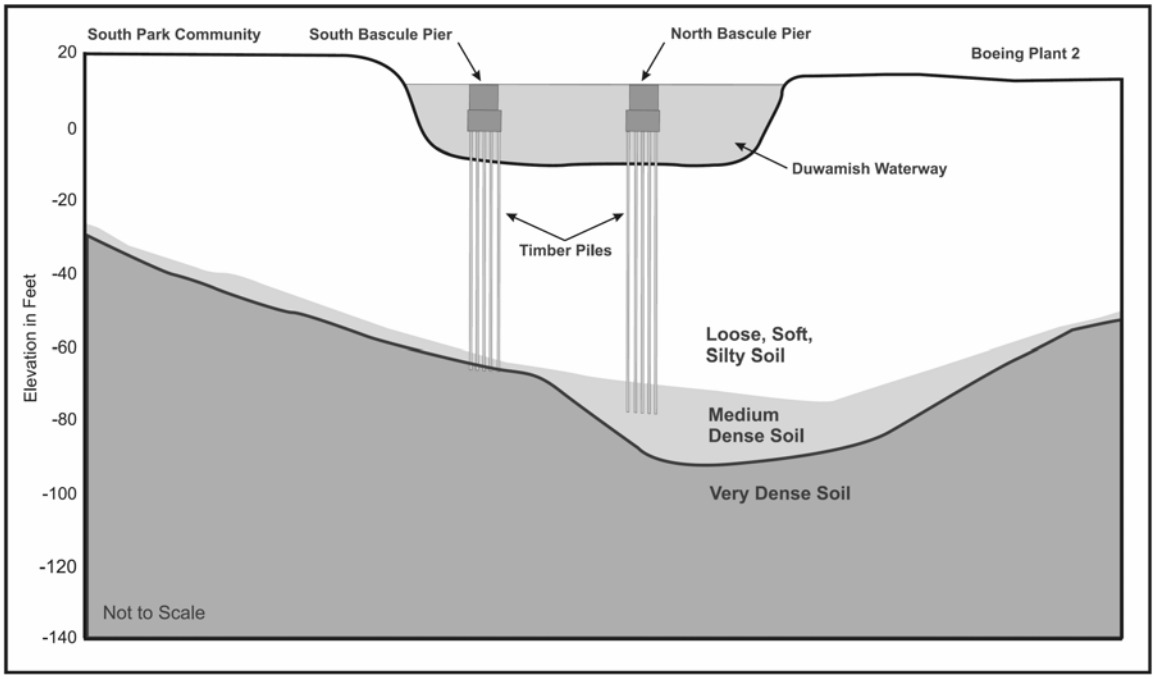


Figure 1-2
North Bascule Pier Shallow Timber Piles

Figure 1-3
North Bascule Pier Wall Cracks

Figure 1-4
North Bascule Pier Spalling

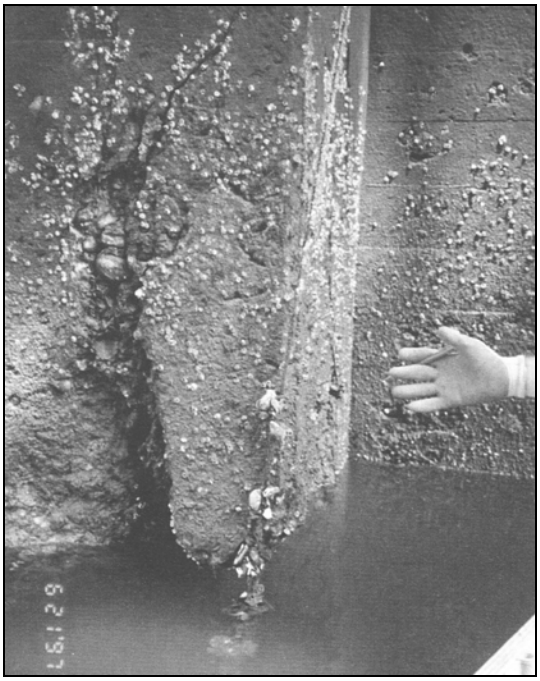


Figure 1-5
North Bascule Pier Spalling Detail

1.2.2 Recent Earthquake Damage

The condition of the bridge also worsened significantly as a result of the Nisqually Earthquake in February 2001. Damage to the bridge from the earthquake is shown in Figure 1-6 and Figure 1-7. Immediately after the earthquake, the bridge could not open to vessels for a month. Major repairs were necessary and cost over $740,000. Since the earthquake, operation of the bridge has been less reliable, requiring it to be closed for repairs intermittently for several days at a time. Furthermore, the bridge remains vulnerable to future seismic events as it is located in the Seattle Fault Zone.

A 2002 bridge inspection conducted by King County reported that the sufficiency rating of the bridge condition was rated a 6.0 out of a possible 100 (King County 2002c). This sufficiency rating is a numeric value that indicates a bridge's relative ability to serve its intended purpose. It is the summation of calculated values based on structural condition, geometric layout of the bridge, the number of vehicles crossing the bridge, the length of the detour route should the bridge be closed, and the capability of the bridge rail. The 6.0 sufficiency rating for South Park Bridge was among the lowest ratings given any bridge structure in the State of Washington in 2002. This rating clearly documents the structural deficiency of the bridge and qualifies funding for a replacement bridge or rehabilitation from the federal Highway Bridge Replacement and Rehabilitation Program [23 CFR 650.405].

1.2.3 High Maintenance Costs

Maintenance costs associated with the old bridge are substantial. In recent years, costs have ranged between $200,000 and $300,000 annually. This is approximately 18 percent of the total King County maintenance budget for all bridges. In addition, King County estimates deferred restoration and maintenance costs to be $14.5 million. Examples of work that has been deferred include: seismic retrofit of a portion of the bridge (deck and trusses only), concrete approach replacement, and electrical system replacement. These dollar amounts reflect the substantial effort that would be necessary to extend the life of portions of the bridge and improve operational reliability. However, this work would not include repairing the main bascule piers, and the piers would remain unstable and seismically vulnerable. See Section 2.5.2 for more discussion of the Rehabilitation Alternative.

Figure 1-6
Nisqually Earthquake Rail Damage
(East Side of South Approach)

Figure 1-7
Nisqually Earthquake Approach Repair

1.2.4 Existing Design

In addition, the design of the existing South Park Bridge does not meet current roadway design standards, and it has many design deficiencies. The overall bridge width—including lane widths, shoulders, and sidewalks—should be 68 feet according to current applicable design standards. The existing bridge width is only 52 feet. The lanes are too narrow and there are no roadway shoulders between the traffic lanes and the bridge sidewalks. There is no center median providing space between the two directions of traffic. The electrical control system is nearly all original and out of code. Replacement parts are no longer available. Water intrusion in the electrical conduits causing short-circuiting has resulted in numerous emergency bridge closures. Together, these deficiencies highlight some of the dated design standards that need to be addressed in either the design of a new bridge or rehabilitation of the existing bridge.

In conclusion, the bridge will be closed in the future due to excessive structural deterioration or failure of the movable span operations (particularly in the event of another earthquake). In addition, the maintenance costs could become more than King County can reasonably continue to spend. Closure of the bridge would have a substantial impact on the transportation system and traffic conditions in the surrounding area—including SR-99, SR-509, First Avenue S., and East Marginal Way S. Roadway improvements are required in the near future to protect public safety and to maintain a transportation corridor that is critical to the local and regional economy.

1.3 The South Park Project Area

The South Park Bridge is located about four miles south of downtown Seattle (see Figure 1-1). It is south of the industrial Georgetown area of Seattle and the King County International Airport (known as Boeing Field). The northern edge of the South Park community is bound by the Duwamish Waterway. The community encompasses the project corridor defined by 16th Avenue S. between East Marginal Way S. and the South Park Bridge and 14th Avenue S. between the bridge and S. Trenton Street. The project corridor continues west on S. Trenton Street and north on 12th Avenue S. to S. Cloverdale Street. Residences and businesses in the project area are primarily located in the City of Seattle.

The project area encompasses three local government jurisdictions—City of Seattle, City of Tukwila, and King County (see Figure 1-8). The area north of the Duwamish Waterway (between East Marginal Way S. and the waterway) lies within the city limits of both the City of Seattle (northern portion) and the City of

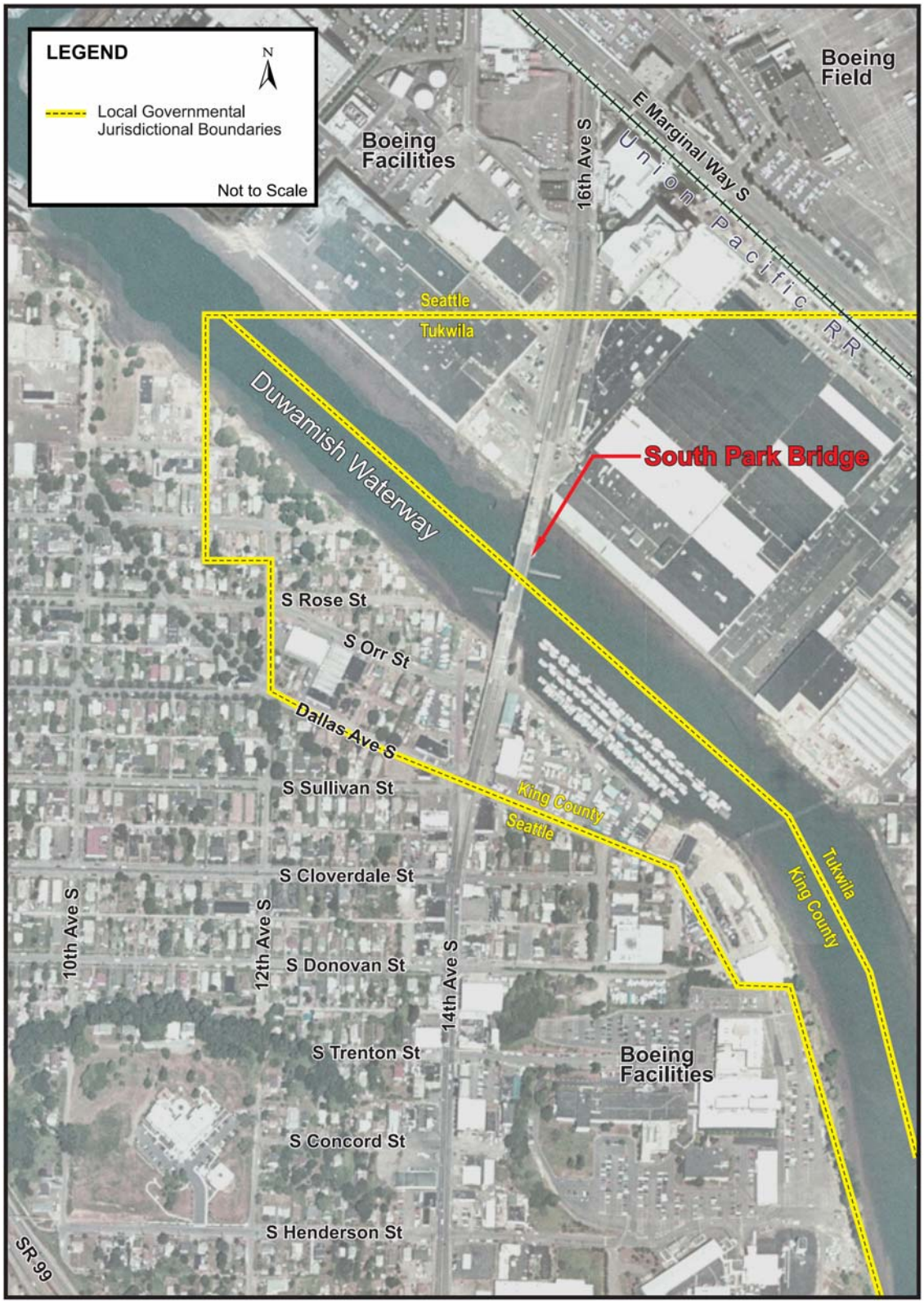


Figure 1-8
Project Area Street Map

Tukwila (southern portion). The project area south of the Duwamish Waterway lies within unincorporated King County and the City of Seattle. The two-block area between the riverbank and Dallas Avenue S. is in King County, and the blocks to the south on 14th Avenue S., S. Trenton Street, 12th Avenue S., and S. Cloverdale Street are all located in the City of Seattle.

Land uses in the project area are a mixture of residential, retail commercial, and industrial uses. The Boeing Company's Plant 2 (Boeing Plant 2) dominates the north side of the Duwamish Waterway. On the south side, retail commercial and light industrial land uses are located on 14th Avenue S. and along the south bank of the Duwamish Waterway upstream of the South Park Bridge. Most of the buildings located on 14th Avenue S. have no front setbacks and extend all the way to the sidewalk. Areas to east and west of the buildings along 14th Avenue S. are generally comprised of single-family residences.

1.4 The Existing South Park Bridge

The existing South Park Bridge was constructed over the Duwamish Waterway between 1929 and 1931. This bridge, however, was not the first to cross the Duwamish Waterway at South Park. Between 1913 and 1920, 1.3 miles of the meandering river was straightened. These efforts channelized the river and convert it to a maintained waterway for boat traffic. One of the first bridges across the Duwamish Waterway was constructed in 1914 at 14th Avenue S. The location of this older wooden bridge was immediately west of the current bridge alignment such that the southern terminus of the previous bridge connected to the old brick road that currently exists between the Duwamish Waterway and Dallas Avenue S.

The existing bridge structure is a double-leaf bascule bridge, or "drawbridge." The design of the bridge is called a Scherzer rolling-lift bascule bridge. The two sides of the bridge, or bascule leaves, open in a rolling motion allowing the bridge to be raised vertically, while simultaneously rolling away from the waterway. (They do not pivot on a simple "hinge" like the pivot trunion bridges that typically span Seattle's ship canal.) Because it is the only operational example of a Scherzer rolling-lift bascule bridge in Washington, the bridge is listed on the National Register of Historic Places (Soderberg 1980) and the King County Landmark Register (Palmer and Palmer 1996). Because the prior protection structures are not attached to the bridge, they are not part of the historic designation. The following sections describe the existing bridge design, operation and navigational clearances, vehicular traffic, and role in the transportation network.

1.4.1 Bridge Design

Each side of the bridge is flanked by two truss approach spans and twelve concrete slab approach spans. Figure 1-9 and Figure 1-10 show details of the original engineering drawings for the bridge. The overall length of the bridge is approximately 1,045 feet, abutment-to-abutment, and approximately 1,340 feet in its entirety to the street grade. The double-leaf bascule movable span has a center-to-center distance between the front bearing points of approximately 190 feet. The roadway consists of four 9.5-foot lanes. The pavement is 38 feet wide with 6-foot sidewalks on both sides. The total width of the bridge (outside-to-outside) is 52 feet. Reinforced concrete piers on top of timber pilings support the bascule span. The two large in-water piers support the counterweights, track supports, and racks for the rolling lift. The attached towers house the operating machinery, electrical equipment, and operator control room. (For definitions of technical terms, please see *List of Acronyms* and *Glossary* at the front of this document.)

1.4.2 Bridge Operation and Navigation Clearances

The South Park Bridge spans the Duwamish Waterway, which is a navigation channel maintained and dredged by the U.S. Army Corps of Engineers, but is regulated by the U.S. Coast Guard. At the bridge location, the Duwamish Waterway flows east to west, though the Duwamish River and the waterway generally flow northwards to Elliott Bay.

The bridge opens for large-sized industrial, commercial, and recreational vessels. Bridge openings occur approximately three times per day on average to accommodate waterway traffic (King County 2002d). On some days, however, the bridge does not need to open for any commercial or recreational boats. In contrast, the bridge opens frequently on summer weekend days.

The existing maximum vertical clearance of the bridge when closed is approximately 34 feet at mean high water (MHW) (see Figure 1-10). The existing navigable horizontal clearance is approximately 118 feet at the water level (between pier-protection structures) but narrows to 92 feet approximately 114 feet from the MHW to the open bascule leaves. The depth of the navigation channel is approximately 15 feet at mean lower low-water (MLLW).

1.4.3 Bridge Traffic

Since 1931, the existing movable span bridge has carried traffic along the 14th Avenue S. and 16th Avenue S. corridor across the Duwamish Waterway. On a typical workday, a mix of approximately 20,000 cars, trucks, and buses use the bridge (SDOT 2001). Pedestrians and bicyclists also use the bridge.

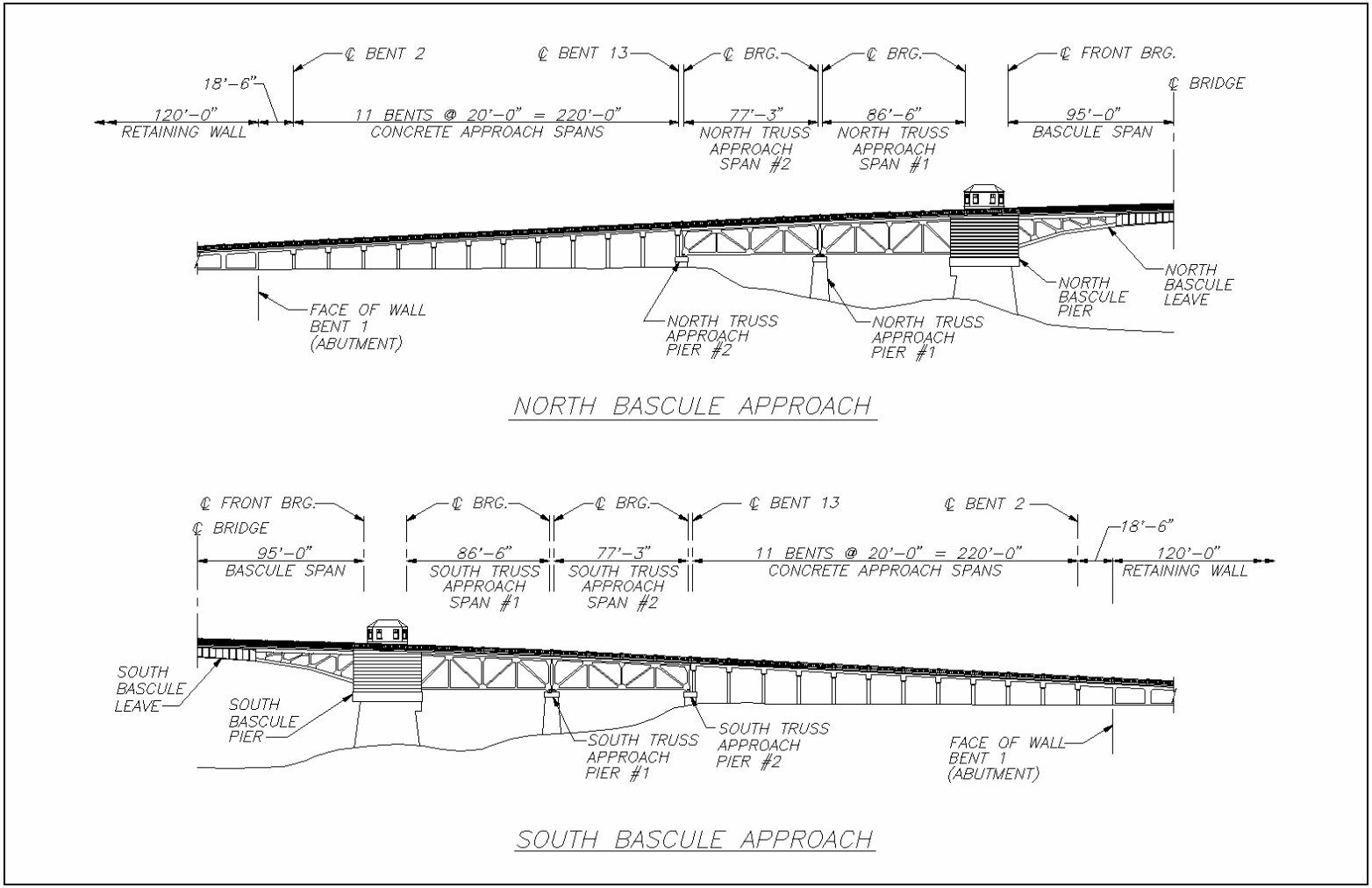


Figure 1-9
Original South Park Bridge Drawings

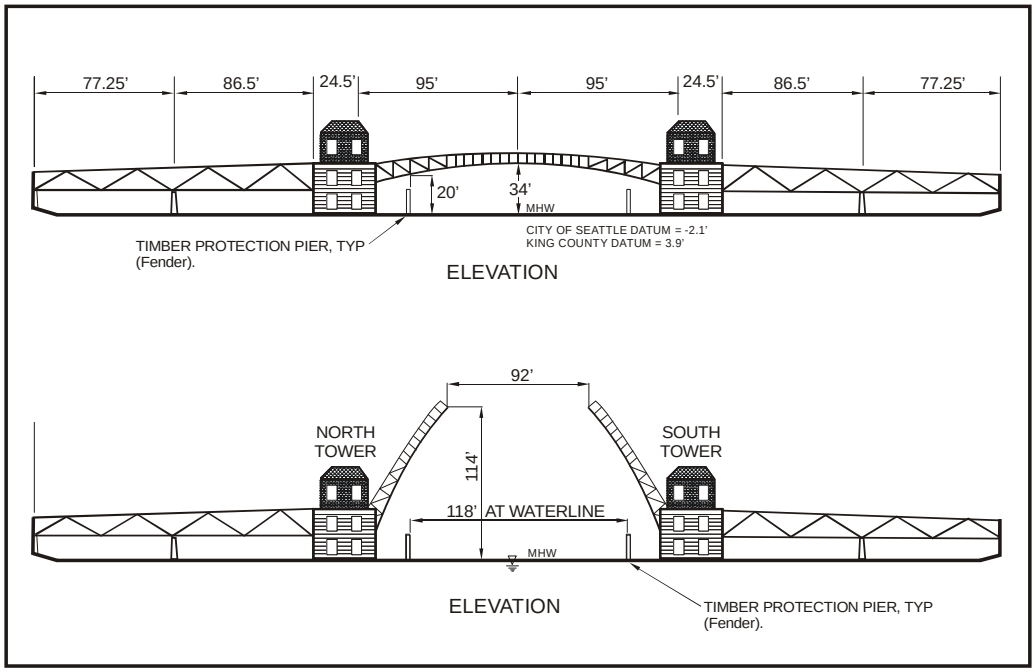


Figure 1-10
Existing Bridge Navigational Clearances

As a regional link in the transportation network, the bridge provides access to employment centers in the Duwamish industrial area and downtown Seattle (Parsons Brinckerhoff 2004g). Many of the vehicle trips originate in residential neighborhoods in the communities of West Seattle and White Center and cities to the south, such as Burien and SeaTac. The South Park Bridge carries truck traffic traveling to and from large industrial manufacturers, including The Boeing Company (Boeing).

For residents of the South Park community, the bridge is the primary crossing of the Duwamish Waterway to and from destinations north and east of the community. It is located at river mile (RM) 3.8, and the nearest bridges are located over a mile from the South Park commercial district. The First Avenue S. Bridge is located downstream at RM 2.5 and the Boeing Access Road Bridge is located upstream at RM 5.2.

1.4.4 The Transportation Network and Mobility

The existing roadway network surrounding the South Park Bridge consists of various roadway classifications. They range in size from local two-lane streets to major limited-access highways. Regional traffic movement in the South Park area is concentrated to three nearby north-south corridors, including SR-99, SR-509, and East Marginal Way S. Circulation within the South Park community is

provided through a system of local streets and arterials. The Duwamish Waterway and large-scale facilities, such as Boeing Field and Boeing Plant 2, create barriers within the road network and limit access to and from the major regional routes.

Freight movement in areas surrounding the South Park community is substantial due to the high concentration of industrial and manufacturing uses in the general area. Trucks primarily use East Marginal Way S., SR-99, and SR-509. The 14th/16th Avenue S. corridor connects East Marginal Way S. and SR-99. The South Park Bridge, a portion of 14th Avenue S., and S. Cloverdale Street are designated a truck route by King County, although it is not designated a Major Truck Street in the City of Seattle Comprehensive Plan or Freight Mobility Strategic Action Plan. Trucks use the community's principal arterial, S. Cloverdale Street, to access the City of Seattle South Recycling and Disposal Station located at 8105 Fifth Avenue S. In addition, this route is used to access both SR-509 and SR-99, which are located west of the community. With respect to rail traffic, the only train crossing in the study area is located immediately south of the intersection of East Marginal Way S. and 16th Avenue S.

Bus routes serving the South Park community are primarily located along major north-south corridors, including East Marginal Way S., 14th Avenue S., and 16th Avenue S. Seven major King County Metro bus routes serve the area, including Routes 60, 131, 132, 134, 154, 173, and 174. Routes 60, 131, and 134 cross the South Park Bridge, and five of the seven bus routes travel along S. Cloverdale Street.

Pedestrians use the sidewalks on the bridge and, occasionally, bicyclists will also use the sidewalks. Both pedestrians and bicyclists are commonly seen in the South Park area, especially near the community's center near the intersection of 14th Avenue S. and S. Cloverdale Street. Mid-day pedestrian volumes are higher than during the morning or evening commute periods due to shopping, transit use, and lunch-related walking trips.

1.5 History of the Project

Over the past 18 years, a number of engineering studies have been prepared on the South Park Bridge to assess the condition, longevity, and alternatives to rehabilitate or replace the bridge. Starting in 1987, when the bridge was 56 years old, King County contracted for the preparation of a general engineering investigation report to assess the condition of the bridge. In 1991 and 1993, additional studies were completed, including a geotechnical study, foundation design report, and a life-cycle cost analysis. These studies prompted King County to undertake a series of studies in 1994 addressing liquefaction risks as well as the condition of the concrete, substructures, approach span joints, and load rating. A study was conducted to evaluate potential replacement alternatives for the bridge and another study investigated community issues related to the bridge.

Since 1994, King County has recognized that the bridge required either rehabilitation or replacement and has continued to investigate the condition and vulnerabilities of the bridge in an effort to evaluate these options. Two key engineering studies were conducted to help frame the current pursuit to evaluate potential alternatives for rehabilitation or replacement of the South Park Bridge. A 1994 study evaluated potential design options and a 1999 study researched and presented the likely steps required to conduct the necessary environmental review of the project alternatives and to complete necessary permitting (Sverdrup 1994, Entranco 1999).

In addition, several detailed studies have been prepared to support the preparation of this Draft EIS. In 2002, nine alternatives were proposed, evaluated, and screened (Parsons Brinckerhoff 2002). A technical memo was prepared and recommended more detailed evaluation and environmental assessment of four alternatives—rehabilitation, a new bascule bridge, and two different-height fixed-span bridges. A detailed technical study evaluated two options to rehabilitate the existing bridge and recommended replacing the large bascule piers rather than reinforcing the existing piers (Parsons Brinckerhoff 2003a). In 2003, conceptual engineering plans and structural designs were prepared on the proposed replacement bridge alternatives (Parsons Brinckerhoff 2003b, Parsons Brinckerhoff 2003d). In addition, a total of 14 technical reports were finalized in 2004 to assess potential environmental impacts of the project alternatives.

1.6 Organization of this Document

This Draft EIS document is divided into five major chapters. This chapter, Chapter 1, describes the purpose and the need for the project. Chapter 2 describes the engineering design criteria, the alternatives considered, and the four Build Alternatives evaluated in this document. Chapter 3 summarizes the detailed environmental impact analysis of the proposed project alternatives. Potential environmental impacts are considered for the following issues: transportation, property acquisition and relocations, land use, economics, social elements, cultural resources, visual, air pollution, noise and vibration, utilities, water quality, fish and wildlife, geology and soils, and hazardous materials. Chapter 4 reviews the public and agency coordination activities that have been undertaken for this Draft EIS. Chapter 5 is the Draft Section 4(f) Evaluation.

The document also contains a List of Acronyms, a Glossary, and a Summary. These sections precede Chapter 1. A List of References and an Index follow Chapter 5. Appendices are also included at the end of the document. Copies of the technical reports supporting the analysis contained in this Draft EIS are bound in five separate volumes of appendices; however, a CD Rom of all of these technical reports is contained in Appendix F of this volume.

This page intentionally blank

CHAPTER 2

THE PROJECT ALTERNATIVES

Chapter 2 The Project Alternatives

This section describes the proposed project alternatives evaluated in this Draft EIS. These alternatives include the No Action Alternative, the Rehabilitation Alternative, and the three Replacement Bridge Alternatives (Bascule Bridge, Mid-Level Fixed-Span Bridge, and High-Level Fixed-Span Bridge alternatives). The first section describes the transportation engineering criteria and standards used to design the alternatives. The second section describes the rationale for the project termini. The next two sections describe the alternatives selection process and the alternatives that were considered but were rejected because they would result in greater environmental impacts. The fifth section describes in detail the five alternatives evaluated in this Draft EIS. The last two sections describe the anticipated construction durations, schedule, and estimated costs for the alternatives.

2.1 Bridge Design Criteria

The following sections describe the engineering roadway cross-section standards, design speeds and grades, ADA compliance, and bridge pier protection design criteria used to develop the conceptual designs for the project alternatives. As the existing bridge does not meet current geometric, structural, and ADA design standards, the incorporation of these standards in the proposed replacement and rehabilitation alternatives for the bridge is consistent with funding criteria of the federal Highway Bridge Replacement and Rehabilitation Program [23 CFR 650.405].

2.1.1 Engineering Roadway Cross-Section Standards

Except for the No Action Alternative, construction of any of the project alternatives would incorporate current and applicable transportation engineering design criteria for the roadway/bridge, alignment, cross-sections, and transition segment. In particular, the road cross-section design is a key design element that varies depending on the project Build Alternatives (see Figure 2-1).

The existing bridge cross-section incorporates four 9.5-foot travel lanes, raised curbs on both sides of the pavement, and a 6-foot sidewalk on either side of the roadway. The outside-to-outside dimension of the existing bridge is 52 feet.

The current lane widths are non-standard and would change for the Rehabilitation Alternative and for the three Replacement Bridge Alternatives. For the Rehabilitation Alternative, the pavement would remain approximately the same width, but would be reconfigured for three standard lanes. There would be two 12-foot lanes on the outside and one 11-foot lane in the middle of the roadway. Traffic would use one 12-foot lane for northbound travel and the other two lanes for southbound travel. Because less of the existing pavement is needed for the

three lanes, the existing 6-foot sidewalk on either side of the roadway would be widened to approximately 7.5 feet.

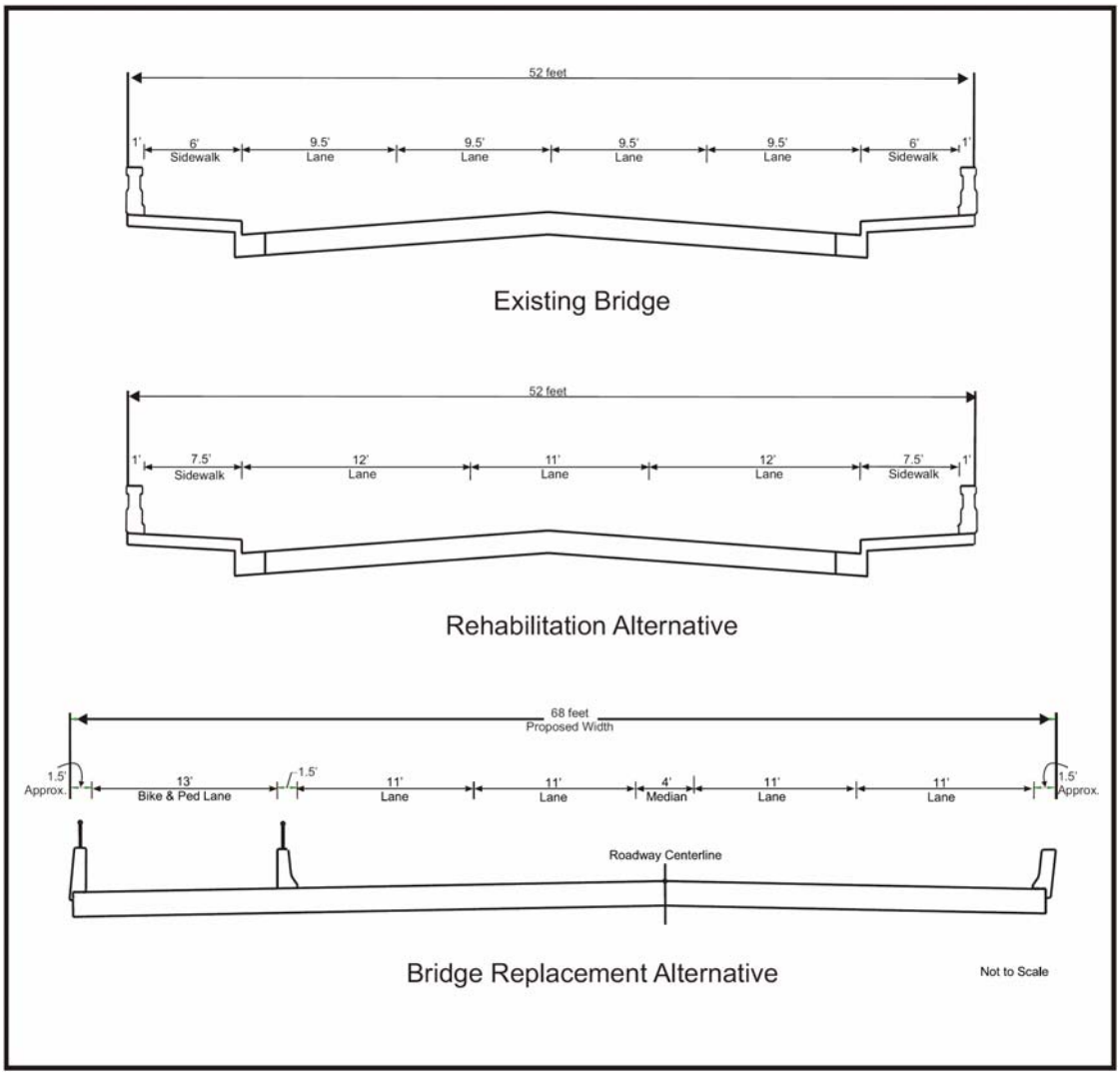


Figure 2-1
Existing and Proposed Bridge Cross-Section Designs

In contrast, each of the Replacement Bridge Alternatives would be designed with four standard 11-foot lanes, traffic barriers or a painted median down the center, a traffic barrier on each side of the pavement, and a single combined 13-foot pedestrian/bike path on the west (downstream) side of the bridge. The width of the cross-section for the new Replacement Bridge Alternatives, including the exterior barriers, would total approximately 68 feet.

2.1.2 Engineering Design Speeds and Grades

Other important criteria include the design speed and maximum grade for a new bridge. King County road standards call for a 35-mph design speed and a maximum 8-percent grade for the slope of the bridge deck. Initially, these standards were incorporated into each of the alternatives. An 8-percent maximum grade for the High-Level Fixed-Span Bridge Alternative, however, would have resulted in a very long bridge. The north end of the bridge and roadway improvements would have extended across East Marginal Way S. and into Boeing Field. To reduce these impacts, the maximum grade for the High-Level Fixed-Span Bridge Alternative alone was allowed to slightly exceed 8 percent. This change reduced the overall length of the bridge by several hundred feet and allowed the north end of the bridge to be south of East Marginal Way S. These design criteria were agreed to by the City of Seattle Department of Transportation (SDOT) and will need to have a design deviation, which must be approved by the County Road Engineer.

2.1.3 ADA Compliance

Wherever possible, the proposed Build Alternatives would provide a continuous unobstructed pedestrian route that would meet the requirements of the Americans with Disabilities Act (ADA) accessibility guidelines. Overall, full compliance would be more difficult for the Rehabilitation Alternative due to existing structure constraints, whereas construction of the new bridges would be fully compliant.

The design of the pedestrian route(s) would vary among the alternatives. ADA compliance for each of the alternatives is described below by design element.

- **Barriers:** Exterior barriers of sidewalks for each of the Build Alternatives would be designed for bicyclist safety standards, which meet ADA guidelines. It would not be possible to meet ADA requirements for the Rehabilitation Alternative if the exterior barriers were rehabilitated to the same height as the existing structure for historic preservation.

- **Slope:** The overall slope of the bridge deck for the Rehabilitation and Bascule Bridge alternatives would be 5 percent, which complies with ADA guidelines. The 8-percent grades of the bridge deck slopes for the Mid-Level Fixed-Span Bridge and High-Level Fixed-Span Bridge alternatives are proposed to minimize the length of these bridges. However, the sidewalks of these alternatives are contiguous with the bridge deck and have the same slope as the bridge deck, so they are not required to comply with ADA grade guidelines.

- **Width:** The 13-foot width of the combined bike and pedestrian path for the three Replacement Bridge Alternatives would meet ADA guidelines. But, the sidewalk width of the Rehabilitation Alternative would not be compliant with

ADA guidelines because of the constraints imposed by the existing historic structure and desire to comply with engineering design standards for the vehicle lanes, medians, and roadway grade, etc.

- **Bicycle Ramp:** The barrier height, width, and grades of the bicycle ramp near S. Orr Street for the Mid-Level Fixed-Span Bridge Alternative would be ADA compliant.

Access for mobility impaired individuals would be maintained along the existing bridge during construction, as possible, but the existing sidewalk width and exterior barriers are not ADA compliant. Temporary construction-related rerouting for pedestrians and mobility impaired individuals and the use of temporary facilities (including temporary sidewalks, ramps, and bus stops) would comply with ADA requirements for all project alternatives.

2.1.4 Bridge Pier Protection

In addition, all Build Alternatives would include construction of new in-water pier protection structures. These structures would be designed to protect all bridge piers located adjacent to the Duwamish Waterway navigation channel. They would be designed to meet all applicable U.S. Coast Guard requirements.

2.2 Project Termini

The FHWA has general criteria that must be met in selecting project termini (start and end points of construction) for a transportation project and requires documentation of its independent utility [23 CFR 771.111(f)]. The criteria state that a proposed project Build Alternative shall:

- Connect logical termini, such as major crossroads, population centers, major traffic generators, or major highways
- Be of sufficient length to address environmental matters on a broad scope (ensure a meaningful analysis)
- Have independent utility, or be usable and a reasonable expenditure, even if no additional transportation improvements are made in the area
- Not restrict consideration of alternatives for other reasonably foreseeable transportation projects in the area

The South Park Bridge Project is consistent with the FHWA criteria described above in the following ways:

- The proposed project spans the Duwamish Waterway and connects East Marginal Way S. (a major north-south roadway serving Seattle's industrial area) and the residential South Park community.

- The length of the proposed project depends on the alternative (approximately 0.2 to 0.5 mile), but all alternatives allow for meaningful analysis of potential environmental impacts.

- The proposed project alternative terminus points are defined by engineering design criteria based on the height of the bridge, maximum grade, and required transition segments between the bridge approach and existing road pavement.

- The proposed project provides a vital linkage in the regional transportation system and, as such, has independent utility even if other transportation projects in the area are never constructed.

- The proposed project would not restrict or preclude any other known or reasonably foreseeable transportation improvements in the area.

2.3 Alternatives Selection Process

An initial range of potential new bridge alternatives and alignments was considered primarily based on earlier studies (Sverdrup 1994, Entranco 1999). In addition, input from agencies, members of the public, and the project team was considered.

In considering construction of a new bridge or other type of crossing of the waterway, technical analysis and community input indicated that construction parallel and adjacent to the existing bridge was the only practical alternative alignment. From the beginning, the community was opposed to construction of a new bridge on the same alignment as the existing bridge due to the prolonged construction period during which the community and its businesses would lose the use of the existing bridge. And, through-traffic using the bridge would be detoured, which could cause adverse impacts to the many 14th Avenue S. businesses substantially dependent upon drive-by traffic. Due to the very urbanized environment, use of an alignment substantially different from the existing bridge to either the north or south would cause substantial land use impacts to both industrial buildings on the north shore and single-family residences on the south shore. Moreover, the existing road rights of way to the west of the existing bridge on the south shore had been occupied by a bridge prior to the 1931 construction of the existing bridge and thereby reduced the need for property acquisition for the construction of a new bridge. As such, it was determined that a new bridge should be aligned immediately to the west (downstream) of the existing bridge to minimize these impacts.

Conceptual engineering set the alignment for a new bridge approximately 80 feet to the west of the centerline of the existing bridge. This is as close to the existing structure as is practicable without compromising construction activities while still allowing continued use of the existing bridge during construction of a new bridge. This alignment is nearly the same as the alignment of the existing red brick road immediately west of the existing South Park Bridge on the south side of the Duwamish Waterway. It is also the approximate alignment of the original 1914 bridge that preceded the existing South Park Bridge and remained operational during the construction of the current bridge dating from 1931.

The second phase of project planning involved the development of a number of potential project alternatives that would be consistent with the approved Purpose and Need Statement. Initially, the project team—members of King County staff and consultants—identified a total of nine alternatives. Each of these alternatives was consistent with the Purpose and Need Statement.

Next, the project team conducted a number of initial analyses to compare the nine potential project alternatives. Preliminary investigations of the project area examined land use, traffic, cultural and historic resources, socioeconomic characteristics of the South Park community, recreational and commercial use of the Duwamish Waterway, soil and water quality issues, plant and animal life, and background air and noise conditions. In addition, environmental review and permitting issues associated with these alternatives were evaluated.

The project team developed evaluation criteria to compare and contrast the nine potential project alternatives (Parsons Brinckerhoff 2002). In all, a total of seven criteria were used to evaluate the alternatives. These criteria included the following: regional mobility, local access, waterway navigation, community impacts, aquatic habitat protection, construction impacts, and cost. This analysis identified several alternatives that were less reasonable because they would result in substantially greater impacts.

2.4 Alternatives Considered But Rejected

The project team initially considered nine alternatives for the proposed South Park Bridge Project. In addition, a more detailed evaluation of optional designs for the Rehabilitation Alternative was conducted. The selection process for the final alternatives considered in this EIS is described below.

2.4.1 The Initial Nine Alternatives

The original list of nine potential project alternatives included seven new construction alternatives, rehabilitation of the existing bridge, and a No Action Alternative that considers closure of the existing bridge. The No Action Alternative would require rerouting of traffic that currently uses the existing

bridge to other bridges crossing the Duwamish Waterway, primarily the First Avenue S. Bridge (SR-99) located approximately 1.3 miles downstream of the South Park Bridge. The new Build Alternatives included the following: a fixed high-level bridge (approximately 100 feet, see Figure 2-2 for example), a fixed mid-level bridge (approximately 65 feet), and several low-level bridges (approximately 35 feet). These low-level bridges included a fixed low-level bridge, a movable bascule bridge, a movable vertical lift bridge (see Figure 2-3 for example), and a movable swing bridge (see Figure 2-4 for example). In addition, a tunnel alternative was considered.

The alternatives were rated for regional mobility, local access, navigation, community impacts, aquatic habitat, construction impacts, and estimated project costs. This screening evaluation determined that four of the nine potential alternatives should be dropped from detailed analysis (Parsons Brinckerhoff 2002). The four potential alternatives considered less reasonable included the low-level fixed-span bridge, the movable vertical-lift bridge, the movable swing bridge, and the tunnel. These alternatives were eliminated for the following reasons.

Figure 2-2
Typical Fixed-Span Design: West Seattle Bridge

Figure 2-3
Typical Vertical Lift Design (not local)

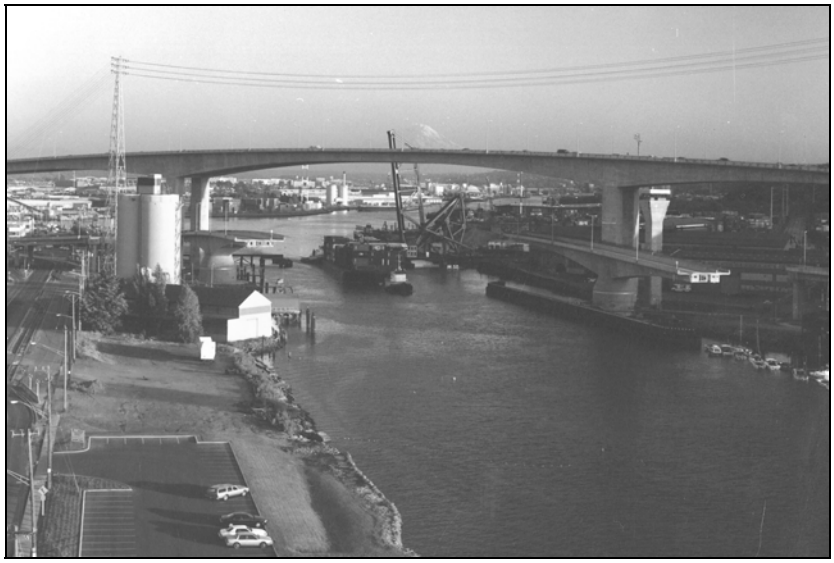


Figure 2-4
Typical Swing Design: Seattle Swing Bridge

- **Low-Level Fixed-Span Bridge Alternative**: This alternative was primarily eliminated because of its approximate 35-foot height over the Duwamish Waterway. The height would prevent continued use of the Duwamish Waterway by a substantial number of recreation and commercial boats that currently use the waterway.

- **Movable Vertical-Lift Bridge Alternative**: This alternative was primarily eliminated because the height of the structural elements (see Figure 2-3), not the bridge deck, would be considerably taller than surrounding buildings and structures. Though the bridge deck would be approximately 35 feet above the Duwamish Waterway, the support structures needed to operate the bridge would be approximately 150–200 feet above the Duwamish Waterway. In addition, opening and closing this type of bridge would take approximately 10–15 minutes and would create traffic delays and congestion impacts to the community. This duration is more than the low-level bascule bridge alternative that requires only an estimated 4–6 minutes to open and close the bridge.

- **Movable Swing Bridge Alternative**: This alternative was primarily eliminated because it would require the purchase of substantial right of way. Operation of this bridge type would require the bridge alignment to be approximately 150 feet downstream of the existing bridge in order for the existing bridge to be operational during the construction period. In contrast, a new bascule bridge would only need to be an estimated 80 feet downstream. The bridge control tower would be tall compared to surrounding buildings and structures. Furthermore, operation of this type of bridge would create traffic congestion in the community due to the 10–15 minutes required to open and close the bridge.

- **Tunnel Alternative**: This alternative was primarily eliminated because in-water construction activities would cause substantially greater impacts to fish, including Endangered Species Act (ESA)-listed species, and their habitat in the Duwamish Waterway. Construction activities would disturb contaminated sediments in the river bottom and this area is designated a Superfund Site. Construction of the tunnel portals ("openings") would require the purchase of many commercial properties on 14th Avenue S. The estimated length of the tunnel would extend south to S. Henderson Street. Moreover, the northern terminus of this alternative would extend into Boeing Field.

Based on this screening evaluation, King County identified four build alternatives to be considered for detailed analysis in the South Park Bridge Project Draft EIS. These alternatives include a high-level fixed-span bridge, a mid-level fixed-span bridge, a bascule bridge, and rehabilitation of the existing bridge. These alternatives were selected because they had fewer potential impacts than the other

alternatives. In addition, federal and state environmental regulations require evaluation of the No Action Alternative.

2.4.2 Rehabilitation Alternative Options

With respect to the proposal to rehabilitate the existing bridge, the project engineers investigated options for the conceptual engineering of this alternative. In May 2003, the *Rehabilitation Feasibility Study Technical Memorandum* (Parsons Brinckerhoff 2003a) was completed. The goal of this technical study was to identify the most appropriate design option that would satisfy applicable guidelines for historic rehabilitation as well as other critical requirements, such as seismic design standards, waterway navigation clearance, and acceptable service life.

This study evaluated two options. Option 1 would preserve the original bascule piers by constructing a concrete reinforcing "collar" around the existing base of the in-water bascule pier structures. Other elements of the bridge would be reconstructed, repaired, or refurbished. Option 2 would replace the bascule piers and foundations, the concrete approach structures, and the steel truss approach piers.

Based on the structural engineering evaluation, the two options were compared and contrasted. The primary advantage of Option 1 was that the construction activities would not require closure of the bridge except for very short periods of time. The additional substructure required to strengthen the steel truss approach, however, would add more columns and footings in the waterway. The existing structure's historical appearance would be substantially altered by these additional structural members. And most importantly, the uncertain condition of the concrete that is causing on-going chemical deterioration from the inside of the bascule pier substructure and footings would result in a less predictable remaining service life for the rehabilitated bridge.

The design of Option 2 would preserve the shape and size of the bascule piers and steel truss approaches. The existing bridge's historical appearance would be retained, though the integrity of the original structural elements would not be preserved. The newly constructed elements would result in the construction of a bridge that would have an estimated 75-year service life, which would be comparable to the construction of an entirely new bridge. The methods of construction, however, would also require that the bridge be closed for an estimated 30 months.

The estimated costs of these two design options were nearly the same. However, the estimated service life of Option 2 was a predictable 75 years, whereas the service life of Option 1 could not be predicted with any certainty. Due to the unavoidable impacts on the historical integrity of the existing bridge, historic resource specialists determined that neither of the rehabilitation options was

consistent with the Secretary of Interior's Standards for Rehabilitation and Guidelines for Rebuilding Historic Buildings. Option 1 would preserve the integrity, but not the appearance, of the original structural elements; whereas, Option 2 would have the same historic appearance but very little of the original structure or materials. As a result, Option 2 was selected as the conceptual engineering design for the Rehabilitation Alternative in order to maximize the benefits associated with the public expenditure needed to rehabilitate the South Park Bridge.

2.5 Alternatives Analyzed in the EIS

A total of five alternatives were identified for detailed evaluation in the environmental review process—No Action Alternative, Rehabilitation Alternative, Bascule Bridge Alternative, Mid-Level Fixed-Span Bridge Alternative, High-Level Fixed-Span Bridge Alternative**.** The following sections describe each of the proposed project alternatives based on conceptual civil and structural engineering (Parsons Brinckerhoff 2003b, Parsons Brinckerhoff 2003d). Figure 2-5 shows a comparison of the local street networks in the South Park community by alternative.

2.5.1 No Action Alternative

The No Action Alternative for this project assumes that the poor condition of the existing bridge structure would require it to be closed at some time in the future, although the bridge could continue to operate for the foreseeable future. As such, for purposes of environmental review, it is assumed the existing bridge would be closed permanently some time before 2027.

However, the bridge could be closed for a variety of other reasons besides its deteriorated condition. Another earthquake could cause an unexpected emergency closure of the bridge. The ongoing movement of the bridge foundations could eventually cause the movable spans to become misaligned to the extent that repairs would not be feasible. Over the past 10 years, maintenance costs (not including operation costs) for the South Park Bridge have averaged approximately $286,000 per year, comprising an estimated 18 percent of the King County total bridge maintenance budget. This cost could become more than King County is able to expend. Under any of these circumstances, the bridge would be closed. When closed, no vehicular, bicycle, or pedestrian traffic would be allowed to use the bridge. Bridge closure, however, would allow for widening of the navigation channel in the Duwamish Waterway.

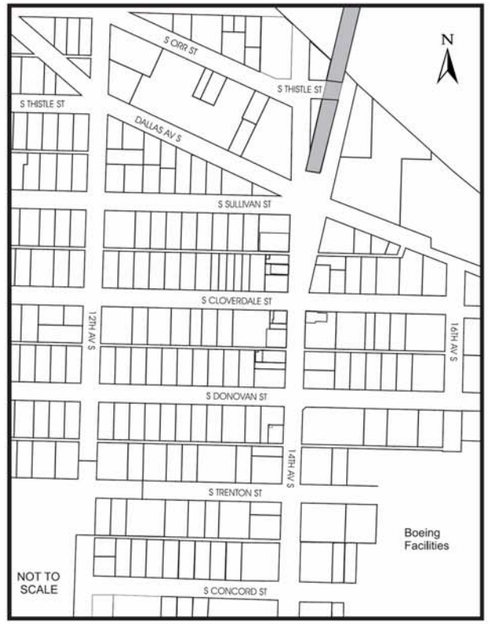
The U.S. Coast Guard regulates bridges that span navigable waterways such as the Duwamish Waterway. If the bridge is no longer operating, the U.S. Coast Guard regulations require demolition and removal of the bridge and associated pier protection structures.

If the decision is to demolish the bridge, there would be no change in the local street network except 14th Avenue S. and 16th Avenue S. would be dead-ended on both sides of the Duwamish Waterway. Figure 2-5 shows the existing local street network and the local street network following the removal of the existing bridge (No Action Alternative). As the roadway does not currently provide direct access to the adjacent Boeing properties, the exact location of the road closure on the north side would need to be negotiated with Boeing as well as the owner of the railroad tracks located immediately south of East Marginal Way S.

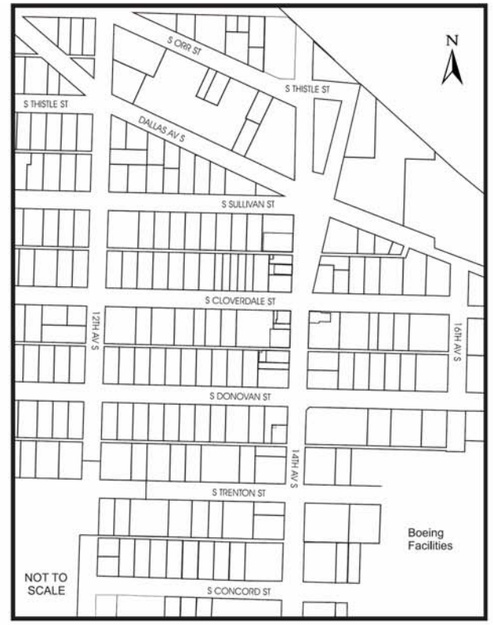
Following the removal of the bridge and pier protection structures, the northern end of 14th Avenue S. would be reconstructed. This could provide an opportunity to develop open space amenities or additional parking for customers patronizing local businesses. Views from the commercial district would be improved with direct views of the Duwamish Waterway and the marina. Shoreline habitat also could be improved for both fish and wildlife. Specific plans for reconstruction would be developed based on established community goals and citizen input. The No-Action Alternative, however, would eliminate future use of the bridge across the Duwamish Waterway. As such, this alternative does not meet the Purpose and Need Statement of the South Park Bridge Project (see Chapter 1).

2.5.2 Rehabilitation Alternative

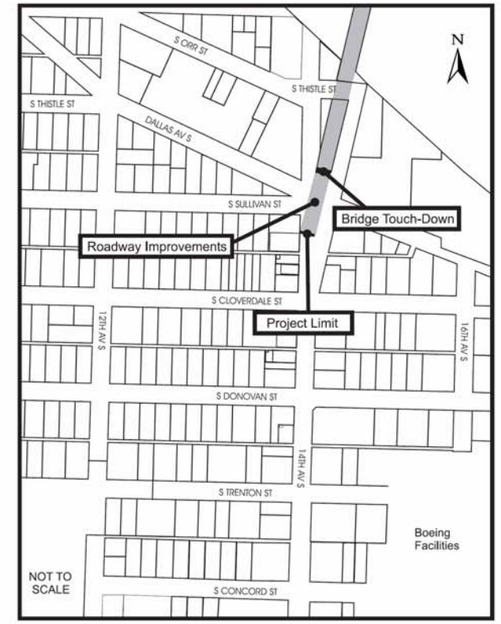
For the Rehabilitation Alternative, much of the existing bridge structure would need to be replaced (see Figure 2-6) to restore the structural integrity of the bridge. Access for construction activities would require the purchase of three properties. The existing steel trusses of the approach spans and the bascule leaves would be refurbished and reused. The mechanical and electrical operating systems would be refurbished and/or replaced. Studies have confirmed the existing bridge piers are gradually shifting because the foundation pilings were not originally driven to a sufficient depth (see Chapter 1). Although the initial goal was to rehabilitate the existing piers of this historic bridge, the design team's structural analyses determined that the existing bascule piers and truss approach span piers must be replaced in order to ensure the long-term (approximately 75 years) life of the bridge. If the bascule piers were reconstructed, the longevity of the Rehabilitation Alternative would be similar to the expected minimum life of a new bridge structure.



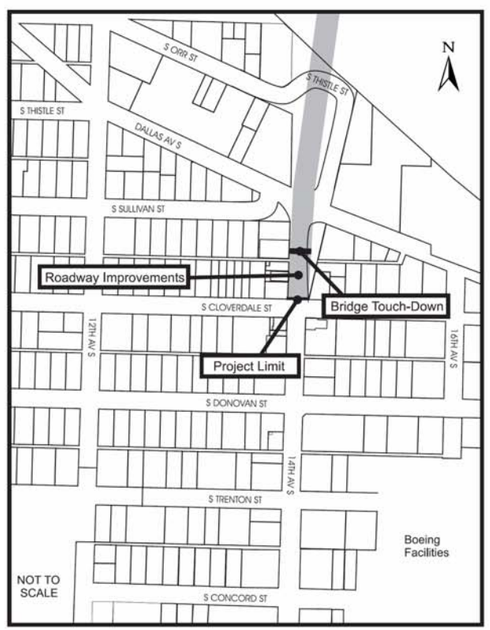
Existing Conditions



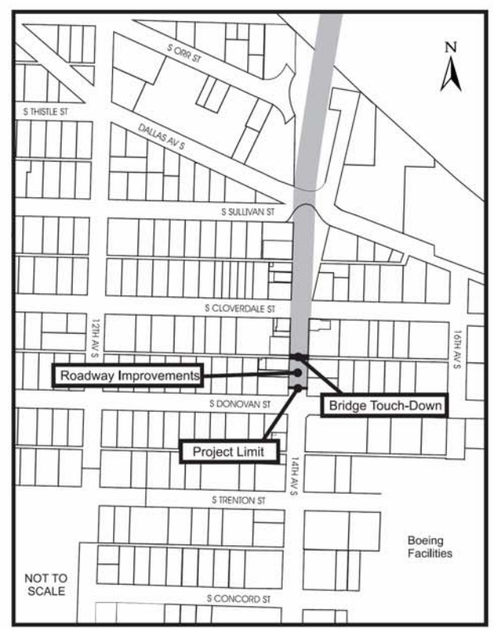
No Action Alternative



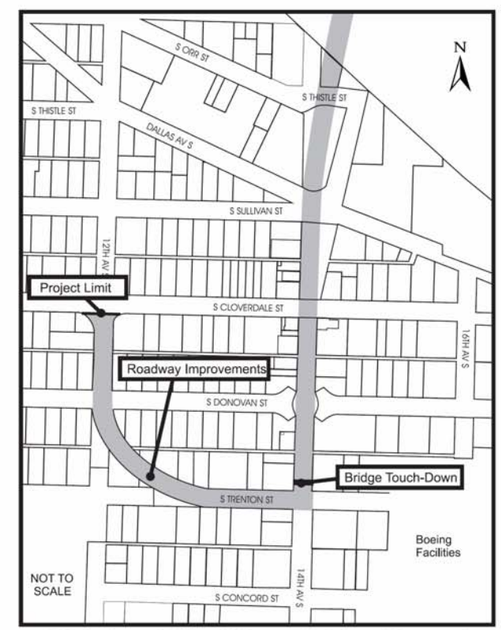
Rehabilitation Alternative



Bascule Bridge Alternative

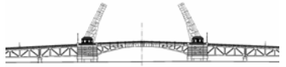


Mid-Level Fixed-Span Bridge Alternative



High-Level Fixed-Span Bridge Alternative

Figure 2-5
Comparison of the Local Street Network by Alternative



This page intentionally blank

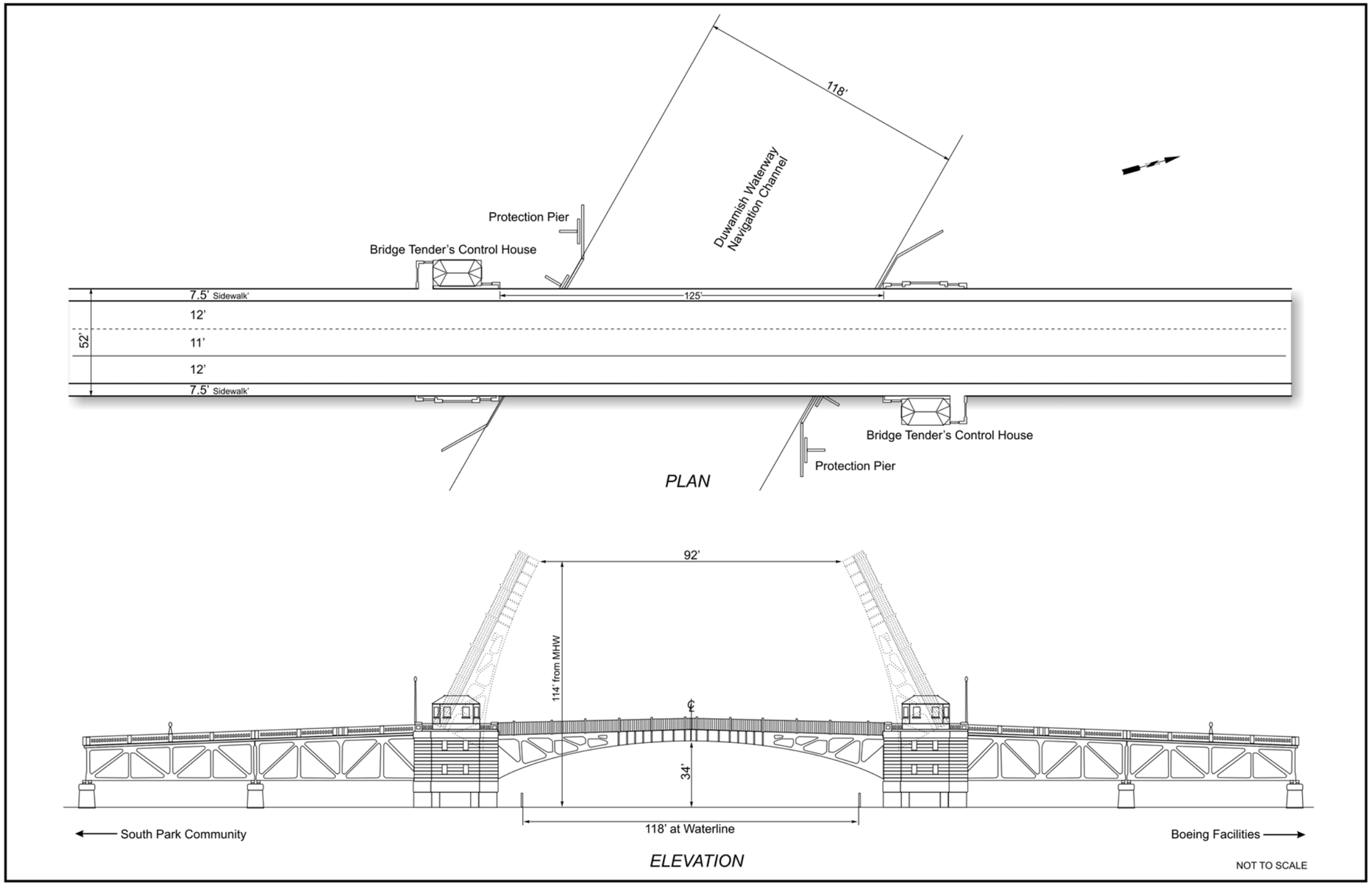


Figure 2-6
Rehabilitation Alternative:
Plan and Profile

This page intentionally blank

The new bascule piers are proposed to be approximately the same size, location, and historic character as the existing piers (see Figure 2-6). To construct the new bascule piers, the bascule leaves, steel approach spans, and pier protection structures would need to be removed. The steel truss elements of the bridge structure would be taken to another site for repair, refurbishment, and/or painting before they are reinstalled following the construction of the new piers. The concrete shafts or pilings supporting the foundations of the new piers would extend below the existing pilings to a depth beneath the riverbed where dense soils exist. The removal of the steel truss spans also would allow for replacement of the steel approach piers. The concrete approach spans and bridge abutments would be replaced, and the bridge deck would be reconstructed. In addition, new pier protection structures would be installed.

Like the existing bridge, there would be piers both on land and in the water. The first on-land piers would be only an estimated 20 feet from the top of the south embankment, and the closest in-water piers would be approximately 20 feet from the top of the embankment. The piers on the north shoreline would extend through the existing Boeing dock.

The conceptual engineering analysis also determined that the mechanical and electrical systems would need to be replaced. Any required construction activities, including replacement of the bridge railings, bridge tender towers, and lamp posts, would be done in a manner that preserves the historic character of the existing bridge.

To meet current roadway design standards, the new bridge deck would remain approximately the same width as the existing, but the pavement would be striped to accommodate three standard traffic lanes instead of four. Bicyclists and pedestrians would continue to be able to use the bridge via a 7.5-foot pedestrian path on each side of the bridge. A separate bicycle path would not be provided.

Following construction, the existing 118-foot navigable channel width would be preserved so existing waterway users could continue to use the navigation channel to travel upriver of the South Park Bridge. Closure of the bridge during construction is estimated to last approximately 30 months.

The proposed design would require only slight changes in the local street network. Figure 2-5 shows the local street network in the South Park community following construction activities for the rehabilitation of the existing bridge. The figure also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. To improve vehicular and pedestrian safety, S. Sullivan Street would intersect Dallas Avenue S., which would become the main cross street intersection with 14th Avenue S. The 16th Avenue S. (immediately east of the bridge) intersection with Dallas Avenue S. as well as 14th Avenue S.

may also need to be reconfigured. Access to points north via the South Park Bridge would be maintained.

2.5.3 Bascule Bridge Alternative

The Bascule Bridge Alternative would result in the construction of a new movable bridge immediately downriver of the existing bridge (see Figure 2-7). The bridge mechanism could be a Scherzer rolling lift type (no longer a common design for new movable bridges) or another type. Unlike the existing bridge's grated bascule leaves, the bridge deck of the bascule leaves for the new bascule bridge would be a solid surface to improve vehicle traction and to control stormwater runoff. The bridge length would be approximately 935 feet from abutment-to-abutment, not including roadway approaches. Road improvements would extend from a point just north of S. Cloverdale Street on the south side of the waterway and north to a point opposite the northeast corner of Boeing Building 2-15. This alternative would require the full or partial acquisition of seven properties and the displacement of existing land uses on these properties (see Figure 2-8).

The interior walls of the bridge abutments would be approximately 200 feet from the top of the embankment, or approximately 50 feet closer to the shore than the existing bridge. With fewer piers than the existing bridge, the first on-land piers of this alternative would be approximately 55 feet from the top of the south embankment at the shortest distance and the closest in-water piers would be approximately 65 feet away. On the north shoreline, the closest in-water piers would be approximately 95 feet from the top of the embankment and the closest on-land piers would be approximately 30 feet away.

Similar to the existing bascule bridge, this bridge profile would be approximately 34 feet above the Duwamish Waterway when in the closed position. The mid-section span would be comprised of two movable leaves that could be raised to open the bridge. The navigation channel would be approximately 125 feet in width (slightly greater than the existing 118-foot-wide channel). This two-leaf bascule bridge would not impose limitations to the height of waterway users passing the bridge because the new bridge would be approximately 125 feet between the tips of the raised spans. This is the exact same dimension of the width of the navigation channel. In comparison, the existing bridge bascule leaves only have a 92-foot opening.

Following bridge construction and installation of new pier protection structures, there would be some change in the local street network (see Figure 2-5). S. Sullivan Street would be permanently reconfigured to improve traffic safety and vehicular and truck turning movements from the new bascule bridge to Dallas Avenue S. As such, S. Sullivan Street would no longer have direct access to 14th Avenue S. and the bridge. The intersection of 16th Avenue S. (immediately east of the bridge) and Dallas Avenue S. also would need to be reconfigured. To ensure adequate vertical clearance for vehicles, S. Thistle Street would need to be

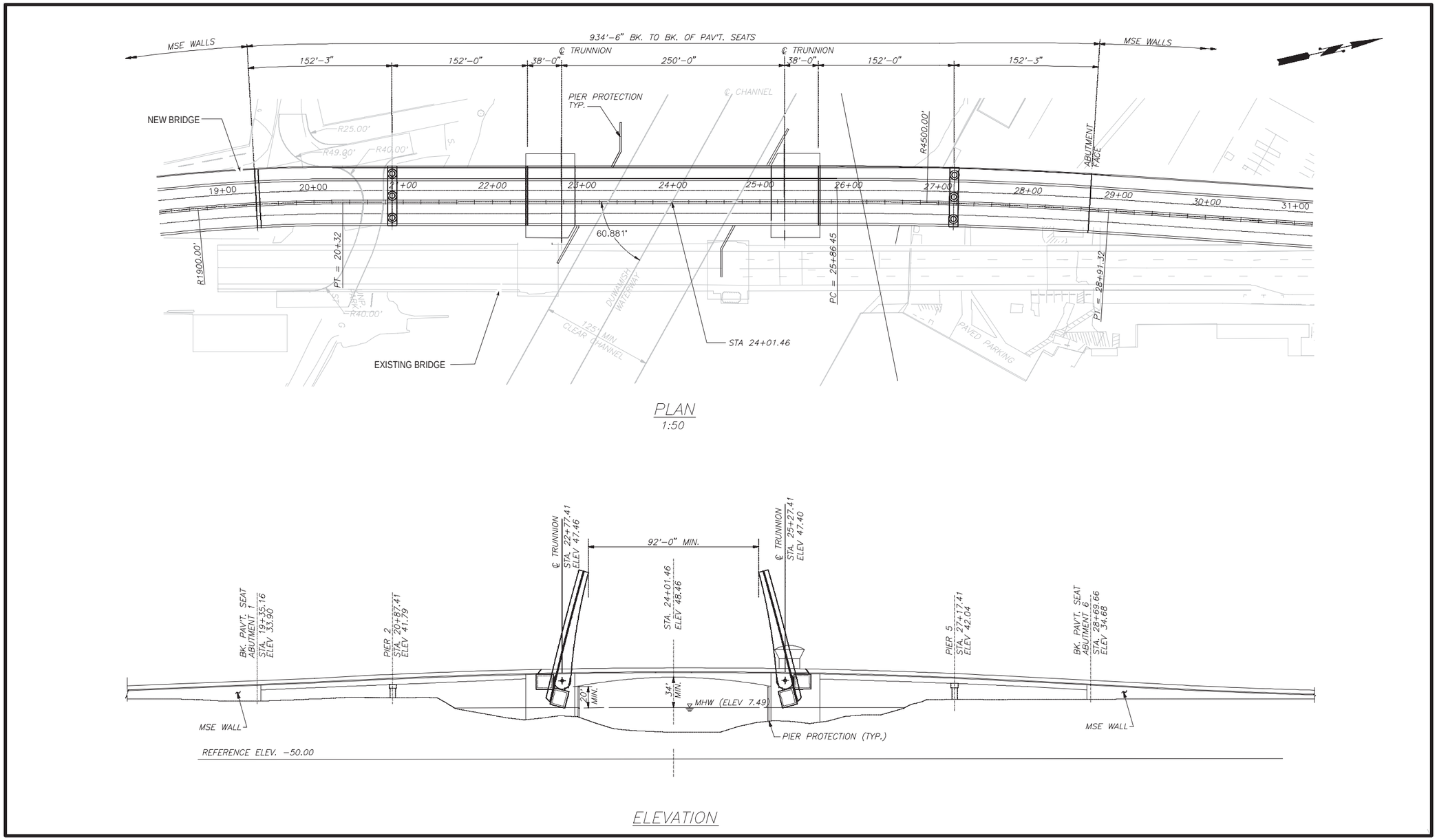


Figure 2-7
Bascule Bridge Alternative:
Plan and Profile

This page intentionally blank

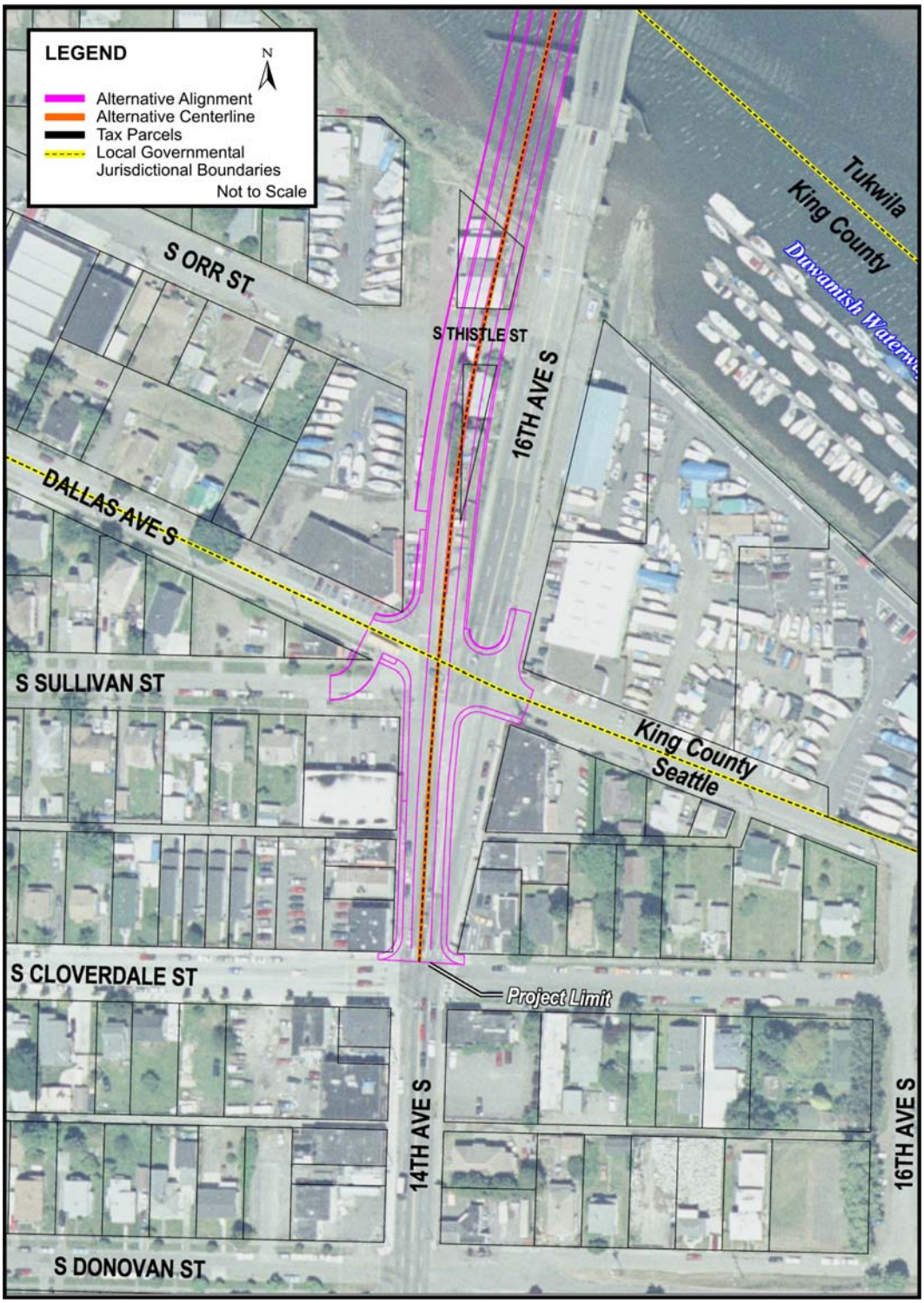


Figure 2-8
Bascule Bridge Alternative: Aerial View

slightly realigned further to the north and closer to the Duwamish Waterway. This figure also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. Access to points north via the South Park Bridge would be maintained.

Following construction of the new bridge, the existing bridge and its pier protection structures would be demolished and removed as described for the No Action Alternative.

2.5.4 Mid-Level Fixed-Span Bridge Alternative

The Mid-Level Fixed-Span Bridge Alternative would result in the construction of a non-movable bridge (see Figure 2-9). The bridge length would be approximately 1,660 feet abutment-to-abutment, not including roadway approaches. Road improvements would extend from slightly north of S. Donovan Street north to a point approximately 320 feet south of East Marginal Way S. (see Figure 2-10). Construction would require the full or partial acquisition and displacement of land uses of 14 properties.

The interior walls of the abutments would be approximately 550 feet from the top of the Duwamish Waterway embankment, or 300 feet further set back than the existing bridge. The closest on-land piers would be approximately 85 feet from the south embankment and the closest in-water piers would be approximately 100 feet away. On the north side, the closest in-water piers would be approximately 130 feet from the top of the embankment and the closest on-land piers would be approximately 65 feet away.

The mid-point of the bridge profile across the Duwamish Waterway would be approximately 65 feet above MHW of the Duwamish Waterway. The horizontal clearance would be approximately 125 feet, or slightly greater than the existing clearance. The 65-foot vertical clearance, however, would restrict use of some existing waterway traffic, including some tugs and barges. Most vessels that currently pass the existing bridge would continue to be able to use the navigation channel. The width of the new mid-level bridge would be reduced near the south side abutment at S. Orr Street. At this point, the proposed 13-foot bike-pedestrian path is separated from the elevated approach roadway and descends to ground level via a ramped structure. This design feature reduces land use and relocation impacts on 14th Avenue S. (see Figure 2-10).

Following construction of the bridge and its pier protection structures, there would be changes in the local street network (see Figure 2-5). The location of the south abutment and its vertical clearance would require modification of Dallas Avenue S. and S. Sullivan Street. As such, S. Sullivan Street would likely be merged into Dallas

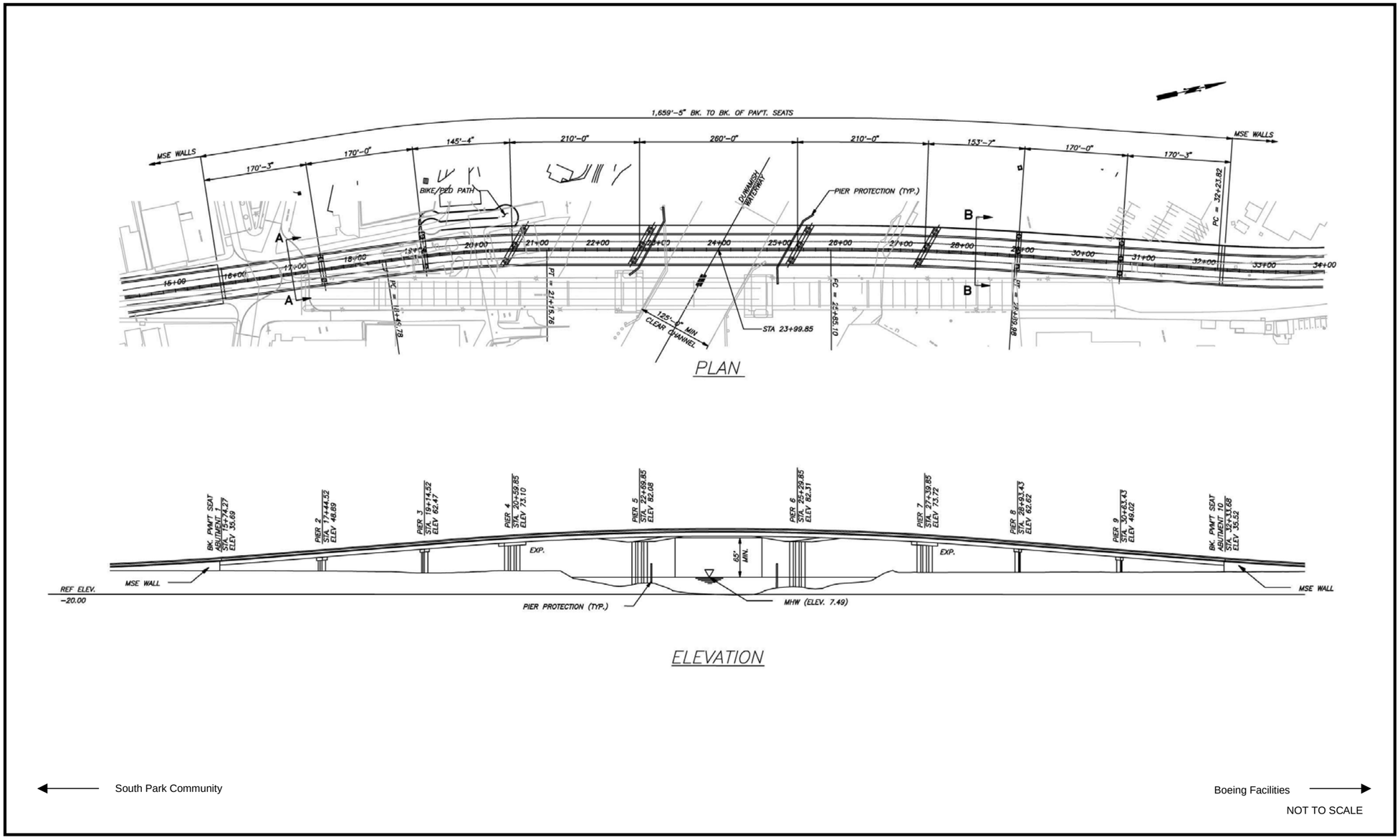


Figure 2-9
Mid-Level Fixed-Span Bridge Alternative: Plan and Profile

This page intentionally blank

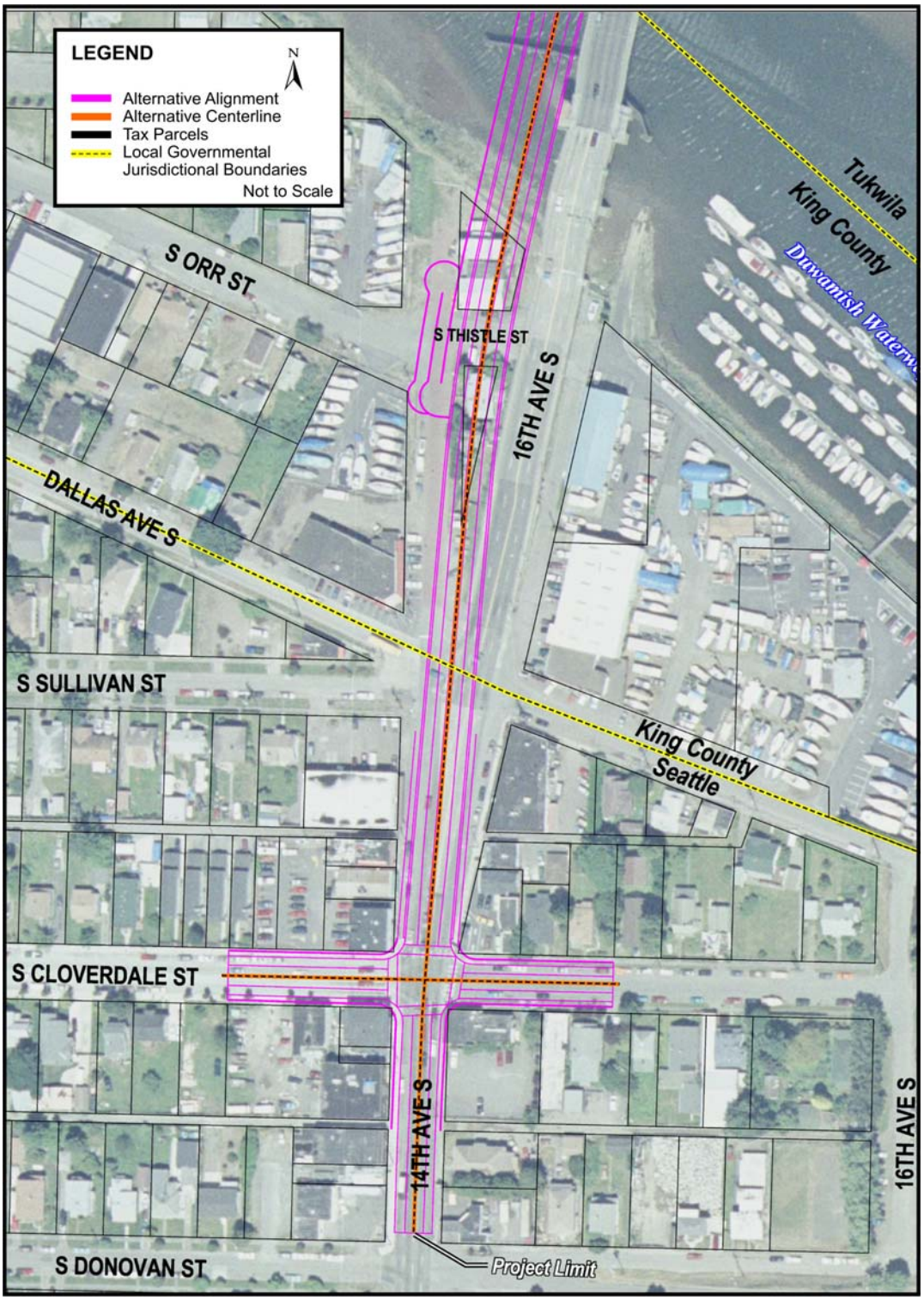


Figure 2-10
Mid-Level Fixed-Span Bridge Alternative: Aerial View

Avenue S. just west of the new bridge structure, and a new roadway would be constructed under the new bridge. The alignment of this roadway would be slightly to the north to ensure it would have a minimum allowable vertical clearance. Neither street would have direct access to the new South Park Bridge.

Figure 2-5 also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. A retaining wall supporting the elevated approach roadway would be constructed immediately adjacent to properties fronting on both sides of 14th Avenue S. for the majority of the distance between S. Sullivan Street and S. Cloverdale Street. As such, properties with frontage on this portion of 14th Avenue S. would lose direct transportation access.

Traffic would be able to access the bridge at S. Cloverdale Street, which would be raised a maximum of approximately 5 feet at the intersection to meet the descending grade of the bridge. This change would require increased grades on S. Cloverdale Street to either side of 14th Avenue S. to meet the new grade of 14th Avenue S. This change would allow traffic on S. Cloverdale Street to continue to have direct access to 14th Avenue S. A retaining wall would also need to be constructed around the four corners of the intersection of S. Cloverdale Street and 14th Avenue S. due to the grade changes of both streets.

S. Orr Street would be closed due to the location of the support structures for the proposed separated pedestrian/bike path ramp, which would allow bicyclists and pedestrians to descend from the bridge level to the street level. In addition, S. Thistle Street would be closed as it would no longer be able to connect to S. Orr Street.

Following construction of the new bridge, the existing bridge and its old pier protection structures would be demolished and removed as described for the No Action Alternative.

2.5.5 High-Level Fixed-Span Bridge Alternative

The High-Level Fixed-Span Bridge Alternative is a non-movable bridge (see Figure 2-11). The bridge length would be approximately 2,332 feet abutment-to-abutment, not including roadway approaches. The interior walls of the abutments would be approximately 900 feet from the top of the Duwamish Waterway embankment, or 650 feet further set back than the existing bridge. The on-land and in-water piers and pier protection structures of this alternative are approximately in the same location as proposed for the Mid-Level Fixed-Span Bridge Alternative. Road improvements would extend from S. Trenton Street and continue north to East Marginal Way S. This alternative would require minor modification of the 16th Avenue S./East Marginal Way S. intersection and the existing railroad track crossing immediately south of this intersection (see Figure 2-12). Construction of this

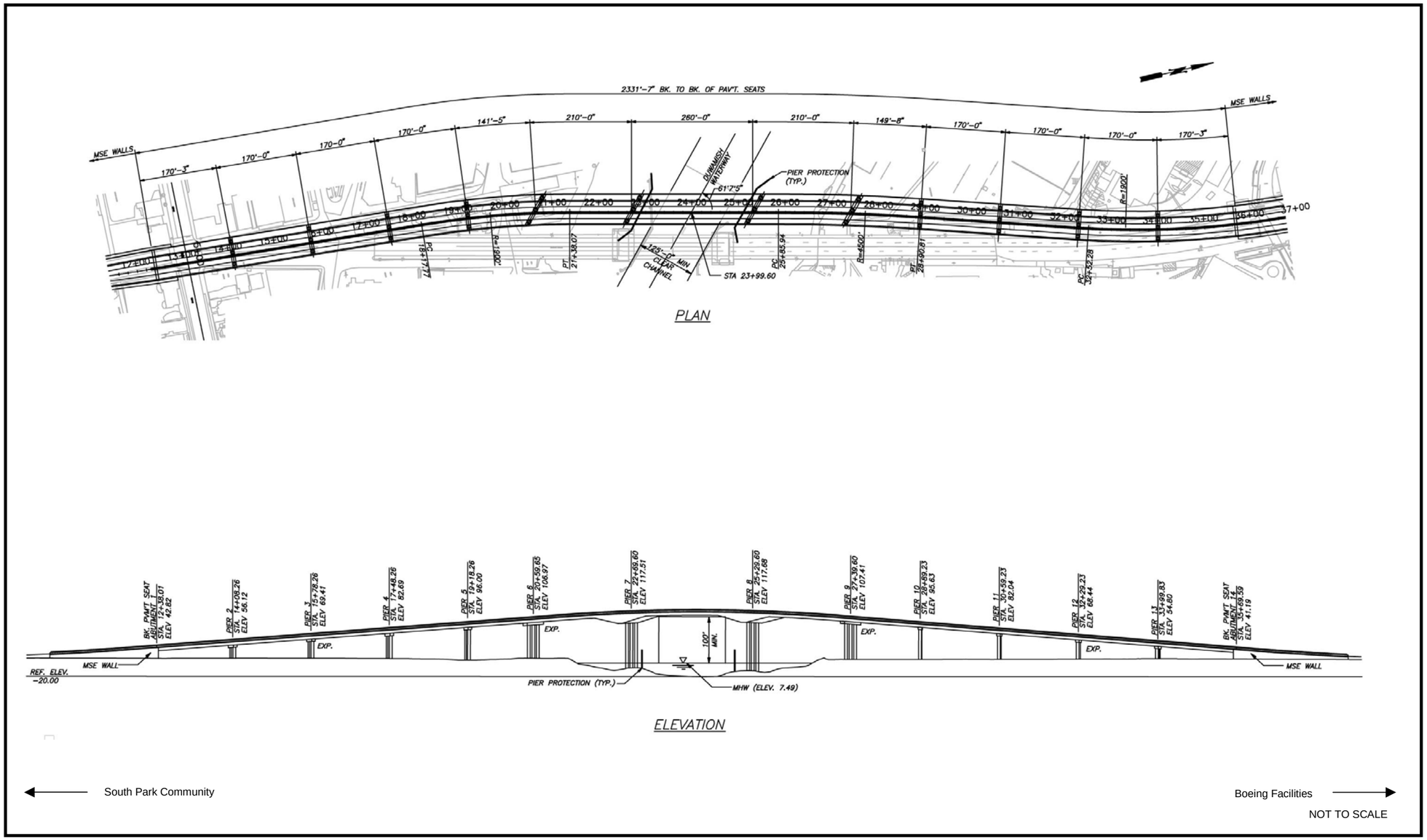


Figure 2-11
High-Level Fixed-Span Bridge Alternative: Plan and Profile

This page intentionally blank

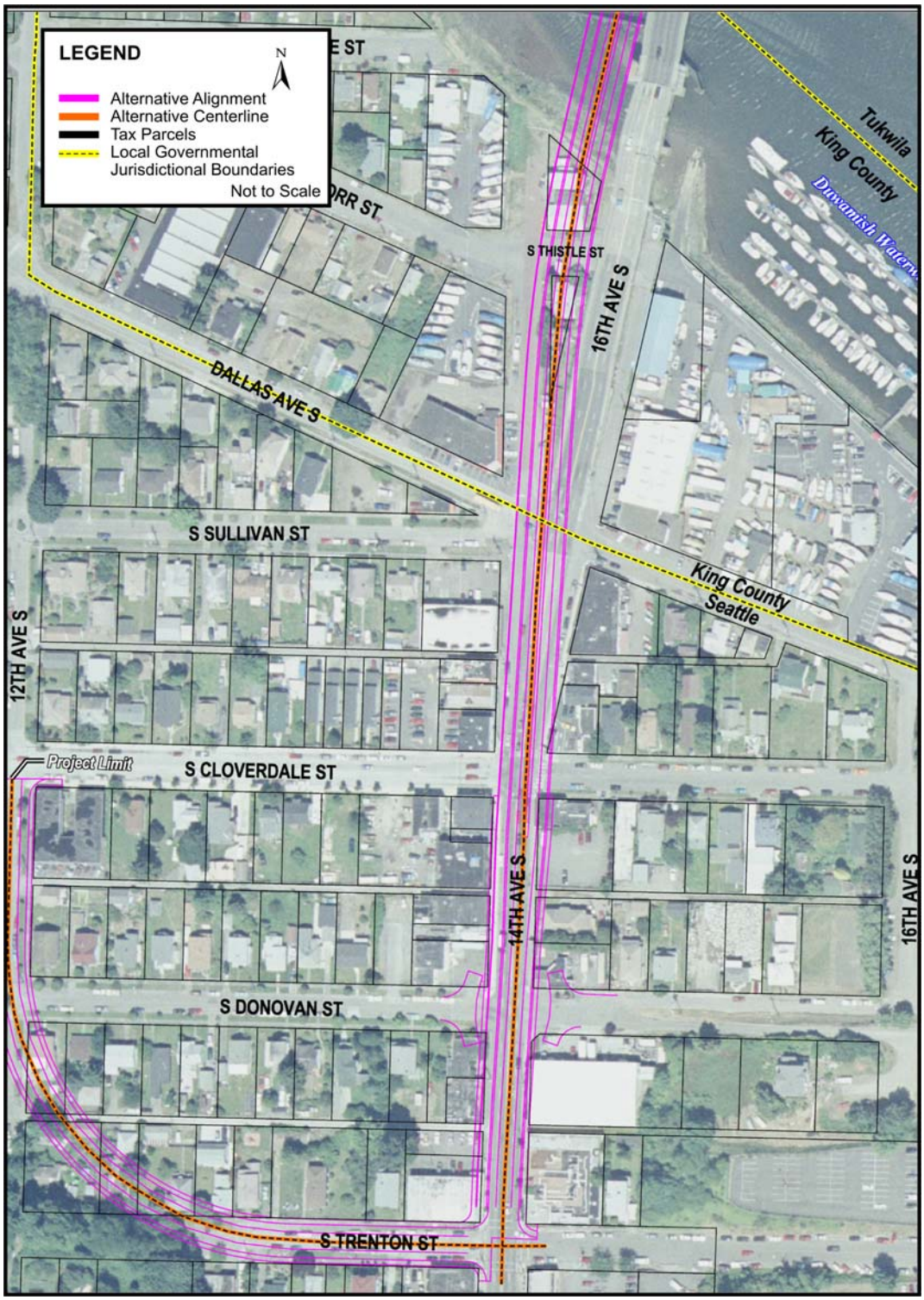


Figure 2-12
High-Level Fixed-Span Bridge Alternative: Aerial View

alternative would require the full or partial acquisition of 39 properties and the displacement of existing land uses on these properties.

The bridge design would allow for approximately 100 feet of vertical clearance above the MHW of the Duwamish Waterway as desired by the U.S. Coast Guard. The horizontal waterway clearance for the navigation channel would be approximately 125 feet, which is slightly greater than the existing 118-foot clearance (between pier protection structures). The bridge's 100-foot vertical clearance would not be expected to limit the height of boats and barges currently passing under the bridge. However, vessels larger than those currently using the navigation channel might not be able to pass the bridge in the future.

Following construction, there would be numerous changes in the local street network as shown in Figure 2-5. The figure also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. The bridge south abutment would require Dallas Avenue S., S. Sullivan Street, and S. Cloverdale Street to be converted to underpasses under the new South Park Bridge. A retaining wall supporting the elevated approach roadway would be constructed immediately adjacent to properties fronting on the west sides of 14th Avenue S. for the majority of the two-block distance between S. Cloverdale Street and S. Trenton Street. Properties on the east side of the roadway, however, would generally be acquired for right of way due to shifting the alignment slightly east of the existing roadway centerline to minimize land use impacts (Parsons Brinckerhoff 2003b). In addition, S. Donovan Street would be closed at 14th Avenue S. due to obstruction from the bridge abutment, and a cul-de-sac would be constructed on either side of the abutment on S. Donovan Street.

To allow traffic to access the new South Park Bridge, a new principle arterial roadway would need to be constructed between S. Trenton Street and 12th Avenue S. and road improvements would be required on 12th Avenue S. north to S. Cloverdale Street. This new route would allow traffic, trucks, and buses to continue to access the new South Park Bridge from S. Cloverdale Street via 12th Avenue S. and S. Trenton Street.

Following construction and transfer of the traffic to the new bridge, the existing bridge and its associated pier protection structures would be demolished and removed as described for the No Action Alternative.

2.6 Construction Schedule, Duration, and Activities

2.6.1 Construction Schedule

Construction of a rehabilitated or replacement bridge for the existing South Park Bridge is planned to take approximately two to three years, including the

demolition and removal of the existing bridge and pier protection structures. Construction is anticipated to start within the next several years, and the bridge is assumed to be completed by 2009 for the analysis in this document. The funding of some alternatives, however, is uncertain and construction could be delayed several years.

2.6.2 Construction Durations

The actual duration required for construction activities varies for each of the alternatives. Construction activities associated with the No Action Alternative involve only demolition of the existing bridge, removal of the pier protection structures, and restoration of the site. The construction period for this alternative would be the shortest of all alternatives, approximately 8 months. The other alternatives would additionally require rehabilitation of the existing bridge or construction of a new replacement bridge and installation of new pier protection structures. Anticipated construction durations (demolition of existing and construction of new) would be approximately 32 months for the Rehabilitation Alternative, 33 months for the Bascule Bridge Alternative, 20 months for the Mid-Level Fixed-Span Bridge Alternative, and 24 months for the High-Level Fixed-Span Bridge Alternative (see Table 2-1) (Parsons Brinckerhoff 2003d).

Table 2-1. Construction Durations for the Project Alternatives

Alternative	Construction Duration	Existing Bridge Closures
No Action	8 months	Bridge closed, then demolished and removed.
Rehabilitation	32 months	Bridge closed for approximately 30 months—all but two months.
Bascule Bridge	33 months	Bridge closed for short-term temporary periods (about four weeks total).
Mid-Level Fixed-Span Bridge	20 months	Bridge closed for short-term temporary periods (about four weeks total).
High-Level Fixed-Span Bridge	24 months	Bridge closed for short-term temporary periods (about four weeks total).

Source: Parsons Brinckerhoff 2003d.

2.6.3 Major Construction Activities

From a construction perspective, the five project alternatives include three major different types of construction activities. The No Action Alternative assumes the

existing bridge condition would eventually require closure and removal of the bridge and its associated pier protection structures. Construction activities would focus on demolishing the existing bridge and restoring the project area. Bridge removal is also associated with the Replacement Bridge Alternatives.

The Rehabilitation Alternative would require bridge closure for approximately 30 months for rehabilitation and/or replacement of various elements of the existing bridge. Rehabilitation of the existing bridge would require closure of the existing bridge for approximately 30 months and efforts would be made to minimize the closure period as much as possible. Rehabilitation activities would begin as soon as possible after completion of final design engineering and acquisition of construction permits. Traffic would be given advance notice to take alternate routes prior to closure of the existing bridge.

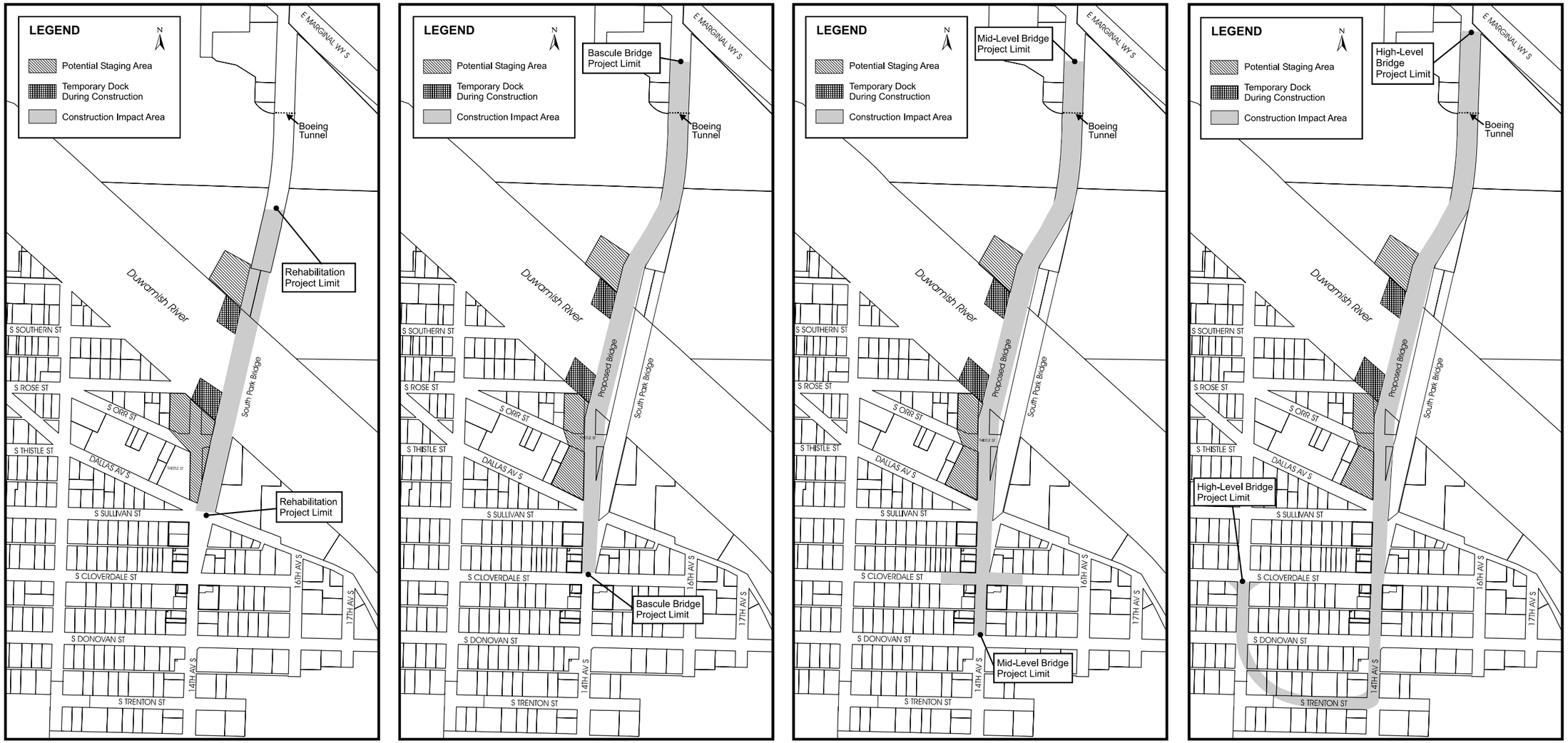
The Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridge alternatives would all result in constructing a replacement bridge approximately 80 feet downstream of the existing bridge. For these three alternatives, the new bridge would be constructed while the existing bridge continues to be operational. When the new bridge is connected to the existing road, there would be short-term temporary bridge closures. These closures could be limited to weekends or could extend for approximately one month, depending on the alternative. Once the new bridge is completed and new pier protection structures have been installed, traffic would be rerouted to the new bridge and then the existing bridge structure would be demolished in a similar fashion as described for the No Action Alternative.

The construction of a temporary dock and construction staging area would likely be required on both banks of the waterway for all Build Alternatives (see Figure 2-13). The staging area would be adjacent to the temporary dock to allow for easy unloading of equipment or materials directly to the construction staging area. Containment areas, approximately 20,000 square feet each, also would need to be established on both banks of the Duwamish Waterway (WCI 2004b). These containment areas would be used to store potentially contaminated water and/or sediments prior to potential treatment or disposal offsite. The specific location of the staging areas, temporary docks, and containment areas would be negotiated during permitting and/or construction contract negotiations and could involve private property and/or public right of way. The construction staging area on the Boeing Plant 2 property would likely be a negotiated temporary use and would not require property acquisition.

2.6.4 Construction Sequencing

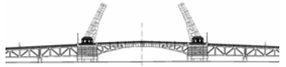
Rehabilitation Alternative

Construction of the new bascule piers would likely be the first major construction activity for the Rehabilitation Alternative. This would entail removing the existing pier protection structures, installing temporary supports for the bridge



Rehabilitation Alternative | Bascule Bridge Alternative | Mid-Level Fixed-Span Bridge Alternative | High-Level Fixed-Span Bridge Alternative

Figure 2-13
Proposed Construction Impact Areas



This page intentionally blank

superstructure, removing the bascule leaves as well as the steel truss spans, installing cofferdams around the existing steel truss approach piers and bascule piers, and demolishing the existing piers.

The bascule leaves and steel truss approach spans would be removed from the construction site for refurbishment. Construction of the new piers would involve drilling shafts through the existing timber piles, constructing the pile cap, dewatering the construction area inside the cofferdam, constructing the upper portions of the pier, removing the cofferdam, and, finally, reconstructing the upper portions of the bascule pier and bridge control towers. Workers would reconstruct the concrete approach spans and replace the abutments. Workers would also reconstruct the bridge deck and replace the mechanical and electrical systems used to operate the bridge. Replacement of the piers, bridge control towers, bridge railings, and lamp posts would be done in a manner that would preserve the historic character of these features.

Build Alternatives

Major construction activities and sequencing would be similar for the Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridge alternatives, but the construction duration and the impact area for each of these three alternatives would differ. Following completion of final design engineering, acquisition of construction permits, purchase of needed property, and relocation of residents and businesses, construction activities would begin. The first activities would include establishing the construction staging areas and constructing temporary docks with pilings on both sides of the waterway (see Figure 2-13).

Buildings affected by the construction activities would be demolished, and utilities would be either temporarily or permanently relocated. To minimize traffic impacts, construction activities would begin with the construction of the in-water piers. Construction activities would progress landward from the central portion of each bridge alternative. Both in-water and on-land construction would begin with construction of the sub-structures (piers and abutment) and would be followed by placement of the superstructure (beams, deck, rails). Efforts would be made to do in-water installation of cofferdams during the fish window (i.e., time when in-water construction is allowed by permitting agencies). On-land construction of the piers, abutment, retaining walls, and transition segment at either end of the bridge would likely require temporary closure of adjacent or nearby roads and rerouting of local traffic. If possible, these temporary closures could be limited to weekend and/or night times to minimize impacts to the community. Construction activities on the north and south portions of the new bridge structures could occur either separately or concurrently. New pier protection structures would be installed. The last of the construction activities would be the construction of the new curb and gutter of the at-grade roadway and paving the roadway to match the existing width of 14th Avenue S. Figure 2-13 shows the project limits, or start and

end points, of construction activities for each of the four project Build Alternatives.

Staging

For the Rehabilitation Alternative and the Replacement Bridge Alternatives, new girders and other oversized materials would most likely be delivered to the project site by barge. Large cranes located on the barges or temporary docks would off-load the materials and place them in nearby construction staging areas. Removal of the existing bridge pier foundations and construction of the new bascule and steel truss piers would require the use of cofferdams to isolate the construction activities. Construction of the new approach-span piers would use drilled shafts, which would likely incorporate the use of temporary casings to isolate the construction activities. This in-water work would be performed by equipment operated from the temporary docks or from barges.

Demolition

Demolition of the existing bridge would involve disassembly and removal of the existing bascule leaves, superstructure, bridge piers, pier protection structures, and abutments. Cranes would use the existing bridge structure and approaches as much as possible to remove the various elements of the bridge. Barges would likely be used to remove oversized materials. At this time, the demolition work alone may not require construction of temporary docks and would not require the acquisition of private property on the banks of the Duwamish Waterway for staging areas. Removal of the abutment foundations, however, would likely require temporary short-term closure of adjacent and, possibly, nearby streets. During this time, local traffic would be temporarily rerouted from the immediate area.

Restoration

Following the completion of the construction activities associated with any of the project alternatives, disturbed areas would be restored. Conceptual site restoration plans would be developed for each alternative based on additional consultation with resource agencies and other stakeholders.

2.7 Estimated Costs for the Alternatives

Cost estimates for construction and operation and maintenance (O&M) for each of the proposed project alternatives have been prepared by the project engineers (see Table 2-2). The construction cost estimate for each project alternative, including the No Action Alternative, is broken down into the following components: (1) final plans, specifications, and estimates (PS&E); (2) right-of-way costs; and (3) construction (supplies, equipment, and labor) and construction-related costs. The total construction cost estimates are shown in 2003 dollars as

well as escalated costs for 2008, which is the anticipated mid-point of the assumed project construction period. These cost estimates were calculated based on the conceptual engineering plans prepared for each of the alternatives (Parsons Brinckerhoff 2003d).

Table 2-2. Cost Estimates of the Project Alternatives

Alternative	PS&E	Right of Way	Construction	Total Construction (2003 dollars)	Total Construction (2008 dollars)	O&M (2008 dollars)[1]
No Action	$250,000	$0	$6,750,000	$7,000,000	$9M	$0 [1]
Rehabilitation	$6,843,000	$754,000	$56,333,000	$63,930,000	$74M	$11M
Bascule Bridge	$8,253,000	$3,655,000	$65,426,000	$77,334,000	$90M	$11M
Mid-Level Fixed-Span Bridge	$4,235,000	$6,377,000	$50,911,000	$61,523,000	$71M	$2M
High-Level Fixed-Span Bridge	$5,261,000	$15,310,000	$49,889,000	$70,460,000	$82M	$3M

Note:

[1]The long-term O&M costs for the Build Alternatives are the total amounts over the 75-year life of the bridge alternatives. These costs do not include current costs associated with the existing bridge (from present to date of demolition or rehabilitation). The maintenance cost for the existing bridge has averaged approximately $286,000 per year during the past 10 years. The annual bridge operation costs (e.g., bridge tender salaries) have risen incrementally with inflation, and the operation cost for 2004 was approximately $225,768. As such, once demolished, there would be no O&M costs associated with the No Action Alternative.

Source: Parsons Brinckerhoff 2003d.

Clearly, the No Action Alternative is the least expensive to construct, as the existing bridge would not be rehabilitated nor would a new replacement bridge be constructed. The cost to remove the existing bridge structure would be approximately $7,000,000 (2003 dollars). The estimated costs to either rehabilitate or replace the existing bridge structure range between approximately $62 million and $77 million. The least costly of the Build Alternatives is the Mid-Level Fixed-Span Bridge Alternative, which is estimated to cost approximately $61,523,000. The Rehabilitation Alternative is estimated to cost approximately $63,930,000, and the High-Level Fixed-Span Bridge Alternative is estimated to cost approximately $70,460,000. The most costly of the Build Alternatives is the Bascule Bridge Alternative. This alternative is estimated to cost $77,334,000.

Table 2-2 also shows the estimated O&M cost for the alternatives. For all alternatives, the current O&M costs associated with the existing bridge would continue until the existing bridge is demolished or reconstruction begins on the Rehabilitation Alternative. The long-term estimated O&M costs include the cost of inspections and replacement or upgrades of mechanical and electrical equipment as well as labor associated with operation of one of the bascule bridge alternatives. These costs are estimated for the anticipated 75-year life of each bridge alternative, including the Rehabilitation Alternative. No annual costs would be associated with the No Action Alternative following demolition of the existing bridge. The O&M cost estimates for the Mid-Level Fixed-Span Bridge and High-Level Fixed-Span Bridge alternatives are similarly low at $2 million and $3 million, respectively. The O&M costs for the two movable bascule bridge alternatives are very similar and are estimated to be approximately $11 million.

CHAPTER 3

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Chapter 3 Affected Environment and Environmental Consequences

3.1 Introduction

3.1.1 Overview of Impacts

This chapter discusses the existing conditions and the anticipated environmental impacts that would occur for each of the proposed project alternatives. The project alternatives are the No Action Alternative, Rehabilitation Alternative, Bascule Bridge Alternative, Mid-Level Fixed-Span Bridge Alternative, and High-Level Fixed-Span Bridge Alternative. References to the Build Alternatives include all of the proposed project alternatives with the exception of the No Action Alternative. References to the Replacement Alternatives include the Bascule Bridge, Mid-Level Fixed-Span Bridge, and the High-Level Fixed-Span Bridge alternatives.

This Draft EIS evaluates environmental impacts for the following elements of the environment: transportation, relocation, land use, economics, social elements, cultural and historical resources, visual, air, noise, utilities, water, fish and wildlife, geology and soils, and hazardous materials. Mitigation measures are recommended to avoid, reduce, or minimize adverse environmental impacts.

Several different kinds of potential environmental impacts are discussed for each of the 14 elements of the environment. Direct effects or impacts are caused by the proposed action and occur at the same time and/or place. They may occur during the construction of the proposed project or during the long-term operation of the project. Indirect or secondary impacts are caused by the action, but occur later in time or are farther removed in distance from the project area. They are reasonably foreseeable and are not speculative actions. In addition, cumulative impacts may occur. These are the additive effects of the proposed project combined with other past and reasonably foreseeable actions not linked to the proposed project.

The information presented in this chapter regarding direct, secondary, and cumulative effects is a summary of detailed technical analyses of potential environmental impacts. Appendix B provides a completed list of each of the technical reports prepared on the South Park Bridge Project. Copies of these reports are contained in the five appendix volumes of the Draft EIS and are also copied on the CD Rom in Appendix F of this volume. This chapter provides information that allows for comparison of the environmental impacts of each of the project alternatives proposed for the South Park Bridge Project.

3.1.2 Potential Impacts from Other Foreseeable Projects

The potential for cumulative impacts from other foreseeable projects in the vicinity of the project area are addressed in the Draft EIS. Several projects are planned in the South Park neighborhood and the Duwamish Waterway that may

be occurring close enough in time and/or location to create the potential for cumulative effects when combined with impacts from the construction or operation of the South Park Bridge Project alternatives. These could be both adverse as well as beneficial effects. The following projects have been identified as having the potential to result in cumulative impacts in conjunction with the South Park Bridge Project.

Boeing Plant 2 Duwamish Waterway Sediment Cleanup

A cleanup plan is being prepared to address contaminated sediments in the Duwamish Waterway associated with past activities at the Boeing Plant 2 site. This Superfund Site includes the portions of the north side of the Duwamish Waterway from approximately mid-channel to the shoreline along the Boeing Plant 2 site. The proposed cleanup area includes portions of the Duwamish Waterway on or near the location of the existing South Park Bridge and the bridge replacement alignments. The in-water activities will primarily consist of "capping" the existing riverbed sediments with clean clay-like material to contain the contaminated sediments and isolate them from the water. The estimated timeframe for construction is between late 2006 and early 2008.

Duwamish Waterway Maintenance Dredging

The U.S. Army Corps of Engineers dredges sediments within the navigation channel of the Duwamish Waterway in the area known as the turn-around basin (where vessels can turn around at the widened terminus of the channelized portion of the Duwamish River) at River Mile 5.2 (approximately 1.3 mile upstream from the South Park Bridge). The specific amounts of river sediment that are dredged and the exact timing of maintenance dredging are determined annually based on the amount of sediment deposition and shoaling in the turn-around basin. Maintenance dredging could be occurring during construction of the South Park Bridge Project.

14th Avenue S. Paving and Business Improvement Projects

The City of Seattle Department of Transportation and Department of Neighborhoods have several improvements planned for the South Park community. These projects include: (1) paving 16th Avenue S. north of the bridge to East Marginal Way S., (2) paving 14th Avenue S. south of the bridge, (3) upgrading the street signals at the two intersections on either side of the bridge and several intersections on 14th Avenue S. and S. Cloverdale Street, and (4) providing Community Development Block Grant funding for various business improvement projects. Most of the business improvement projects will be completed by the end of 2005. Design and paving of 16th Avenue S. and 14th Avenue S. is proposed to start in 2008 depending on funding.

City of Seattle Drainage Improvements

The South Park community has for years had flooding events due to an inadequate stormwater drainage system. In 2002, the City of Seattle conducted a drainage study of the community to identify specific problems. In 2004, the City of Seattle adopted a comprehensive drainage plan for the city (SPU 2005). This plan identifies candidate projects in the community, including regrading of roadways, upgrading of existing drainage systems, and construction of new drainage systems. A number of specific projects located in the South Park community were included in the *City of Seattle 2005–2010 Adopted Capital Improvement Program* (SDOF 2004). The main program for drainage improvements would involve construction of drainage pipes on most east-west running streets throughout the basin. Since a funding source for the roadway improvements is not currently secured, construction of these improvements could occur a number of years in the future.

Duwamish Shoreline Restoration Project

A local South Park non-profit organization, Environmental Coalition of South Seattle (ECOSS), has proposed restoration of the fisheries habitat along the south shore of the Duwamish Waterway to the west (downstream) of the South Park Bridge. This project is a separate community-based project that would not be part of the proposed South Park Bridge Project. Funds have not yet been secured for construction of this project and implementation of the project could be several years in the future.

In addition, efforts were made to identify other foreseeable residential or commercial development projects in the South Park community that could potentially result in cumulative impacts. No other significant projects proposed for development in the community were identified (Louie 2005).

In combination with the other foreseeable projects that were identified, the South Park Bridge Project could result in both adverse and beneficial cumulative impacts. These cumulative impacts are detailed for each element of the environment in the following sections.

3.2 Transportation and Mobility

This section discusses existing traffic conditions and forecasts traffic for each of the proposed project alternatives. First, a brief summary of the methods used to analyze traffic conditions in the South Park area is given. Existing and future conditions for the roadway network, peak hour volumes, Level of Service (LOS), and parking are then described. In addition, existing and future conditions for freight movement (trucks and trains), transit, and bicyclists and pedestrians are described. Lastly, recommended mitigation measures are listed to address and reduce the transportation impacts for the proposed alternatives. For additional detailed information, please see Appendix K, *Transportation Technical Report* (Parsons Brinckerhoff 2004g).

3.2.1 Methodology

The forecasting methodology used for this project incorporates traditional forecasting steps including: trip generation (traffic volume), trip distribution (travel to and from), mode choice (i.e., vehicle or transit), and trip assignment (specific roadway or highway taken). Travel-demand forecasts for this project were produced using the current as of 2002 King County travel model (based on the EMME/2 software program). The forecasts were generated from approved 1998 baseline data and a long-range 2020 forecast. Future land use assumptions are incorporated in the computer model. Transportation improvement projects within the general area of the proposed project also are included to reflect anticipated future changes in the roadway network (e.g., the Des Moines Memorial Drive S. conversion from four lanes to three lanes and the SR-509 extension projects). The 2027 forecasts were also compared to the Puget Sound Regional Council long-range 2030 forecasts to ensure consistency.

To better understand the travel patterns produced by the King County travel model, a select link analysis of the South Park Bridge for the 1998 evening peak-period conditions was performed. This analysis identifies traffic using a specific roadway segment. The model output shows that approximately 6,500 trips used 14th Avenue S. and 16th Avenue S. (and the South Park Bridge) during the evening peak period. Zone-to-zone trips produced from the analysis were aggregated and summarized into a district-to-district format. This is summarized in greater detail in the Peak Hour Volumes section following and in Appendix K, *Transportation Technical Report* (Parsons Brinckerhoff 2004g).

Analysis of roadway and intersection operational performance was also conducted using the Synchro analysis program. This computer-modeling program evaluates intersection delays and congestion. It generates traffic-delay (seconds), travel-time, Level-of-Service, and queue-length data. The results of this analysis are used to determine how roadway geometry or volumes would affect traffic circulation and roadway congestion at intersections.

3.2.2 Existing Conditions

Roadway Network

The existing roadway network surrounding the South Park Bridge consists of various roadway classifications. They include local two-lane streets and major limited-access highways. Regional traffic movement in the South Park area is concentrated in three north-south corridors: SR-99, SR-509, and East Marginal Way S. Local circulation is provided through principle arterials and local streets. S. Cloverdale Street and 14th/16th Avenue S. are designated truck routes. Airport Way S. is another major commercial truck route through the area. Natural features, such as the Duwamish Waterway, and large-scale land uses, such as Boeing Field, create barriers and limit access to and from these major regional routes.

Key roadways surrounding the South Park Bridge include SR-99, SR-509, East Marginal Way S., 14th/16th Avenue S., and S. Boeing Access Road (see Figure 3-1). Existing lane geometry of 13 major intersections in the project area is shown in Figure 3-2. These roadways are described below:

- SR-99 is a limited-access state facility and principal arterial. This two-way roadway varies from four lanes to six lanes. The posted speed limit is 40 mph, lane widths are 12 feet, and grades are flat.

- SR-509 is a limited-access state highway. Three lanes are generally provided in each direction with access ramps at designated points along the corridor. Lane widths are 12 feet and the posted speed limit is 40 to 55 mph. Grades are moderate.

- East Marginal Way S. is a principal arterial with two to three lanes in each direction. Lane widths along the segment between First Avenue S. and the S. Boeing Access Road range from 10 to 14 feet and the posted speed limit is 35 mph. Grades are flat.

- 14th/16th Avenue S. is a four-lane north-south major arterial. The South Park Bridge is part of the 14th/16th Avenue S. corridor. Lane widths, not including the bridge section, are 12 to 14 feet and the posted speed limit is 35 mph. Lanes on the bridge deck are relatively narrow at approximately 9.5 feet each. Grades are flat with the exception of the bridge approaches.

- The S. Boeing Access Road is a major east-west arterial. It consists of two to three lanes in each direction. No posted speed limit is given for the segment west of I-5. The lane widths are from 11 to 12 feet. Grades are moderate.

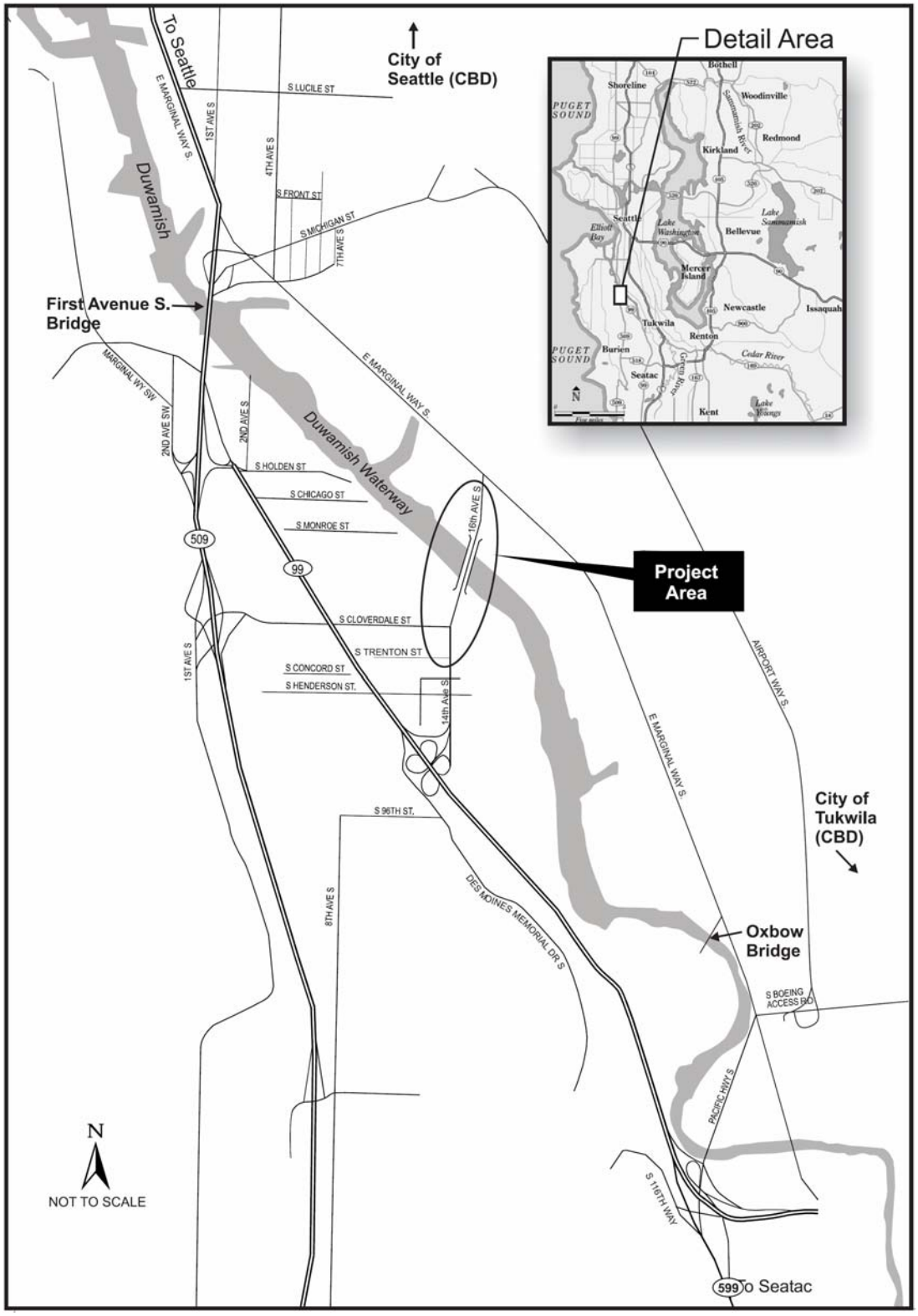
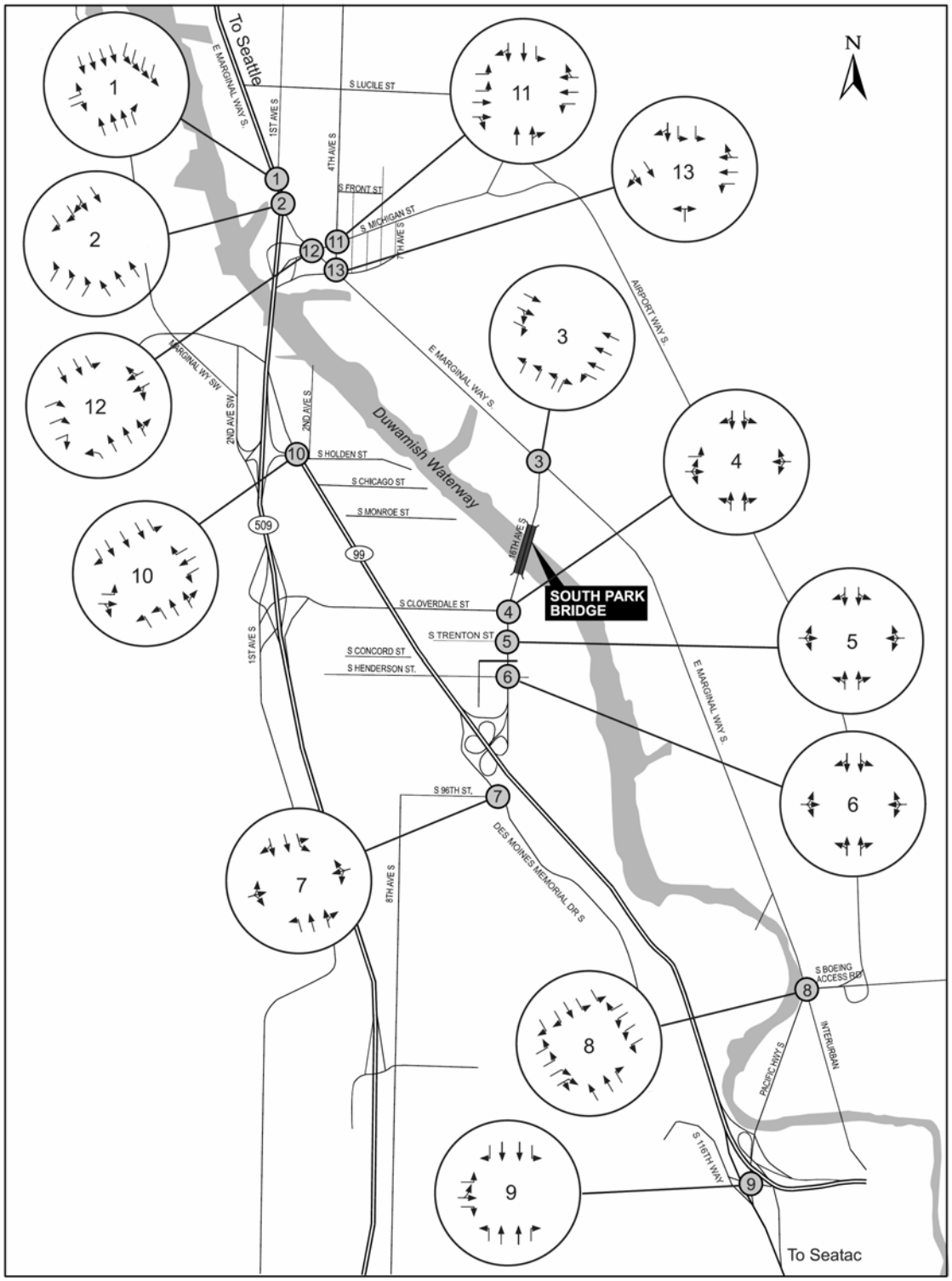


Figure 3-1
Existing Road Network



Note: Each large circle is a diagram of the corresponding numbered intersection. Arrows represent each individual traffic lane at the intersection.

Figure 3-2
Existing Lane Geometry

- S. Cloverdale Street is a principal east-west arterial. One lane of travel is provided in each direction between SR-99 and 14th Avenue S., and turn lanes are provided at major intersections. Grades along S. Cloverdale Street are modest. The posted speed limit is 30 mph between SR-99 and 14th Avenue S.

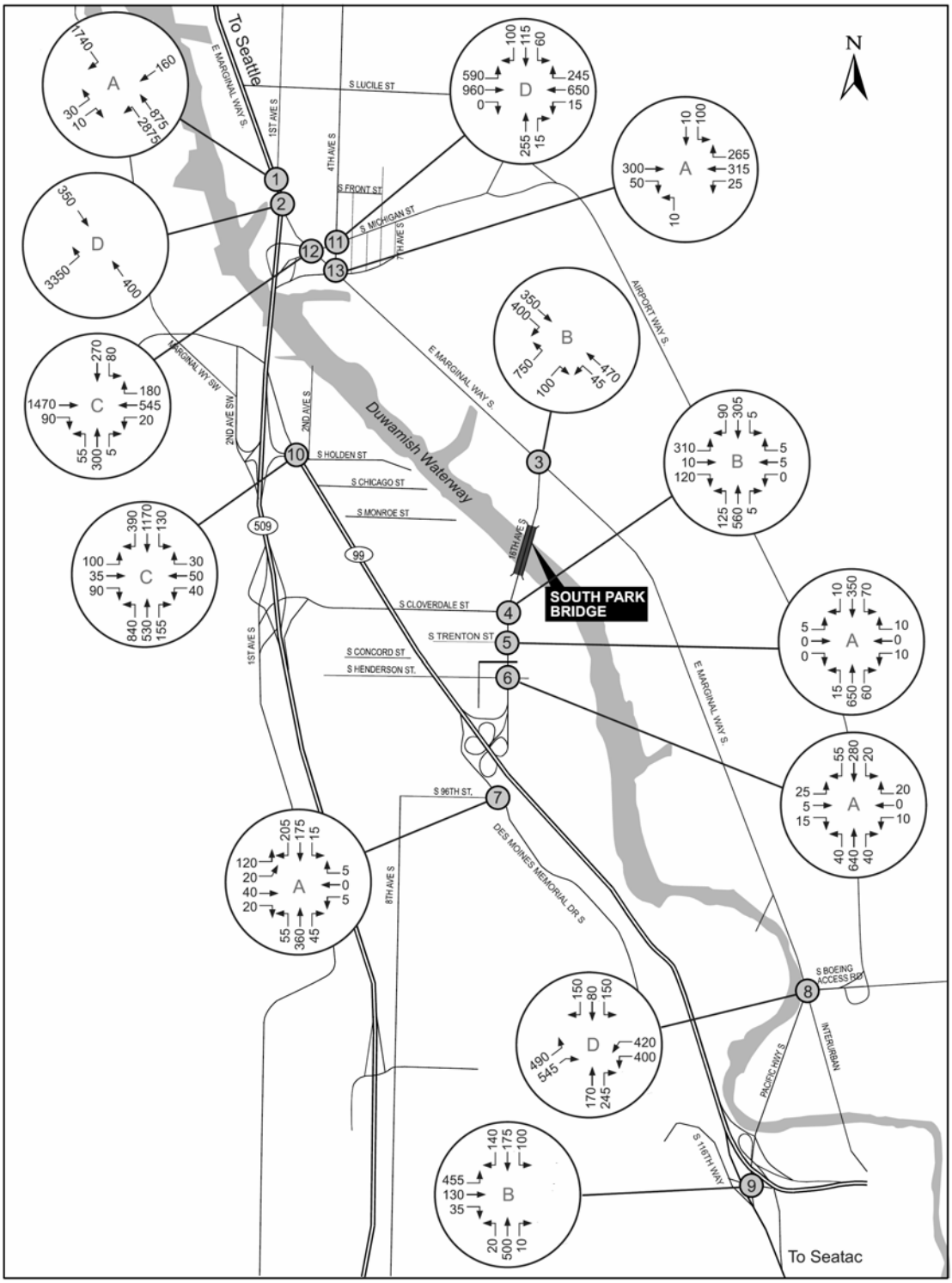
- Airport Way S. is a north-south freeway "frontage" road that is a principal arterial. Two lanes are provided in each direction with left-turn lanes at major intersections. Grades are flat and lanes are 11 to 12 feet wide.

Regional and Local Network Link

The South Park Bridge is a major link in the regional transportation network. It connects East Marginal Way S. and SR-99, two key north-south arterials in Seattle's Duwamish industrial area. The bridge and S. Cloverdale Street are designated a truck route by King County, although it is not designated as a Major Truck Street in the City of Seattle's Comprehensive Plan or Freight Mobility Strategic Action Plan. The City of Seattle, however, does allow for the occasional use of the bridge for over-legal trips. The Port of Seattle recognizes the bridge as a route for heavy and oversize traffic, and they have noted that it provides an alternative crossing of the Duwamish Waterway in the event that other bridges or routes are closed. These trucks service the commercial and industrial businesses in the area. The bridge is also a critical route for both fire and emergency medical services for the South Park community, the Boeing complex located in both the cities of Seattle and Tukwila, and Seattle's Georgetown neighborhood. Furthermore, transportation studies determined that residents of the South Park community as well as a significant number of residents of Burien, Tukwila, and SeaTac use the bridge to travel north across the Duwamish Waterway to both jobs and retail commercial districts.

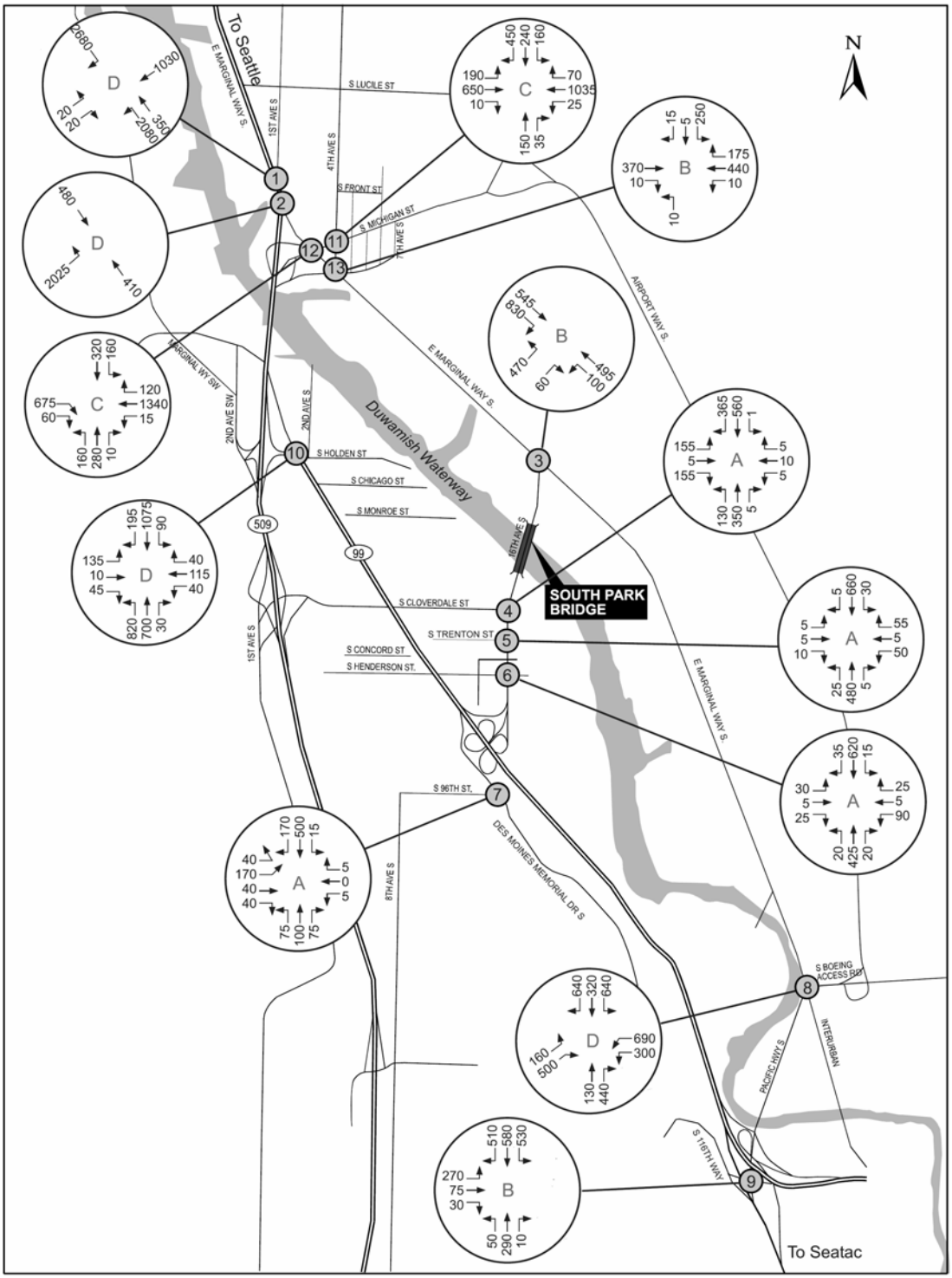
Peak Hour Volumes

Evaluation of existing peak-hour volumes and roadway conditions was conducted to determine the worst-case traffic congestion periods. Peak-hour intersection volumes were determined by field counts. Morning (AM) peak-period counts were conducted from 7 to 9 a.m. and evening (PM) peak-period counts were conducted from 4 to 6 p.m. The highest peak-hour volumes occurred from 7:15 to 8:15 a.m. during the morning-commute period (see Figure 3-3) and from 4 to 5 p.m. for the evening-commute period (see Figure 3-4). The AM peak-hour counts, however, were generally higher than PM peak-hour counts at major intersections in the South Park area.



Note: Each circle shows the general directional flow and volume of traffic at each corresponding numbered intersection. Arrows do not represent individual traffic lanes. Letters indicate the average Level of Service (congestion) conditions at each intersection.

Figure 3-3
Existing AM Peak-Hour Conditions



Note: Each circle shows the general directional flow and volume of traffic at each corresponding numbered intersection. Arrows do not represent individual traffic lanes. Letters indicate the average Level of Service (congestion) conditions at each intersection.

Figure 3-4
Existing PM Peak-Hour Conditions

The transportation network analysis showed that during the PM peak, the South Seattle area, comprising areas within the City of Seattle south of the West Seattle Freeway, including Boeing Field, is the origin for roughly 40 percent of total trips. Most of the trips are destined to areas south of the bridge. The Burien/Tukwila/SeaTac area accounts for 27 percent and the Shorewood/ Boulevard Park area accounts for 16 percent of the trips.

This analysis indicates that the majority of trips using the South Park Bridge are work or commute-related. They originate at employment centers, such as Boeing (south Seattle campus), and with destinations that are typically residential areas, such as Burien, Tukwila, or Shorewood.

Level of Service

Capacity analysis of AM and PM peak-hour conditions was conducted for 13 key signalized intersections and was used to determine Level of Service. Standardized Level of Service criteria for signalized intersections are shown in Table 3-1. LOS A represents best conditions and LOS F represents worst conditions. Highly congested roadways with LOS E or LOS F generally are identified as needing roadway or intersection capacity improvements.

Table 3-1. Level of Service Criteria

LOS	Signalized Delay (seconds/vehicle)	Traffic Flow Characteristics
A	≤ 10	Low delays, virtually free flow, unimpeded
B	> 10 and ≤ 20	Stable flow with minor delays, less freedom to maneuver through the intersection
C	> 20 and ≤ 35	Stable flow with some delays, less freedom to maneuver through the intersection
D	> 35 and ≤ 55	Long delays and high density, but stable flow and operations
E	> 55 and ≤ 80	Operating conditions at or near capacity
F	> 80	Forced operation, breakdown conditions

Source: TRB 2000

Level of Service analysis results for the project area are shown in Figure 3-3 (AM peak-hour LOS) and Figure 3-4 (PM peak-hour LOS). The analysis indicates low to moderately high traffic delays are currently characteristic of roadways and intersections in the South Park area. No intersections were determined to have LOS E or LOS F conditions, which represent operating conditions at or near capacity or worse conditions.

A review of the existing AM and PM peak-hour data indicates three intersections currently operate at LOS D (long traffic delays). Higher congestion intersections

include First Avenue S. Bridge/East Marginal Way S. (intersection #2) and East Marginal Way S./S. Boeing Access Road (intersection #8). Some congestion is expected at these intersections because they carry the greatest amount of traffic during peak periods and serve as "gateways" into the South Park area. In addition, key turning movements at S. Michigan Street/4th Avenue S. (intersection #11) and S. Holden Street/SR-99 (intersection #10) also show moderate to high levels of congestion during both peak-hour periods. Traffic delays for the four intersections approaching the South Park Bridge along 14th /16th Avenue S. are generally low. Delays for these intersections are LOS A or LOS B. Analysis results for the remaining intersections show modest delays with low congestion levels.

Actual operation of the bridge does not affect Level of Service on 14th/16th Avenue S. Review of the King County daily bridge logs indicated that the bridge opens only an estimated three times per day (24 hours) on average to accommodate waterway traffic. On some days, the bridge does not open for any commercial or recreational boats. Bridge openings are most frequent on summer-month weekend days when recreational boats travel up and down the waterway. (Additional information is found in Section 3.5 Economics.)

Parking

Parking near the South Park Bridge is mainly on-street parallel parking along 14th Avenue S. (south of the bridge). This parking is primarily used by patrons of local businesses in the South Park commercial district.

Approximately 40 to 50 on-street parallel parking spaces are located between S. Cloverdale Street and S. Director Street (three blocks south of S. Trenton Street). Additional on-street parking is available on 14th Avenue S. and 16th Avenue S. to either side of the bridge and extends to side streets such as S. Cloverdale Street and S. Trenton Street. In addition, the survey of businesses along 14th Avenue S. indicated that most of the retail establishments also have some off-street parking available for patrons (Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2005a). See Section 3.5 Economics for additional discussion.

The outside lanes on 14th Avenue S. are 11 to 12 feet wide and are used for parking during off-peak hours of the day. Due to heavy commute traffic volumes, some on-street parking is restricted during peak hours. There are no parking restrictions for the east side of 14th Avenue S. during commute periods between 7 and 9 a.m. or between 4 and 6 p.m. During field observations, only a moderate number of parallel parking activities (roughly 14–20) were observed along 14th Avenue S. during peak hours. For the west side of the roadway (southbound), however, parking is prohibited between 3 and 6 p.m. At this time, the main flow of traffic is southbound across the bridge, and congestion at the 14th Avenue S./ S. Cloverdale Street intersection requires full use of both southbound lanes,

especially considering turning movements. Furthermore, parking is limited to only one hour on the west side of the street during non-peak-hour periods.

Freight Movement (Trucks and Trains)

Freight movement in the South Park area is noticeable due to the high concentration of industrial and manufacturing uses. There is substantial truck traffic on East Marginal Way S. and SR-99. In addition, S. Cloverdale Street is used by trucks (designated as a truck route by King County) to access SR-509 and SR-99 from 14th Avenue S.

With respect to rail transport, there is only one set of railroad tracks in the study area. The Union Pacific Railroad tracks intersect 16th Avenue S. immediately south of East Marginal Way S. Field observations indicated no trains crossed 16th Avenue S. during peak commute periods. However, off-peak site visits determined that trains continue to use the railroad tracks, and crossings of less than three minutes created traffic delays. Trains using these tracks generally consist of four to six cars.

Transit

Bus routes serving the South Park community are primarily located along major north-south roadways such as East Marginal Way S., 14th/16th Avenue S., and S. Cloverdale Street. Major King County Metro bus routes serving the area include Route 60 (Broadway-White Center; weekday only), Routes 131, 132, and 134 (Seattle-Des Moines), Route 154 (Auburn-Boeing), Route 173 (Seattle-Federal Way), and Route 174 (Seattle-SeaTac-Federal Way).

During the AM and PM commute periods, buses serving the South Park community (Routes 60, 131, 132, and 134) are on a schedule arriving every 10 to 30 minutes. During off-peak periods, buses come every 20 to 60 minutes. Buses on Routes 131, 132, and 134 along S. Cloverdale Street come every 20 minutes during the morning and evening peak commute periods. Figure 3-5 shows bus routes and bus stop locations in South Park.

Currently, bus volumes on the roadways served by transit are minor. For the above bus routes, the proportion of buses is generally less than 1 percent of the typical weekday (or peak hour) directional traffic volumes.

Based on King County data, there are no plans to add bus routes through the South Park community in the near future.

Pedestrians and Bicyclists

Few pedestrians and bicyclists are generally seen in the South Park community. Field observations recorded only a handful of pedestrians and bicyclists during the AM and PM peak-hour periods at key study area intersections. Based on field notes, fewer than ten pedestrians and bicyclists were observed at each intersection

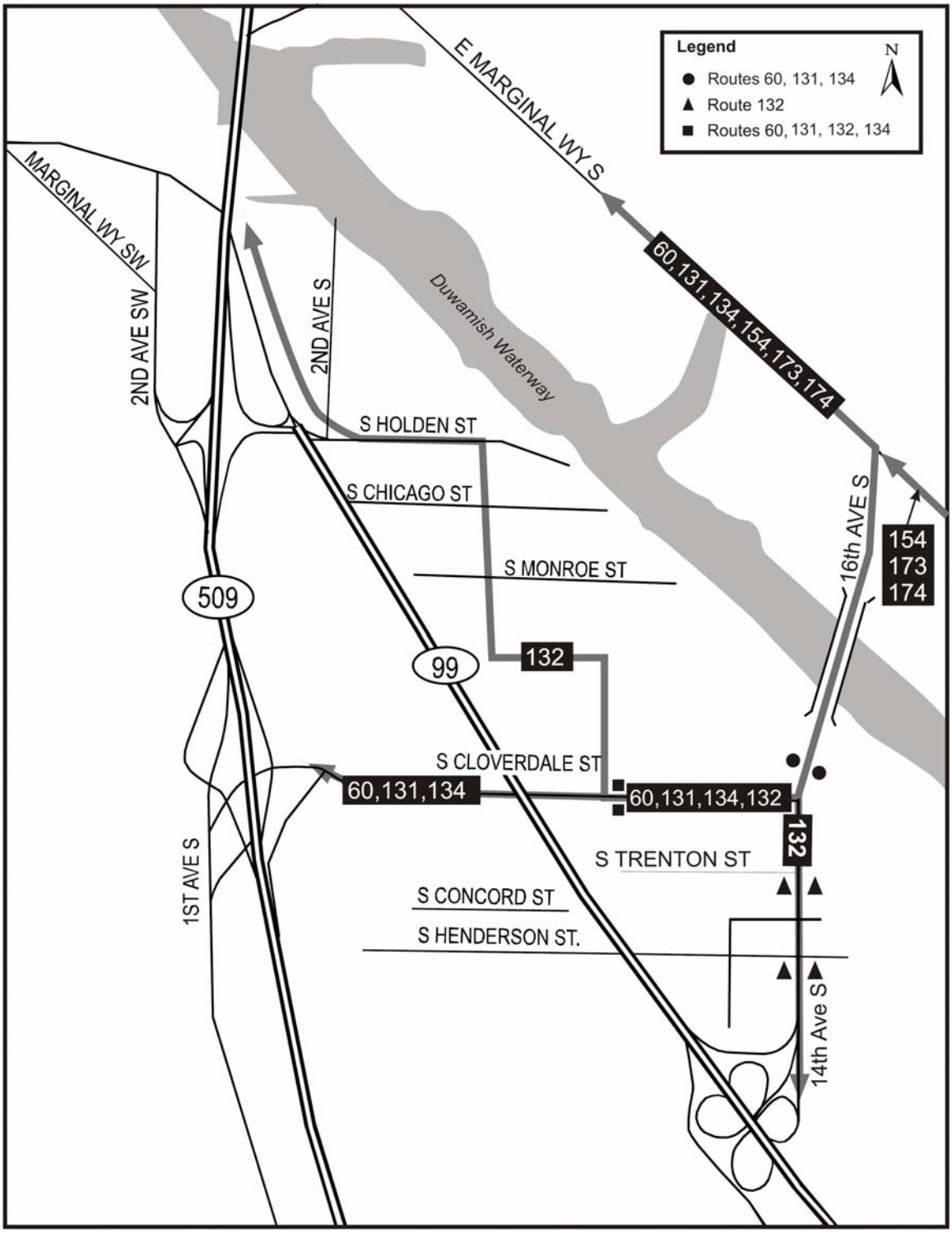


Figure 3-5
Bus Routes and Bus Stop Locations in South Park

during the two-hour peak period. This number of pedestrians compared to the number of vehicles amounts to less than 1 percent of the total intersection vehicular traffic volume (during the peak hour). Mid-day pedestrian volumes may be higher than during the AM or PM commute periods due to lunch-related walking trips and could comprise up to 2 to 3 percent of the total vehicular volume. This is especially true in the South Park business district on 14th Avenue S. where several restaurants and stores are located.

The *King County Bicycling Guidemap* (King County 1998) shows 14th/16th Avenue S. as a "commonly-used" route by bicyclists. No designated bicycle lane, however, is provided south of East Marginal Way S. Dallas Avenue S. is also a recommended bicycle route that ties into another bicycle route along the Duwamish Waterway. This bicycle route runs along SR-99, connects to S. Henderson Street and 8th Avenue S., and ultimately ties into the First Avenue S. Bridge bicycle route.

3.2.3 Environmental Impacts

This section describes construction and operational impacts and influences on transportation and mobility related to each of the proposed project alternatives. As described in Section 3.2.1 Methodology, the analysis of future travel was based on analysis of computer model forecasts of trip generation, distribution, mode choice, and trip assignment. This section describes future 2027 peak-period volumes, Level of Service, parking, and truck and train freight movement. In addition, future transit use and pedestrian and bicycle activity is described.

Construction Activity

Peak hour service, Level of Service, and parking issues would be affected during the construction phase of the project. As a result of construction activity associated with the various alternatives, varying degrees of disruption to traffic flow and accessibility would occur.

The overall impacts of construction for the Build Alternatives would affect the South Park community for between two to three years. The bridge, however, would be closed on a permanent basis at the beginning of the 8-month bridge removal process for the No Action Alternative. For the other alternatives, construction activities would be phased and disruptions to traffic flow and required use of detours would be localized and would change as construction progressed. Except for the Rehabilitation Alternative, traffic would continue to be able to use the existing South Park Bridge most of the construction period. For the Rehabilitation Alternative, the existing bridge would be closed for approximately 30 of the 32 months of the construction period.

All construction impacts would be temporary, though those of the Rehabilitation Alternative would not be considered short-term. Overall construction impacts would consist of the following:

- *Traffic Operations*—Anticipated roadway closures and detouring of traffic would increase congestion levels on key local routes such as 14th Avenue S. and S. Cloverdale Street This assessment assumes that traffic volumes do not decrease significantly from the pre-construction scenario.

- *Business Access*—Access to local businesses would be affected as a result of construction sequencing for the various alternatives. This is especially likely for businesses that rely on direct access to and from 14th Avenue S, particularly near S. Cloverdale Street. For additional analysis, see Section 3.5 Economics.

- *Parking*—On-street parking along 14th Avenue S. would be reduced during the construction period. Current parking regulations generally allow on-street parking during non-peak periods. Needed traffic detours and construction staging, however, would require the use of this portion of the public right of way used for parking.

- *Freight Movement (Trucks and Trains)*—For varying periods during the construction periods required for the project alternatives, freight trucks may need to use alternative routes and/or traffic detours due to their size. Trains using the railroad tracks near East Marginal Way S. would not be affected.

- *Transit and Pedestrian/Bicyclist Movements*—Transit and non-motorized modes would be affected as a result of construction activity. Bus transit routes would need to adjust to the potential roadway closures both on 14th Avenue S. as well as on project area local streets. Buses might also need to use detours. Local access for pedestrians and bicyclists would be affected similar to vehicular traffic. No movements would be allowed across the bridge when closed during construction. Some sidewalk closures would occur during heavy construction periods (involving major excavation and reconstruction of 14th Avenue S, for example). In addition, pedestrians might need to use detours and/or alternative routes to reach particular destinations in the South Park community. These impacts would particularly be adverse for the Rehabilitation Alternative as transit riders and pedestrians trying to catch buses on East Marginal Way S. may have considerable difficulties making reasonable alternative travel arrangements for the long period that the bridge would be closed. For additional discussion, see Section 3.6 Social Elements.

Long-Term Operation

Peak Hour Volumes

Future intersection volumes for each of the alternatives were derived from travel-demand forecasts. Derivation of traffic volumes for the No Action Alternative assumes the bridge link is removed from the transportation network. This results

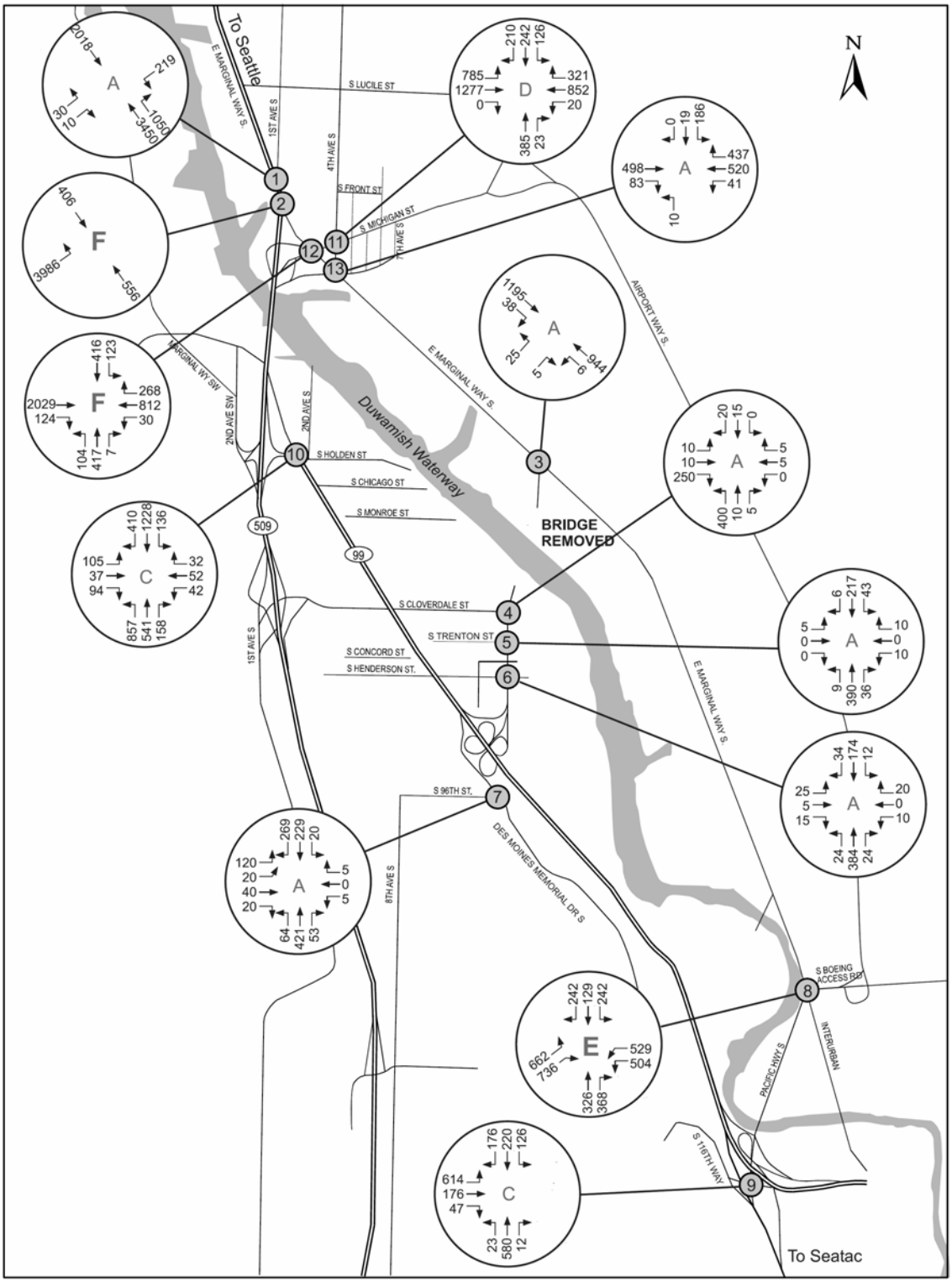
in an area-wide redistribution of north-south traffic flow. Traffic taking the South Park Bridge route is predicted to redistribute to parallel or alternative routes in the transportation network, including East Marginal Way S., SR-99, and S. Airport Way (see Figure 3-6). Similar to current conditions, the AM peak-hour period would be the most congested during a typical weekday. Particularly high traffic volumes would be expected at the key gateway intersections located immediately north of the First Avenue S. Bridge.

For the Build Alternatives, traffic volumes on the bridge would be similar. The volumes generally would not be affected within the foreseeable future by the number of travel lanes. Only beyond the 20-year horizon would the three lanes of the Rehabilitation Alternative become a constraint and affect travel behavior. In addition, high traffic volumes would be expected on the key gateway intersections north of the First Avenue S. Bridge. Figure 3-7 shows AM peak-hour volumes for 2027 conditions for the Build Alternatives. Traffic volumes, however, would be lower than those for the No Action Alternative as traffic would use the 14th/16th Avenue S. corridor.

Level of Service

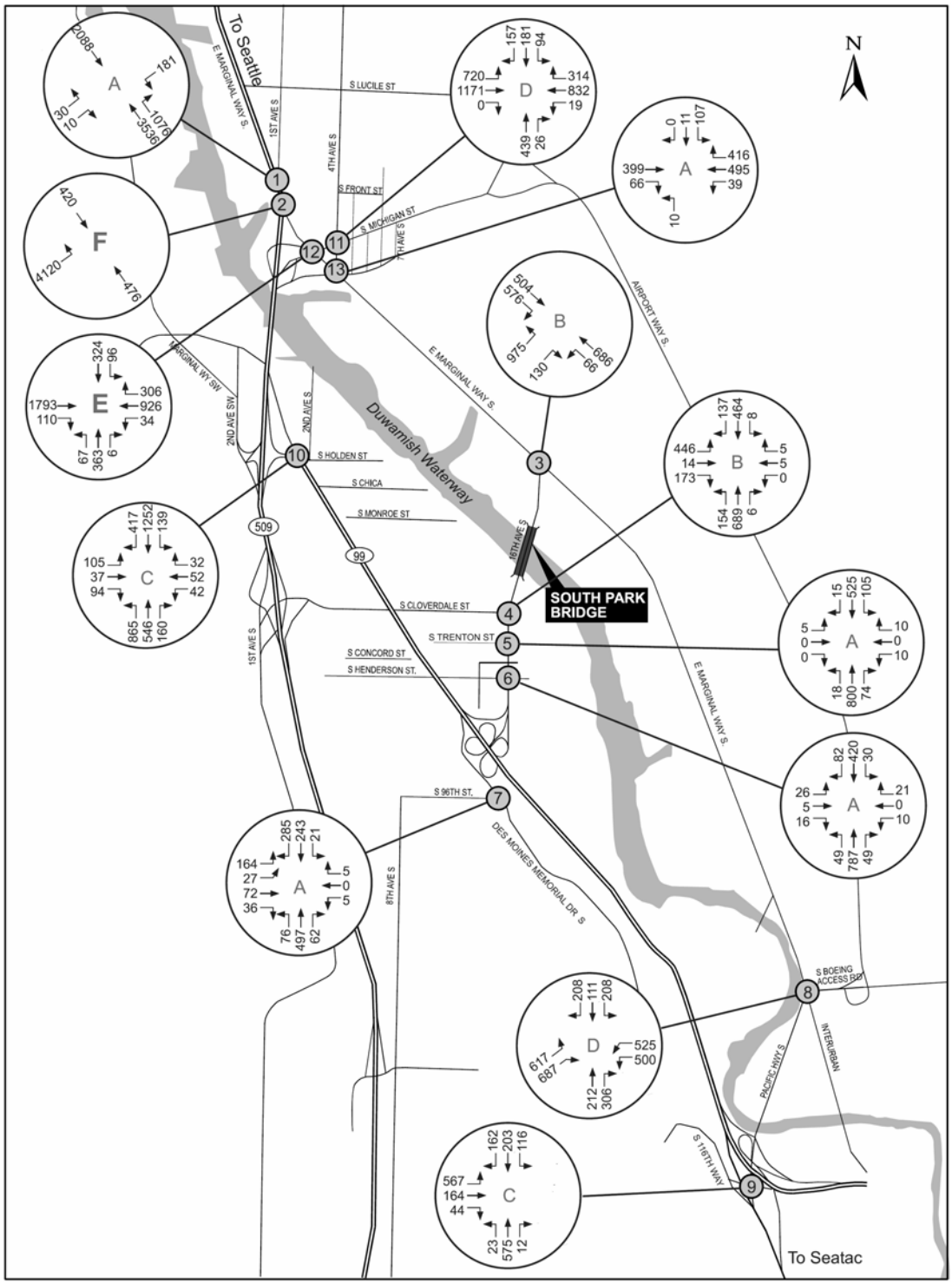
Level of Service determinations for 2027 traffic conditions were performed for the proposed project alternatives. The signal phasing and timing of the key intersections were optimized in the computer travel model to ensure that the transportation network could adapt to future changes in travel patterns. This avoids underestimating the ability of the signals to accommodate increases in traffic volume.

The analysis for the Build Alternatives indicates that there would be high levels of congestion (traffic delays) at the gateway intersections. Specific intersections in the immediate project area include First Avenue S. Bridge/East Marginal Way S. (intersection #2), E. Marginal Way S./S. Boeing Access Road (intersection #8), S. Michigan Street/4th Avenue S. (intersection #11), and East Marginal Way S./ S. Michigan Street (intersection #12). Delays for these intersections are expected to fall into the LOS D, LOS E, or LOS F range with average delays of more than 60 seconds per vehicle. The No Action Alternative would have similar delays to the Build Alternatives, but with increased congestion levels for the gateway intersections. This is consistent with the redistribution of traffic volumes caused by removal of the bridge link in the transportation network. On a comparative basis, the Bascule Bridge and Mid-Level Fixed-Span Bridge alternatives would result in the lowest congestion levels both on 14th Avenue S. as well as local streets in adjacent neighborhoods. Congestion in adjacent neighborhoods would be slightly higher for the High-Level Fixed-Span Bridge Alternative due to the construction of the new connector road along S. Trenton Street and 12th Avenue S. north to S. Cloverdale Street. The Rehabilitation Alternative would not create additional congestion on 14th Avenue S. due to the three lanes across the bridge



Note: Each circle shows the general directional flow and volume of traffic at each corresponding numbered intersection. Arrows do not represent individual traffic lanes. Letters indicate the average Level of Service (congestion) conditions at each intersection.

Figure 3-6
Future 2027 No Action Alternative AM Peak-Hour Conditions



Note: Each circle shows the general directional flow and volume of traffic at each corresponding numbered intersection. Arrows do not represent individual traffic lanes. Letters indicate the average Level of Service (congestion) conditions at each intersection.

Figure 3-7
Future 2027 Build Alternatives AM Peak-Hour Conditions

because the flow of traffic would be controlled by the traffic signals at intersections to the north and south of the bridge, i.e., 16th Avenue S./East Marginal Way S., and 14th Avenue S./S. Cloverdale Street.

Shifts in traffic patterns from potential closure of the bridge could substantially increase or decrease congestion levels, depending on the specific intersection or roadway in question. This would be especially true for 14th Avenue S. immediately south of the bridge (decrease in congestion) and critical roadways providing access to the Boeing manufacturing divisions. The analysis results indicate that heavy congestion would occur in the future with or without the bridge because congestion is more dependent on the combination of background traffic conditions and limited carrying capacity within the regional transportation network.

Detailed analysis of intersections was not performed for the High-Level Fixed-Span Bridge Alternative because of expected similarities between this alternative and the other Replacement Bridge Alternatives. Year 2027 traffic volumes for the High-Level Fixed-Span Bridge Alternative indicate that traffic using S. Cloverdale Street would shift to S. Trenton Street and 12th Avenue S., the new primary access route to and from the bridge and SR-99. Congestion would occur at the 14th Avenue S./S. Trenton Street intersection and would be similar to congestion at the 14th Avenue S./S. Cloverdale Street intersection for the Bascule Bridge and Mid-Level Fixed-Span Bridge alternatives.

Parking

Anticipated 2027 parking impacts along 14th Avenue S. in South Park would depend on the bridge configuration of the selected alternative. Parking impacts would range from minor (maximum of three to four total parking spaces eliminated) to substantial (more than 40 parking spaces eliminated). On-street parking impacts for the No Action, Rehabilitation, and Bascule Bridge alternatives would be modest due to the absence of major changes to 14th Avenue S. north of S. Cloverdale Street. The lane configurations on 14th Avenue S. would not change despite major design differences in the bridge structure or removal of the bridge. Therefore, minor parking loss would occur as a result of potential modifications to lane striping (maximum of three to four parking spaces).

For the Mid-Level Bridge Alternative, required property acquisitions north of S. Cloverdale Street would result in a loss of approximately 10 parking spaces (includes both sides of 14th Avenue S.) between S. Sullivan Street and S. Cloverdale Street. And due to vertical geometric modifications near S. Cloverdale Street on 14th Avenue S., an additional three to four spaces may be lost between S. Cloverdale Street and S. Donovan Street.

Impacts under the High-Level Fixed-Span Bridge Alternative would be greater because the bridge touchdown point would be at the 14th Avenue S./S. Trenton Street intersection. Due to more extensive property acquisitions for this alternative, approximately 45 to 50 parking spaces (both sides of 14th Avenue S.),

the equivalent of approximately 450 lineal feet south of S. Cloverdale Street, would be eliminated. Most of these spaces would be those located between S. Cloverdale Street and S. Trenton Street. An additional 10 spaces could also be lost between S. Cloverdale Street and S. Sullivan Street.

For all of the Build Alternatives, current parking restrictions would be retained during peak-traffic periods (i.e., PM peak hour—from 3 p.m. to 6 p.m.). However, these restrictions would likely be expanded to include the AM off-peak northbound direction. Expanded parking restrictions would result in removal of southbound parking along 14th Avenue S. during the AM peak period, eliminating three to four blocks of parking on the east side of 14th Avenue S. between S. Cloverdale Street and S. Concord Street (approximately 600 to 800 lineal feet). Removal of these AM peak-period parking spaces would have a minor effect due to the start time for many businesses. However, overall business-operating hours could be affected, resulting in a potential loss of patronage for some businesses. For additional discussion of parking impacts on businesses, see Section 3.5 Economics.

Freight Movement (Trucks and Trains)

For the No Action Alternative, removal of the bridge would require permanent re-routing of truck traffic for access to and from destinations on either side of the bridge. Impacts of this rerouting would particularly affect the First Avenue S./East Marginal Way S. and East Marginal Way S./S. Boeing Access Road intersections. Since most truck traffic uses 14th Avenue S. as a bypass route to other major arterial routes in the vicinity, travel routes would be altered and would be longer in length and duration.

Freight truck routes would not be substantially affected by the Rehabilitation or the Bascule Bridge alternatives since a crossing over the Duwamish Waterway would remain in essentially its same location. Freight trucks could continue to use 14th Avenue S. to deliver or pick up goods from businesses on 14th Avenue S. and/or could continue to use 14th Avenue S. as a bypass route.

The Mid-Level Fixed-Span Bridge Alternative has both advantages and disadvantages over the Rehabilitation and Bascule Bridge alternatives regarding freight traffic. The alignment of the alternative would be essentially in its same location. Traffic would have use of an uninterrupted crossing compared to the openings and closings of the Rehabilitation and Bascule Bridge alternatives. The grade of the bridge, however, would be much steeper than either the Rehabilitation or Bascule Bridge alternative.

Freight access would be substantially affected for the High-Level Fixed-Span Bridge Alternative. Trucks would have an uninterrupted crossing of the Duwamish Waterway as there would be no bridge openings like the two bascule bridge alternatives. Due to the new bridge touchdown point at S. Trenton Street, trucks would need to travel a longer route along S. Trenton Street and 12th

Avenue S. to access local businesses off of S. Cloverdale Street. This would increase truck-related travel times. The long, steep grade (slightly greater than 8 percent) associated with the High-Level Fixed-Span Bridge Alternative would affect climbing speeds for trucks in both directions and could slow traffic. Compared to the other Replacement Alternatives, this alternative bypass route would not be as practical for freight trucks.

No impacts would be expected to the movement of freight on the Union Pacific Railroad tracks. Conceptual designs of the proposed project alternatives would not require modification of the existing railroad tracks.

Traffic volume increases for the Build Alternatives would cause increases in traffic delay. Traffic volumes on 16th Avenue S., however, would be considerably reduced under the No Action Alternative due to removal of the bridge and the elimination of north-south through trips. As such, traffic delays would be less under this alternative compared to the Build Alternatives.

Transit

For the No Action Alternative, transit service for the existing Routes 60, 131, and 134 would be eliminated due to removal of the bridge. Transit users would need to take alternative routes, such as routes crossing the Duwamish Waterway using the First Avenue S. Bridge. These changes would increase travel time and make transit use more circuitous for patrons. Based on discussions with King County Metro staff, it would be impractical to provide a direct transit route between Georgetown and South Park.

Impacts to bus service for the Rehabilitation, Bascule Bridge, and Mid-Level Fixed-Span Bridge alternatives would be minor since no re-routing would be required. However, for the Mid-Level Fixed-Span Bridge Alternative, the bus stops nearest the bridge structure (at south end of the bridge near S. Cloverdale Street) may need to be relocated southerly to an adjacent block on 14th Avenue S. or eliminated due to the alignment configuration. Consideration would be given to minimize any additional walk time for transit patrons when specific relocation of these stops is determined. Transit service levels and routes would likely increase and/or expand system-wide by 2027 based on long-range King County Metro service plans.

Impacts to transit service for the High-Level Fixed-Span Bridge Alternative would require rerouting of Routes 60, 131, 132, and 134 based on the location of the bridge touchdown point and lack of direct access to S. Cloverdale Street from 14th Avenue S.

However, under all alternatives, new or modified routes and service levels would likely be implemented to ensure that transit service is maintained in the South Park area.

Pedestrians and Bicyclists

Impacts on pedestrians and bicyclists would depend on whether or not the bridge is removed, as under the No Action Alternative, and on the specific bridge configuration for the various Build Alternatives. Compared to the other alternatives, steeper grades under the Mid-Level Fixed-Span Bridge Alternative and the High-Level Fixed-Span Bridge Alternative would make it more difficult for pedestrians and bicyclists to use the bridge.

Generally, increased numbers of pedestrians and bicyclists would be expected to use the bridge route due to additional urban development and higher land use densities. However, pedestrian and bicycle travel patterns are not expected to substantially change.

Pedestrian and bicycle traffic across the bridge would be eliminated for the No Action Alternative. Travel for both pedestrians and bicyclists would be longer in duration. Bicyclists who depend on the bridge to cross the waterway, such as residents of the South Park community, would be forced to use less convenient alternative routes, such as the First Avenue S. Bridge. Such routes, however, may not be reasonable for pedestrians due to the substantial increase in distance.

No adverse impacts are expected for the Rehabilitation or Bascule Bridge alternatives.

For the Mid-Level Fixed-Span Bridge Alternative, access for pedestrians and bicyclists across the bridge would change. This alternative includes the construction of a pedestrian/bicycle ramp from the bridge elevation to ground level at S. Orr Street. This would allow continued access to and from the bridge, but could increase travel time for pedestrians and bicyclists.

Pedestrian and bicyclist use of the High-Level Fixed-Span Bridge Alternative is anticipated to be considerably less than any of the other Build Alternatives. Users could only gain access to the bridge at the 14th Avenue S./S. Trenton Street intersection. No designated non-motorized ramp is proposed. This configuration would increase travel distances and travel time for users and may not be accessible for persons with mobility disabilities. The grade would be slightly greater than 8 percent and would be longer than the other Build Alternatives. This design would require both pedestrians and bicyclists to exert a greater effort to use the bridge to cross the Duwamish Waterway and could reduce the attractiveness of the bridge as a non-motorized route.

An additional discussion of potential impacts on pedestrian and bicyclist use is presented in Section 3.6 Social Elements as these issues relate to community cohesion.

3.2.4 Secondary and Cumulative Impacts

Secondary Impacts

Secondary transportation impacts have been taken into consideration by the computer software models used to analyze future transportation conditions. The impacts related to traffic congestion, delays, signal operations, etc., are incorporated into the analysis through the use of traffic volume forecasts and simulation of future roadway/intersection conditions. The computer simulations indicate the long-term change in traffic flows on roadways in the project vicinity for each project alternative.

These future traffic simulations indicate that the Level of Service on roadways in the project vicinity do not change substantially for the different alternatives because the volume of traffic using the South Park Bridge is not as significant in comparison to volumes using other primary arterials such as East Marginal Way S., SR-99, and SR-509. However, if a bridge crossing is maintained in the future, traffic volumes at the nearby intersections immediately to the north and south of the bridge would be more congested and there would be lower levels of service than if there were no bridge. In contrast, if the bridge was ultimately removed, traffic would use alternative routes and traffic congestion would be higher and the Level of Service lower at the further distant intersections, including S. Boeing Access Road and S. Michigan Street intersections with East Marginal Way S. They would have LOS E and LOS F (capacity or forced) conditions. These secondary and cumulative impacts are described in more detail in Appendix K, *Transportation Technical Report* (Parsons Brinckerhoff 2004g).

Cumulative Impacts

If the construction of any one of the bridge project alternatives coincides with construction activities associated with the Duwamish Waterway sediment cleanup, the Duwamish shoreline restoration, 14th Avenue S. paving improvements, or proposed Seattle drainage improvement projects, then traffic congestion and temporary construction detours could be greater and/or longer in duration.

3.2.5 Mitigation of Impacts

Due to system-wide increases in traffic, congestion levels and vehicle delays at major intersections would increase in the future. The Rehabilitation, Bascule Bridge, and Mid-Level Fixed-Span Bridge alternatives maintain a link across the Duwamish Waterway and would not require extensive mitigation measures. This is because low congestion levels are expected along 14th/16th Avenue S.

Several localized measures, however, could be implemented to improve the overall operational efficiency and mobility in the South Park area for several of the alternatives, especially the High-Level Fixed-Span Bridge Alternative and the No Action Alternative (where the bridge is removed). This effort would be

considered good practice to facilitate effective future operations. The following sections describe proposed mitigation measures.

Signal Optimization and Coordination

Traffic signal phasing and timing for the Build Alternatives and the No Action Alternative should be optimized to accommodate future traffic volumes, trip distribution patterns, and roadway modifications. This would maximize the capacities of the transportation network. The analysis and steps employed to determine appropriate optimization strategies could include simulation and analysis of future traffic operations using specialized software. Signal coordination, especially along 14th Avenue S., is also recommended to maximize traffic flow within and through the South Park community. Coordination of multiple signals would also reduce congestion by maximizing the efficiency of traffic flow on targeted arterial corridors. In particular, coordination between the bridge and all signals along 14th/16th Avenue S. and remote communications to the signal system should be provided.

To better accommodate emergency vehicles in the South Park area, intelligent transportation system (ITS) measures should also be pursued for the signal system. ITS signal measures could include designated pre-emption (priority) for emergency vehicles that extend or switch to a green light for the traffic stream of interest. For example, if northbound traveling emergency vehicles were responding to a fire, the northbound traffic signals on 14th Avenue S. could hold or switch to green until the emergency vehicles have passed through the signal system. Additional hardware, such as radio transponders and advanced computer software would be needed to allow this level of signal control.

Coordination between King County and neighboring jurisdictions (i.e., City of Seattle, City of Tukwila, etc.) would be needed to ensure that signal phasing/timing strategies will accommodate the needs of the various users of the bridge. This coordination would include potential cost-sharing of signal improvements and implementation of appropriate ITS measures for emergency response vehicles.

Turn Lanes at 14th Avenue S./S. Cloverdale Street

For the Rehabilitation, Bascule Bridge, and Mid-Level Fixed-Span Bridge alternatives, traffic congestion related to turning movement volumes at the 14th Avenue S./S. Cloverdale Street intersection is expected to increase noticeably by 2027. Therefore, the current permissive phasing patterns and approach capacities for northbound and southbound traffic may not be adequate. To minimize this traffic congestion, northbound and southbound turning lanes are recommended at the intersection of 14th Avenue S./S. Cloverdale Street for these alternatives. This widening of 14th Avenue S. to accommodate left turn lanes would likely require additional right-of-way and property acquisition and would involve coordination between King County and neighboring jurisdictions such as the City of Seattle and City of Tukwila in terms of both operational issues and cost-sharing.

Parking Restrictions During Peak-Hour Periods

To maintain reasonable long-term capacity along 14th Avenue S. for the Rehabilitation, Bascule Bridge, and Mid-Level Fixed-Span Bridge alternatives, a prohibition on southbound on-street parking during the AM peak period is recommended. This loss of parking would likely be modest in comparison to the total parking space inventory on side streets and along 14th Avenue S. However, due to the generally perceived shortage of on-street parking in the commercial district, however, this restriction may not be acceptable to the community (see Section 3.5 Economics and public comments reported in Chapter 4 Public and Agency Coordination).

Turn Lanes at 14th Avenue S./S. Trenton Street

The High-Level Fixed-Span Bridge Alternative touchdown point would be relocated to the 14th Avenue S./S. Trenton Street intersection. Therefore, S. Trenton Street and 12th Avenue S. would become the primary access route through the community. This would substantially increase turning movements on 14th Avenue S. at S. Trenton Street, especially in the northbound direction. This would likely require designated left-turn storage lanes on 14th Avenue S. at S. Trenton Street (creating a 5-lane cross-section on 14th Avenue S. at S. Trenton Street). These turn lanes would reduce 14th Avenue S. congestion and would allow separation of left-turning traffic from the north-south through-traffic streams. In addition, future roadway widening (accommodated within the existing right of way) would likely be needed on 14th Avenue S. near S. Trenton Street to allow for lane re-striping changes and implementation of the turning lanes.

Construction Mitigation

Mitigation of construction impacts is critical to ensure that reasonable levels of traffic flow are maintained even during major construction phases. For the majority of alternatives (i.e., the No Action, Bascule Bridge, Mid-Level Fixed-Span Bridge, and Rehabilitation Bridge alternatives), a number of traffic mitigation measures would be implemented to allow some degree of local access and circulation. These measures would be expanded slightly for the High-Level Fixed-Span Bridge Alternative due to the more extensive area affected during the construction phase. Because the start of construction for the No Action Alternative begins with permanent closure of the bridge, the focus of the construction mitigation measures for this alternative would need to address long-term impacts of a permanent traffic re-route.

Mitigation related to construction activity would likely include appropriate signage to provide clear warning of construction activity, the estimated duration of construction, and potential alternative (detour) routes. In addition, modified lane striping and/or channeling would be needed to effectively direct drivers around the congestion zone(s), especially along 14th Avenue S. and S. Cloverdale Street. Changes to the signal timings could be implemented as a primary measure

to adjust cycle lengths and green time phasing for anticipated changes in traffic volumes/patterns (tailored specifically to the construction period).

Additional lane restrictions may be needed during the construction period. Lanes may be narrowed or closed temporarily to accommodate construction vehicles. This would further reduce roadway capacity. Additional restrictions to on-street parking during commute peak periods may also be needed to accommodate traffic volumes and increase travel times through the South Park community and across the bridge.

Local access to businesses on 14th Avenue S. should be maintained by providing alternative driveway access or back-door access via east-west side streets or alleyways. Signs indicating that businesses are open during construction would also be needed to inform patrons and through-traffic. Appropriate channelization on 14th Avenue S. should be given to allow turns off of 14th Avenue S., where safe turning-movement conditions can be provided. Walkways for pedestrians should be clearly marked for general travel as well as access to community businesses. When construction activities prohibit the use of on-street parking, alternative parking facilities should be considered, including off-street parking.

Re-routing of transit vehicles and relocation of stops would also be incorporated to avoid the construction zone(s), but still provide reasonable walking distances to/from destinations in the South Park area. King County Road Services Division would need to coordinate with King County Metro well in advance of the start of construction to ensure implementation of an appropriate plan. Alternative pedestrian/bicyclist routes should be identified and posted (via signs) to indicate which roadways are to be used during construction and to minimize conflicts between construction vehicles and pedestrians/bicyclists.

Long-Term Bridge Closure Mitigation

The No Action Alternative substantially changes the character of the street system in the South Park community due to a permanent bridge closure. Impacts to local access, bus service, and traffic circulation would be unavoidable, but mitigation measures could be implemented to offset the long-term effects of a bridge closure. With regard to business access, possibly the most critical mitigation measure would be signage. These signs could give notice to patrons on alternative routes to and from a local business. As discussed previously, bus service in the South Park area would require modifications of the current routes to ensure that suitable service levels are maintained. This effort would involve close coordination with King County Metro planners to maximum the efficiency of the future routes and the frequency and location of stops. Mitigation to minimize impacts on local vehicular circulation would primarily consist of extensive signage and public education to inform drivers of which routes are the most efficient for a given destination.

3.3 Relocations

This section describes displacement and relocation issues pertaining to the proposed project. The first part describes existing land uses and character. The second part describes the anticipated property acquisition that would be required for each of the project alternatives. This acquisition or purchase of land would be necessary for right of way for the new bridge structure or for construction staging. Right of way acquisition would displace buildings with commercial businesses as well as single-family and apartment dwellings. Permanent jobs and residents would also be displaced. The proposed mitigation for displacement and relocation impacts is in compliance with federal and state laws that require property and business owners to be compensated at fair market value. For additional, more detailed information, see Appendix L, *Relocations Technical Report* (Parsons Brinckerhoff 2004e).

3.3.1 Affected Environment

Current adjacent land uses are industrial north of the South Park Bridge to East Marginal Way S. Adjacent land uses south of the bridge include a mixture of commercial, retail, and industrial. Residential uses are prevalent to the east and west beyond the businesses along 14th Avenue S. In addition, many of the building structures located south of the bridge are close to the existing sidewalk and have both front door and driveway access from 14th Avenue S. On-street parking is also present along certain sections of 14th Avenue S. Boeing land uses immediately west of 16th Avenue S. are a parking lot. Boeing office and manufacturing buildings are east of the roadway.

These property characteristics define potential issues related to relocation and displacement associated with property acquisition. The South Park community is generally located in an industrial area south of Seattle. There are numerous heavy commercial, wholesale distribution, and industrial properties located in relative close proximity to the South Park community. The vacancy rate for industrial land in the south Seattle area was approximately 5 percent in 2001 and the amount of occupied space declined by 31,015 square feet in the first quarter of 2002 (Trammel Crow 2002). If industrial and/or heavy commercial land uses were to be displaced, it is anticipated that other appropriate property located within close proximity to current locations could be acquired.

A July 2004 online search for local commercial and business property listings did not identify any properties in the South Park area. The commercial/industrial market, however, reflects the economic slowdown in the greater Seattle area. The office vacancy rate in the Southend area, which includes South Seattle, was approximately 21 percent at the end of 2003, and the industrial vacancy rate was about 5 percent (EDC 2004). The overall office vacancy rate dropped in the first quarter of 2004, which may indicate that the office market is improving (Colliers 2004). While this information does not present specific information for the South

Park area, generally, vacancy rates suggest that properties may be available in the broader project area. However, nearby opportunities for business and commercial property relocation may be harder to find.

Presently, retail commercial properties in the South Park community are located almost exclusively along 14th Avenue S. The majority of existing businesses are minority owned and/or comprised of predominantly minority employees. A number of the businesses provide services for members of the ethnic groups residing in the South Park community, particularly Hispanics. However, other members of the community benefit from these services being located within the residential neighborhood. Business characteristics are discussed in more detail in Section 3.5 Economics.

Housing growth in the neighborhood has not been substantial in recent years. There were 59 new housing units added to the South Park neighborhood between 1994 and 2001, which represents approximately 17 percent of the neighborhood's 20-year growth target (Seattle 2002a). A review of assessor's records for single-family residences in the project area indicates that the average assessed value of homes was approximately $125,000 in 2002 (King County 2002a). According to Windermere Real Estate Company, the median house in the Georgetown/South Park area is approximately 77 years old with 1,056 square feet, and is therefore "older and smaller than many Seattle-area homes" (Seattle PI 2002a and Seattle PI 2002b). Considering the median-priced single family home in King County was $280,000 in 2002, the cost of housing in the South Park community has been among the most affordable in the region (King County 2002b).

As indicated above, the average 2002 assessed value of single family homes in the project area is approximately $125,000. A review of several recent (July 2004) on-line real estate listings in the project area indicates that finding single-family replacement homes in a similar price range continues to be difficult. Listings in the South Park area were reviewed in the market range of $125,000 to $200,000. This search identified 24 listings for homes ranging in price from $119,950 to $200,000. Most of these listings were in the upper price range, with an average value of approximately $175,100 (Windermere 2004). Thus, for some residents, single-family homes at approximately the same price as their current residences may not be readily available in the immediate project area.

Generally, rental properties are more available, although prices vary widely. In the first part of 2004, the vacancy rate in King County was over 7 percent (Cain and Scott 2004). Real estate listings in the South Park area included more apartment units than single family homes for rent. Rates ranged from $500 to $1,500 per month and up. The average apartment rental price was approximately $625 per month (Rental Association of Puget Sound 2004). Depending on the number of bedrooms required, and other specialized needs, rental properties (apartments or single-family homes) may be more plentiful for potential displaced residents.

3.3.2 Environmental Impacts

Table 3-2 summarizes the parcel acquisition, displacements, and relocations associated with each of the project alternatives. The following sections briefly describe these impacts for each of the alternatives. Table 3-3 and Figure 3-8 provide a detailed list, by alternative, of the parcels that would be acquired.

The construction of the project alternatives proposed for the South Park Bridge Project would require the acquisition or purchase of additional land. This land would be needed for permanent right of way as well as temporary use as a construction staging area. The acquisition of land could include only the land or the land and part or all of the building(s) on the property. For each alternative, some properties would be fully acquired. In such cases, the "sliver" of land required for bridge and/or roadway construction would affect the building because most 14th Avenue S. buildings abut the sidewalk. For others, the needed right of way would only require acquisition of a portion of the property, primarily just land. This is called a partial acquisition. Review of the existing lot sizes for all parcels that would be fully acquired shows that these lots could be redeveloped under existing zoning as the amount of land required would not likely reduce the parcel size below required minimum lot sizes.

No Action Alternative

There would be no property acquisitions or displacements for the No Action Alternative. This alternative would not require acquisition of property to conduct the demolition work. A temporary construction staging area would be established on existing public right of way.

Rehabilitation Alternative

The Rehabilitation Alternative would require acquisition of additional property. No additional land would be required for widening the structure, but land would be required to allow the construction equipment to get close to the existing bridge structure and to establish a temporary construction staging area. After construction, this land could be redeveloped consistent with existing zoning. The Rehabilitation Alternative would require the acquisition of up to three parcels on the southend of the existing bridge. These parcels include residential and commercial uses located in three buildings. This alternative would result in displacing commercial property used by three businesses and an estimated 16 permanent jobs. None of these businesses are minority and/or Hispanic/Latino owned (Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2005a). One owner-occupied and one rental single-family residence also would be acquired, which would affect an estimated seven persons. Neither of these are minority households.

Table 3-2. Summary Table of Affected Parcels in the South Park Neighborhood

Alternative	Number of Affected Parcels	Total Area	Buildings	Businesses (employees)	Residences (people)
No Action	0	0	0	0	0
Rehabilitation	3	0.67 acres	3	3 (16)	2 (7)
Bascule Bridge	7	2.11 acres	5	5 (29)	2 (7)
Mid-Level Fixed-Span Bridge	14	3.04 acres	13	17 (89)	3+ (10)
High-Level Fixed-Span Bridge	39	7.15 acres	36	26 (124+)	19+ (50)

Note: Table includes total number of parcels potentially affected by property acquisitions. Total area affected is the total size of each parcel located south of the Duwamish Waterway. This is because the buildings on 14th Avenue S. generally come to the edge of the sidewalk, so partial acquisition of only land and no buildings is not likely. The table, however, includes the two large Boeing parcels located north of the existing bridge. Only an estimated partial land acquisition for these parcels is included in this table because the land is currently used as a parking lot. In addition, the total number of employees that could be affected for the High-Level Fixed-Span Bridge Alternative could include approximately 180 employees above the 124 indicated in the table because it is uncertain whether or not these displaced Sea Mar Community Medical Center employees would be displaced or relocated in the South Park area. Overall, the information presented is for comparison purposes only and does not reflect actual acquisition needs.

Source: Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2004b, Parsons Brinckerhoff 2005a.

Bascule Bridge Alternative

The Bascule Bridge Alternative would require acquisition of up to seven parcels, including five south of the existing bridge between Dallas Avenue S. and the Duwamish Waterway and two partial acquisitions north of the existing bridge. A variety of land uses occur on these parcels, including residential, retail, and commercial uses. Both of the Boeing parcels are parking lots for adjacent industrial uses.

Two of the five displaced businesses are minority-owned and a total of at least 21 of the 29 employees were identified as minorities (Parsons Brinckerhoff 2003c, Parsons Brinkerhoff 2005a). Both of the residential displacements that would occur would be the same as in the Rehabilitation Alternative and would affect an estimated seven persons, none of whom are minorities. Review of the existing lot sizes for all parcels that would be fully acquired shows that these lots could be redeveloped under existing zoning as the amount of land required would not likely reduce the parcel size below required minimum lot sizes. Opportunities for replacement property would be similar to those described above.

Table 3-3. Potential Parcel Acquisitions

Map No.	Parcel and Address	Current Use	Parcel Size	No Action	Rehabili-tation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge	Full Parcel Assessed Value (2002)
1.	0895 1239 S. Rose Street	Residential (1 bldg. = 1 SF dwelling & boat storage)	19,500 sq.ft.	None	Full for construction staging	Full for construction staging	Full for construction staging	Full for construction staging	$195,000
2.	0860 1400 S. Thistle Street	Retail (1 bldg. = 1 small manufacture of signs business)	6,400 sq.ft.	None	Full for construction staging	Full for roadway construction	Full for roadway construction	Full for roadway construction	$99,900
3.	0080 1403 S. Thistle Street	Residential/Realty (1 bldg. = 1 SF dwelling & home-occupation real estate business)	3,325 sq.ft.	None	Full for construction staging	Full for roadway construction	Full for roadway construction	Full for roadway construction	$97,000
4.	1045 8456 Dallas Ave S.	Tavern (1 bldg. = 1 restaurant and bar business and boat storage)	29,700 sq.ft.	None	None	Full for construction staging	Full for construction staging	Full for roadway construction and construction staging	$381,100
5.	7340 8457 Dallas Ave S.	Restaurant (1 bldg. = 1 restaurant business)	1,800 sq.ft.	None	None	Full for roadway construction	Full for roadway construction	Full for roadway construction	$54,700
6.	7550 8507 14th Avenue S.	Retail (1 bldg. = 1 convenience store & parking lot)	12,000 sq.ft.	None	None	None	Full due to access change	Full due to access change	$383,900
7.	8688 8500 14th Avenue S.	Restaurant/Retail (1 bldg. = 1 restaurant, 1 wire money store, & 1 dry cleaners)	10,500 sq.ft.	None	None	None	Full due to access change	Full due to access change	$573,100
8.	7567 8515 14th Avenue S.	Restaurant/Residential (1 bldg. = 1 restaurant & 1 apt. upstairs)	2,250 sq.ft.	None	None	None	Full due to access change	Full due to access change	$140,200
9.	7566 8517 14th Avenue S.	Restaurant (1 bldg. = 1 restaurant)	2,625 sq.ft.	None	None	None	Full due to access change	Full due to access change	$164,000

Table 3-3. Potential Parcel Acquisitions (continued)

Map No.	Parcel and Address	Current Use	Parcel Size	No Action	Rehabili-tation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge	Full Parcel Assessed Value (2002)
10.	7565 8525 14th Avenue S.	Retail/Residential (1 bldg. = 1 video store & 1 apt. past uses)	4,125 sq.ft.	None	None	None	Full due to access change	Full due to access change	$186,100
11.	8711 8514 14th Avenue S.	Travel Service (1 bldg. = 1 travel agency business)	3,545 sq.ft.	None	None	None	Full due to access change	Full due to access change	$72,200
12.	8714 8520 14th Avenue S.	Retail (2 bldgs. = 1 hair dresser, 1 repair & sales business, & 1 coffee stand)	5,400 sq.ft.	None	None	None	Full due to access change	Full due to access change	$118,500
13.	7820 / 7821 8601 and 8603 14th Avenue S.[1]	Retail/Residential (1 bldg. = 1 grocery store, 1 bakery in store, & 2 apts. upstairs)	3,295 sq.ft.	None	None	None	None	Full for access change	$184,900
14.	8654 8600 14th Avenue S.	Restaurant (1 bldg. = 1 restaurant)	12,000 sq.ft.	None	None	None	None	Full for roadway construction	$224,600
15.	7810 8611/13 14th Avenue S. (1251 S. Cloverdale Street)	Restaurant/Retail (1 bldg. = 1 restaurant, 1 closed video store, 1 insurance company, & 1 clothes shop)	17,705 sq.ft.	None	None	None	None	Full for access change	$654,400
16.	7841 8615 14th Avenue S.	Vacant Building (1 bldg. = closed nightclub)	3,878 sq.ft.	None	None	None	None	Full for access change	$127,900
17.	7840 8617 14th Avenue S	Tavern (1 bldg. = 1 tavern)	2,122 sq.ft.	None	None	None	None	Full for access change	$79,000
18.	7842 8621 14th Avenue S.	Retail (1 bldg. = 1 sewing business)	6,000 sq.ft.	None	None	None	None	Full for access change	$84,000
19.	8686 8616 14th Avenue S.	Residential (1 bldg. = 4 apts.)	6,000 sq.ft.	None	None	None	None	Full for roadway construction	$154,000

Table 3-3. Potential Parcel Acquisitions (continued)

Map No.	Parcel and Address	Current Use	Parcel Size	No Action	Rehabili-tation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge	Full Parcel Assessed Value (2002)
20.	8683 8620 14th Avenue S.	Vacant Building (1 bldg. = no past use apparent)	6,000 sq.ft.	None	None	None	None	Full for roadway construction	$59,500
21.	8095 8701 14th Avenue S.	Health Clinic (1 bldg. = dental clinic)	6,000 sq.ft.	None	None	None	None	Full for access change	$186,300
22.	8096 8709 14th Avenue S.	Restaurant (1 bldg. = 1 restaurant)	3,000 sq.ft.	None	None	None	None	Full for roadway construction	$252,200
23.	8110 8721 14th Avenue S.	Parking Lot (no building on site)	3,000 sq.ft.	None	None	None	None	Full for roadway construction	$24,000
24.	8115 8721 14th Avenue S.	Wholesale (1 bldg. = 1 wholesale distribution business)	9,000 sq.ft.	None	None	None	None	Full for roadway construction	$301,500
25.	8629 8700 14th Avenue S.	Wholesale (1 bldg. = 1 wholesale distribution business)	23,950 sq.ft.	None	None	None	None	Full for roadway construction	$658,800
26.	8649 8720 14th Avenue S.	Health Clinic (1 bldg. = 1 medical/ dental clinic & pharmacy)	12,000 sq.ft.	None	None	None	None	Full for roadway construction	$791,000
27.	8351 8801 14th Avenue S.	Health Clinic (1 bldg. = 1 medical/ dental clinic)	4,200 sq.ft.	None	None	None	None	Full for roadway construction	$303,000
28.	5935 1057 S. Donovan Street	Residential (1 bldg. = 1 SF dwelling)	6,000 sq.ft.	None	None	None	None	Partial for roadway construction	$42,000
29.	7985 1203 S. Donovan Street	Residential (1 bldg. = 1 SF dwelling)	6,000 sq.ft.	None	None	None	None	Full for roadway construction	$155,000
30.	7995 1207 S. Donovan Street	Residential (1 bldg. = 1 SF dwelling)	6,000 sq.ft.	None	None	None	None	Partial for roadway construction	$42,000

Table 3-3. Potential Parcel Acquisitions (continued)

Map No.	Parcel and Address	Current Use	Parcel Size	No Action	Rehabili-tation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge	Full Parcel Assessed Value (2002)
31.	8230 8718 12th Avenue S.	Residential (1 bldg. = 1 SF dwelling)	12,000 sq.ft.	None	None	None	None	Full for roadway construction	$138,000
32.	8220 1210 S. Trenton Street	Residential (1 bldg. = 1 SF dwelling)	6,000 sq.ft.	None	None	None	None	Full for roadway construction	$149,000
33.	8205 1220 S. Trenton Street	Residential (1 bldg. = 1 SF dwelling)	9,000 sq.ft.	None	None	None	None	Full for roadway construction	$166,000
34.	8195 1226 S. Trenton Street	Residential (1 bldg. = 1 SF dwelling)	6,000 sq.ft.	None	None	None	None	Full for roadway construction	$152,000
35.	8185 1230 S. Trenton Street	Residential (1 bldg.=1 SF dwelling)	6,000 sq.ft.	None	None	None	None	Partial for roadway construction	$42,000
36.	6176 8605 12th Avenue S.	Residential (1 bldg.=1 MF dwelling - duplex)	4,000 sq.ft.	None	None	None	None	Full for roadway construction	$148,000
37.	0005(a)	Boeing Co. Plant 2 (large parcel, several buildings, parking lot)	1,158,109 sq.ft.[2]	None	None	Partial	Partial	Partial for roadway construction	$6,071,000
38.	0005(b)	Boeing Co. Plant 2 (large parcel, several buildings, parking lot)	264,400 sq.ft.[2]	None	None	Partial for roadway construction	Partial for roadway construction	Partial for roadway construction	$1,200,000

Notes: None = Acquisition of land or building(s) is not anticipated.
Full = Full acquisition of the entire parcel is likely required.
Partial = Acquisition of land only is likely required.

[1]Includes one building on two parcels under the same ownership.
[2]Estimated partial acquisition shown for this very large parcel owned by Boeing. Actual acquisition will be determined following final engineering design. Estimates at this time are 29,174 sq. ft. and 2,430 sq. ft.

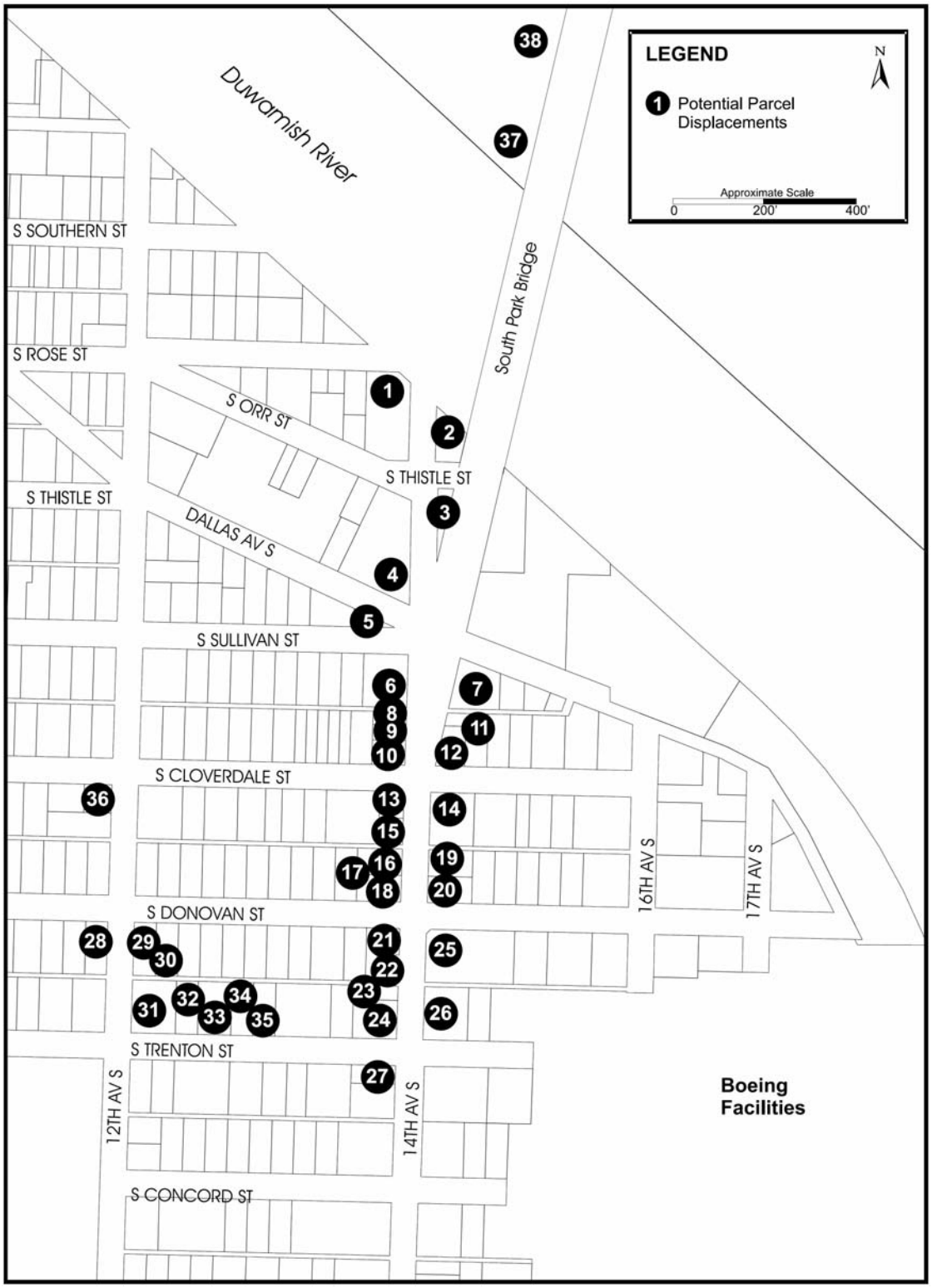


Figure 3-8
Potential Parcels to Be Acquired

Mid-Level Fixed-Span Bridge Alternative

The Mid-Level Fixed-Span Bridge Alternative would require acquisition of up to 14 parcels, 12 south of the existing bridge on both sides of 14th Avenue S. north of S. Cloverdale Street and two additional parcels north of the bridge. Land uses on these parcels include residential, retail, and commercial uses. Partial acquisition of the two industrial parcels on 16th Avenue S. north of the bridge would also occur.

A total of 10 of the 17 displaced businesses are minority-owned and an estimated 76 of the 89 employees were identified as minorities (Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2005a). Under this alternative, the two residential displacements would be the same as for the Bascule Bridge Alternative plus an additional residence and apartment.

Under this alternative, several parcels would be displaced by changes in the existing access. The access to these parcels would be blocked by the bridge approach structure. (See Section 2.5.4 for more details.) Though these parcels would no longer be accessible, it is possible that new access could be provided. It is not known whether these parcels losing access would be redeveloped or not. The redevelopment potential of each parcel would depend on specific access needs of the affected land use and the property owner's desires. Review of the existing lot sizes for all parcels that would be fully acquired shows that these lots could be redeveloped under existing zoning as the amount of land required would not likely reduce the parcel size below required minimum lot sizes. The increased number of potential displacements under this alternative may cause more difficulty for property and business owners to find nearby replacement properties than would occur from the Rehabilitation or Bascule Bridge alternatives.

High-Level Fixed-Span Bridge Alternative

The High-Level Fixed-Span Bridge Alternative would require full acquisition of up to 39 parcels. This includes full acquisition of 34 parcels and partial acquisition of three parcels south of the existing bridge. Partial acquisition of two additional parcels north of the bridge would also be required. Land uses on these parcels include residential, retail, commercial, and industrial.

This alternative requires full acquisition of up to six parcels on S. Trenton Street or 12th Avenue S. to provide revised access to the new bridge via S. Trenton Street. This re-route also would require partial acquisition of three parcels in the same area. Each of the parcels affected by the proposed revisions to 12th Avenue S. currently include single-family residential uses.

Fifteen of the 26 fully or partially displaced businesses would be minority-owned and more than 91 of the more than 124 employees were identified as minorities. These employment statistics do not include the approximately 180 employees of the Sea Mar Community Health Clinic that would be affected by the acquisition

of two of the organization's five buildings in South Park. It is unknown what proportion of these employees are minorities or if they would be displaced or relocated in the South Park area. Under this alternative, an estimated 19 residential displacements involving 50 persons would occur. No information is available on which residences are owner-occupied and which are renter-occupied. For the apartments located above businesses on 14th Avenue S. and the several multifamily residences located in the middle and south portions of the street, it is assumed these dwelling units are renter-occupied.

As with the Mid-Level Fixed-Span Bridge Alternative, parcel acquisition in the commercial district is assumed where land and/or buildings would be needed for right of way and where parcels would lose access primarily on the west side of 14th Avenue S. south of S. Cloverdale Street. (See Section 2.5.5 for more details.) Where parcel displacements are related to changes in access, and where it may be possible to provide new access to some parcels, it is not known whether these parcels could be redeveloped. Similar to the Mid-Level Fixed-Span Bridge Alternative, the redevelopment potential for parcels with changes in access would depend on specific access needs of the affected land use and the property owner's desires. Review of the existing lot sizes for all but perhaps two of the parcels that would be fully acquired shows that these lots could be redeveloped under existing zoning as the amount of land required would not likely reduce the parcel size below required minimum lot sizes. Because of the very high number of potential displacements under this alternative, it would be quite difficult for all property and business owners to find suitable replacement properties in the area.

3.3.3 Secondary and Cumulative Impacts

Secondary Impacts

The proposed Build Alternatives could result in secondary relocation impacts in the project area because of property acquisition. Permanent closure of the bridge, a very long-term temporary closure of the bridge, or substantial disruption of the existing commercial district also could lead to secondary relocation impacts.

The No Action Alternative requires closure and removal of the bridge, which would likely have longer-term impacts on local businesses and residents. Some residents and businesses may choose to relocate to other areas to address transportation conveniences that would be lost with permanent bridge closure. Or, businesses may relocate due to the reduced traffic volumes and therefore reduced business sales. Such decisions to relocate would be secondary impacts attributed to the No Action Alternative.

The Rehabilitation Alternative also would likely result in secondary relocations, not due to permanent bridge closure but because of the length of time (approximately 30 months) the bridge would be closed for rehabilitation. Some local businesses would suffer from adverse economic conditions during this period. If these impacts are severe enough to result in business closures and/or

subsequent relocations, these secondary displacements would be attributable to implementation of the Rehabilitation Alternative.

Historically, the South Park community has struggled to establish itself as a viable business and residential area. The five potential property displacements under the Bascule Bridge Alternative would not cause substantial disruption or additional secondary displacements in the South Park community, particularly in the business district. However, the Mid-Level Fixed-Span Bridge Alternative would have greater potential for adverse secondary impacts on the viability of the business district due to the displacement of the seven additional properties along 14th Avenue S. between S. Sullivan Street and S. Cloverdale Street. These additional property acquisitions would cause more substantial long-term disruption to the existing business district. There would be greater potential for adverse secondary impacts due to other subsequent displacements.

The High-Level Fixed-Span Bridge Alternative, however, would result in additional displacements. The alternative would require many property acquisitions, which comprise a large proportion of the business properties along 14th Avenue S. The displacement of 39 properties, nearly two-thirds of the commercial district, would result in substantial direct effects that long-term would cause additional displacements. The re-routing of traffic from the bridge through the nearby residential neighborhood along S. Trenton Street and 12th Avenue S., as well as numerous changes to the street network, would detour traffic off of 14th Avenue S., which is the heart of the commercial district. Together, these effects would most likely reduce the overall long-term vitality of the commercial district and could also affect the stability of the adjacent residential neighborhood. The result would be additional secondary displacements in the community. Section 3.5 Economics provides more information on potential business impacts of the proposed project.

It is possible that displaced buildings, under any of the Build Alternatives, would be replaced after construction has concluded. In such cases, the impact would be temporary. In fact, some displacements could lead to new opportunities for redevelopment along 14th Avenue S. where existing buildings on parcels acquired for the bridge replacement project may be demolished. Such redevelopment would largely depend on new access and other improvements. Where new development occurs, it could be a catalyst for community revitalization.

Conversely, if acquired properties where buildings are demolished are not redeveloped, the project alternatives would have added to difficulties the community has historically faced in developing an attractive business and residential environment. These impacts would be greatest under the High-Level Fixed-Span Bridge Alternative where the largest number of potential displacements would occur.

Cumulative Impacts

No significant future development of either residential or commercial projects has been identified for the South Park community (Louie 2005).

But, potential displacements associated with the bridge and roadway improvements of the proposed South Park Bridge Project could add to other disruptive impacts resulting from proposed actions nearby. No specific relocation needs, however, have been identified for any of the proposed projects in the project vicinity (see Section 3.1 Introduction). Business improvement opportunities may be diminished by displacements associated with the Build Alternatives, especially in the near-term. This could result in additional turnover because remaining businesses may experience reduced opportunities for revitalization, and the general business climate of the neighborhood may not improve.

Over the long term, changes associated with the South Park Bridge Build Alternatives, in combination with the 14th Avenue S. paving and business improvements and Seattle drainage improvement projects, would benefit the community and attract additional new development. If additional monies could be used to replace access for some displaced buildings or to improve pedestrian access and/or provide parking where displacements have occurred, fewer overall relocations may occur and more stability for existing businesses may be provided.

3.3.4 Mitigation Measures

The proposed project would be designed to minimize the number of parcel acquisitions and relocations for the project alternatives. Where parcel acquisitions cannot be avoided, compensation would be provided at fair market value in compliance with the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended [42 USC 4601 et seq. and 49 CFR Part 24], and the Washington Relocation Assistance-Real Property Acquisition Policy Act of 1971, as amended [RCW 8.26 and WAC 468-100]. These regulations provide for relocation services for all property and business owners as well as residents without discrimination. Relocation assistance would be provided for all residences and businesses, including help in locating suitable replacement housing and business sites. Under state and federal laws, no resident is required to move unless comparable residential replacement property is available within that person's financial means.

Comparable replacement housing must be decent, safe, and sanitary; it should be functionally similar to the present dwelling. Decent, safe, and sanitary housing means that a dwelling must meet all of the minimum requirements established by state regulations, and it must conform to applicable housing and occupancy codes. Replacement dwellings should have the following attributes:

- Be adequate in size to accommodate the displaced persons
- Have a similar number of rooms and living space
- Be located in an area not subject to unreasonable adverse environmental conditions
- Generally, be no less desirable than the present dwelling with respect to public utilities and commercial and public facilities
- Be located on a site that is of a suitable size for the dwelling unit with normal site improvements
- Be currently available to the affected property owner and within his/her financial means
- Provide reasonable access to the displaced person's place of employment

If replacement housing is not available within a resident's financial ability to afford, alternative solutions, generally referred to as "housing of last resort," may be used. Solutions could include:

- Purchase of housing for displaced individuals and the subsequent renting or selling of the house to those individuals at a price within their financial capabilities
- Renovation of existing housing
- Provision of financing for homeowner-occupants with low incomes and/or poor credit histories who have occupied their homes for at least 180 days
- Partnerships with public or private agencies that provide housing for low-income individuals

Relocation assistance would be available to both residents and business owners. Relocation services would be provided by qualified personnel employed by King County and may include the following assistance:

- Determination of any special needs and requirements
- Explanation of relocation benefits
- Provision of individual assistance
- Provision of transportation, if necessary
- Assurance of the availability of comparable property in advance of displacement
- Provision of referral to comparable properties
- Provision of the amount of the maximum replacement housing entitlement in writing 90 days (or more) before the required vacate date
- Inspection of houses for decent, safe, and sanitary conditions

- Information on other federal, state, and local programs offering assistance to displacees
- Provision of counseling to minimize hardships associated with relocations

King County would work closely with affected business owners to minimize the level of disruption that may be caused by the need to relocate. The County would make every effort to assist business owners in finding a suitable replacement site, giving special attention to local opportunities within the South Park area. Where businesses must relocate, the County would seek to ensure that moves are made in a timely manner that would reduce overall expenses, inconveniences, and the amount of time a business must be closed during the move. The County does not, however, have programs available for potential displaced property owners beyond the measures provided by the federal and state regulations.

3.4 Land Use

Based on the anticipated property acquisitions required for each of the project alternatives, certain types of land uses in the South Park community would be displaced (see Section 3.3 Relocations). This section describes the existing land uses in the project area and the local government zoning and comprehensive plan land use policies that regulate future land development in the project corridor. The displacement of land uses would result in different levels of disruption to the community based on the severity of the impacts. Some disruptions may not be directly related to property acquisition for the project but may occur based on the independent decision-making of property and business owners in the community. All of these types of land use impacts are described in this section. For additional, more detailed information, see Appendix M, *Land Use Technical Report* (Parsons Brinckerhoff 2004c).

3.4.1 Affected Environment

The South Park Bridge project area is generally located in the Duwamish industrial area south of downtown Seattle. The bridge actually lies at the juncture of three local government jurisdictional boundaries. The north end of the bridge is located in the City of Tukwila and the south end of the bridge is located in unincorporated King County. Land to both the north and south of the bridge is located within the boundaries of the City of Seattle.

Existing land uses are consistent with local government zoning and comprehensive plans and policies. Existing land uses are industrial, wholesale distribution, retail commercial, and both single-family and multi-family residential. Land use patterns beyond the immediate project area include similar uses with residential uses south of the Duwamish Waterway and industrial/heavy commercial uses to the north. A combination of residential and heavy commercial uses is found immediately adjacent to the Duwamish Waterway on the South Park shore.

Members of the community indicate that business activity along 14th Avenue S. has increased in recent years. In January 2002, the Seattle Post Intelligencer newspaper indicated that the South Park business district “is enjoying a revival” (Seattle PI 2002a) and again in July 2002 stated that “...After hard times, South Park is on the upswing with a new hair salon, espresso stand, money-transfer store and a restaurant opening in the past year” (Seattle PI 2002b). That same article indicated that the future of the bridge “will shape the fate of South Park’s business district.”

Zoning designations of the project area by the three local government jurisdictions include Industrial and Manufacturing Industrial zones north of the bridge and General Industrial, Neighborhood Commercial, Multi-Family, Industrial, and Regional Business zones on the south. Figure 3-9 shows the zoning designations of land in the project area.

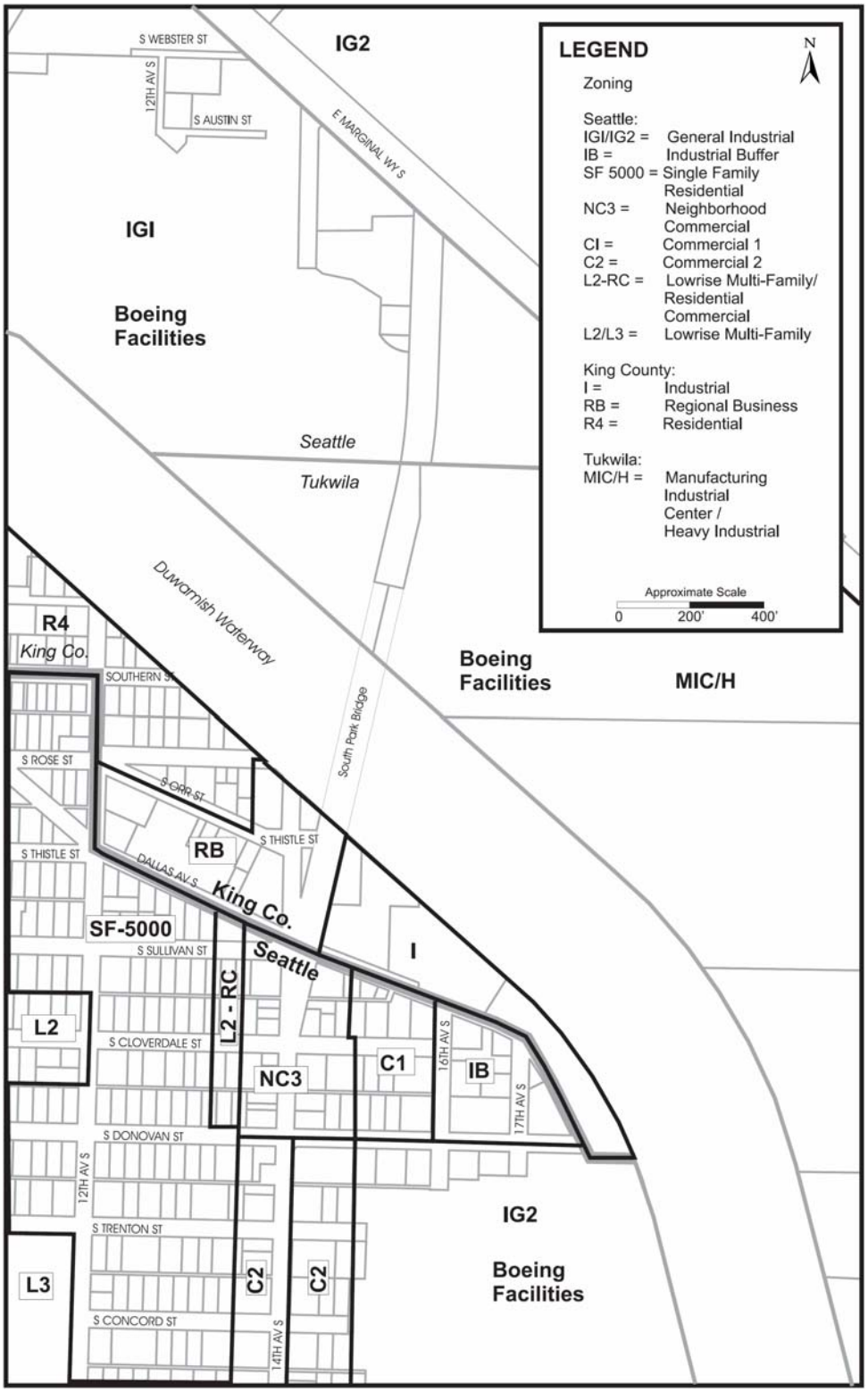


Figure 3-9
Existing Land Use Zoning

Each of the local governments also has land use plans and policies that apply to the project area. The Washington *Growth Management Act* (Washington 1990) and the Puget Sound Regional Council (PSRC) regional transportation plan provide broad goals for coordinating land use and transportation facilities. The Seattle, Tukwila, and King County comprehensive plans and neighborhood plans provide additional direction at the local level. Figure 3-10 shows the local government comprehensive plan land use designations for the South Park community.

The proposed Build Alternatives would be consistent with regional and local land use plans and policies that call for improvements to transportation facilities as well as enhanced travel conditions for the movement of goods and services, commute traffic, and general vehicle trips. The proposed project alternatives would provide some, but not complete, agreement with these plans and policies linking transportation and land use provisions, as well as plans designating the neighborhood as an urban residential village. Some changes in land use that could result from the Build Alternatives would not agree with policies in these plans, which are intended to preserve residential and commercial land uses in the local neighborhood. Moreover, the No Action Alternative would not be consistent with these plans because removal of the existing bridge would diminish local travel opportunities. Where the Build Alternatives result in the displacement of businesses, they would not meet goals and policies intended to provide residential and business opportunities within local urban areas

The City of Seattle will be focusing federal grant funds to construct, maintain, and repair affordable housing throughout the city, including the South Park neighborhood (Seattle 2004). Between 2000 and 2020, the PSRC forecasts that only 206 new single-family dwellings and 347 multi-family dwellings for the South Park community (forecast analysis zone 5815—census tracts 109 and 112) (PSRC 2003). No significant residential or commercial development projects have been identified. Potential gentrification of the neighborhood could increase housing prices and the affordability of housing for modest- and low-income persons (Louie 2005). Future development may require rezoning, but such changes will be consistent with the goals and policies in *Seattle's Comprehensive Plan* (Seattle 2001) because Washington's *Growth Management Act* (Washington 1990) requires consistency between land use plans and zoning.

3.4.2 Environmental Impacts

Potential land use impacts would range from relatively minor to more extensive depending on the project alternative. The No Action Alternative would not require any land acquisition and therefore would not immediately be expected to change existing land uses. The proposed Build Alternatives would result in altering existing land uses in the project area by removing residences and businesses in the commercial district and converting land to roadway use.

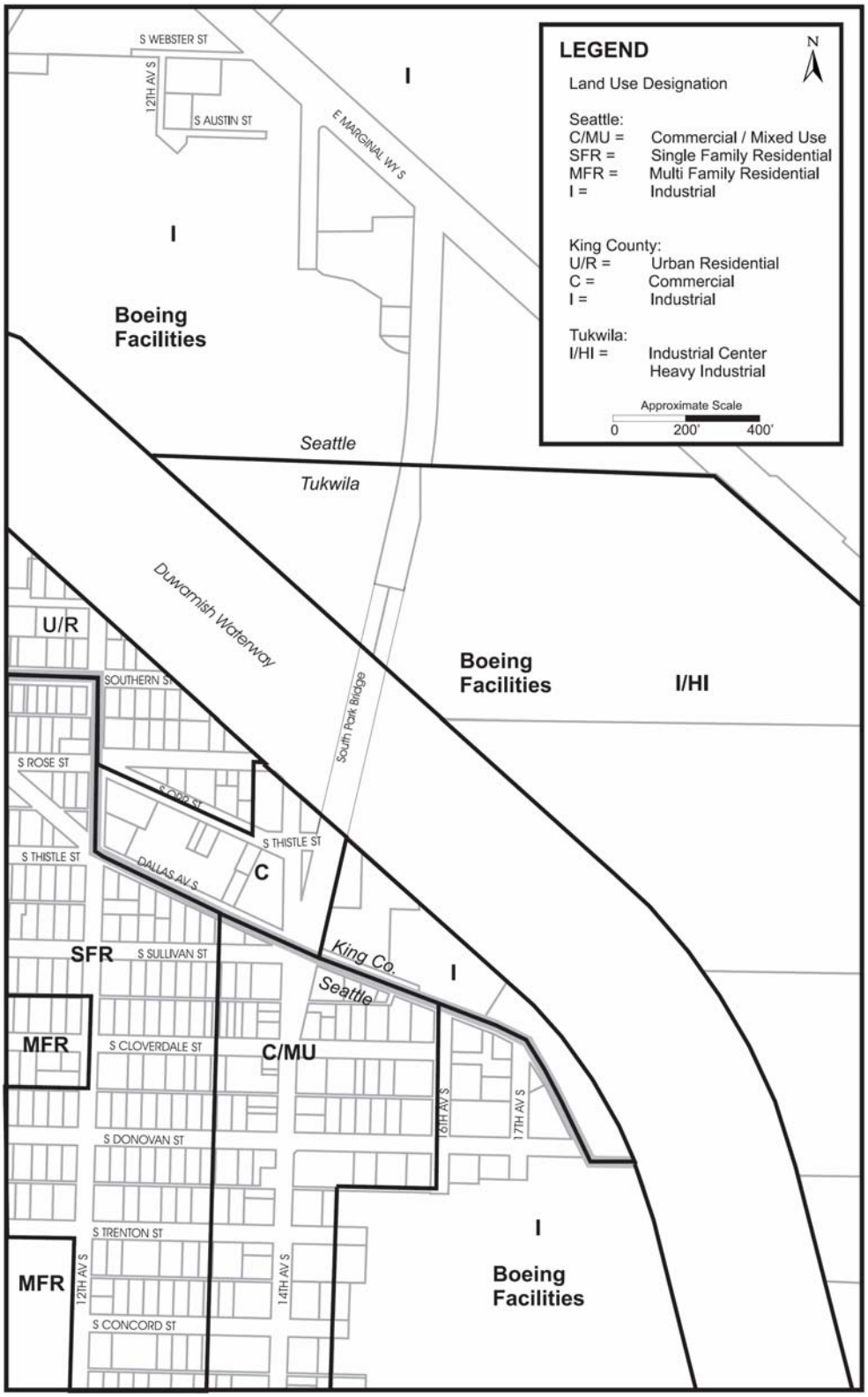


Figure 3-10
Comprehensive Plan Land Use Designations

Common to All Build Alternatives

Due to jurisdictional boundaries in the project study area, the comprehensive plan land use goals and policies of three different local governments are applicable to the proposed project Build Alternatives. Review of the *King County Comprehensive Plan 2000* (King County 2001), *Seattle's Comprehensive Plan* (Seattle 2001), *Greater Duwamish Manufacturing and Industrial Center Plan* (Seattle 1999), *South Park Residential Urban Village Plan* (South Park Planning Committee 1998), and the *Tukwila Comprehensive Plan* (Tukwila 1995) indicates that all of the Build Alternatives are generally consistent with these planning documents, except as noted in Section 3.4.1 Affected Environment, above.

Due to the disruption to existing land uses for the Mid-Level Fixed-Span Bridge and the High-Level Fixed-Span Bridge alternatives, these alternatives are less consistent with the local government land use planning documents. The continued existence of the South Park Bridge under the Build Alternatives maintains a vital link in the regional transportation network and, as such, these alternatives are consistent with the PSRC's *Vision 2020* (PSRC 1990), *Destination 2030* (PSRC 2001), and the Washington *Growth Management Act* (Washington 1990).

No Action Alternative

The No Action Alternative is uniquely different from the Build Alternatives as the alternative assumes the South Park Bridge would eventually be demolished and removed from the site and a replacement bridge would not be constructed. This action constitutes removal of a vital link in the regional transportation network. The loss of this linkage would be expected to affect land uses in the South Park community, the Duwamish industrial area, and communities as far south as Burien. As such, the No Action Alternative would not be consistent with local government (King County, City of Seattle, and City of Tukwila) comprehensive land use plans; nor would this alternative be consistent with *Vision 2020* (PSRC 1990), *Destination 2030* (PSRC 2001), or the Washington *Growth Management Act* (Washington 1990).

The No Action Alternative, however, would not directly affect land uses following demolition of the South Park Bridge. No right of way would be required and no properties would need to be purchased in order to carry out the demolition activities. Adjacent land uses would experience temporary short-term impacts during the demolition of the bridge. The site of the existing bridge would be redeveloped to integrate the dead-end turn-around constructed on 14th/16th Avenue S. on either side of the Duwamish Waterway.

Future land uses under the No Action Alternative would make it more difficult to achieve the planned urban residential village approach for the neighborhood, especially regarding the long-term viability of remaining businesses after bridge closure. The No Action Alternative would not directly change existing land uses; however, some businesses may not survive if the bridge is permanently closed

(see discussion of secondary impacts following). Commercial access to and from Boeing and other nearby commercial/industrial properties would be affected by the potential re-routing of traffic now using the bridge. Travel to the South Park neighborhood from communities to the east, including Beacon Hill, North Rainier, Holly Park, and Rainier Beach, would not be as direct as now provided by the bridge. The South Park neighborhood may experience a transition to a greater mix of residential and neighborhood retail uses, more localized commercial or industrial uses, and less dependence on travel connections currently provided by the bridge.

Rehabilitation Alternative

The Rehabilitation Alternative would not affect existing land uses greatly because construction would occur largely within the existing right of way. The footprint of this alternative would end to the south of S. Sullivan Street and would not affect a large part of the middle and southern project areas south of the Duwamish Waterway. The Rehabilitation Alternative would affect uses immediately adjacent to the bridge and waterway. All of three parcels would be affected on the south, totaling an estimated 0.67 acres. No parcels would be affected north of the Duwamish Waterway. Overall, land use displacements would be minimal. This alternative would displace up to three buildings.

Bascule Bridge Alternative

The Bascule Bridge Alternative would affect the smallest area of existing uses south of the bridge compared to the other Replacement Bridge Alternatives. Although some residential and business losses would occur, this alternative would have fewer impacts than the other Replacement Bridge Alternatives. Under this alternative, the southern project limits would extend to near S. Cloverdale Street. This alternative would result in displacing up to five buildings. It would affect parts of two parcels north of the waterway and five parcels south of the waterway. Total acreage affected would be an estimated 2.11 acres. Because of the small number of parcels affected, this alternative would not be expected to affect adjacent land uses greatly. Where commercial properties are displaced on the south side of the bridge, parcels may redevelop in the future and such redevelopment would be consistent with commercial and industrial zoning. Land uses on parcels owned by Boeing on the north side of the bridge are expected to remain largely unaffected by this alternative as the area displaced is a parking lot.

Mid-Level Fixed-Span Bridge Alternative

The Mid-Level Fixed-Span Bridge Alternative would result in potential land use changes between S. Donovan Street and the Duwamish Waterway. Business and residential displacements would occur. The impacts of these displacements are described in more detail in Appendix L, *Relocations Technical Report* (Parsons Brinckerhoff 2004e). This alternative would displace up to 13 buildings. It would affect parts of two parcels north of the waterway and twelve parcels south of the

waterway. Total acreage affected would be an estimated 3.04 acres. Vacated parcels would create opportunities for redevelopment and the number of displaced buildings could lead to a different land use character in the future. Redevelopment would be consistent with neighborhood commercial zoning under this alternative. The parking lots associated with the industrial uses on parcels owned by Boeing on the north side of the bridge would be expected to remain largely unaffected by this alternative.

High-Level Fixed-Span Bridge Alternative

The High-Level Fixed-Span Bridge Alternative would affect the largest area south of the bridge, resulting in potentially substantial land use changes on 14th Avenue S. between S. Trenton Street and the Duwamish Waterway. Displacement for this alternative also extends along S. Trenton Street and 12th Avenue S. These local residential streets would be improved to provide new access to 14th Avenue S. The alternative would result in the potential displacement of up to 36 buildings. It would affect parts of two parcels north of the waterway and thirty-seven parcels south of the waterway, including seven residences along S. Trenton Street and 12th Avenue S. In total, an estimated 7.15 acres of land would be affected. Because this alternative would affect the largest area among the Replacement Bridge Alternatives, it would provide the greatest opportunity for redevelopment and new land uses in the future. Some properties, however, may not redevelop because of potential access constraints caused by proposed roadway changes under this alternative. New uses would be expected to conform to uses allowed under the existing zoning, including business, neighborhood commercial, and commercial zones. Industrial uses on parcels owned by Boeing on the north side of the bridge would be expected to remain largely unaffected by this alternative. Table 3-2 in Section 3.3 Relocations summarizes land use impacts of the Build Alternatives and the No Action Alternative.

3.4.3 Secondary and Cumulative Impacts

Secondary Impacts

Closure of the existing bridge under the No Action Alternative would be expected to influence future land uses. Some businesses would likely fail and/or other changes would likely occur. Without the bridge, however, this alternative could also lead to the development of more residential uses in the area due to the substantial decrease in traffic disruption on 14th Avenue S.

As a secondary impact, the Build Alternatives would result in varying opportunities for additional redevelopment depending on property acquisitions. The Rehabilitation and Bascule Bridge alternatives would have relatively limited secondary impacts because the area affected under these alternatives would not be substantial. Displacements would total only 3 and 7 parcels, respectively. The Mid-Level Fixed-Span Bridge Alternative would result in more substantial disruption to the community with 14 properties acquired, which would result in

moderate opportunities for redevelopment depending how access could be provided to properties after construction. The High-Level Fixed-Span Bridge Alternative would have the greatest potential for future disruption as well as redevelopment in the project area. This alternative would require acquisition of 39 properties, which includes disruption of most of the existing uses in the South Park commercial district along 14th Avenue S.

As a result, depending on the alternative and its associated displacement of land uses, there would be less land zoned for future development of retail and commercial land uses along 14th Avenue S.

Cumulative Impacts

Long-term, other projects proposed in the project area vicinity combined with one of the proposed Build Alternatives generally would benefit the South Park community. The City of Seattle recent expenditures to provide businesses on 14th Avenue S. with grants to improve their store fronts and planned 14th Avenue S. paving and drainage improvement projects would spotlight the community as a desirable affordable neighborhood. The planned Duwamish Waterway sediment cleanup would also improve public perceptions of the community and could stimulate redevelopment activities in the community. No other significant residential or commercial development projects have been identified for the community (Louie 2005).

The proposed project could also contribute to revitalization of the local neighborhood, which may also affect affordability of local residences. The South Park community currently is one of the most affordable neighborhoods in Seattle, and housing values are increasing. Based on King County assessor records, the average annual value of residential properties in the South Park community has increased approximately 10 percent between 2000 and 2005—faster than for King County (Parsons Brinckerhoff 2005b). The neighborhood may also be undergoing gentrification (Louie 2005). The proposed project, in combination with cleanup of the Duwamish Waterway, may contribute to renewed interest in the South Park community for future development. Combined with ongoing increases in housing prices and potential gentrification of the South Park neighborhood, the proposed project could contribute to conditions where housing may become less affordable for modest- and low-income individuals choosing to live in the South Park community.

3.4.4 Mitigation Measures

Potential mitigation measures for land use impacts would generally not be needed under each of the Build Alternatives. The Bascule Bridge Alternative is generally consistent with local, regional, and state land use planning goals and policies.

The potential disturbance to existing land use for the Mid-Level Fixed-Span Bridge Alternative and the High-Level Fixed-Span Bridge Alternative would not be totally consistent with land use goals and policies. This is especially true for

the High-Level Fixed-Span Bridge Alternative due to acquisition of more than two-thirds of the community's commercial district.

The local jurisdictions would work with the community to determine appropriate redevelopment land uses for parcels acquired for the proposed street and bridge improvements. Future redevelopment should be sensitive to community needs and desires, including continued viability of the existing businesses along 14th Avenue S. Mitigation should consider providing for replacement businesses, new accesses, street landscaping, bus shelters or pullouts, and other measures that could contribute to making the South Park community an attractive and accessible environment for retail, service, and residential uses. Potential uses along the riverfront should consider future public recreation and shoreline access opportunities.

The proposed No Action Alternative, however, is generally not consistent with adopted local government, regional, and state land use goals and policies. This impact would likely require substantial mitigation, which could include (1) working with the community to develop revised land use plans, (2) providing assistance to community property owners and businesses, or (3) using public funds for redevelopment projects in the South Park community.

The cost effectiveness of implementing individual mitigation efforts under each Build Alternative has not been determined. When fewer impacts occur, however, it would likely be more cost effective to provide mitigation measures than when more substantial land use impacts occur and greater mitigation measures would be needed.

3.5 Economics

This section discusses potential economic effects of the proposed project alternatives. Property acquisition, construction detours, noise, and short-term and temporary closures of the bridge would affect some South Park businesses. Following construction, changes in the street network, traffic patterns, on-street parking, and potential permanent rerouting of traffic if the bridge is not rehabilitated or replaced would all affect businesses long-term. Existing conditions, potential economic impacts, proposed mitigation measures, and secondary and cumulative impacts are all discussed below. For additional, more detailed information, see Appendix N, *Economics Technical Report* (Parsons Brinckerhoff 2004b).

3.5.1 Affected Environment

South Park is about four miles south of downtown Seattle. Access into South Park from the Puget Sound Region is available, though limited, via multiple modes of transportation, transit, and navigation, including several Metro bus routes. The local economy is comprised of highway-related, marine-related industrial, retail commercial, and health-care businesses. The South Park business district consists roughly of eight blocks along both sides of 14th Avenue S. from S. Director Street north to the Duwamish Waterway. Several vacant buildings and residential units are interspersed with these businesses. The following sections describe in detail the South Park business district, marine businesses and vessel traffic, and employment.

Plans and Policies

Commercial development in the South Park community is regulated by land use plans, zoning, and business licenses. As discussed in Section 3.4 Land Use, land uses are primarily regulated by the City of Seattle, but the northern two blocks of the commercial district are located in unincorporated King County, which has regulatory jurisdiction over these blocks. In 1998, the community completed a city-sponsored neighborhood plan called the *South Park Residential Urban Village Plan* (South Park Planning Committee 1998). Portions of this subarea plan were subsequently incorporated into the recently updated City of Seattle comprehensive plan. There are no other commercial district plans for the neighborhood and, despite the name of the neighborhood plan, the South Park community is not a city-designated “urban village” as set forth in the City’s new urban village strategy in the *City of Seattle Comprehensive Plan: Towards a Sustainable Seattle* (Seattle 2005). The City of Seattle has used Community Development Block Grant funds for several small economic development projects in the community.

South Park Business District

South Park has a small diverse business district along 14th Avenue S. Based on survey efforts, there are an estimated 35 businesses on 14th Avenue S. within the eight blocks comprising the business district (Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2005a). Businesses within this district include restaurants, taverns, community-oriented retail shops and services, marine services, several auto service and repair businesses, and medical and dental clinics. Substantial proportions of South Park businesses are owned by, operated by, or serve persons who belong to minority populations, particularly Hispanic/Latinos. Fully 15 of the 35 businesses are owned by minorities, many of whom say they are located in South Park because of the large Hispanic/Latino population in the community and the cost of doing business is relatively inexpensive. For example, there are three Spanish-speaking businesses that sell money orders and transfers as well as a Spanish-speaking insurance agency.

The South Park business district provides employment for many nearby residents. More than 200 full- and part-time workers are employed by South Park commercial district businesses, exclusive of the Sea Mar Community Health Center. This medical center is located in five buildings in South Park and provides medical, dental, pharmaceutical, and social services. The health center has over 32,000 active records for patients in the Seattle metropolitan area. Approximately 450 workers are employed by the Sea Mar Community Health Center in South Park.

Table 3-4 summarizes key findings of a survey conducted with owners and managers of the businesses during June and July of 2003 (Parsons Brinckerhoff 2003c). Supplemental survey work was again conducted in December 2004 (Parsons Brinckerhoff 2005a). This effort determined local businesses generally fall into three categories:

- Businesses that provide services to Boeing or other local industrial businesses
- Businesses that provide services to South Park residents and the Hispanic/Latino population in the Seattle metropolitan area
- Light industrial and service businesses that have located in South Park because there is access to multiple modes of transportation and affordable real estate costs

The average length of time that businesses have been at their current South Park location is approximately 11 years—the minimum is less than 1 year and the maximum is 56 years. About half of the properties are owned rather than leased.

Table 3-4. Key Findings from the Local Business Survey

Survey Questions	Responses[1]		
Business Location & Real Estate			
	Average	**Min**	**Max**
Number of years business located at current address	11	<1	56
		Owned	**Leased**
Business owns or leases property		17	18
		Yes	**No**
Business on 14th Avenue S. with apartment(s) in building (i.e., upstairs)		5	30
Business with off-street parking		30	5
Business also has operated from a different location		12	23
Business owner has considered moving business		3	32
Business Owner			
		Yes	**No**
Business owner considers self to be of a racial or ethnic minority		21	14
Business Employees			
	Average	**Min**	**Max[2]**
Full-time employees	3[2]	0	13
Part-time employees	2[2]	0	15
Race and ethnicity of employees:		**Total**	**Percent**
White/Caucasian		150	24
African American/Black		45	7
Asian/Hawaiian/Pacific Islanders		76	12
American Indian/Native Alaskan/Eskimo/Aleut		6	1
Latino/Hispanic		320	52
Mixed or Other		22	4
Total		618	100
Business with employees of single race and/or ethnicity:		**Total**	**Percent**
White/Caucasian		9	25
African American/Black		0	0
Asian/Hawaiian/Pacific Islanders		3	9
American Indian/Native Alaskan/Eskimo/Aleut		0	0
Latino/Hispanic		9	26
		Yes	**No**
Business with majority of employees living in South Park		9	16
Business with majority of employees driving to work		24	11
Business Customers			
		Yes	**No**
Business with most customers from the South Park area		17	18
Business with most customers making a special trip		29	6
Business with significant share of customers dropping by		10	25
Business where majority of customers drive to the business		28	3
Business where majority of customers walk to the business		3	18
Business owners consider majority of customers racial or ethnic minority		22	10

Notes:
[1]Total number of surveys completed was 35. Sums may not total due to non-response.
[2]Averages exclude the many employees (400 full-time and 50 part-time) at the several buildings of the Sea Mar Community Health Center in order to no skew the findings.

Source: Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2005a.

The Sea Mar Community Health Center is the largest employer in South Park. The particular mission of this non-profit is to serve the health needs of the Hispanic/Latino and low-income populations in the Seattle metropolitan area. As such, the presence of this health center in South Park draws a large Hispanic/Latino population to the community, both in terms of local residents and those from the Seattle region who travel to South Park for medical services. Several local business owners say many come to South Park to visit the clinic and then stop by local shops to purchase favorite Mexican foods and bakery goods.

The racial and ethnic composition of local business employees and owners reflects the diversity of the South Park community. Of the 35 businesses surveyed, 12 have a workforce completely comprised of minorities; 9 have a workforce completely comprised of White employees; and 0 have a mix of minority and non-minority employees (Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2005a).

In terms of employee commuting patterns, business owners or managers say that the majority of their employees drive to work and live in neighborhoods outside of South Park. These neighborhoods include White Center, Burien, Bothell, Kent, and Beacon Hill.

Most business owners or managers estimate that most of their customers make a special trip to visit their businesses as opposed to stopping while they pass through South Park. For these business owners, the existing bridge is an important asset considering the few roads and bridges providing access into the neighborhood from adjacent neighborhoods. Nearly all businesses have off-street parking. About half of the businesses surveyed suggest that most of their customers come from the South Park area. The restaurants, in particular, have many local customers and considerable patronage from Boeing employees. Approximately two-thirds of the surveyed businesses indicate that a majority of their patrons belong to a minority population.

Local business owners and operators who participated in the survey as well as public meeting attendees have repeatedly expressed concern about potential short- and long-term impacts on South Park businesses that would result from taking no action, rehabilitating, or replacing the South Park Bridge. Specific concerns identified include preserving a cross-river transportation facility, maintaining through-traffic during construction, and avoiding as much property acquisition and business relocation as possible.

Duwamish Waterway Businesses and Vessel Traffic

In addition to the retail and commercial business district, South Park business activities also include mixed light industrial and manufacturing along the Duwamish Waterway. Most of this activity is located along the south shore and west of the South Park Bridge towards the First Avenue S. Bridge.

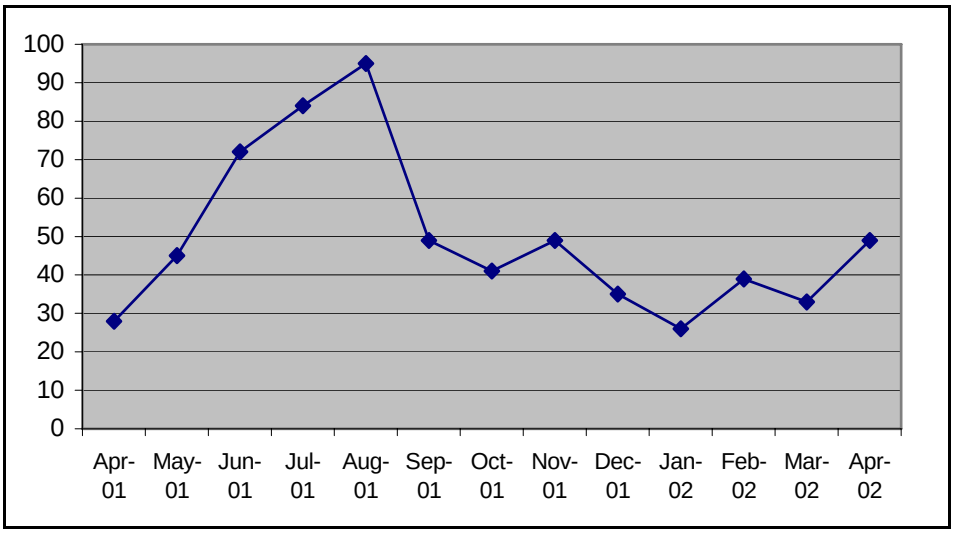
Table 3-5 lists current Seattle area businesses that operate vessels in the Duwamish Waterway near South Park and the types of business activities ongoing.

During the period of April 1, 2001, to April 30, 2002, the number of bridge openings for marine vessel passage ranged from 26 to 95 per month according to King County Daily Bridge Logs (King County 2002d) (see Figure 3-11). Bridge openings are seasonal and occur much more frequently during summer months.

Table 3-5. Local Businesses Using the Duwamish Waterway

Name of Business or Property Owner	Location	Type of Services (2002)
Crowley Marine Services	Provides services to facilities on the Duwamish River, but located elsewhere	No towboat service in last year to Duwamish River
Delta Marine Industries	West shore of Duwamish River; upstream of South Park Bridge	Luxury yacht manufacture and maintenance
Duwamish Yacht Club	West shore of Duwamish River; upstream of South Park Bridge	112 slips for recreational boats (power and sail)
Foss Maritime Company	Provides services to facilities on the Duwamish River, but located elsewhere	No towboat service in last year to Duwamish River
Island Tug & Barge	Provides services to facilities on the Duwamish River, but located elsewhere	Approximately 75 tugboat hauls per year to upstream facilities and hauls of barges and derricks
Manson Construction Company	Provides services to facilities on the Duwamish River, but located elsewhere	Several trips per year to haul derricks to Delta Marine to launch yachts
Monsanto Wharf	East shore of Duwamish River; upstream of South Park Bridge	Slip 6 (not in use)
Muckleshoot Indian Tribe	West shore of Duwamish River at turn-around basin; upstream of South Park Bridge	No marine services
Rick's Master Marine, Inc.	Boat repair and sales	Marine services located adjacent to the South Park Marina
South Park Marina	South shore of Duwamish River; just upstream of South Park Bridge	Moorage for 150 recreational boats
The Boeing Company	North shore of Duwamish River; just upstream of South Park Bridge	6 loading platforms (not in use)
Western Tugboat	Provides services to facilities on the Duwamish River, but located elsewhere	Approximately 6 tugboat hauls per year to upstream facilities and barge hauls for dredging activities

Sources: Crow 2002; Jones 2002; Crowley 2002; Langjahr 2002; Llanos 2002; Manson 2002; Schrewsbury 2002; and Ellefsen 2002.



Source: King County 2002d.

Figure 3-11
South Park Bridge Openings by Month for All Vessels
(April 2001–April 2002)

Employment

Seattle is a significant component of the state's economy. Based on 2000 census data, 22 percent of Seattle residents are employed in education/health/social service industries (see Table 3-6). Other major employment sectors for Seattle residents are professional/scientific/ management/administrative/waste management services (16 percent), retail trade (11 percent), and arts/entertainment/recreation/accommodation/food services (10 percent).

In comparison, the largest sector of employment for residents living in the study area and South Park is manufacturing (19 and 22 percent, respectively). This is due in large part to the presence of Boeing and other industrial/manufacturing facilities in close proximity.

The area north of South Park also reports a high proportion of jobs in manufacturing and industrial sectors. As stated in the *Greater Duwamish Manufacturing and Industrial Center Plan* (Greater Duwamish Planning Committee 1999), there were approximately 60,700 people employed in the Duwamish industrial area. Two-thirds of these jobs were in the heavy and light industrial categories. The next largest industrial sectors were services, retail trade, and construction, representing approximately 30 percent of total jobs. There were also approximately 1,989 employees of government and education agencies, 600 sole proprietors, and 150 employees engaged in agricultural services and/or mining (Greater Duwamish Planning Committee 1999).

Table 3-6. Employment by Industry (Number/Percent of Jobs)

Industry	South Park	Study Area	Seattle
Total Population Employed (16 years and older)	**1,576**	**5,761**	**321,524**
Agriculture; forestry; fishing and hunting; mining	12 0.8%	30 0.5%	1,103 0.3%
Construction	167 10.6%	478 8.3%	12,892 4.0%
Manufacturing	352 22.3%	1,079 18.7%	26,753 8.3%
Wholesale trade	59 3.7%	273 4.7%	10,471 3.3%
Retail trade	127 8.1%	602 10.4%	35,645 11.1%
Transportation and warehousing; utilities	100 6.3%	480 8.3%	13,492 4.2%
Information	26 1.6%	190 3.3%	19,175 6.0%
Finance; insurance; real estate and rental and leasing	55 3.5%	299 5.2%	22,171 6.9%
Professional; scientific; management; administrative; waste management services	214 13.6%	624 10.8%	51,813 16.1%
Educational; health and social services	163 10.3%	656 11.4%	69,507 21.6%
Arts; entertainment; recreation; accommodation and food services	248 15.7%	676 11.7%	31,762 9.9%
Other services (except public administration)	33 2.1%	226 3.9%	15,538 4.8%
Public administration	20 1.3%	148 2.6%	11,202 3.5%
Note: South Park is defined as census tract 112. The study area is defined as census tracts 109, 112, 263, and 264.			

Source: U.S. Census 2000.

Employment forecasts project a continued reliance on manufacturing jobs in the study area; however, this trend is steadily decreasing (PSRC 2001). The proportion of service and retail trade sectors is projected to increase over the next several decades (PSRC 2002).

Employment at local South Park businesses is primarily in the retail trade and food services sectors. These types of businesses employ on average three full-time and two part-time employees (Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2005a). More than 200 workers are employed by businesses located in the South

Park business district along 14th Avenue S. The Sea Mar Community Health Center employs approximately 400 full-time and 50 part-time employees. In addition, Delta Marine Industries located about one mile upstream of the bridge employs an average of 300–350 workers to manufacture luxury yachts for the worldwide market.

3.5.2 Environmental Impacts

The impacts associated with each alternative are described in this section. These impacts are categorized by those that would occur during construction activities and those that would occur over the long-term operation of the bridge alternatives. Long-term impacts are primarily associated with property acquisition and changes in the transportation network, marine vessel navigation, and regional travel patterns.

The need to acquire full or partial parcels of property is directly linked to impacts on South Park businesses, especially those located within the South Park business district fronting on 14th Avenue S. Table 3-2 and Table 3-3 in Section 3.3 Relocations lists the potential property acquisitions as well as the number of operating businesses, vacant buildings, residential structures, and parking lots that would be affected by each of the alternatives. In addition, the assessed real property value of all parcels that would be fully acquired is totaled by alternative.

When South Park businesses are displaced, the associated jobs are also displaced. These jobs would change in location if businesses were relocated or would be lost if businesses were permanently closed. Table 3-7 below shows the estimated number of permanent jobs that would be affected by each alternative. With construction activities, temporary jobs would be created. These jobs are characterized as direct (jobs in the construction highway industry), indirect (jobs in industries that supply materials for highway construction), and induced (jobs in industries that benefit from the spending and investments made by the direct and indirect jobs).

The construction and long-term impacts to the local and regional economy that would be expected to result by alternative are summarized below.

No Action Alternative

For the No Action Alternative, the bridge across the Duwamish Waterway would be demolished and removed. No acquisitions would be needed, so no businesses or jobs would be displaced. The crossing would no longer exist and traffic would need to use other nearby bridges crossing the Duwamish Waterway, including the First Avenue S. Bridge and the Boeing Access Road Bridge. South Park business district activities and associated jobs would likely decrease. Regional transportation costs would increase for some businesses due to more circuitous travel routes. And, without the bridge connection, there may be a decrease in commercial property values in South Park because one less major route would provide access to the area. The impact to residential property values would be

unknown. Less pass-through truck and passenger vehicle traffic through the community could improve livability and therefore increase residential property values. However, the potential loss of nearby commercial activities could detract from some values that residents place on South Park residential property. And furthermore, if residents need to commute north for jobs, then the commuting time could increase due to less direct routes. As a result, they may choose to live elsewhere to maintain commute times.

Table 3-7. Number of Estimated Businesses and Jobs Affected by Alternative

Type of Job	No Action	Rehabili-tation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge
Businesses	0	3	5	17	26
Permanent Jobs Displaced[1]	0	16	29	89	124+[2]
Temporary Jobs Created	284	2,372	2,755	2,143	2,100
Direct	53	445	517	402	394
Indirect	133	1,110	1,289	1,003	983
Induced	98	817	949	738	723

Notes:
[1]Permanent jobs displaced are those arising from property acquisition only.
[2]This estimated number of displaced workers does not include the specific number of workers who would be displaced by acquisition of two of the five buildings occupied by the Sea Mar Community Health Center that would be displaced under the High-Level Fixed-Span Bridge Alternative. It is uncertain if these estimated 180 jobs would be displaced or relocated in the South Park area.

Source for estimate: Keane 1996.

Rehabilitation Alternative

For the Rehabilitation Alternative, there would be effects on South Park businesses during the construction period due to the nearly 30-month-long closure of the bridge. In addition, there would be long-term residual impacts on local businesses, particularly if some businesses would need to relocate or terminate business activities in the wake of not remaining viable during the 30-month bridge closure during construction. This alternative, however, would require the acquisition of three properties and would displace three businesses and an estimated 16 jobs. There would be no long-term changes to marine-related traffic and businesses and minimal changes in location of permanent jobs, property values, and regional business activities.

Bascule Bridge Alternative

During construction of the Bascule Bridge Alternative, there would be minor, short-term temporary impacts to local businesses in the South Park community

due to traffic re-routes. Except for very short periods, the existing bridge would remain operational during the construction period. Similar to the Rehabilitation Alternative, this alternative would require property acquisition. An estimated five businesses and 29 jobs would be displaced. There would be no changes to marine-related traffic and businesses following construction and opening of the new bridge. In addition, there would be minimal changes in location of permanent jobs, property values, and regional business activities.

Mid-Level Fixed-Span Bridge Alternative

The temporary short-term construction impacts for the Mid-Level Fixed-Span Bridge Alternative would be similar to the Bascule Bridge Alternative. The existing bridge would remain operational during construction, except for very short periods. Long-term, however, there would be displacement of a number of businesses and jobs. An estimated 17, more than one-third, of the 14th Avenue S. businesses and associated jobs would be displaced and tax revenues would be reduced. There would be few impacts to most marine-related traffic and businesses.

However, one business, Delta Marine Industries, would be adversely affected. This business manufactures and provides maintenance to luxury yachts. This business would lose the ability to conduct some of its existing business at its current location. The luxury yachts themselves, as well as the derricks needed to launch these boats, would not be able to pass under the new bridge due to the 65-foot vertical navigation constraint. The height limitation of this alternative is less than the minimum 100-foot vertical clearance established by the U.S. Coast Guard which has guided business development and expansion of upstream companies like Delta Marine for many decades.

These two major effects to marine and community businesses could cause substantial changes in the location of current permanent jobs in the South Park area. For remaining businesses, however, there would likely be only minimal changes to property values, tax revenues, and regional business activities.

High-Level Fixed-Span Bridge Alternative

The High-Level Fixed-Span Bridge Alternative would have substantial construction impacts to the South Park community. There would be severe displacement of approximately two-thirds of the 14th Avenue S. businesses (26 businesses) and more than 124 jobs and associated tax revenues. In addition to these impacts, the required property acquisition would displace two of the five buildings in which the Sea Mar Community Health Center. An estimated 180 persons are employed at these locations, but it is uncertain if these jobs would be displaced or relocated in the South Park area considering three buildings comprising the medical center would be unaffected. The duration of the construction period would not be comparatively long, but the actual extent of construction activities south to S. Trenton Street would be disruptive to traffic patterns and would require many temporary detours. Together,

these changes would create substantial changes in location of permanent jobs from the beginning of the construction activities.

Long-term, there would be substantial changes to traffic patterns due to local street network changes that would direct bridge traffic along S. Trenton Street and 12th Avenue S. There would likely be few impacts to marine-related traffic and businesses as the equipment and manufactured yachts could continue to use the waterway with a 100-foot vertical navigation clearance restriction. In South Park, there would be few direct effects to remaining businesses, but the displacement of nearly two-thirds of the businesses in the community business district would be a substantial change. In addition, there could possibly be an increase in transportation costs for regional businesses if regional freight traffic seeks other routes to avoid the higher 8-percent grade on the new bridge.

3.5.3 Secondary and Cumulative Impacts

Secondary Impacts

Each of the project alternatives would have secondary, or indirect, economic impacts. Secondary economic impacts to the South Park business district of the No Action Alternative would be severe. The eventual closure of the South Park Bridge and loss of a cross-river connection would decrease local South Park business viability due to the loss of through traffic from the existing bridge and decreased accessibility of neighborhood businesses to outside clients, employees, and suppliers. Based on the survey of South Park businesses on 14th Avenue S., an estimated 29 percent of the businesses rely on through traffic customers as the majority of their customers (Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2005a). An estimated 51 percent of the businesses claimed that the majority of their customers were not from the South Park community. Only 9 percent said that the majority of their employees were from the community. In addition, the increased distance of travel routes for freight trucks that had been using 14th Avenue S. as a bypass route to their destination would incur increased transportation costs for Greater Duwamish regional businesses.

For the Rehabilitation Alternative, secondary impacts would include loss of additional businesses, jobs, and associated tax revenues because businesses would sustain economic losses during the construction period. Some businesses may also decide to relocate to avoid such effects, but if so, it is unlikely they would return to South Park once the bridge reopens due to the cost to relocate a second time.

Adverse secondary impacts from the Bascule Bridge Alternative would be minor. A total of five businesses and an estimated 29 jobs would be displaced. This is a relatively small proportion of the total number of businesses and jobs in the South Park commercial district. Therefore, these project-related adverse effects would not threaten the long-term viability of the business district. The short period of bridge closure during the construction period would not likely have additional

adverse effects on the community businesses or the commercial district. The replacement bridge would function nearly the same as the existing bridge and there would be only minor changes to the street network.

The loss of businesses displaced for the Mid-Level Fixed-Span Bridge and High-Level Fixed-Span Bridge alternatives would be more substantial and would likely lead to additional losses of local South Park businesses over time. The displacement of some businesses could affect other businesses because patrons historically shopped at both and/or the loss of businesses would reduce the overall market draw of the community commercial district. This would especially be the case in the High-Level Fixed-Span Bridge Alternative, which would result in displacement of nearly two-thirds of existing businesses in the commercial district, more than 124 jobs, plus two of the five buildings (approximately 180 employees) comprising the Sea Mar Community Health Center.

In addition, over time, both marine businesses and barge operators could lose the ability to conduct some future business activities upstream of the South Park Bridge under the High-Level Fixed-Span Bridge Alternative. For barge operators, the average size of barges is continuing to increase in both width and height. Long-term, it may not be possible for barge operators to send the most appropriate barge to conduct activities upstream of the South Park Bridge due to horizontal and/or vertical clearance restriction. For Delta Marine Industries, the company may not be able to manufacture the larger-sized luxury yachts they anticipate will be needed to satisfy future customer demand because the boats could not be launched and pass under the 100-foot fixed-span of the proposed replacement bridge. As such, the High-Level Fixed-Span Bridge Alternative may limit the overall growth of the company at its current site.

Cumulative Impacts

The implementation of any of the alternatives would have cumulative impacts. The construction of one of the project Build Alternatives, especially the Bascule Bridge Alternative, combined with on-going dredging of the Duwamish Waterway and the sediment cleanup, would contribute to improving the Duwamish Waterway for long-term use of the waterway. The South Park Bridge project would contribute to the objectives in the larger-scale Duwamish Waterway sediment cleanup project since it would also involve cleaning up contaminated properties acquired for the construction of the proposed project.

No specific non-project constraints or threats to the economic viability of the local business community have been identified. And, the construction of the proposed bridge project is not anticipated to adversely affect other development in the community. Rather, public economic and redevelopment efforts to support the existing business community are being pursued by the City of Seattle in the South Park community (Seattle 2004). The City of Seattle proposed 14th Avenue S. paving and street lighting improvement and Seattle Public Utilities proposal to

improve the storm drainage system in the area. The combined projects would likely increase property values. Overall, these are beneficial cumulative impacts to the South Park community.

No other road or highway projects are known at this time that would conflict or cause adverse cumulative impacts when implementing any of the alternatives evaluated in the South Park Bridge Project. And no significant residential or commercial development projects are proposed for the community (Louie 2005).

3.5.4 Mitigation Measures

The mitigation measures proposed below are general in nature. Specific mitigation measures will need to be determined as part of final design and prior to construction. These measures should be based on the expected cost effectiveness, specific needs of individual businesses, and resiliency of individual businesses to endure the impacts associated with each alternative.

Mitigation for Construction Impacts

Potential mitigation to reduce adverse economic effects on the extent and number of businesses, jobs, and access during construction activities includes:

- Coordinate with U.S. Coast Guard and King County for navigation passage through the in-water construction activities to mitigate for construction delays and provide public notices to marine users.
- Coordinate the timing of temporary bridge closures to minimize impacts to business activities, especially those related to seasonal or high-sales periods, to the extent construction activities allow.
- Ensure all businesses maintain current or modified access and minimize the duration of modified access to businesses.
- Provide signage, lighting, or other information to indicate that businesses are open.
- Provide public information (e.g., press releases, newsletters) on construction activities and on-going business activities.
- Develop a media campaign to inform public about on-going business activities during construction, access to business, and parking options.
- Consider developing a loan program for business owners to maintain business viability if revenues are lost during construction activities.

- Maintain highly visible and direct access for pedestrians, bicyclists, passenger vehicles, emergency response vehicles and services, and trucks during business hours and during important business seasons.

- Provide standard advance notice if utilities would be disrupted and schedule major utility shut-offs during non-business hours.

- Adhere to construction schedules so that business merchants can plan sales and other retail events around the construction. Unforeseen conditions and other factors may disrupt schedules on short notice and therefore not allow either construction or businesses to plan accordingly.

- Phase construction in each block to allow vehicular and pedestrian access to individual businesses.

- Implement dust and vibration mitigation during business hours.

- Minimize impacts and provide public information during scheduled community events (e.g., Fiesta Patrias) or holiday seasons that local businesses depend on for high sales.

Mitigation for Operational Impacts

Potential mitigation to reduce permanent long-term adverse economic effects on the extent and number of businesses, jobs, and access includes:

- Compensate for right of way acquisition, displacement and relocation of businesses, and loss of property value per the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended [42 USC 4601 et seq. and 49 CFR Part 24], and the Washington Relocation Assistance-Real Property Acquisition Policy Act of 1971, as amended [RCW 8.26 and WAC 468-100].

- Consider temporary relocation of displaced businesses during construction and permanent return to a place in the South Park community after construction.

- Provide off-street parking opportunities to mitigate for the loss of on-street parking.

A caveat regarding mitigation for right of way acquisition, displacement, and relocation of businesses is that most of the businesses surveyed indicated that they would not be able to remain viable upon relocation (Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2005a). Many members of the project Citizen Advisory Group (CAG) agree that substantial business displacements could not be mitigated, such as those needed under the Mid-Level Fixed-Span Bridge and

High-Level Fixed-Span Bridge alternatives. Moreover, many business owners and managers believe that the loss of businesses in the South Park community, especially businesses that provide services to a predominantly Hispanic/Latino clientele, would adversely resonate through South Park as well as the larger Hispanic/Latino community in the Seattle metropolitan area.

3.6 Social Elements

This section of the document provides background information for the project study area on the following topics: the community character, population, demographics, household characteristics, housing, income, community and social services, public services, recreation, pedestrian/bicycle facilities, and transit services. In addition, factors affecting community cohesion and anti-discrimination concerns are discussed. The following sections summarize the existing social environment in the community, the construction and operational impacts of each of the project alternatives, the secondary and cumulative impacts, and recommended mitigation measures. Additional related information regarding public involvement activities and concerns is found in Chapter 4 Public and Agency Coordination. In addition, more detailed analysis of social issues is contained in Appendix O, *Social Elements Technical Report* (Parsons Brinckerhoff 2004f).

3.6.1 Affected Environment

Setting

The South Park community is a somewhat isolated community in Seattle. Figure 3-12 is an aerial photo of the South Park vicinity and clearly depicts the wooded hillsides, highways, industrial land uses, and the Duwamish Waterway that surround the community. These surrounding features tend to isolate the community from adjacent areas, which focuses community interaction internally amongst South Park residents and local businesses. Access into and out of the community is limited; yet, residents are able to find convenience commercial retail and personal services within the South Park community commercial district. In addition, several community and social services are located in the neighborhood (see Figure 3-12).

Located in a major metropolitan city, the South Park community is also very much tied to the larger region. Most residents commute to jobs located outside of the community, many in downtown Seattle and others to cities in south King County. Residents travel to nearby communities to shop at large grocery stores and pharmacies, conduct their personal banking activities, and to make major household purchases.

Community Facilities and Services

There are many community facilities located in the South Park neighborhood. These include a medical and dental clinic, a fire station, an elementary school, a community center, and several parks. Currently, there is no middle school or high school in South Park, but construction of a neighborhood library started in July 2005. As shown in Figure 3-13, the several community parks are located

Figure 3-12
South Park Community Study Area

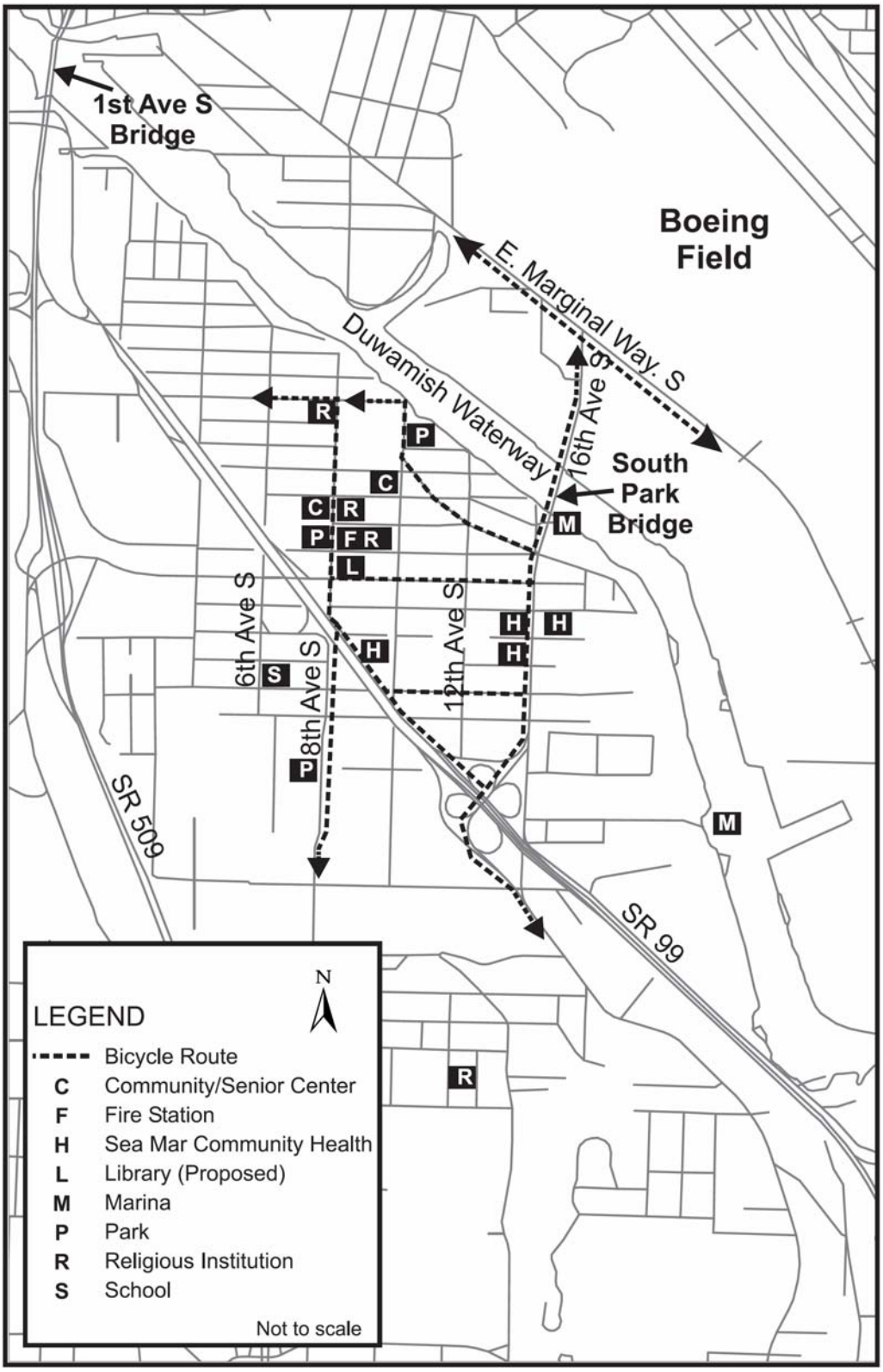


Figure 3-13
Community Facilities in South Park

approximately 0.5 miles or greater from the project corridor and would not be affected by construction or operation of the project alternatives. These amenities and isolation help to create strong cohesion for this self-contained community.

Public Services include police, fire, and emergency medical services. Because the neighborhood is located within the boundaries of both the City of Seattle and unincorporated King County, coordination between service providers is important. Both City of Seattle police and the King County Sheriff's Office respond to emergency situations. Fire Station No. 26 provides primary fire and emergency medical response services to the community, including the small area of unincorporated King County. This fire station (located at 800 S. Cloverdale Street), however, also provides secondary response service to Georgetown, Boeing Field, and Boeing properties located across the bridge, north and east of South Park. Similarly, Fire Station Nos. 11, 27, and 32 in nearby communities provide secondary response service to emergencies in South Park. These secondary fire response services often must use the South Park Bridge.

Neighborhood Character

Existing land uses in the South Park community are mixed. The area is predominantly residential with both single-family and multi-family dwellings. Land uses on either side of 14th Avenue S., between the Duwamish Waterway south to approximately S. Director Street, are a mixture of neighborhood retail and service businesses. Many of these businesses serve the Hispanic/Latino and Asian residents in the community. The business uses typically extend only one parcel off of 14th Avenue S. along the eight-block commercial district. (Additional information regarding the characteristics of the South Park business district is provided in Section 3.5 Economics.) To the east of the southern portion of this commercial district, there is a very large training facility owned by Boeing. In addition, much of the area between 12th Avenue S. and 17th Avenue S. north of Dallas Avenue S. is comprised of light industrial uses. Several of these businesses support the commercial, industrial, as well as recreational uses of the Duwamish Waterway. For additional discussion of general land uses in the area, see Section 3.4 Land Use.

Demographics

Recent statistics published about the South Park community indicate that the community residents are both racially and ethnically diverse. Census tract 112 includes the South Park community and is the primary census tract that encompasses the vast majority of the residential areas surrounding the project corridor (see Figure 3-14). In 2000, the U.S. Census Bureau reported a large percentage of the residents of South Park is of Hispanic/Latino heritage. The population of the South Park community was reported to be 3,717 in 2000 (see Table 3-8). Approximately 56 percent of the population is Persons of Color (all non-White races) and 37 percent is Hispanic/Latino heritage (White and non-White races).

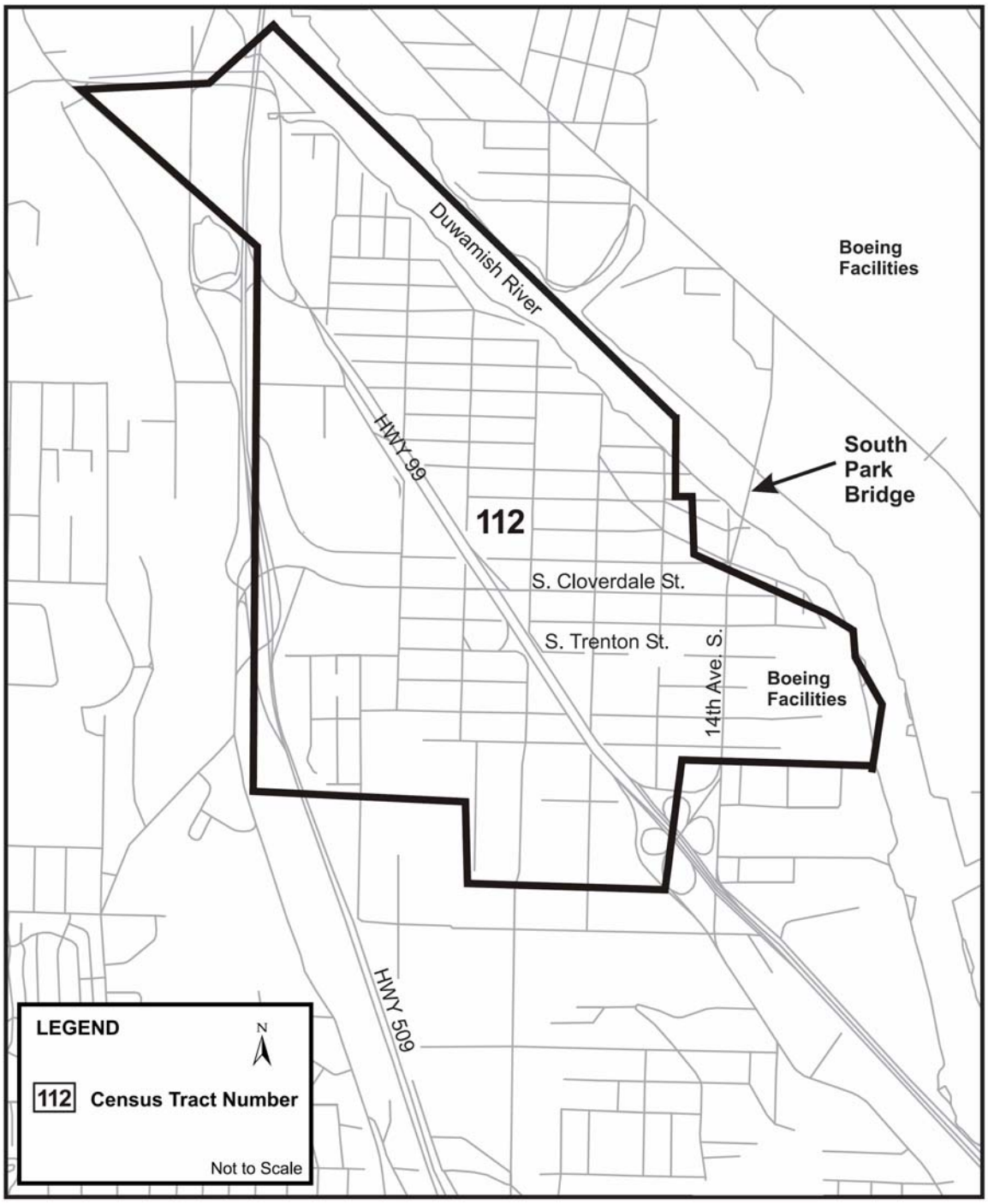


Figure 3-14
Census Tract 112 Map

Table 3-8. Population Race and Hispanic/Latino Characteristics, 1990 and 2000

Area	1990				2000			
	Total Pop.	White	Persons of Color	Hispanic/ Latino	Total Pop.	White	Persons of Color	Hispanic/ Latino
South Park Community	2,809	1,874 (67%)	935 (33%)	420 (15%)	3,717	1,626 (44%)	2,091 (56%)	1,379 (37%)
City of Seattle	516,259	388,858 (75%)	127,401 (25%)	18,349 (4%)	563,374	394,889 (70%)	168,485 (30%)	29,719 (5%)

Source: U.S. Census, 1990 and 2000.

Census information about residents who were born in foreign countries and those who have limited English language proficiency helps to describe the diversity of the South Park community. In 2000, census figures identified an estimated 34 percent of the population was foreign-born. An estimated 21 percent (786 persons) were born in South or Central America, 19 percent (701 persons) in Mexico, 4 percent (150 persons) in Cambodia, and 3 percent (120 persons) in Vietnam. The majority of the other foreign-born population came from various countries in Southeast Asia. Local social services and the nearby elementary school administrators confirmed that Spanish, Cambodian, and Vietnamese were the most common foreign languages spoken in South Park. Of the adult population, however, the Census Bureau reported only an estimated 488 persons, or 13 percent, is linguistically isolated. From the above data, it can be assumed that the largest proportion of these persons speak Spanish.

In addition, the Muckleshoot Indian Tribe conducts tribal fishing activities in the South Park Bridge project area. Their tribal reservation is located near Auburn, approximately 28 miles from the South Park community, and Native Americans are not a substantial minority group in the community. The Tribe conducts commercial and ceremonial-subsistence fishing throughout the Duwamish River and Elliott Bay. The Suquamish Tribe (reservation located approximately 22 miles from the South Park community) is another federally recognized tribe with treaty fishing rights in the lower-Duwamish River. Tribal fishers use the Duwamish River boat ramp at the First Avenue S. Bridge (approximately 1 mile downstream) for access to these waters.

A representative of the Muckleshoot Tribe attended the agency scoping meeting and expressed concerns regarding treaty fishing issues, especially disruptions to fishing during the construction period and potential dispersal of contaminated sediments that could affect fish species. The Suquamish Tribe also has been consulted regarding their tribal fishing rights in the Duwamish River, and they expressed similar concerns. Additional consultation will be conducted with affected tribes in order to avoid or minimize effects on tribal fishing activities (see Section 3.6.4 Mitigation Measures regarding mitigation for environmental justice).

The City of Seattle has also identified the South Park community as economically distressed, in part due to low median household incomes and a relatively higher proportion of households requiring public assistance compared to other Seattle communities. The 1999 median household income was $31,304, which was well below the citywide median household income of $45,736. The percentage of the population living at or below the poverty level as reported by the U.S. Census Bureau (which uses the U.S. Department of Health and Human Services poverty level designations), however, was nearly the same as reported for Seattle—13 and 14 percent, respectively. The community, however, clearly has a substantial number of low-income households.

General demographic characteristics also identify the South Park community as having a higher percentage of family households than is generally characteristic of Seattle. A total of 75 percent of workers use vehicles to get to work and 16 percent use transit. This compares to 68 percent and 18 percent, respectively, for the City of Seattle. An estimated 14 percent of households in the South Park community, however, are dependent on transit for their mobility as they have no access to a vehicle for personal use. This is slightly less than the 18 percent in Seattle. In addition, an estimated 9 percent of persons older than 16 years of age have transportation mobility limitations and this is slightly greater than the 6 percent in all of Seattle.

Environmental Justice

The demographic characteristics of the South Park community clearly show it is a minority population as defined by the Presidential Executive Order 12898 on environmental justice. This directive requires federal agencies to identify and address potential disproportionately high and adverse effects on minority and low-income populations. The FHWA Order 6640.23 (FHWA 1998) implements the Executive Order to ensure no person is excluded from participating in, denied the benefits of, or subjected to discrimination because of race, color, or national origin. As such, potential adverse environmental impacts that disproportionately affect this community must be mitigated (avoided, reduced, and/or minimized) to comply with federal and State anti-discrimination laws, regulations, and guidance.

Community Cohesion

Overall, South Park appears to be a residential neighborhood with community identity and cohesion. Local shops provide convenience commercial retail and services and places for residents to interact. Public facilities include parks, a community center, and nearby religious institutions; also, construction began on a neighborhood library in July 2005 (see Figure 3-13). The South Park Community Center sponsors many programs and events tailored to the local Hispanic/Latino community (i.e., an author reading and Spanish-speaking discussion by noted writer Isabel Allende in May 2004). Community activists also have worked for several years and recently received full funding for the development of the Cesar Chavez Park at 7th Avenue S. and S. Cloverdale Street.

The community is very mixed racially and ethnically. Spanish, Vietnamese, and Cambodian are the three most common foreign languages spoken in the community. But, in 2000, an estimated 37 percent of the population was Hispanic/Latino. Locals and others from the metropolitan area converge on South Park in September for the annual "Fiesta Patias" celebrating Mexico's independence from Spain. South Park identifies itself as an Hispanic/Latino community.

Moreover, many business owners say they are located in South Park because of the large Hispanic/Latino community. Local businesses include several Mexican restaurants, grocery stores that sell specialty Mexican food items, and several money order and transfer businesses (Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2005a). At least 10 of the 35 businesses on 14th Avenue S. clearly cater to the Hispanic/Latino residents. Many owners and their employees speak Spanish, and some speak limited English. These businesses and the Sea Mar Community Health Center, which serves Hispanic/Latino and low-income persons in the Seattle region, make South Park an important focus of the Hispanic/Latino population in the Seattle metropolitan area.

Long term, the cohesion in the South Park neighborhood is expected to be maintained. Future growth and development in the neighborhood is anticipated to be slow over the coming 20 years. The PSRC forecasts population for the immediate area and the Lower Duwamish industrial area to increase from 4,898 to 6,128 by 2020—an average annual increase of only 1.3 percent (PSRC 2003). And due to declining employment in the manufacturing sector, total employment in this same area is only forecast to increase from 23,280 to 24,819 by 2020. This slow rate of change should help to preserve community cohesion, especially in light of high rates of growth in the Puget Sound area.

3.6.2 Environmental Impacts

The analysis of potential adverse impacts addresses a total of seven social elements of the environment. These elements include the following: population and housing; community and social services; public services; recreation; pedestrian, bicycle, and transit; community cohesion; and compliance with federal and State anti-discrimination laws, regulations, and guidance. The potential impacts on social elements of the community differ quite substantially for each of the proposed project alternatives. The following discussion identifies the primary construction and operation impacts for each of the alternatives.

No Action Alternative

Social Elements

The No Action Alternative would require demolition and removal of the South Park Bridge at some time in the future. No properties would be acquired and no residents, businesses, or employees would be displaced. Short-term temporary

construction period detours and delays would affect access to community, social, and public services. Temporary construction impacts would affect the South Park Marina and recreational navigation.

From the start of demolition and removal of the existing bridge, there would be permanent re-routes to and from the community. There would be no long-term navigation obstructions in the Duwamish Waterway. Travelers would not experience delays in trips to local community, social, and public services within South Park. The diminished traffic on 14th Avenue S. would result in decreased noise, air pollution, and congestion, which would be perceived as an improvement in the quality of life for residents. Light and glare from the bridge to adjacent districts would be eliminated and there would be opportunity to improve shoreline amenities.

There would be no change to pedestrian and bike access within the South Park community following construction, and the reduced traffic congestion could result in increased walking and biking activities. However, removal of the bridge would permanently prevent auto, pedestrian, bike, or transit crossing of the Duwamish Waterway at the 14th/16th Avenue S. location. The First Avenue S. Bridge is about two miles west of the South Park Bridge and would provide an alternate location for crossing the Duwamish Waterway. Travel by private automobile via the First Avenue S. Bridge would be somewhat longer in duration. Travel by foot or bicycle via this bridge would be substantially longer and not reasonable for most. Travel by public transit would be longer duration and Routes 60, 134, and 161 would no longer provide direct service between Georgetown and South Park. These changes would especially be felt by persons dependent upon public transportation or other special transportation services.

Fire protection and emergency medical response in South Park as well as the adjacent community of Georgetown, Boeing Field, and the Boeing properties would be adversely affected due to increased response times and limited alternative routes across the Duwamish Waterway, i.e., primarily the First Avenue S. Bridge.

Overall, community cohesion could potentially be improved with the removal of the bridge, permanent traffic re-routes, and increased isolation of the community. Local businesses, however, would be affected by the change in travel patterns, especially those businesses reliant upon the existing through traffic and/or easy access to area heavy commercial and industrial businesses. Transportation access and travel time would increase for both shoppers and Sea Mar Community Health Center patients who reside outside of the South Park community. As such, the changes in access both within the community as well as between the community and the region are mixed and the overall effect is uncertain. All of these changes, both adverse and beneficial, would affect the long-term stability of the commercial district and the residential neighborhood.

Environmental Justice

There would be no direct impacts to minority or low-income persons due to acquisition of property; but removal of the bridge would generally result in adverse effects on low-income, minority, and Hispanic/Latino residents and businesses in this already economically distressed community. Tribal fishing in the Duwamish could be affected perhaps one season by in-water construction activities, considering demolition and removal of the bridge would take about 8 months. Moreover, the removal of the bridge would affect members of the larger regional Hispanic/Latino community who may visit the South Park community. A comprehensive look at potential adverse and beneficial impacts indicates the effects would be mixed, and the effects would disproportionately affect minority and low-income populations. Considering impacts would not be severe and mitigating measures could lessen impacts, this alternative would be consistent with federal and State anti-discrimination laws, regulations, and guidance (including Presidential Executive Order 12898 on environmental justice).

Rehabilitation Alternative

Social Elements

Construction of the Rehabilitation Alternative would require acquisition of three properties, including two single-family residences. These property acquisitions would not affect minority and/or low-income persons based on community surveys (Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2005a). There would be disruptions to the South Park Marina (see Figure 3-15) and recreational navigation on the Duwamish Waterway for up to 30 months of the construction period due to the substantial in-water construction activities involved in constructing new bascule piers. Closure of the bridge during rehabilitation for nearly the entire construction period would require detours and delays to travel to community, social, and public services. Persons dependent upon public transportation or other special transportation services would be particularly affected. During this relatively long period of construction, the bridge closure would also affect businesses in the community. This concern and the fear of potential failure of businesses were voiced repeatedly by members of the public and business owners. For additional discussion, see Section 3.5 Economics and Chapter 4 Public and Agency Coordination.

Following rehabilitation, the historic South Park Bridge across the Duwamish Waterway would continue to serve as a major gateway into the South Park community. Much of the existing historic structure would be rebuilt. It would not meet federal preservation guidelines, but the historic look of the structure would remain. There would be no long-term changes in channel width or vertical clearance for marine traffic. There would be no change to pedestrian, bike, or transit access within South Park; and pedestrian, bike, or transit crossings of the Duwamish Waterway would be preserved with some improvements to safety. Light and glare from the bridge would remain similar to current conditions, and

the bridge would continue to be a defining element of the visual aesthetics of the South Park community. There would not likely be any long-term permanent change in community cohesion anticipated due to rehabilitation of the historic bridge, though there could be vacant store fronts and/or changes in businesses and their ownership during rehabilitation and the first year or two following construction due to effects on businesses during construction.

Environmental Justice

The acquisition of the three parcels in the South Park community required for the construction of the Rehabilitation Alternative would not affect minority or low-income residents. The displacement of three businesses, however, may affect low-income workers. Analysis of businesses along 14th Avenue S. indicates that a high proportion of property owners, business owners, and employees in the South Park business district are minorities and/or low-income. Closure of the existing South Park Bridge for approximately 30 months during construction of the Rehabilitation Alternative would adversely affect these minority and low-income populations due to potential reduced business sales and/or possible business failures. The bridge closure during construction would also detour traffic destined to South Park businesses and the regional medical clinic, which would affect the Hispanic/Latino community in the larger Seattle metropolitan area. In addition, tribal fishing would be disrupted two seasons during the 32-month construction period due to the substantial in-water construction activities. These adverse effects would have high and disproportionate effects on minorities and low-income populations during the construction period.

Following the construction period, however, no adverse impacts are expected to affect minority and/or low-income populations. Traffic across the Duwamish Waterway at 14th Avenue S. would continue. Access to and from the community for residents, businesses, employees, and the regional Hispanic/Latino population would be the same as existing conditions.

As such, the relatively long period of bridge closure during the construction period would mean that this alternative would result in temporary disproportionate adverse affects on minority and low-income populations. Substantial mitigation measures (see Section 3.6.4) could reduce the severity of these impacts. As such, this alternative would be consistent with federal and state anti-discrimination laws, regulations, and guidance (including Presidential Executive Order 12898 on environmental justice).

Bascule Bridge Alternative

Social Elements

Construction of the Bascule Bridge Alternative would require acquisition of seven properties, including parts of two parcels owned by Boeing. Two single-family dwellings and an estimated seven White persons would be displaced. Community surveys did not identify if these households were low-income. The existing bridge

would be in use for the duration of the construction period. Short-term temporary detours and delays would affect community/social and public services during construction. Temporary short-term disruptions would occur to the South Park Marina and recreational navigation on the Duwamish Waterway (see Figure 3-16).

The long-term use of the new bascule bridge would have few effects. There would be minor reconfiguration of the local street network, but a bascule-type bridge across the Duwamish Waterway would be maintained for the long-term future to facilitate access to community/social and public services in both South Park and to and from adjacent neighborhoods and downtown Seattle. There would be a slightly wider channel and continued unlimited vertical navigation clearance following the construction period. Existing recreational boating on the Duwamish and use of the South Park Marina would continue. There would be no change to pedestrian, bike, and transit access within South Park following construction; and pedestrian, bike, or transit crossing of the Duwamish Waterway would be preserved and safety much improved over existing conditions. There would be little change in community cohesion due to demolition of the historic bridge, especially if the new bascule bridge were designed to look historic.

Figure 3-15
South Park Marina

Figure 3-16
Duwamish Waterway Recreational Boating

Environmental Justice

The acquisition of seven parcels, including property owned by Boeing, would not affect minorities or low-income residents. The displacement of the five businesses, however, could affect low-income workers. The continued use of the existing bridge during the construction period would not be expected to result in substantial adverse effects to minority property or business owners and/or minority or low-income employees in the South Park business district other than the temporary traffic detours and air and noise impacts during the construction period. Tribal fishing in the Duwamish would be affected for potentially one to

two seasons by in-water construction activities during the construction period. The construction and long-term operation of the Bascule Bridge Alternative would not result in disproportional high impacts to minority or low-income populations. This alternative would be consistent with federal and State anti-discrimination laws, regulations, and guidance (including Presidential Executive Order 12898).

Mid-Level Fixed-Span Bridge Alternative

Social Elements

Construction of the Mid-Level Fixed-Span Bridge Alternative would take less time than either the Rehabilitation or the Bascule Bridge alternatives, but the property acquisition effects would be greater. A total of 14 properties, including parts of two Boeing properties, would be acquired. A minimum of three residential dwellings would be acquired, which would displace an estimated 10 persons. Two of these households are White, but neither the race of the third household nor the income status of any of the households was determined by community surveys. In addition, the property acquisition could affect the stability of the commercial district with displacement of 17 businesses comprising an estimated 40 percent of the business district (Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2005a). Moreover, a total of 10 of these businesses are owned by minorities and an estimated 76 of the 89 employees are minorities. These effects would broadly affect minority populations in this economically distressed community. The community has repeatedly expressed concern about these land acquisition impacts.

The existing bridge would be in use during the construction period; however, short-term temporary detours and travel would delay travel to and from community/social and public services. In addition, temporary short-term disruptions would affect the South Park Marina and recreational boating on the Duwamish Waterway.

The long-term use of the new fixed-span bridge would preserve a crossing of the Duwamish Waterway. Minor reconfiguration of the local street network plus closure of S. Thistle Street would occur, but a bridge across the Duwamish Waterway would be maintained for the future to facilitate access to community/social and public services in both South Park and to and from adjacent neighborhoods. A slightly wider channel would be constructed, but the vertical navigation clearance would be limited to 65 feet following the construction period. This would affect both recreational and commercial uses of the Duwamish, including effects on the upstream Delta Marine boat manufacturer, which employs many local residents. There would be a minor change to pedestrian, bike, and transit access within South Park following construction due to the pedestrian/bicycle ramp at S. Orr Street. The pedestrian, bike, or transit crossing of the Duwamish Waterway would be preserved and safety greatly improved. The steep grade of the ramp may discourage some pedestrians or bicyclists from using the combined pathway. Some change in community cohesion is anticipated due to demolition of the historic bridge, replacement with a fixed-span bridge, bridge height, and impacts to the commercial district. Together, these changes

could affect the long-term stability of the South Park business district. Moreover, the increased length of the bridge would introduce more light and glare into the community.

Environmental Justice

The acquisition of 14 parcels in the South Park community, including property owned by Boeing, would affect minority and low-income persons. Based on community surveys, it appears that the residential property acquired would not affect minority or low-income persons. The acquisition of the 17 businesses, however, would affect substantial numbers of minority business owners, minority workers, and potentially low-income workers. Construction activities in the Duwamish Waterway would affect Tribal fishing for a minimum of one season.

This alternative could also affect the stability of the eight-block Hispanic/Latino business district due to displacement of 17 of the 35 businesses in the business district. More than half of these businesses are owned by minorities. Moreover, several of these businesses sell specialty Mexican items, foods, or services purchased by members of the Hispanic/Latino population residing in the Seattle metropolitan area. Though the existing South Park Bridge would be in use during the vast majority of the construction period, the long-term operation of the Mid-Level Fixed-Span Bridge Alternative would adversely affect the South Park community and its minority and low-income populations.

Considering both construction and operation impacts, the Mid-Level Fixed-Span Bridge Alternative would result in disproportionate and high impacts to minorities and low-income households and persons working in the business district, especially considering the low-level job skills typical in the area. This alternative would not be in compliance with federal and State anti-discrimination laws, regulations, and guidance (including Presidential Executive Order 12898).

High-Level Fixed-Span Bridge Alternative

Social Elements

Construction of the High-Level Fixed-Span Bridge Alternative would cause the most substantial effects on the South Park community with acquisition of a total of 39 properties. The County would acquire ten single-family, six multi-family, and a minimum of three apartment buildings. This would displace an estimated 50 persons. Community surveys, however, were not able to determine the racial and household income status of these residents. But based on community-wide statistics, a large proportion would be expected to be minorities. This alternative would also require acquisition of commercial properties and would displace an estimated 26 businesses and more than 124 jobs. Furthermore, the County would acquire two buildings of the Sea Mar Community Health Center where an additional approximate 180 persons are employed (see Figure 3-17). Moreover, this health center provides comprehensive medical and social services for the Hispanic/Latino and low-income populations of the Seattle metropolitan area.

Multiple short-term temporary detours and delays would affect community/social and public services during construction. The existing bridge would remain in use during the construction period. Temporary short-term disruptions also would occur to the South Park Marina and to recreational navigation on the Duwamish Waterway.

The high-level elevation of this alternative causes the bridge structure touchdown to shift south to nearly S. Trenton Street. Vehicles would no longer have direct access from the bridge to S. Cloverdale Street. This would require permanent re-routing of bridge traffic through the South Park community on S. Trenton Street and 12th Avenue S. Reconfiguration of the local street network would include closure of S. Donovan Street and construction of a new connector road from S. Trenton Street to 12th Avenue S. Bridge traffic would be permanently re-routed through a residential neighborhood and would alter access to some community/ social and public services in South Park and to and from adjacent neighborhoods and downtown Seattle. Travel routes and travel times would likely be increased due to the S. Trenton Street re-route of traffic. Persons dependent upon public transportation or other special transportation services would be particularly affected.

The increased length of the bridge and increased light and glare from the bridge, street closures, and a new arterial connector street would create barriers in the community. Pedestrian and bike access within South Park would be improved following construction, though. Bus service would be re-routed to 12th Avenue S. and S. Trenton Street and bus stops would be relocated. These changes would be less conveniently located for some residents. However, pedestrian, bike, and transit crossing of the Duwamish Waterway would be improved, though bridge length and the more than 8-percent grade could discourage pedestrian and bicycle use on the bridge.

A slightly wider channel would be constructed, but the vertical navigation clearance would be limited to 100 feet. Long term, this could potentially affect both navigational use of the Duwamish Waterway as well as upstream businesses, e.g., Delta Marine Industries.

Substantial adverse impacts to community cohesion are anticipated due to demolition of the historic bridge, replacement with a fixed-span bridge, and construction of the new connector street. A total of 39 properties would be acquired in the South Park community, including property owned by Boeing and two Sea Mar Community Health Center buildings. There would be potentially 26 displacements of businesses in the commercial district (see Figure 3-18), which would mean residents would no longer be able to purchase convenience goods and services in South Park and would need to shop outside of the community. The remaining South Park businesses would be primarily the northend marine-related businesses and several auto repair and services businesses. General public comments and those of the CAG have been quite outspoken against this particular alternative. (See Chapter 4 Public and Agency Coordination for a more detailed discussion of public and agency comment on the

South Park Bridge Project.) In fact, at one meeting, members of the public stated they would prefer no bridge to the High-Level Fixed-Span Bridge Alternative.

Figure 3-17
Sea Mar Community Health Center

Figure 3-18
Business District
Hispanic/Latino Restaurants

Environmental Justice

The construction of the High-Level Fixed-Span Bridge Alternative would require acquisition of 39 parcels, including portions of two properties owned by Boeing. Based on community demographic data and surveys, the displacement of 19+ households would include a substantial number of minorities and could include low-income persons.

Analysis of property and business ownership and employees in the project corridor also indicates these acquisitions would have a high and disproportionate adverse impact on minority and potentially low-income workers at the 26 displaced businesses. The alternative would displace nearly three-quarters of the businesses and two-thirds of the commercial blocks that comprise the neighborhood commercial district. The majority of these businesses is minority-owned and they serve the Hispanic/Latino and Asian residents in the community and the region. An estimated 91 of the more than 124 jobs that would be displaced are currently held by minority persons. An additional 180 jobs could be displaced or relocated due to the acquisition of two of the five buildings comprising the Sea Mar Community Health Center. The racial composition of these employees is unknown, but it is assumed to include a substantial number of minority and Hispanic/Latino employees considering the patient composition the organization primarily serves.

The anticipated impacts would also affect minority, Hispanic/Latino, and low-income persons residing in the Seattle region. Two buildings acquired are currently owned by the Sea Mar Community Health Center, which provides medical and social services particularly to minority, Hispanic/Latino, and low-income persons in the Seattle metropolitan area. The aggregate affect on the business district due to displacement and potentially reduced numbers of persons from the region coming to South Park for medical and social services would threaten the viability of the remaining businesses. Moreover, fishing also would be affected at least one season due to the in-water

construction activities, which would affect Native Americans residing in the region.

Considering all of these construction and operation effects, this alternative would not be in compliance with federal or State anti-discrimination laws, regulations, and guidance (including Presidential Executive Order 12898).

Comparison of Alternatives

A comparison of the Rehabilitation Alternative and the three Replacement Bridge Alternatives highlights that the increasing length of the alternatives is related to the cumulative severity of the adverse social impacts of each alternative. Generally, the longer the bridge, the greater the impacts to population and housing, community and social services, public services, pedestrian and bicycle trails, transit, community cohesion, and minority/low-income populations.

The No Action Alternative, however, is an exception because the removal of the bridge would not require property acquisition. As such, this alternative would not directly affect population, housing, businesses, jobs, community and social services, and/or local access. However, traffic into and out of the community would be permanently re-routed, which would increase travel time, especially to Georgetown and downtown Seattle for shopping and work. Over time, this change in traffic patterns could change land uses. Potential improvements to noise and air quality and decreased traffic congestion on 14th Avenue S. would likely increase pedestrian and bicycle traffic and the general perceived quality of life in South Park. Together, these changes would likely result in improved community cohesion. But, the removal of the bridge and the creation of a substantial barrier to the movement of people from outside South Park to shop and obtain medical, dental, and social services in South Park would likely affect the long-term viability of the commercial core and heart of the South Park community. Together, these effects are mixed but could be substantial, despite the lack of property acquisitions.

As such, an overall comparison of the Build Alternatives would place the Rehabilitation and Bascule Bridge alternatives with similar low impacts. The Mid-Level Fixed-Span Bridge Alternative would result in moderate impacts. The High-Level Fixed-Span Bridge Alternative, however, would result in severe impacts. Furthermore, both the Mid-Level Fixed-Span Bridge and High-Level Fixed-Span Bridge alternatives would have disproportionate and high effects long term on minority and likely low-income populations in South Park and the Seattle metropolitan region.

3.6.3 Secondary and Cumulative Impacts

Secondary Impacts

Secondary impacts would be primarily related to the extent of changes in the community, particularly the community's commercial district. Rehabilitation or

construction of a new bridge could cause adverse effects, including long-term instability in the neighborhood commercial district. This issue was repeatedly raised at the various public involvement activities held (see Chapter 4 Public and Agency Coordination). Some businesses would continue, but others would be displaced because of needed acquisition of project right of way or temporary construction staging areas. Additional businesses could sell or fail based on changes or instability of the neighborhood commercial district. Based on a survey of local businesses, most business owners do not want to relocate and feel their business would not be successful if relocated away from South Park (Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2005a). Potential property acquisition would also displace Hispanic/Latino and Asian businesses serving local residents, which could cause minorities to move from South Park and/or could disrupt the demographic character of the existing community. These changes could alter shopping patterns of residents and disrupt existing community cohesion. Substantial changes in the commercial district could also dissuade visitors from shopping in the community and could have adverse effects on the larger Hispanic/Latino community in the Seattle metropolitan region considering the South Park community is viewed as the heart of that minority community.

Such secondary impacts would be expected to be minor for the Rehabilitation and Bascule Bridge alternatives. They would be moderate for the Mid-Level Fixed-Span Bridge Alternative. The removal of the bridge for the No Action Alternative would also cause a severe level of secondary impacts. In contrast, the secondary impacts of the High-Level Fixed-Span Bridge Alternative would be most severe considering approximately two-thirds of the blocks comprising the existing commercial district would be acquired and an estimated 26 businesses displaced. Changes to the commercial district could both increase and decrease the attractiveness of the community as a residential neighborhood for families.

Cumulative Impacts

Cumulative impacts would also occur considering the proposed South Park Bridge Project and other projects that would be developed in the near future (see Section 3.1 Introduction). These projects include Duwamish Waterway dredging, Duwamish Waterway sediment cleanup, and the Duwamish shoreline restoration project. These projects would not likely result in cumulative adverse social impacts during the construction period as long as coordination between the activities associated with these projects occurs.

In addition, the City of Seattle has proposed funds for the 14th Avenue S. paving and street lighting project as well as drainage improvements. Depending on specific improvements that would be constructed and the timing of the construction activities, the Mid-Level Fixed-Span Bridge and High-Level Fixed-Span Bridge alternatives could disrupt newly constructed street improvements or storm drainage facilities. Long-term, however, these projects together would improve the South Park community cohesion as well as public perception of the

community by residents, business owners, as well as others from outside the community. The cumulative social effects of these proposed projects would benefit the community long term.

3.6.4 Mitigation Measures

The South Park community would receive benefits from each of the Build Alternatives. The use of the South Park Bridge would continue for an additional 75 years. Traffic lanes and sidewalks on the bridge would be widened and built to engineering standards. Except for the Rehabilitation Alternative, a combined pedestrian/bicycle path would be incorporated into the new bridge design. The five-way intersection created by 14th Avenue S., Dallas Avenue S., and S. Sullivan Street would be reconfigured and street signs or signals would be added. Additional roadway pavement and sidewalk improvements could occur south of S. Sullivan Street depending on the length of the project alternative. Together, these changes would improve traffic flow and vehicular and pedestrian safety. In addition, the Build Alternatives would accommodate future traffic demands.

The following is a list of potential mitigation measures recommended to avoid or minimize anticipated social impacts to the South Park community for project alternatives.

Population and Housing

- Provide compensation for the occupants of all residential properties acquired for right of way or construction staging areas per the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended [42 USC 4601 et seq. and 49 CFR Part 24], and the Washington Relocation Assistance-Real Property Acquisition Policy Act of 1971, as amended [RCW 8.26 and WAC 468-100].

- Establish a project area advisory group prior to the start of construction activities to solicit input for mitigation measures to minimize construction impacts.

- Periodically mail notices and/or hold public meetings to alert members of the public of planned construction activities and traffic detours. Also consider using the newspaper, radio, or television media to notify the public.

Community and Social Services

- Plan temporary construction impacts to minimize disruptions to access to community and social services.

- Mail notices of planned construction and/or demolition activities, planned temporary road closures and detours, changes in other access routes, and the schedule for these activities periodically to all community facilities and social services operating in the South Park community.

- Should the High-Level Fixed-Span Bridge Alternative be selected, work closely with the Sea Mar Community Health Center to ensure the continuance of health care services in the project area due to potential displacements of several of their buildings under that alternative. This coordination should include assistance in temporarily or permanently relocating buildings and/or services affected by the proposed project.

Public Services

- Coordinate construction and/or demolition activities, planned temporary road closures and detours, and the schedule for these activities with the City of Seattle Fire and Police departments and the School District. As appropriate, additional coordination may also be needed with King County and the City of Tukwila fire and emergency medical response services.

- If the No Action Alternative is selected, coordinate closely with the City of Seattle Fire Department Station Nos. 11, 26, 27, and 32 and others, as appropriate, to ensure adequate fire protection and emergency medical response capabilities are provided to the South Park community and adjacent communities prior to bridge closure during construction and demolition of the bridge.

Recreation

- Coordinate planned design and construction activities with ECOSS to minimize potential impacts to the proposed waterfront restoration and open space along the south shore of the Duwamish River downstream of the existing South Park Bridge.

Pedestrian, Bicycle, and Transit

- Plan temporary construction impacts, including traffic detours, to minimize disruptions to pedestrian, bicycle, and transit routes in the community.

- Distribute periodic press releases, newsletters, or notices to South Park residents to advise them of changes in pedestrian, bicycle, or transit routes during construction and/or demolition activities. Also consider using radio and television to notify the public.

- Following selection of the preferred alternative and the initiation of preliminary engineering, initiate detailed coordinated efforts with King

County Metro to ensure transit services are maintained during construction and demolition activities associated with any of the proposed project alternatives.

- Coordinate with King County Metro to ensure current levels of transit services continue to be provided to the South Park community following construction and/or demolition activities. In particular, this coordination should carefully study alternatives to replace bus service affected by the closure and demolition of the South Park Bridge under the No Action Alternative.

Community Cohesion

- Plan construction and/or demolition activities to minimize potential impacts to community-wide activities, including the popular "Fiesta Patrias."

- Work with local business organizations and individual businesses prior to construction to identify both construction and operation mitigation measures to address both construction detours and/or the potential loss of on-street parking, which could adversely affect local businesses in the South Park business district.

- Carefully consider community land use goals and policies in the *South Park Residential Urban Village Plan* (South Park Planning Committee 1998) when finalizing site restoration plans and overall project mitigation measures.

- Conduct several project-specific community outreach meetings to solicit potential ideas for post-construction site restoration and project mitigation measures. In particular, input for potential street furniture, landscaping, relocation of transit stops, open space, or parks would help the community participate in the redevelopment of the project area. These series of meetings could also address land use goals and objectives for 14th Avenue S., especially regarding properties that would be acquired for right of way, construction laydown areas, or construction activities for the Rehabilitation or Replacement Bridge alternatives.

- To mark the conclusion of construction and/or demolition activities, host a community event to announce the opening of a rehabilitated or newly constructed South Park Bridge.

- If one of the Replacement Bridge Alternatives is selected, solicit public input on bridge aesthetics and design in an effort to meet community objectives to maintain the historic character of a key gateway to the community.

- Due to the significance of the 14th Avenue S. business district in the community, to the extent practicable, replace displaced on-street and off-street parking in the immediate project area to facilitate long-term viability of project corridor businesses.

Environmental Justice

- Prepare all written public notices, press releases, or newsletters produced to alert community facilities, social services, businesses, and residents of the planned construction, demolition, and long-term impacts to the community in English as well as Spanish, to ensure project communications are understood.

- Do not rely heavily on Internet media for public notices as home computers may not be as prominently used by the many modest and low-income residents in the community and/or individuals who may have limited English language proficiency.

- Distribute public notices to local businesses, shops, restaurants, community centers, social service agencies, health clinics, libraries, schools, and other organizations in the community. Give particular attention to include and maximize distribution to minority and low-income members of the community. Translate these notices into non-English languages, as appropriate.

- Publish press releases in both regional as well as local Spanish daily and/or weekly newspapers, e.g. the "Siete Dias." Investigate the use of Seattle's Spanish-speaking ("Radio Sol") and potential Asian-speaking language radio stations to get notices out to community residents.

- Consult with representatives of the Muckleshoot and Suquamish Tribes prior to the start of construction activities to make sure there is a clear understanding of their tribal fishing activities near the South Park Bridge and that anticipated construction activities are understood. In cooperation with tribal representatives, develop acceptable mitigation measures to avoid, reduce, or minimize potential temporary and long-term effects to fishing, including potential deterioration of the fisheries habitat due to potential disturbance of contaminated sediments in the Duwamish Waterway. See Sections 3.13.4 and 3.15.4 for additional recommended mitigation measures related to fish, wildlife, and vegetation as well as hazardous materials.

3.7 Cultural Resources

This section discusses potential impacts to cultural (archaeological and historic) resources for each proposed alternative. Possible mitigation measures and secondary and cumulative impacts are also discussed. For additional, more detailed information see Appendix P, *Cultural and Historical Resources Technical Report* (Historical Research Associates 2004). Agency coordination efforts are also documented in Appendix E Agency Coordination.

3.7.1 Affected Environment

The area surrounding South Park Bridge is an alluvial floodplain located approximately five miles upstream from the mouth of the Duwamish River. As such, there could be archaeological resources buried in the project corridor, as Native American villages were generally located near a river channel or a tributary. The South Park community was settled in the middle of the 1800s, and a number of old structures still exist. In addition, the South Park Bridge is the only Scherzer rolling-lift bascule bridge existing in Washington State and is listed in the National Register of Historic Places (NRHP), the Washington Heritage Register, and the King County Landmark Register.

This section identifies the potential for encountering known or unknown historic and archeological resources within the area of potential effect (APE) (i.e., study area). The APE encompasses the area within 0.5 mile of the South Park Bridge. Findings are based on background research and field investigations described in the technical report (Historical Research Associates 2004), and augmented with subsequent archaeological information discussed below. The regulatory context of cultural resources is first described. Following are separate discussions of archaeological and historic resources.

Regulatory Context

The discussion of cultural resources provides documentation of historic and archaeological resources to support compliance with various federal, state, and local regulations that concern archaeological and historic resources. These include NEPA, Section 106 of the National Historic Preservation Act (NHPA) [USC 1966], Section 4(f) of the Department of Transportation Act, the State Environmental Policy Act (SEPA), the King County Landmarks Ordinance, and the Seattle Landmarks Preservation Ordinance.

In particular, Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on properties listed in or eligible to be listed in the NRHP. Evaluation of the NRHP eligibility of a resource is guided by NRHP criteria for evaluation. These criteria state that eligibility for inclusion in the NRHP require that a resource must “possess integrity of location, design,

setting, materials, workmanship, feeling and association" and meet at least one of the following four criteria for historic significance [36 CFR 60.4]:

- Criterion A: Association with events that have made a significant contribution to the broad patterns of our history
- Criterion B: Association with the lives of persons significant in our past
- Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction
- Criterion D: Yield, or may be likely to yield, information important in prehistory or history

The objectives of the cultural resources analysis included the following: (1) identify a study area that encompassed the APE (0.5-mile radius from project corridor) for any of the five alternatives, (2) identify previously recorded cultural resources within the APE, (3) identify, evaluate, and record undocumented cultural resources within the APE, (4) determine the potential impacts of each alternative on known cultural resources, and (5) identify a preliminary approach to impact mitigation.

Archaeological Resources

For archaeological resources, a number of factors that influence the presence of archaeological sites were considered. The potential for archaeological resources within the APE depends on the configuration of the local landforms prior to historic modification, the types of prehistoric and historic activities that occurred within the APE, and the subsequent disturbance of the soils and sediments. Information on landform configuration, river channelization, historic land use activities, and the potential disturbance to prehistoric and historic archaeological resources resulting from subsequent development and construction in developing an assessment of the study area's archaeological potential were all reviewed. Recommendations for archaeological fieldwork, including testing and/or ground disturbance monitoring, are based on an assessment of disturbances and the resultant impacts to archaeological resources.

The existing South Park Bridge and all proposed alternatives are located over filled marshlands and old channels of the Duwamish River. One historic river channel is 4,000 feet east of the existing channel, under what is now Boeing Field, although the channel undoubtedly meandered historically. Native American villages, as indicated by historic documents and archaeological studies, were generally located near the river channel or a tributary (Carter 1997, Waterman 1920). Areas to either side of the abandoned river channel would normally be

considered highly sensitive for prehistoric cultural resources. Previously recorded prehistoric sites are located on landforms similar to those encountered within the APE.

Reshaping of the Duwamish River basin through channeling, filling, and grading has likely buried prehistoric archaeological resources in the area or, in the case of the existing river channel, destroyed older prehistoric archaeological sites. For example, the logs of eight soil borings (Shannon & Wilson 2003b) drilled for this project were reviewed as part of the reassessment of archaeological sensitivity in the APE. These logs identify fill to depths varying between 0.6 and 20 feet, and show the presence of a stable surface between 8 and 17 feet, capped by 8 feet of fill.

In 1997, the City of Tukwila identified potential archaeologically sensitive areas within the City of Tukwila Manufacturing/Industrial Center (Carter 1997). The study examined historic, topographical, and geological maps and consulted previous archaeological and ethnographic research in the region to identify culturally sensitive landforms. The study concluded that highly sensitive landforms in the Duwamish River basin consisted of channel or wetland areas. These areas included the historic courses of the Duwamish River, oxbows of former river channels, wetland/swampy areas, confluences of small sloughs and tributaries, upland terraces of the Duwamish River, adjacent bedrock outcrops, and adjacent upland ridge margins. A number of these types of landforms are represented within the APE, and were identified in the technical report found in Appendix P (Historical Research Associates 2004) as high probability areas. That report stated that the area north of the Duwamish Waterway was considered to have a low probability of containing archaeological resources.

However, based on subsequent review by the King County Department of Transportation's archaeologist, the potentially affected area near the Duwamish Waterway is considered to have a high likelihood of containing prehistoric archaeological resources. This conclusion is based on the implications of the historical meanderings of the Duwamish River. The river did not have a single historic channel. Instead, the river channel repeatedly migrated across the floodplain, creating oxbows, sloughs, and swamps where it once flowed. Consequently, extensive areas on either side of the present day Duwamish Waterway have a higher probability of containing artifacts from prehistoric cultural activities associated with landscape features that have subsequently been reshaped by either natural or man-made changes to the Duwamish River and related landscape elements.

Recent investigations at other sites also have suggested the high potential for undisturbed or minimally disturbed sites exists in areas where extensive modern development was believed to have destroyed extant archaeology. Although no final report has yet been produced, a very large Native American village and cemetery site originally believed to be destroyed by development was discovered

to be substantially intact in 2003 (Hartmann 2005, deBoer 2004). Also, a prehistoric archaeological site was recently discovered just over 2 miles to the south of the South Park Bridge site on a piece of land that had been developed, filled, and paved. The site is located in an area that archaeologists assumed had been disturbed by road and bridge building, as well as by historic farming and residential activities. In fact, the site appears to be intact (LeTourneau 2005).

Therefore, the potential exists for deeply buried prehistoric cultural resources within most of the APE, except in and immediately adjacent to the existing channel. Intact or disturbed archeological deposits may be present below pavement and foundations.

The project site is used for tribal fishing activities by two Indian tribes. The Muckleshoot Tribe conducts commercial and ceremonial-subsistence fishing throughout the Duwamish River and Elliott Bay. A representative of the Muckleshoot Indian Tribe attended the agency scoping meeting and expressed concerns regarding treaty fishing issues, especially potential effects on fishing during the construction period and potential dispersal of contaminated sediments that could affect fish species. Members of the Suquamish Tribe also fish in these waters. The Suquamish Tribe has also been consulted with, and they have expressed an interest in any activities that may impact the survival rates of fish passing through the Duwamish Waterway. However, they have no fisheries concerns specific to the project site. Both tribes are interested in archaeological resources and have requested that they also continue to be consulted with in that regard. Additional consultation will be conducted with affected tribes in order to avoid or minimize potential adverse effects on tribal fishing activities and cultural resources.

Historic archaeological resources, related to early Euro-American settlement and the development of the South Park community, also may be present throughout the APE. Because these later period resources tend to be located nearer the modern surface, it is likely that these resources have been damaged or buried during later development of the area.

In summary, the APE for archaeological resources has a high potential to contain intact subsurface archaeological resources. However, no archaeological sites have been recorded and none of the potential resources discussed have been confirmed at this time.

Historic Resources

Identification of historic resources within the APE is based on background research, archival studies, and field investigations. A 1991 historic resource survey and inventory study of the South Park neighborhood (Sullivan and Trueblood 1991) was commissioned by the City of Seattle and provided a

baseline for evaluating historic properties. As part of this investigation, 81 properties were surveyed and inventoried.

It was this survey that examined the South Park Bridge, which is the only existing Scherzer rolling-lift bascule bridge remaining in Washington. This historic resource is now listed in the NRHP, the Washington Heritage Register, and the King County Landmark Register.

The 1991 survey identified 12 properties within the APE that may meet NRHP-eligibility criteria. These resources were reevaluated. The current condition and integrity were compared with those noted on the survey forms. It was determined that there have been no major changes to the integrity of these recommended NRHP-eligible properties since the 1991 survey, though the status of a few changed (see Appendix P, *Cultural and Historical Resources Technical Report*).

Historic resources associated with Boeing also were identified in previous studies. The site history and current conditions of Boeing Plant 2 are well documented (Lentz 2000). Plant 2 was Boeing's second manufacturing facility and is composed of multiple buildings (White 2002). In addition to Plant 2, historic files exist on two other Boeing buildings—the Boeing Flight Center and "Hangar No. 1" (Building 3-350). Both of these buildings are located at the north end of Boeing Field. Boeing Plant 2 remains relatively unchanged since the historic period and has been recommended as eligible for inclusion in the NRHP.

In July 2002, an intensive historic buildings survey of the South Park APE was conducted. The APE encompasses much of the South Park residential and commercial neighborhoods, and many historic Boeing facilities. In total, this survey encompassed over 700 properties. Historic resources within the APE were identified based on the following methodology:

- Properties previously surveyed and inventoried in the 1991 historic resource survey were revisited. Resources that were recommended NRHP-eligible were examined and the current conditions were compared with the original survey forms. This survey determined that there had been no major changes to the integrity of recommended NRHP-eligible properties since the 1991 survey.

- Methods for evaluating historic resources in the City of Seattle study, Survey Report: Central and South Park 1991 Certified Local Government Planning Grant (Sullivan and Trueblood 1991), were reviewed. This study provided a comparative context and framework for evaluating individual historic resources within the APE. Newly identified resources were evaluated in comparison to the resources surveyed and evaluated in the 1991 study in terms of architectural and historic significance.

- A total of 23 new resources within the APE were recorded on Washington State Survey and Inventory Forms in accordance with Washington State Office of Archaeology and Historic Preservation standards. Five of these resources meet at least one NRHP-eligibility criteria.

- For resources within Seattle City limits, buildings constructed before 1953 were examined. For resources under King County jurisdiction, a 40-year cut-off date (1963) was used. For all resources, Historical Research Associates (HRA) followed guidelines established in Washington's National Register District Guide (Washington State Office of Archaeology and Historic Preservation 2001).

The analysis by HRA identified a total of 17 historic resources within the APE that were already listed in, or appeared to be eligible for listing in, the NRHP (see Appendix P, *Cultural and Historical Resources Technical Report* (Historical Research Associates 2004). Only one of these resources, the South Park Bridge, is currently in the NRHP, as well as the Washington Heritage Register and King County Landmark Register. Additional resources within the APE include Boeing Plant 2 (which had previously been determined NRHP-eligible), the 14th Avenue S. Red Brick Road Remnant, one commercial building on 14th Avenue S./S. Cloverdale Street in South Park (the old South Park Hall), and 13 houses located throughout the South Park residential neighborhood.

Following the completion of the technical report by HRA, the Office of Archaeology and Historic Preservation (OAHP) was consulted pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended (USC 1966), and 36 CFR Part 800. In addition to the already-listed South Park Bridge and the Boeing Plant 2 (which was previously determined to be NRHP-eligible), OAHP concurred with WSDOT's determination that 13 of the properties are eligible for listing on the National Register. These properties are shown in Table 3-9 and Figure 3-19. The OAHP also concurred that the proposed project alternatives would have an adverse effect on three of the NRHP-eligible or -listed historic resources: South Park Bridge; the Red Brick Road segment of 14th Avenue S.; and South Park Hall. Appendix E contains related agency coordination letters.

3.7.2 Environmental Impacts

This section discusses the nature of potential impacts to historic and archaeological resources for each of the proposed alternatives. Impacts are assessed based on proposed conceptual civil and structural engineering plans (Parsons Brinckerhoff 2003a, 2003b, 2003d) and required property acquisition (see Section 3.3 Relocations).

Table 3-9. Summary of NRHP-Listed or -Eligible Resources within the APE

Map ID #	Address	Construction Date	National Register Eligibility Status
1	South Park Bridge	1931	Listed in the National Register.
2	14th Avenue S. Red Brick Road Remnant	1913	Determined Eligible
3	Boeing Plant 2	1936	Determined Eligible
4	8601 8th Ave. S.	1908	Determined Eligible
5	8307 10th Ave. S.	c. 1905	Determined Eligible
6	724 S. Rose St.	c. 1914	Determined Eligible
7	813 S. Rose St.	c. 1898	Determined Eligible
8	808 S. Sullivan St.	c. 1920	Determined Eligible
9	1019 S. Sullivan St.	c. 1890	Determined Eligible
10	1215 S. Sullivan St.	c. 1910	Determined Eligible
11	857 S. Thistle St.	c. 1905	Determined Eligible
12	1007 S. Thistle St.	c. 1905	Determined Eligible
13	1027 S. Thistle St.	c. 1895	Determined Eligible
14	8611-8613 14th Ave. S./ 1251 S. Cloverdale St. (South Park Hall)	1927	Determined Eligible
15	1215 S. Cloverdale St.	c. 1905	Determined Eligible

Source: Historical Research Associates 2004, OAHP 2005.

Archaeological Resources

No archaeological sites are recorded within the APE, which includes the right of way for all of the alternatives. The No Action Alternative and the Rehabilitation Alternative would not have an impact on any archaeological resources that may exist within the APE. This is because the impact area was previously disturbed during the construction of the original bridge. However, the Replacement Bridge Alternatives would have an impact on the sensitive landforms. The area of ground disturbance during construction has been used as the basis for determining which of the proposed alternatives would have the greatest potential for impacts on sensitive landforms that may contain buried archaeological resources (see Table 3-10). The High-Level Fixed-Span Bridge Alternative would result in the greatest amount of ground disturbance, resulting in the greatest potential for exposing previously undiscovered archaeological resources.

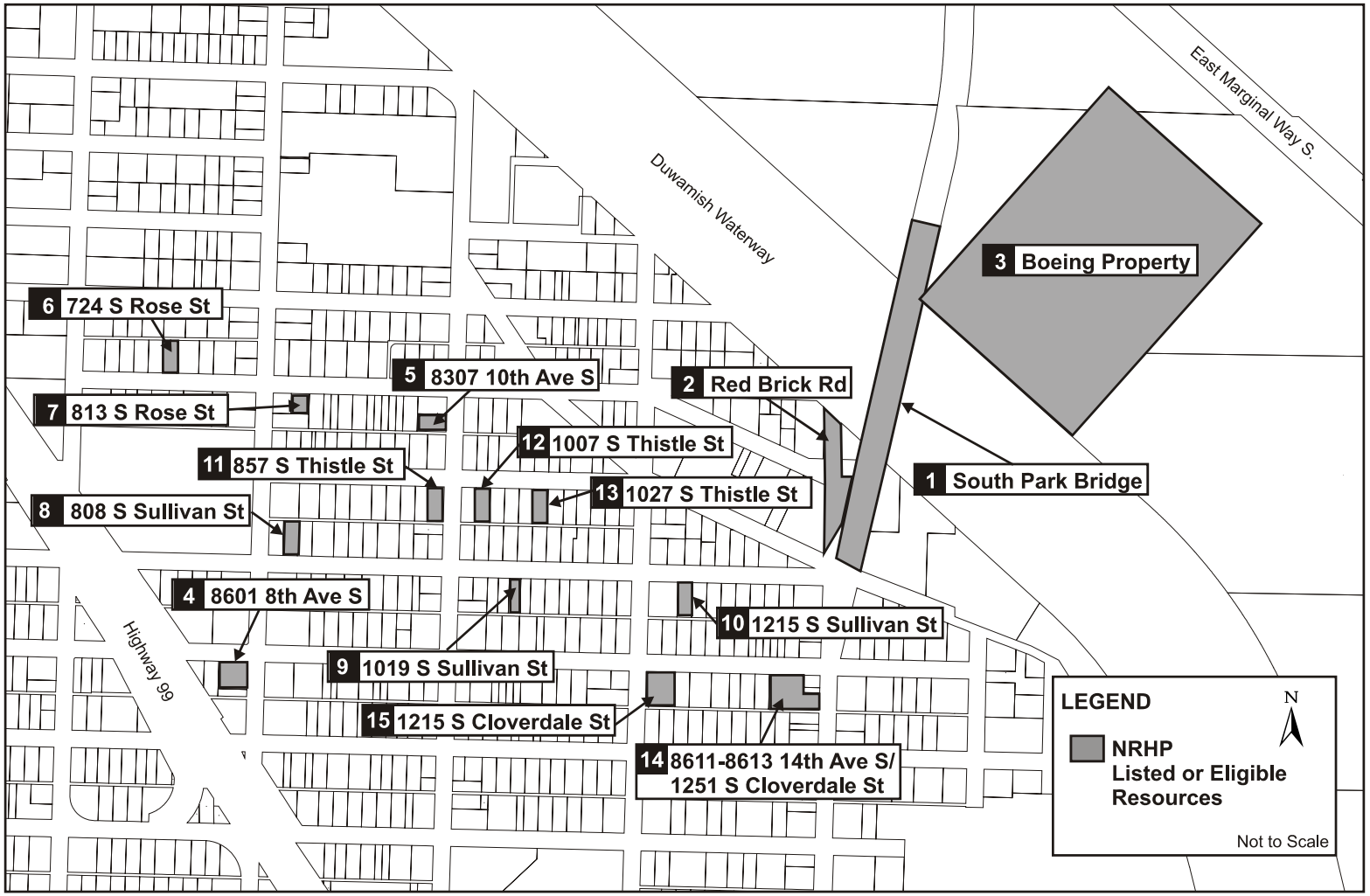


Figure 3-19
Location of NRHP-Eligible and Listed Historic Resources in the Study Area

Table 3-10. Estimated Archaeological Impact Areas for the Proposed Alternatives

Alternative	Estimated Impact Area (ft^2)
Rehabilitation	0 (site previously disturbed)
Bascule Bridge	108,800
Mid-Level Fixed-Span Bridge	108,800
High-Level Fixed-Span Bridge	121,600

Source: Parsons Brinckerhoff 2003b.

Potential buried archaeological resources cannot be identified with certainty until overlaying pavements, fills, and structures are removed. Therefore, prior to construction, subsurface testing should be undertaken to identify archaeological resources, and during construction it may be necessary for a professional archaeologist to monitor all ground disturbing activities, including demolition, grading, and construction, to identify archaeological resources.

Historic Resources

Fifteen NRHP-listed or eligible historic resources were identified in the APE. This includes the existing South Park Bridge, 14th Avenue S. Red Brick Road Remnant, Boeing industrial buildings, South Park Hall, and 11 residential structures. One or more of these resources would be affected by each of the proposed alternatives, including the No Action Alternative. (See Figures 3-20, 3-21, and 3-22 for examples of historic resources.) The paragraphs below describe specific impacts to historic resources for each alternative.

No Action Alternative

The No Action Alternative assumes that the existing bridge would be closed, then demolished and removed at some time in the future. This would constitute an adverse effect to the South Park Bridge, which is listed in the NRHP. Construction activities would not affect the NRHP-eligible 14th Avenue S. Red Brick Road Remnant assuming access to the existing bridge for demolition is adequate without use of this roadway.

The South Park Bridge is the only existing example of a Scherzer rolling-lift bascule bridge in Washington State. It is listed in the National Register of Historic Places, the Washington Heritage Register, and the King County Landmark Register.

Figure 3-20
South Park Bridge

This street section is one of the few stretches of unpaved brick roadway remaining in King County.

Figure 3-21
14th Avenue S. Red Brick Road Remnant

Constructed in 1927, the South Park Hall was a center of community activity for decades. According to long-time residents, the ground floor housed businesses such as a beauty store and hardware store. Historically, the top floor served as a hall for dances and meetings.

Figure 3-22
1251 S. Cloverdale Street/
8611/13 14th Avenue S.

Rehabilitation Alternative

Under the Rehabilitation Alternative, some original bridge features would be reconstructed or preserved, including the brick bridge control tower, roadway balustrades, and the Scherzer rolling-lift mechanisms. These proposed rehabilitation plans defined in the conceptual engineering do not meet the Secretary of the Interior's Standards for Rehabilitation [36 CFR Part 67]. Therefore, these plans would constitute an adverse effect to the South Park Bridge. In addition, the construction activities would temporarily affect (although not adversely) the NRHP-eligible 14th Avenue S. Red Brick Road Remnant. For the Rehabilitation Alternative, the existing bricks could be removed during construction and then replaced following construction to minimize adverse effects. Another resolution might include the stipulation that the bricks be salvaged and reused in another historically suitable context.

Bascule Bridge Alternative

The Bascule Bridge Alternative would have an adverse effect on the local and NRHP-listed South Park Bridge and the NRHP-eligible 14th Avenue S. Red Brick Road Remnant, requiring both the bridge and the road remnant to be removed.

Mid-Level Fixed-Span Bridge Alternative

The Mid-Level Fixed-Span Bridge Alternative would have an adverse effect on the local and NRHP-listed South Park Bridge and the NRHP-eligible 14th Avenue S. Red Brick Road Remnant. This alternative requires that both the bridge and the road remnant be removed. This alternative will also have an indirect adverse effect on the NRHP-eligible South Park Hall (1251 S. Cloverdale Street/ 8611/13 14th Avenue S.) due to the encroachment of the bridge approach ramp.

High-Level Fixed-Span Bridge Alternative

Construction of the High-Level Fixed-Span Bridge Alternative would require demolition of the South Park Bridge, which is listed on the NRHP, and thus constitutes an adverse effect on the historic resource. The 14th Avenue S. Red Brick Road Remnant, just west of the existing bridge, is directly within the High-Level Fixed-Span Bridge Alternative right of way and would be removed. This alternative also would require acquisition of the NRHP-eligible South Park Hall (1251 S. Cloverdale Street/8611/13 14th Avenue S.) due to the very close proximity of the bridge abutment.

Summary

All of the alternatives associated with the proposed project would have an adverse effect on the NRHP-listed South Park Bridge. Additionally, all Replacement Bridge Alternatives would affect other historic and possibly as-yet unidentified archaeological resources within the APE. In particular, the 14th Avenue S. Red Brick Road Remnant would be and the South Park Hall may be adversely affected. The No Action and Rehabilitation alternatives would have the fewest overall long-term effects on historic and as-yet unidentified archaeological resources. The High-Level Fixed-Span Bridge Alternative would have the most extensive effects to the entire suite of cultural resources.

3.7.3 Secondary and Cumulative Impacts

Archaeological Resources

Secondary Impacts

No secondary impacts were identified based on other reasonably foreseeable activities that could occur as a result of any of the proposed project alternatives.

Cumulative Impacts

Planned development in the project vicinity may result in cumulative impacts on archaeological resources. The Duwamish Waterway sediment cleanup, maintenance dredging, 14th Avenue S. paving and street lighting, and shoreline restoration projects would not likely result in cumulative effects when combined with the proposed South Park Bridge Project as the shallow construction activities would occur where ground disturbance has previously occurred. However, it is possible that the construction activities involved in the Seattle drainage improvements could extend to areas not previously disturbed. Cumulative impacts

could also occur to archaeological deposits from continued urban redevelopment of the South Park area.

Historic Resources

Secondary Impacts

The secondary effects on historic resources would differ by project alternative. The No Action Alternative would indirectly affect commercial uses on 14th Avenue S., including an NRHP-eligible property, due to eventual bridge demolition, a major change in transportation access to the South Park community, and potential business failures. Other historic resources in the APE would not be noticeably affected by temporary or long-term visual, noise, and vibration effects.

In contrast, the Rehabilitation Alternative would be the same scale and location as the existing bridge. Bridge closure during nearly all of the 32-month construction period, however, would result in temporary effects similar to the long-term impacts of the No Action Alternative, particularly effects to commercial businesses on 14th Avenue S. The indirect effects of visual, noise, and vibration on historic properties in the APE would not noticeably increase on a temporary or long-term basis.

The Bascule Bridge Alternative would be on a slightly different alignment than the existing bridge and the long-term indirect effects would be similar to those of the Mid-Level Fixed-Span Bridge and High-Level Fixed-Span Bridge alternatives. These alternatives would be on a new alignment immediately west of the existing bridge. The construction of this alternative would affect the setting and association of the NRHP-eligible Boeing Plant 2 property due to required right of way acquisition, but would not result in an adverse effect. However, the long-term impacts of the Bascule Bridge Alternative would be very similar to the Rehabilitation Alternative due to the small area affected.

The roadway improvements associated with the Mid-Level Fixed-Span Bridge Alternative would extend south of the South Park Hall (8611/13 14th Avenue S.). Construction of this alternative would indirectly affect the historical integrity of this NRHP-eligible property by altering its existing setting and association due to slightly increased road elevation in front of the building. Consequently, this alternative would have an adverse effect on this historic property. The construction of this alternative would also affect the setting and association of the NRHP-eligible Boeing Plant 2 property; however, those indirect effects would not result in an adverse effect on that historic property. The acquisition of 14 other properties for this alternative, particularly the businesses on 14th Avenue S. between S. Sullivan Street and S. Cloverdale Street, could also potentially result in abandonment, redevelopment, and/or failure of some businesses in the South Park business district. These potential long-term changes could lead to a more general decline in the economic viability of the neighborhood that could

ultimately have an indirect effect on other historic properties in the project vicinity.

The proposed 100-foot height of the High-Level Fixed-Span Bridge Alternative and the acquisition of a total of 39 properties, mostly on the 14th Avenue S. and S. Trenton Street corridor, would indirectly affect historic resources in the APE similar to the Mid-Level Fixed-Span Bridge Alternative except access from the old South Park Hall (8611/13 14th Avenue S.) also would be adversely affected due to the close proximity of the 20-foot bridge abutment. Because of this change in access, it is expected that the building would be acquired. These long-term effects would be due to the bridge's increased visual intrusion in the community, loss of access to parking, loss of roadway access, and likely business abandonment, redevelopment, and/or failure.

Long-term operational effects from visual, noise, or vibration impacts would also indirectly affect historic properties in South Park. These effects would occur in particular as the result of the increased height and extent of the Mid-Level Fixed-Span Bridge Alternative and, to a greater degree, the High-Level Fixed-Span Bridge Alternative.

For all alternatives, temporary construction-related indirect effects on NRHP-eligible resources would occur, particularly within close proximity of the existing and proposed alignments. Properties that would be affected the most include Boeing Plant 2, the 14th Avenue S. Red Brick Road Remnant, the house at 1215 S. Sullivan Street, the house at 1215 S. Cloverdale Street, and the old South Park Hall at 8611/13 14th Avenue S. The other historic residential properties could be affected by temporary and indirect effects during construction, but to a much lesser degree based on their greater distance from the project site.

Cumulative Impacts

The eventual demolition of the South Park Bridge would contribute to a cumulative loss of historic bridges in King County and Washington State for the No Action Alternative and the proposed Replacement Bridge Alternatives. Substantial modifications to the historic South Park Bridge under the Rehabilitation Alternative would also contribute to a cumulative loss of historic bridges in King County and Washington State. None of the other projects planned in the area as described in Section 3.1 Introduction would be expected to adversely affect historic resources.

3.7.4 Mitigation Measures

This section summarizes potential mitigation measures for historic and archaeological resources within the APE that may be impacted by any of the proposed alternatives.

Archaeological Resources

In order to comply with 36 CFR Parts 800.8(c)(4), 800.13, and 800.14(b)(1)(ii), a programmatic agreement (PA) should be developed to memorialize the commitment to continued efforts to identify archaeological resources in the form of an Archaeological Testing Plan. The PA should also include a Monitoring Plan, an Unanticipated Discovery Plan (UDP), and mitigation measures to resolve adverse effects on archaeological resources eligible for the national, county, or city registers. The PA should be developed by FHWA in consultation with the SHPO and the Advisory Council on Historic Preservation (ACHP), all of whom would be required signatory parties. Additionally, the City of Seattle, City of Tukwila, King County, and affected tribes should also be invited to sign the PA.

The Archaeological Testing Plan could include provisions to excavate trenches where a portion of the sidewalk, parking lot, or road is removed to expose subsoils and auguring as a means of conducting deeper testing. An archeologist would be onsite to monitor the work for archaeological resources and to characterize the soils in terms of their potential to contain archaeological resources. The Monitoring Plan should outline archaeological monitoring procedures and establish protocols for addressing and assessing cultural resources discovered during additional pre-construction geotechnical testing and during construction activities. Construction monitoring would be necessary to prevent any undiscovered archaeological resources from being adversely affected. The UDP would outline protocols to be implemented if cultural resources are encountered during construction.

Mitigation measures to resolve adverse effects to archaeological resources might include, but would not be limited to, a combination of re-engineering, subsurface testing, data recovery, capping, and public interpretation efforts.

Historic Resources

For all Build Alternatives, the PA discussed above should include the measures agreed upon to resolve adverse effects to historic resources eligible for the national, county, or city registers.

Mitigation of adverse effects to the South Park Bridge would likely include documentation of the historic bridge consistent with Historic American Engineering Record (HAER) standards. Additional mitigation measures could include incorporating design elements that are sensitive to the architectural, historic, and cultural context of the bridge; public interpretation; and/or salvaging of notable features of the bridge, including the brick bridge control tower, balustrades, and Scherzer rolling-lift mechanism. Partial preservation in place and/or offsite mitigation—including reuse of part of the northern fixed portion of the bridge to interpret both the history and engineering of the old and new bridges and wartime history of the Boeing plants—could also be considered.

Other mitigation measures could include the following:

- Resolution of adverse effects on the 14th Avenue S. Red Brick Road Remnant might include the stipulation that the bricks be salvaged and reused in another historically suitable context.

- Resolution of adverse effects on Boeing Plant 2 might include limiting or altering construction activities on the north side of the bridge or providing public interpretation.

- For residential and commercial historic properties within the APE, resolution of adverse effects might include the incorporation of design elements into the bridge that reduce visual, noise, and vibration effects upon affected properties. Resolution of adverse effects to residential properties might also include relocation of the affected property. However, the lack of available undeveloped land in South Park may prohibit relocation within the community. Relocation to an area outside of the neighborhood would adversely affect setting and association. Therefore, although relocation should be considered as a mitigation measure, it appears to be a problematic option.

Some mitigation measures might require relocation, salvage, or construction (of an interpretive center, for example). Additional evaluation will be necessary to ensure that these activities would not have their own adverse effects on cultural resources. Historic American Building Survey (HABS) documentation would be done for buildings that are adversely affected.

3.8 Visual Assessment

This section discusses the likely visual changes in the project area for each of the proposed alternatives. An assessment was conducted of the visual qualities of existing views of the South Park Bridge and views from the bridge. The FHWA-prescribed assessment process is based on qualitative characteristics and a rating scheme that follows FHWA guidelines. The assessment process also accounts for who sees the view and the frequency and duration of such views. The same type of assessment was then conducted for each of the project alternatives from a total of nine viewpoints. Photo-simulation perspective drawings as well as simulation sketches were prepared to illustrate the approximate height and bulk of each of the project alternatives compared to the surrounding environment. The specific design of the selected alternative will be done during preliminary and final engineering design. Mitigation measures to address visual impacts are recommended at the end of this section. For additional, more detailed information, see Appendix Q, *Visual Assessment Technical Report* (Osborn Pacific Group 2004).

3.8.1 Affected Environment

An analysis of existing visual aesthetic conditions serves as a baseline for comparison of the visual impact of each of the alternatives. Figure 3-23 shows the landscape districts in the project.

Views Towards the Project

From the north, long-distance views to the waterway and bridge area are obstructed by the Boeing buildings that were constructed adjacent to the waterfront. The typical foreground view from the north features the paved roadway ramp. Likewise, encroachment of industrial buildings obstructs potential viewpoints from much of the south, except for views of the roadway ramp from the commercial area directly south of the bridge. From a few residences, street ends, Duwamish Waterway Park, and the waterway itself, viewpoints of the bridge project area from the west are accessible, but the bridge does not dominate the prevalent industrial character. From the east, the bridge dominates the view from the marina area.

- **The Boeing Company:** The dominant industry of South Park, The Boeing Company enjoys one of the only true superior (as seen from above) views of the South Park Bridge. Views from Boeing are dominated by the roadway and so are rated very low in vividness and intactness. Unity is higher as paving is consistent with the industrial backdrop.

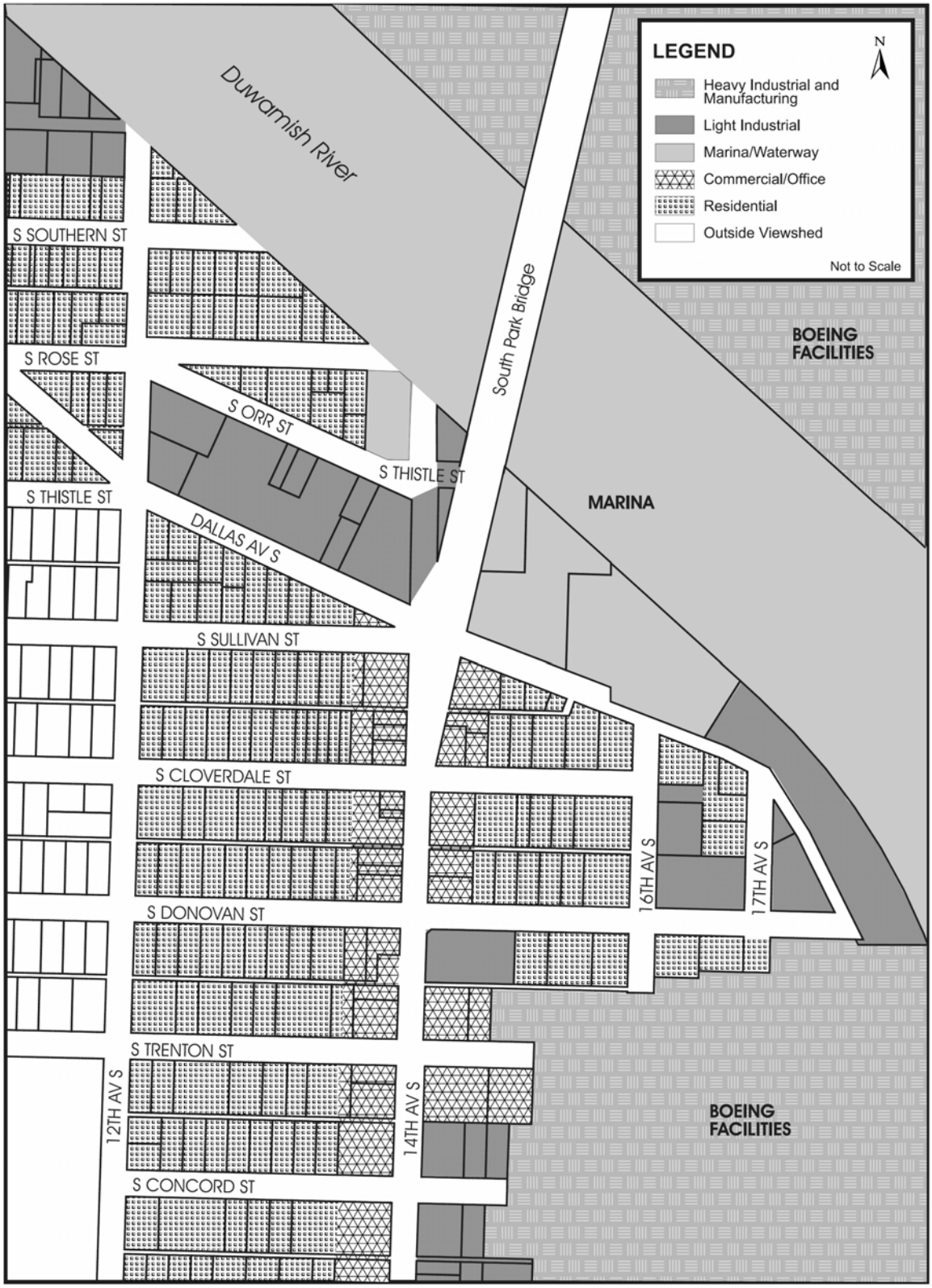


Figure 3-23
Landscape Districts

- **Small Manufacturing District:** The industrial area views the bridge from both normal and inferior positions. Viewers close to the bridge have an inferior position, showcasing the concrete bridge structure, which is uniform with its industrial backdrop. Views from this area rate low in vividness and intactness and higher in unity.

- **The Marina/Waterway District:** The marina observer's inferior position focuses attention on the bridge, not the water. The surrounding industrial buildings tend to dominate foreground and background views; thus, vividness and intactness score moderately low overall. As a uniformly degraded and industrialized marine environment, the views score low to medium for unity.

- **Commercial District:** Views of the bridge are primarily from a normal position in the commercial district. Because of this, one sees little, if any, of the bridge structure. The bridge appears to be a roadway ramp with rails and no marine context is visible. Existing views from the commercial area rate very low in vividness and intactness, but not as low in unity.

- **Residential Neighborhood:** The residential neighborhood furnishes mostly distant views of the bridge from a normal position. Existing views rate low in vividness, but higher in intactness and unity. Viewers from Duwamish Waterway Park, downstream of the bridge, have a more vivid view as the park is situated to feature the bridge profile in the distance. Foreground intactness and unity rate high, while background views dominated by The Boeing Company rate low.

Views From the Project

- **From The Boeing Company Plant 2:** Views from the north side of the bridge would be rated very high when Mt. Rainier is visible. Few motorists would see the waterway below, though pedestrians find its vividness attracts their attention away from the industrial warehouses. For drivers, bland foreground and middleground views of the bridge deck and railing rate low in vividness and intactness, but higher in unity.

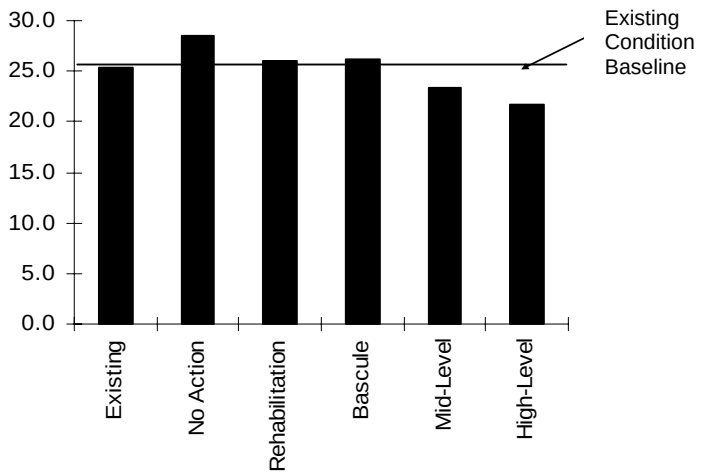
- **Commercial District:** Motorists and pedestrians approaching the bridge from the commercial district have the opportunity to see distant city views, but are not positioned to view the marina or waterway, due to the height of the railings. Background views rate higher than foreground views for this reason. The middleground is dominated by The Boeing Company office buildings and parking lots and rates low in vividness and intactness, but higher in unity.

3.8.2 Environmental Impacts

Five project alternatives were considered in this analysis, and each was evaluated for direct and secondary impacts as well as operational and construction activity impacts. Table 3-11 is a comparison of the visual impacts of the proposed project alternatives. Figure 3-24 shows the location and direction of each viewpoint evaluated below.

Table 3-11. Comparison of the Visual Impacts of the Project Alternatives

Overall Average Visual Quality



Visual Quality Comparison (average visual quality)	Existing	No Action	Rehabili-tation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge
A-1	22.1	27.3	23.5	23.5	21.1	15.8
A-2	20.7	n/a	21.3	22.0	18.3	14.0
B-1	22.0	22.3	22.0	22.0	18.7	19.7
C-1	28.3	28.3	28.3	29.3	25.7	29.3
C-2	30.7	30.7	30.7	31.0	26.0	28.7
D-1	15.3	19.3	18.7	18.7	15.7	11.3
D-2	19.3	n/a	19.3	19.3	18.3	14.0
E-1	30.7	29.7	30.7	30.0	28.7	26.7
E-2	39.3	40.7	39.3	39.3	38.3	35.7
Overall Average Visual Quality	25.4	28.5	26.0	26.1	23.4	21.7
Average Change in Visual Quality	0.0	3.1	0.6	0.7	-2.0	-3.7

Source: Osborn Pacific Group 2004.

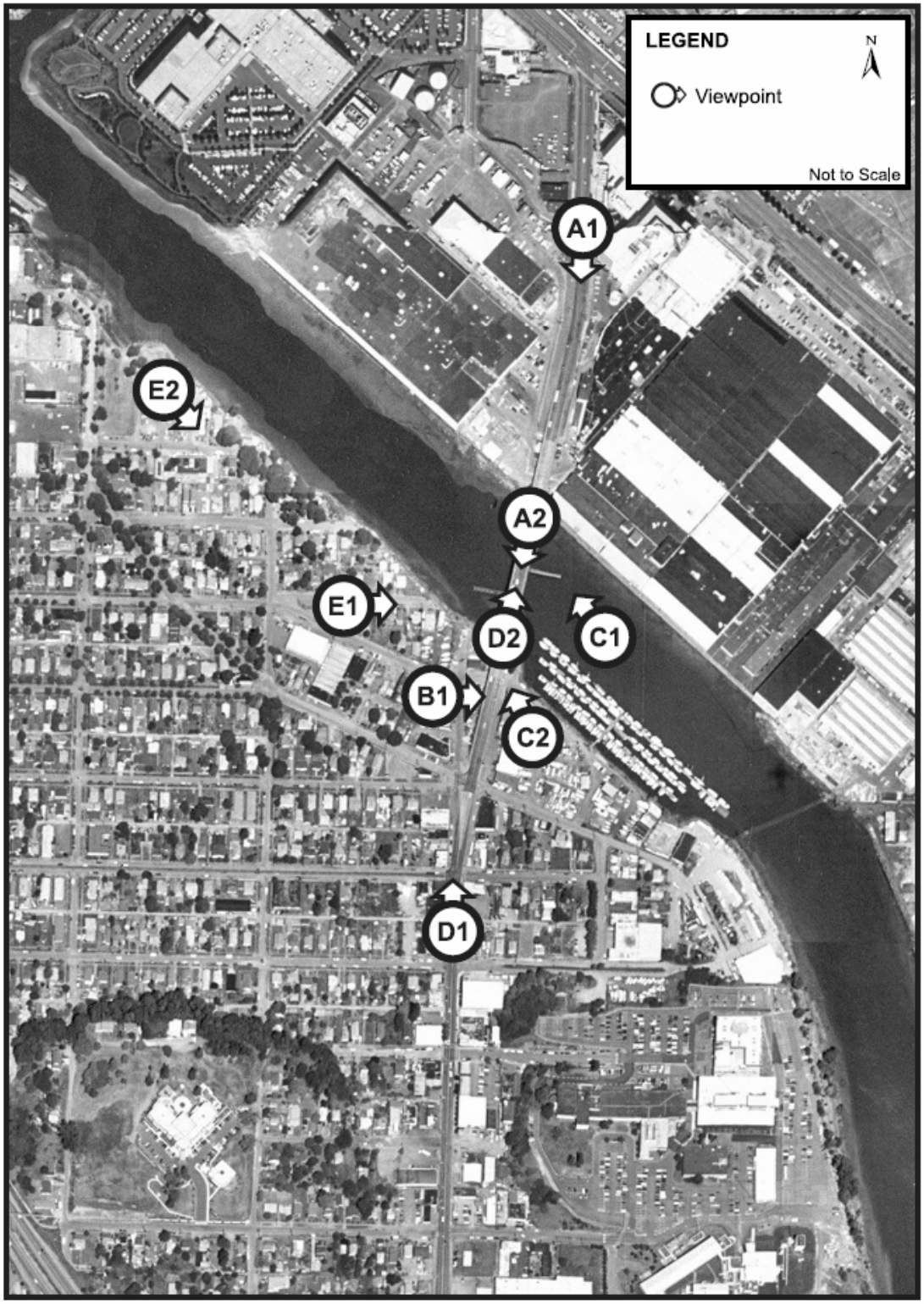


Figure 3-24
Location of Viewpoints Construction and Demolition Impacts

Construction and Demolition Impacts

All of the alternatives would result in visual impacts during the construction phase. Whether these impacts are seen as positive or negative depend somewhat upon one's personal interest and attitudes toward the construction activities occurring on any given day. Watching pile driving progress could be fascinating to nearby industrial workers, but the reminder of a constant annoyance to a nearby daycare provider. Just the opposite could as easily be true. The following summaries outline the different impacts of the various alternatives.

No Action Alternative

Removal of the bridge would create dust and would result in a temporary influx of vehicles, debris piles, dumpsters, fencing, signage and other construction-related equipment. Light and glare from the No Action Alternative would begin to affect viewers as soon as construction begins. Stockpiled construction material and machinery would require security lighting.

Rehabilitation Alternative

The Rehabilitation Alternative would cause the least visual impact, as the work would be confined to the existing bridge alignment plus some adjacent staging areas. Only three buildings would be demolished. However, due to the bridge closure, impact would be longer than new bridge construction for some of the alternatives. Construction signing, new traffic patterns, long lines of cars waiting for flaggers, and detour signs throughout the area would be apparent to viewer groups as they approach the bridge. Trucks, workers, and stockpiled materials, barges, cranes, and work occurring at the water line would be visible for the longest period of time with this alternative. Light and glare from the Rehabilitation Alternative would begin to affect viewers as soon as construction begins. Stockpiled construction material and machinery would require security lighting.

Bascule Bridge Alternative

Approximately five buildings would be demolished during construction of the Bascule Bridge. This alternative could result in some onsite stockpiles. Fencing, barricades, and detour signage would have less visual impact because motorists would continue to use the existing bridge. Trucks, workers, and equipment would be visible from all landscape districts. Barges, cranes, and work occurring at the water line would be visible from the marina, to some Boeing workers, and from selected residential areas. Light and glare from the Bascule Bridge Alternative would begin to affect viewers as soon as construction begins. Stockpiled construction material and machinery would require security lighting.

Mid-Level Fixed-Span Bridge Alternative

Up to 13 buildings would be acquired and/or demolished along 14th Avenue S. during construction of the Mid-Level Fixed-Span Bridge. This alternative is slightly more likely to result in additional onsite stockpiled material during testing. Construction would continue in a similar fashion to the Bascule Bridge

Alternative, except that fencing, barricades, and detour signage would extend even farther south along 14th Avenue S. Trucks, workers, and stockpiled materials would be visible from all districts. Barges, cranes, and work occurring at the water line would be visible from the marina, to some Boeing workers, and from selected residential areas. Light and glare from the Mid-Level Fixed-Span Bridge Alternative would begin to affect viewers as soon as construction begins. Stockpiled construction material and machinery would require security lighting.

High-Level Fixed-Span Bridge Alternative

Up to 36 buildings would be acquired and/or demolished during construction of the High-Level Fixed-Span Bridge Alternative. These include all buildings along 14th Avenue S. to S. Trenton Street. In addition, clearing of several residences would occur in the vicinity of S. Trenton Street and 12th Avenue S. to accommodate permanent traffic re-routes. Construction would continue in a similar fashion to the Mid-Level Fixed-Span Bridge Alternative, except that construction fencing, barricades, and signage for detours and businesses would be visible in an extended area. Trucks, workers, and stockpiled materials would be visible from all districts. Barges, cranes, and work occurring at the water line would be visible from the marina, to some Boeing workers, and from selected residential areas. Light and glare from the High-Level Fixed-Span Bridge Alternative would begin to affect viewers as soon as construction begins. Stockpiled construction material and machinery would require security lighting.

Direct Impacts

The long-term impacts of the alternatives are described in this section. The photo-simulations in Figures 3-25 through 3-34 present two profile views of the alternatives depicted on the map in Figure 3-24. Figures 3-35 through 3-41 are sketch simulations of the alternatives looking both northbound from the intersection of S. Cloverdale Street and 14th Avenue S. and southbound from the intersection of S. Sullivan Street and 14th Avenue S. Together, these simulations and the following text discussions present a comprehensive analysis of potential visual and aesthetic impacts of the proposed alternatives.

No Action Alternative

Since “no action” would ultimately result in bridge removal, the No Action Alternative would achieve slightly increased vividness even though distant views of the city and mountains from the bridge deck vantage point would be gone. The landform and waterforms would both be more easily seen by all viewers. Intactness would increase, as development and encroachment would decrease. Unity would increase greatly as the natural riparian landscape would increase, giving an overall impression of unity with the waterway. Absence of operational impacts would result in increased intactness. The No Action Alternative would result in reduced light and glare from the bridge to the adjacent districts. Figures 3-25 and 3-30 show simulated views of this alternative.

Figure 3-25
Viewpoint C-1 No Action Alternative

Figure 3-26
Viewpoint C-1 Rehabilitation Alternative

Figure 3-27
Viewpoint C-1 Bascule Bridge Alternative

Figure 3-28
Viewpoint C-1 Mid-Level Fixed-Span Bridge Alternative

Figure 3-29
Viewpoint C-1 High-Level Fixed-Span Bridge Alternative

Figure 3-30
Viewpoint E-2 No Action Alternative

Figure 3-31
Viewpoint E-2 Rehabilitation Alternative

Figure 3-32
Viewpoint E-2 Bascule Bridge Alternative

Figure 3-33
Viewpoint E-2 Mid-Level Fixed-Span Bridge Alternative

Figure 3-34
Viewpoint E-2 High-Level Fixed-Span Bridge Alternative

Figure 3-35
Northbound View from Viewpoint D-1—Rehabilitation Alternative

Figure 3-36
Northbound View from Viewpoint D-1—Bascule Bridge Alternative

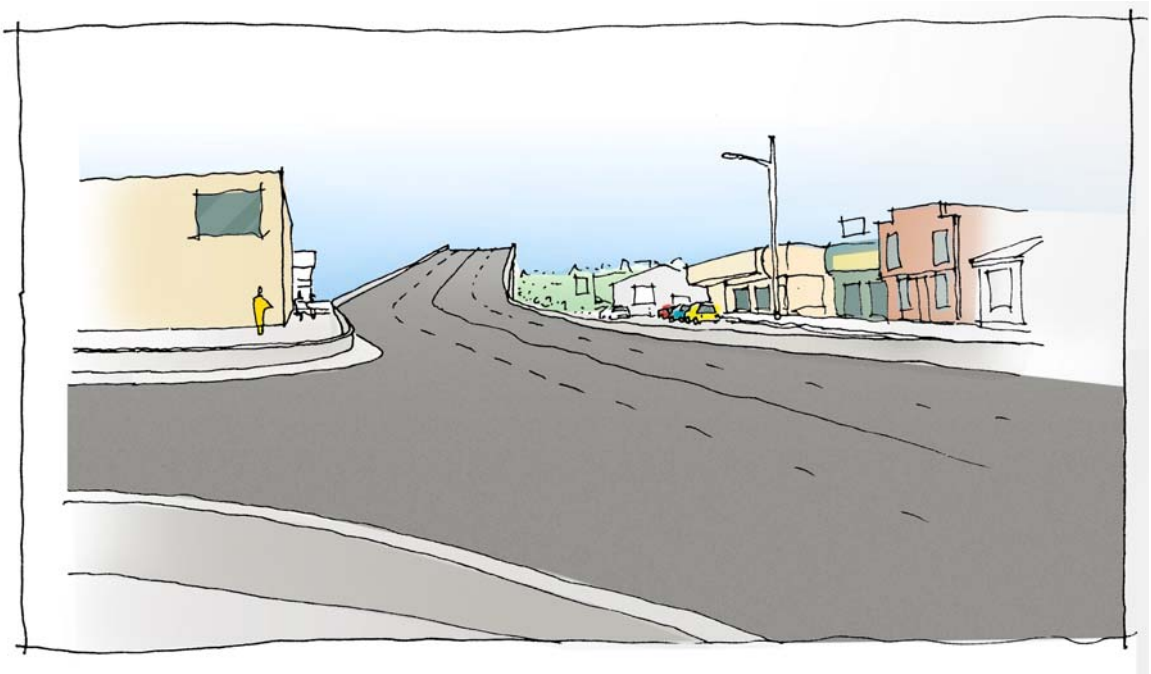


Figure 3-37
Northbound View from Viewpoint D-1—Mid-Level Fixed-Span Bridge Alternative

Figure 3-38
Northbound View from Viewpoint D-1—High-Level Fixed-Span Bridge Alternative

Figure 3-39
Southbound View from Existing Bridge—Rehabilitation and Bascule Bridge Alternatives

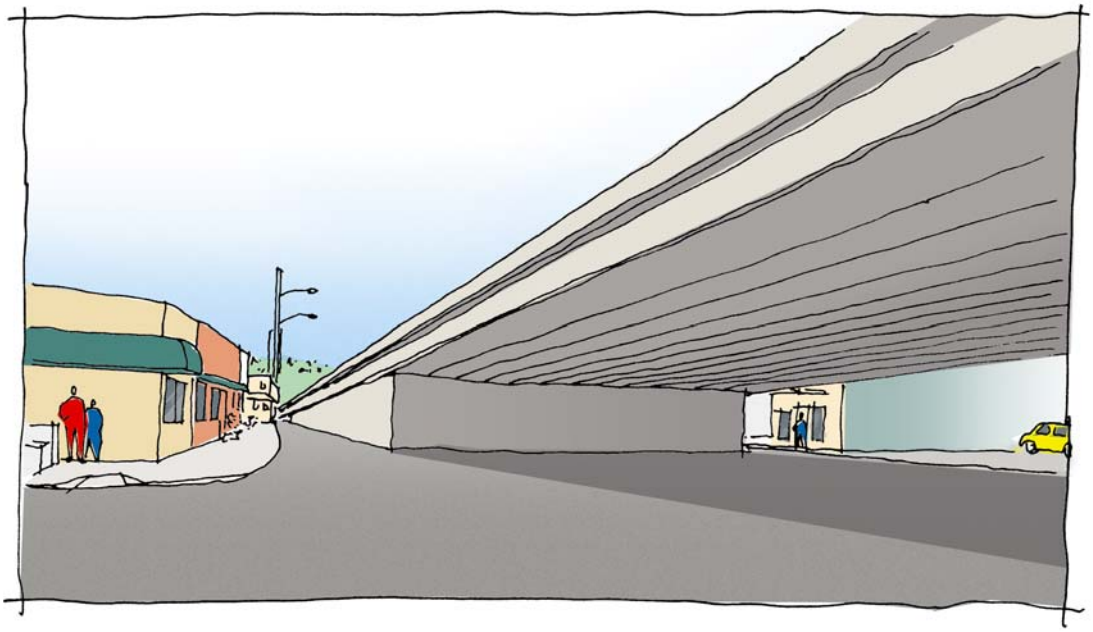


Figure 3-40
Southbound View from Dallas Avenue S.—Mid-Level Fixed-Span Bridge Alternative

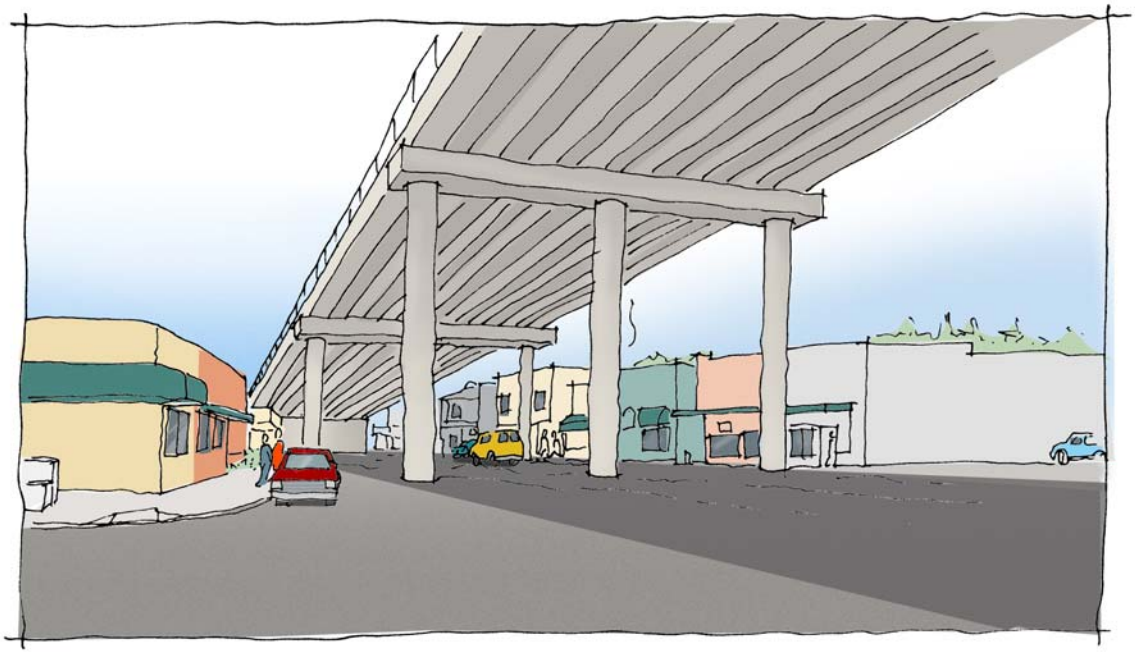


Figure 3-41
Southbound View—High-Level Fixed-Span Bridge Alternative

Rehabilitation Alternative

The Rehabilitation Alternative, by definition, especially if the reconstructed bascule pier were designed to nearly duplicate the design of the existing bascule pier, would not result in substantial visual changes. Operational impacts would remain the same. No substantial light and glare would directly result from the completed bridge. Figures 3-26, 3-31, 3-35, and 3-39 show simulated views of this alternative.

Bascule Bridge Alternative

The Bascule Bridge Alternative would result in increased vividness as the new construction could include "historic" details on the bridge. This could provide opportunity for continuing "historic" detailing throughout the nearby community public spaces. Intactness would remain approximately the same. Unity would increase slightly as the natural landscape would probably increase due to habitat mitigation and enhancement requirements, giving an overall impression of unity with the waterway. Operational impacts would remain the same. No substantial light and glare would directly result from the completed bridge. For the Bascule Bridge Alternative, building demolition along 14th Avenue S. could increase light and glare to the adjacent residential area. Abutments would create dark areas between the bridge and commercial establishments, requiring mitigation lighting that in turn could increase light and glare to the adjacent residential areas. Open bridge support areas could require security lighting, increasing light and glare into the marina and adjacent

industrial area. Figures 3-27, 3-32, 3-36, and 3-39 show simulated views of this alternative.

Mid-Level Fixed-Span Bridge Alternative

The Mid-Level Fixed-Span Bridge would result in increased exposure of the residential neighborhood to the view of passing motorists due to the loss of important buffer buildings between S. Sullivan Street and S. Cloverdale Street. The loss of one more block of commercial buildings between the homes and 14th Avenue S. would change the character of the downtown area from an established and serviceable two-story commercial strip to a predominately one-story residential neighborhood due to removal of much of the commercial businesses and depending on how many of the acquired parcels are redeveloped. Remaining buildings on 14th Avenue S. between S. Cloverdale Street and S. Donovan Street would be faced by a bridge ramp abutment, placing passing vehicles at an elevation just above head level of pedestrians on the adjacent sidewalk. In addition to the abutments, a structure for bicycle and pedestrian access to the bridge from S. Thistle Street would visually block views under the bridge to the waterway from the residential area to the west. No significant light and glare would directly result from the completed bridge.

For the Mid-Level Fixed-Span Bridge Alternative, building demolition along 14th Avenue S. could increase light and glare to the adjacent residential area, depending on future redevelopment. Abutments could create dark areas between the bridge and commercial establishments, requiring mitigation lighting that in turn could increase light and glare to the adjacent residential areas. Open bridge support areas could require security lighting, increasing light and glare into the marina and adjacent industrial area. The dead-end streets created by this alternative would increase headlight glare to the adjacent street-end residences from turning vehicles.

The loss of the buildings along 14th Avenue S. would decrease unity by exposing the quiet residential streets to the busy bridge traffic. In addition, these same residential areas would decrease in intactness as the new structure encroaches upon the neighborhood and S. Orr Street becomes a dead end. However, intactness could increase slightly as the adjacent natural landscape could increase due to habitat mitigation and enhancement. The dominance of the new bridge, however, would detract from an overall impression of unity with the waterway. Absence of operational impacts would result in increased intactness.

Figures 3-28, 3-33, 3-37, and 3-40 show simulated views of this alternative.

High-Level Fixed-Span Bridge Alternative

The High-Level Fixed-Span Bridge Alternative would result in greatly decreased intactness due to encroachment of the new bridge and associated structures into the South Park community. Unity would decrease as the comfortable older character of the few existing buildings likely would be too sparse to look like a

viable commercial district, especially with some at the very north end and others south of S. Trenton Street. Some of the remaining building facades on the west side of 14th Avenue S. would be blocked from view by new bridge abutment walls and ramps. The High-Level Fixed-Span Bridge Alternative would also decrease unity of the adjacent residential neighborhood due to the encroachment of the new bridge as it soars high above the existing homes.

Several residences located blocks away from the bridge itself also would be removed or compromised to accommodate re-routing of traffic on S. Trenton Street and 12th Avenue S. Residences removed due to residential street alignment between S. Trenton Street and 12th Avenue S. would have reduced unity in the affected neighborhood but increased intactness of the neighborhood if it resulted in more generous setbacks or local access open space. The natural landscape could slightly increase due to habitat mitigation and enhancement, but the dominance of the new bridge would distract from an overall impression of unity with the waterway. Absence of operational impacts would result in increased intactness.

The views of the Seattle skyline would be substantially enhanced, at least for commuters, though the exposure time of motorists would be very short and from a distant viewpoint. This increase in visual quality would result if the High-Level Fixed-Span Bridge Alternative is selected. No significant light and glare would directly result from the completed bridge. For the High-Level Fixed-Span Bridge Alternative, building demolition along 14th Avenue S. could increase light and glare to the adjacent residential area depending on the nature of redevelopment of acquired parcels on 14th Avenue S. Abutments would create dark areas between the bridge and commercial establishments, requiring mitigation lighting that in turn could increase light and glare to the adjacent residential areas. Open bridge support areas could require security lighting, increasing light and glare into the marina and adjacent industrial area. The dead-end streets created by this alternative would increase headlight glare to the adjacent street-end residences from turning vehicles.

Figures 3-29, 3-34, 3-38, and 3-41 show simulated views of this alternative.

3.8.3 Secondary and Cumulative Impacts

Secondary Impacts

The following paragraphs describe the potential secondary effects on visual resources as a result of constructing and operating each of the alternatives of the South Park Bridge Project.

No Action Alternative

By removing the existing bridge, the No Action Alternative offers the greatest potential for creating open space and public access to the Duwamish Waterway on the north and south banks, mostly within the designated shoreline. Secondary

changes would be subject to shoreline regulations, which limit building and paving. Overall, this alternative could result in greatly increased intactness in the South Park community by restricting encroachment.

Rehabilitation Alternative

The Rehabilitation Alternative would result in a variety of secondary visual changes. Buildings demolished for construction would result in property becoming available for redevelopment, potentially as public access areas. Major secondary effects could result from lengthy closure of the bridge. When the bridge is reopened, some businesses may no longer remain along 14th Avenue S., and the vitality of the downtown area could be substantially compromised. Collectively, these changes could have an adverse effect on the visual character of the South Park community.

Bascule Bridge Alternative

The new Bascule Bridge, realignment of 14th Avenue S., and mitigation measures along the project corridor could potentially inspire local businesses to restore facades to match the character of the new bridge, which could be designed with a historic character similar to the existing bridge. In contrast to that, new development replacing the tavern and marine buildings could result in modernization. The alignment of the new bridge would result in some property becoming available for redevelopment, potentially as public access areas. The new construction at the intersection of Dallas Avenue S. and S. Sullivan Street would create an opportunity for streetscape enhancement. Visually, these several changes collectively could set a new visual theme for the community based on additional community input. For example, the community could decide to build upon the historic character of the bridge or potentially decide to depart from the historic character and develop a modernized visual character for the community.

Mid-Level Fixed-Span Bridge Alternative

New development replacing the existing buildings could result in redevelopment of a substantial portion of the north end of the commercial business area. Due to the extent of these changes, the new development between S. Cloverdale Street and the waterway would likely result in a general modernization of the north end, decreasing unity with the existing historic character. A portion of the block between S. Donovan Street and S. Cloverdale Street would be flanked by the bridge abutment. Some businesses unable to respond to the marketing challenges presented by the loss of visibility and high maintenance of their entry areas would relocate to less challenging sites. The alignment of the new bridge would result in some property becoming available for development, potentially as public access areas.

High-Level Fixed-Span Bridge Alternative

In the case of the High-Level Fixed-Span Bridge Alternative, many vintage buildings could likely be replaced by new modern construction due to the very extensive impacts along 14th Avenue S. New development would likely result in

decreased unity with the character of the remaining commercial district as well as the historic character of the adjacent residential neighborhoods. The block between S. Trenton Street and S. Donovan Street would be flanked by the bridge abutment. Some businesses unable to respond to the marketing challenges presented by the loss of visibility and high maintenance of their entry areas would relocate to less challenging sites. The alignment of the new bridge would result in some property becoming available for development, potentially as public access areas. The extensive changes to the community would potentially result in a substantial change in the visual character in the South Park community.

Cumulative Impacts

Few adverse cumulative effects to visual resources would occur with the construction and operation of the South Park Bridge Project. The other foreseeable projects in the study area (see Section 3.1 Introduction) would generally result directly or indirectly in an overall improvement of the visual character of South Park. In addition, those other projects would primarily result in changes that would occur below ground (i.e., new utilities) or below the water level in the Duwamish Waterway (i.e., dredging or construction of the engineered sediment cap over contaminated sediment). As such, they would not affect the visual resources in the project area. The proposed 14th Avenue S. paving and streetlighting improvements would help to unify the visual character of the South Park business district, especially if the design of the street lights and other design elements of the bridge are complimentary.

3.8.4 Mitigation Measures

Mitigation for Direct Impacts

Visual mitigation measures may be required no matter which alternative is selected. A number of design options and enhancements could be employed as appropriate to mitigate visual impacts for each alternative. Potential mitigation measures for each alternative are suggested below; however, the incorporation of specific mitigation measures will be determined following selection of the preferred alternative.

All Alternatives

- Context-sensitive design principles should be considered and incorporated into design for the selected alternative to the greatest extent practicable.
- Public interpretive signs could be placed to record and identify the historical significance of the (former) bridge and affected properties.
- Notable features of the bridge could be salvaged (including the Scherzer rolling-lift mechanism).

- New access areas, bus shelters or pullouts, sidewalks, and street landscaping should be considered to enhance access to an attractive retail area.

- Future public recreation and shoreline access opportunities should be considered as potential land use actions.

- Retaining walls may be installed to contain new fill.

- Undergrounding of some utilities may be considered if upgrades are made.

No Action Alternative
All of the above mitigation plus:

- Supplement proposed planting on east side of the old bridge location to create a visual screen and buffer for the marina.

Rehabilitation Alternative
All of the above mitigation plus:

- Salvage bricks from the historic Red Brick Road to be used to repair similar historic roads in the area.

Bascule Bridge Alternative
All of the above mitigation plus:

- Mitigation for the loss of substrate would involve the installation of natural soils where hardened substrates exist. It would also require planting of native riparian vegetation along the shore of the Duwamish Waterway. This could significantly alter the appearance of the shoreline, which is dominated by nearby industrial complexes.

- Develop a public riverfront access point next to the new bridge. Maintain view of the waterway and marina from the commercial area.

- Enhance the visual quality for users of the pedestrian/bicycle path by extending historic character lighting fixtures used on the new bridge into the commercial area. Continue the historic theme design, including lighting, site furnishings, landscaping, etc., into open spaces created by demolition of the existing bridge and/or buildings.

- To reduce mass and scale of abutment walls and discourage graffiti, consider design treatment such as rustication forms for texture or relief, promoting community-oriented murals, or creating small planting strips directly adjacent to the walls.

- Refer to *Seattle's Comprehensive Plan* (Seattle 2001) and the *South Park Residential Urban Village Plan* (South Park Planning Committee 1998) for landscaping enhancement concepts for the commercial business area. Streetscape improvements (vegetation) at either abutment end would help to mitigate the increased quantity of pavement.

Mid-Level Fixed-Span Bridge Alternative

All of the above mitigation plus:

- Consider visual mitigation from as far as two blocks away from the actual proposed bridge replacement area.

- Create a landscape planting strip sufficient in size to accommodate trees adjacent to new retaining wall/abutments, pedestrian ramp, and piers. Plant trees, shrubs, and vines to soften the visual appearance of the wall and provide visual screening or enhancement for affected buildings.

- Restore landscaping disturbed by the construction of the S. Cloverdale Street intersection and introduce landscaping along 14th Avenue S. extending north from the intersection.

High-Level Fixed-Span Bridge Alternative

All of the above mitigation plus:

- Develop a landscaping strip between the residential street ends and the bridge to minimize headlight glare from u-turns and to reduce windblown particulates in the area.

- Restore landscaping disturbed by the construction of the S. Cloverdale Street intersection and introduce landscaping along 14th Avenue S. extending south from the intersection. Restore landscaping at affected residential properties along 12th Avenue S. and S. Trenton Street.

Mitigation for Construction Impacts

Minimizing visual impacts of construction for all alternatives would require mitigating for many visual challenges. Signage, lighting, and other information would be provided to direct traffic to detour routes and indicate that businesses are open. All alternatives would require restoration and re-vegetation of the natural riparian habitat, thereby introducing trucks and stockpiled landscape material. Temporary screens or curtains may surround stationary equipment.

3.9 Air Quality

This section describes anticipated impacts to air quality during the construction and operation of the proposed project alternatives. This analysis is based on prescribed computer modeling, regional transportation forecasts, and federal and State regulations. For this project, potential impacts are expected to be limited to the temporary air emissions that would occur during construction and demolition activities. Best management practices (BMPs) to mitigate these potential impacts are identified at the end of this section. For additional, more detailed information, see Appendix R, *Air Quality Technical Report* (Parsons Brinckerhoff 2004a).

3.9.1 Affected Environment

Air quality in the project area is regulated by the U.S. Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology), and Puget Sound Clean Air Agency (PSCAA). Under the federal Clean Air Act of 1970 (CAA) [42 USC 7401 et seq.], the EPA has established the National Ambient Air Quality Standards (NAAQS), which specify maximum concentrations for carbon monoxide (CO), particulate matter less than 10 micrometers in size (PM_{10}), particulate matter less than 2.5 micrometers in size ($PM_{2.5}$), ozone, sulfur dioxide, lead, and nitrogen dioxide (NO_x). These regulated pollutants are referred to as criteria pollutants. The ambient air quality standards applicable to transportation projects are summarized in Table 3-12.

The FHWA and WSDOT projects must comply with the project-level conformity criteria of the EPA Conformity Rule and with WAC Chapter 173-420. Regionally significant projects must be included in a conforming Metropolitan Transportation Plan (MTP) and Transportation Improvement Plan (TIP) by the regional metropolitan planning organization (MPO).

The South Park Bridge Project does not need to be included operationally in the MTP and TIP because the Build Alternatives would maintain or replace an existing regionally significant connection without substantially changing the capacity of the facility. Should the bridge removal alternative be selected (No Action Alternative), the MTP would require revision to reflect removal of the regionally significant link. As stated in 40 CFR Part 93, specific criteria must be met when determining project conformity. A summary of the project's conformity to the State Implementation Plan (SIP) is discussed in Appendix R, *Air Quality Technical Report* (Parsons Brinckerhoff 2004a). If the project does not make timely progress, as defined in Section 2.7 of that report, the conformity determination would require updating to the latest planning assumptions prior to construction.

Table 3-12. Summary of Ambient Air Quality Standards

Pollutant	National Primary Standards	Washington State Standards	PSCAA Regional Standards
Carbon Monoxide (CO)			
One-Hour Average (not to be exceeded more than once per year)	35 ppm	35 ppm	35 ppm
Eight-Hour Average (not to be exceeded more than once per year)	9 ppm	9 ppm	9 ppm
PM_{10}			
Annual Arithmetic Mean	50 µg/m^3	50 µg/m^3	50 µg/m^3
24-Hour Average Concentration (not to be exceeded more than once per year)	150 µg/m^3	150 µg/m^3	150 µg/m^3
$PM_{2.5}$			
Annual Arithmetic Mean	15 µg/m^3	NS	NS
24-Hour Average Concentration (not to be exceeded more than once per year)	65 µg/m^3	NS	NS
Total Suspended Particulates (TSP)			
Annual Arithmetic Mean	NS	60 µg/m^3	60 µg/m^3
24-Hour Average Concentration (not to be exceeded more than once per year)	NS	150 µg/m^3	150 µg/m^3
Ozone			
One-Hour Average (not to be exceeded more than once per year)	0.12 ppm	0.12 ppm	0.12 ppm
Eight-Hour Average (not to be exceeded more than once per year)	0.08 ppm	NS	NS
Notes: ppm = parts per million µg/m^3 = micrograms per cubic meter NS = No Standard			

Sources: PSCAA Regulation 1 (1994); 40 CFR Part 50 (1997); WAC Chapters. 173-470, 173-474, 173-175 (1996).

3.9.2 Environmental Impacts

Air quality impacts were modeled for both the construction and operation phases of the project alternatives. Modeling for the operational phase was performed for 2007 (assumed first-year operation) and 2027 (the assumed 20-year horizon). Subsequent to modeling, the project schedule was modified and the first year of operation was changed from 2007 to 2009. The results are reported for 2007, but results for 2009 are expected to be very similar. In addition, air quality impacts were analyzed for 2027 instead of 2030 because the air analysis for this project was completed prior to the summer of 2003, when the PSRC extended the horizon year to 2030.

The air quality analysis completed for this project is consistent with the current requirements specified in the WSDOT *Environmental Procedures Manual* (WSDOT 2004). Air quality impacts based on computer modeling and mitigation measures for this project are summarized in Table 3-13. The worst-case 8-hour CO standard is 9 ppm. Values above this threshold are impacts that would require mitigation.

Table 3-13. Summary of Air Quality Impacts and Mitigation

Alternative	Construction Impacts	Long-Term Operational Impacts	Mitigation
No Action	Demolition activities of the existing bridge (estimated approximately 8 months) would result in temporary emissions of pollutants.	Worst-case: 8-hour CO concentrations would range between 3.2 and 3.6 ppm in 2007 and 2.6 and 2.9 ppm in 2027.	Use of BMPs during demolition would control particulate emissions. No mitigation would be required during operation
Rehabilitation	Construction activities (estimated approximately 32 months) would result in temporary emissions of pollutants.	Worst-case: 8-hour CO concentrations would range between 3.2 and 4.8 ppm in 2007 and 2.8 and 3.7 ppm in 2027.	Use of BMPs during construction would control particulate emissions. No mitigation would be required during operation.
Bascule Bridge	Construction activities (estimated approximately 33 months) would result in temporary emissions of pollutants.	Worst-case: 8-hour CO concentrations would range between 3.2 and 4.8 ppm in 2007 and 2.8 and 3.7 ppm in 2027.	Use of BMPs during construction would control particulate emissions. No mitigation would be required during operation.
Mid-Level Fixed-Span Bridge	Construction activities (estimated approximately 20 months) would result in temporary emissions of pollutants.	Worst-case: 8-hour CO concentrations would range between 3.2 and 4.8 ppm in 2007 and 2.8 and 3.7 ppm in 2027.	Use of BMPs during construction would control particulate emissions. No mitigation would be required during operation.
High-Level Fixed-Span Bridge	Construction activities (estimated approximately 24 months) would result in temporary emissions of pollutants.	Worst-case: 8-hour CO concentrations would range between 4.2 and 5.1 ppm in 2007 and 3.2 and 3.6 ppm in 2027.	Use of BMPs during construction would control particulate emissions. No mitigation would be required during operation.

Source: Parsons Brinckerhoff 2004a.

Construction activities would result in temporary pollutant emissions, including dust and odors. The duration of these temporary construction air impacts, however, would vary among the project alternatives. These impacts would last approximately 8 months for the No Action Alternative. The duration of construction for the two fixed-span bridge alternatives would last approximately 20 to 24 months. The construction period for the Rehabilitation Alternative would be approximately 32 months and approximately 33 months for the Bascule Bridge Alternative.

Evaluation of the project alternatives also examined potential long-term air quality impacts in the project area following construction. The computer modeling examined potential changes in the following measures of air pollution: volatile organic compounds, NO_x, PM, CO, air toxics, and other air pollutants. The key variable analyzed was the worse case 8-hour localized concentration of CO. Table 3-13 shows the results of this computer modeling of the potential long-term air impacts. In each case, the No Action Alternative as well as the Build Alternatives, air quality did not exceed regulatory standards.

3.9.3 Secondary and Cumulative Impacts

Secondary Impacts

No secondary air quality impacts were identified based on other reasonably foreseeable activities that could occur as a result of the proposed project alternatives. The Build Alternatives would ultimately contribute to better air quality at adjacent gateway intersections compared to the No Action Alternative.

Cumulative Impacts

The air quality analysis was performed using projected traffic volumes for future years. These projected traffic volumes incorporate anticipated traffic generation from planned land use development. None of the proposed projects in the project vicinity (see Section 3.1 Introduction) would result in long-term air impacts. Therefore, the air quality analysis addresses the cumulative effects of the project and other traffic growth that would be associated with the project.

3.9.4 Mitigation Measures

This section describes the recommended mitigation measures to avoid, reduce, or minimize potential construction and operation impacts to air quality. As shown in the computer modeling, however, impacts to air quality during the operation of the proposed project alternatives would not exceed regulatory thresholds and would not require mitigation. As such, this section only discusses recommended mitigation measures to be implemented during the construction phase of the project.

Particulate emissions (in the form of fugitive dust during construction activities) are regulated by the PSCAA. BMPs direct operators of equipment that could be fugitive dust sources to take reasonable precautions to prevent dust from becoming airborne and to maintain and operate the equipment to minimize emissions. Construction impacts could be reduced by incorporating the mitigation measures outlined in the Associated General Contractors of Washington (AGCW) Guidelines into the project's construction specifications (AGCW 1997). Possible mitigation measures to control PM_{10} (10 parts per million), deposition of PM, and emissions of CO and NO_x during construction of each alternative are listed below:

- Spray exposed soil with water or other dust palliatives to reduce PM_{10} emissions and deposition of PM.
- Cover all trucks transporting materials, wet materials in trucks, or provide adequate freeboard (space from the top of the material to the top of the truck). This would reduce PM_{10} and deposition of PM during transportation.
- Provide wheel washers to remove particulate matter that would otherwise be carried offsite. This would decrease deposition of PM on area roadways.
- Remove PM deposited on paved, public roads to reduce mud on area roadways.
- Route and schedule construction trucks to reduce traffic delays during peak travel times. This would reduce secondary air quality impacts caused by a reduction in traffic speeds while waiting for construction trucks.
- Place quarry spall aprons where trucks enter public roads to reduce mud track-out.
- Gravel or pave haul roads to reduce particulate emissions.
- Require appropriate emission-control devices on all construction equipment powered by gasoline or diesel fuel to reduce CO and NO_x emissions in vehicular exhaust. Use relatively new, well-maintained equipment to reduce CO and NO_x emissions.
- Plant vegetative cover as soon as possible after grading to reduce windblown particulates in the area.
- Route construction trucks away from residential areas to minimize annoyance from dust.
- Use specific retrofit technology for emission reduction on diesel construction equipment; also use ultra low sulfur diesel fuel to the greatest extent possible.

3.10 Noise and Vibration

In this section, potential noise impacts of the proposed project alternatives are evaluated. General noise characteristics, typical noise levels, and a description of regulations affecting the generation of noise in the South Park area are presented. Typical noise levels generated by construction and demolition activities as well as noise levels generated by traffic are described. For this project, field measurements were made at eight locations in South Park. In addition, future noise conditions were forecast using a computer model. Lastly, specific construction and operation noise impacts, potential vibration impacts, and mitigation measures are presented. For additional, more detailed information, see Appendix S, *Noise Technical Report* (Parsons Brinckerhoff 2004d).

3.10.1 Affected Environment

This section discusses general noise characteristics, noise regulations, and typical construction and traffic noise. In addition, noise levels specific to the project area are described.

Noise Characteristics

Sound is created when objects vibrate. The human response to sound depends on the magnitude of a sound as a function of its frequency and time or duration pattern. The magnitude of typical noise levels is presented in Table 3-14.

Humans respond to sound's frequency or pitch. The commonly used frequency weighting for environmental noise is A-weighted decibels (dBA), which is most similar to how humans perceive sounds of low to moderate magnitude. The scale for measuring noise levels is the logarithmic decibel scale. The doubling of the number of noise sources increases noise levels by 3 dBA. The human ear can barely perceive a 3-dBA increase. But, a 5- or 6-dBA increase is readily noticeable and sounds as if the noise is about one and one-half times as loud. A 10-dBA increase appears to be a doubling in noise level to most listeners.

The Regulatory Environment

Applicable noise regulations and guidelines provide a basis for evaluating potential noise impacts. For federally funded highway projects, traffic noise impacts occur when predicted $L_{eq}(h)$ noise levels approach or exceed the FHWA's established noise abatement criteria (NAC) or substantially exceed existing noise levels (USDOT 1982). WSDOT has defined an increase of 10 dBA or more to be a substantial increase.

Table 3-14. Typical Noise Levels

Transportation Sources	Noise Level (dBA)	Other Sources	Description
	130		Painfully loud
Jet takeoff (200 feet)	120		
Car horn (3 feet)			Maximum vocal effort
	110		
	100	Shout (0.5 feet)	
			Very annoying
Heavy truck (50 feet)	90	Jack hammer (50 feet)	Loss of hearing with prolonged exposure
		Home shop tools (3 feet)	
Train on a structure (50 feet)	85	Backhoe (50 feet)	
City bus (50 feet)	80	Bulldozer (50 feet)	Annoying
		Vacuum cleaner (3 feet)	
Train (50 feet)	75	Blender (3 feet)	
City bus at stop (50 feet)			
Freeway traffic (50 feet)	70	Lawn mower (50 feet)	
		Large office	
Train in station (50 feet)	65	Washing machine (3 feet)	Intrusive
	60	TV (10 feet)	
Light traffic (50 feet)		Talking (10 feet)	
Light traffic (100 feet)	50		Quiet
		Refrigerator (3 feet)	
	40	Library	
	30	Soft whisper (15 feet)	Very quiet

Sources: FTA 1995, EPA 1971, EPA 1974.

This project is located within three local governmental jurisdictions: King County, the City of Seattle, and the City of Tukwila. King County standards for noise were followed for the South Park Bridge Project. The City of Seattle standards for noise are similar to King County standards with identical "maximum permissible sound levels" [Seattle Municipal Code 25.08.410] and construction noise allowances [Seattle Municipal Code 25.08.425]. The portion of

the project located in the City of Tukwila does not include sensitive noise receptors.

King County limits noise levels at property lines of neighboring properties [King County Code 12.88.020]. Property line noise regulations are presented in Table 3-15. The King County noise code is an adoption of the Ecology standards [WAC Chapter 173-60]. The maximum permissible sound levels depend on the land use district of both the source noise and receiving property. The standard does not include noise from traffic, aircraft, and railway operations in a public right of way.

Table 3-15. King County Maximum Permissible Sound Levels (dBA)

Noise Source	Receiving Property			
	Residential		Commercial	Industrial
	Day	Night[1]		
Residential	55	45	57	60
Commercial	57	47	60	65
Industrial	60	50	65	70

[1]The maximum permissible noise levels are reduced by 10 dBA for residential receiving properties between 10 p.m. and 7 a.m.

Source: King County Code 12.88.020.

Construction Noise

The maximum permissible sound levels in Table 3-15 also apply to construction activities occurring between 10 p.m. and 7 a.m. on weekdays and 10 p.m. and 9 a.m. on weekends [King County Code 12.88.020]. Performance of construction activities during nighttime hours would require a noise variance from King County or the City of Seattle depending on jurisdiction at the location of the construction. Construction activities carried out between 7 a.m. and 10 p.m. on weekdays and between 9 a.m. and 10 p.m. on weekends are allowed to exceed the standards per the following limits [King County Code 12.88.040]:

- Earthmoving or other large construction equipment may exceed the applicable limit by 25 dBA.
- Portable powered equipment may exceed the limit by 20 dBA.
- Impact equipment, such as jackhammers, may not exceed an L_{eq}(h) of 90 dBA or shorter-duration noise levels of 93 dBA L_{eq}(30 minutes), 96 dBA L_{eq}(15 minutes), and 99 dBA L_{eq}(7.5 minutes).

Short-term exceedances above the permissible sound level are allowed for any noise source. The maximum level may be exceeded by 5 dBA for a total of 15 minutes, by 10 dBA for a total of 5 minutes, or by 15 dBA for a total of 1.5 minutes during any one-hour period.

These allowed exceptions are referred to in terms of the percentage of time a certain level is exceeded; an L_{25} is the noise level that is exceeded 15 minutes during an hour. Therefore, the permissible L_{25} would be 5 dBA greater than the values in Table 3-15, provided that the noise level is below the permissible level for the rest of the hour and never exceeds the permissible level by more than 5 dBA. An hourly L_{eq} of approximately 2 dBA higher than the values in the table is an equivalent sound level to the permissible levels, including the allowed short-term excursions. Using this rule, an $L_{eq}(h)$ of 59 dBA corresponds approximately to a noise level of 57 dBA for 45 minutes and 62 dBA for 15 minutes, which is the maximum permissible noise level created by a source in a commercial zone and received by a property in a residential zone.

Traffic Noise

Noise levels from traffic sources depend on the volume, speed, and type of vehicle. Vehicle noise is a combination of noises from engines, exhaust, and tires. Other conditions affecting traffic noise include steep grades, terrain, vegetation, distance from the roadway, shielding by barriers and buildings, roadway and bridge deck surfaces, and elevation of the roadway in relation to noise receptors. The propagation of noise can be greatly affected by terrain and the elevation of the receiver relative to the noise sources. Breaking the line of sight between a receiver and the highest noise source typically reduces noise levels by approximately 5 dBA.

King County establishes maximum noise levels for individual vehicles [King County Code 12.90.010]; however, collective traffic noise from vehicles operating on public streets is exempt [King County Code 12.90.060]. Because traffic is exempt from the King County property line standards, the FHWA NAC are used to determine impacts from traffic noise. Under the FHWA guidelines, impacts occur when predicted $L_{eq}(h)$ noise levels approach or exceed the NAC or substantially exceed existing noise levels (USDOT 1982). “Substantially exceed” is defined as an increase of 10 dBA or more in the State of Washington.

The FHWA noise abatement criteria specify exterior $L_{eq}(h)$ noise levels for various land activity categories (see Table 3-16). Thus, if a noise level $L_{eq}(h)$ were 66 dBA or higher, it would approach or exceed the FHWA noise abatement criterion of 67 dBA for residences.

Table 3-16. FHWA Noise Abatement Criteria

Activity Category	L_{eq}(h) (dBA)	Description of Activity Category
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	—	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: U.S. Department of Transportation 1982.

Existing Conditions

Noise

For the proposed South Park Bridge Project, existing ambient noise levels were measured at eight locations in the project area (see Figure 3-42). These eight locations represent 45 residences. The noise measurements were used to characterize the weekday noise levels and to calibrate the traffic noise model.

Measured noise locations were representative of all sensitive use in the study area and consistent with the *Manual for Highway Noise and Land Use* (USDOT 1972). Daytime measurements were taken at seven of the locations, and a 24-hour noise measurement was taken at the eighth. Typical receptor distances range between 25 and 200 feet from modeled roadways. Existing and future noise levels for each of the proposed project alternatives were modeled at each of the monitoring locations to describe the alternative's effects.

Vibration

Vibration impacts can occur to historic or other sensitive structures when project construction activities damage a structure even when not occurring immediately adjacent to the structure. Vibration is usually measured as a root-mean-square velocity level, which is reported in velocity decibels (VdB) referenced to a vibration level of micro inches/second. Humans can perceive vibration levels above approximately 65 VdB.

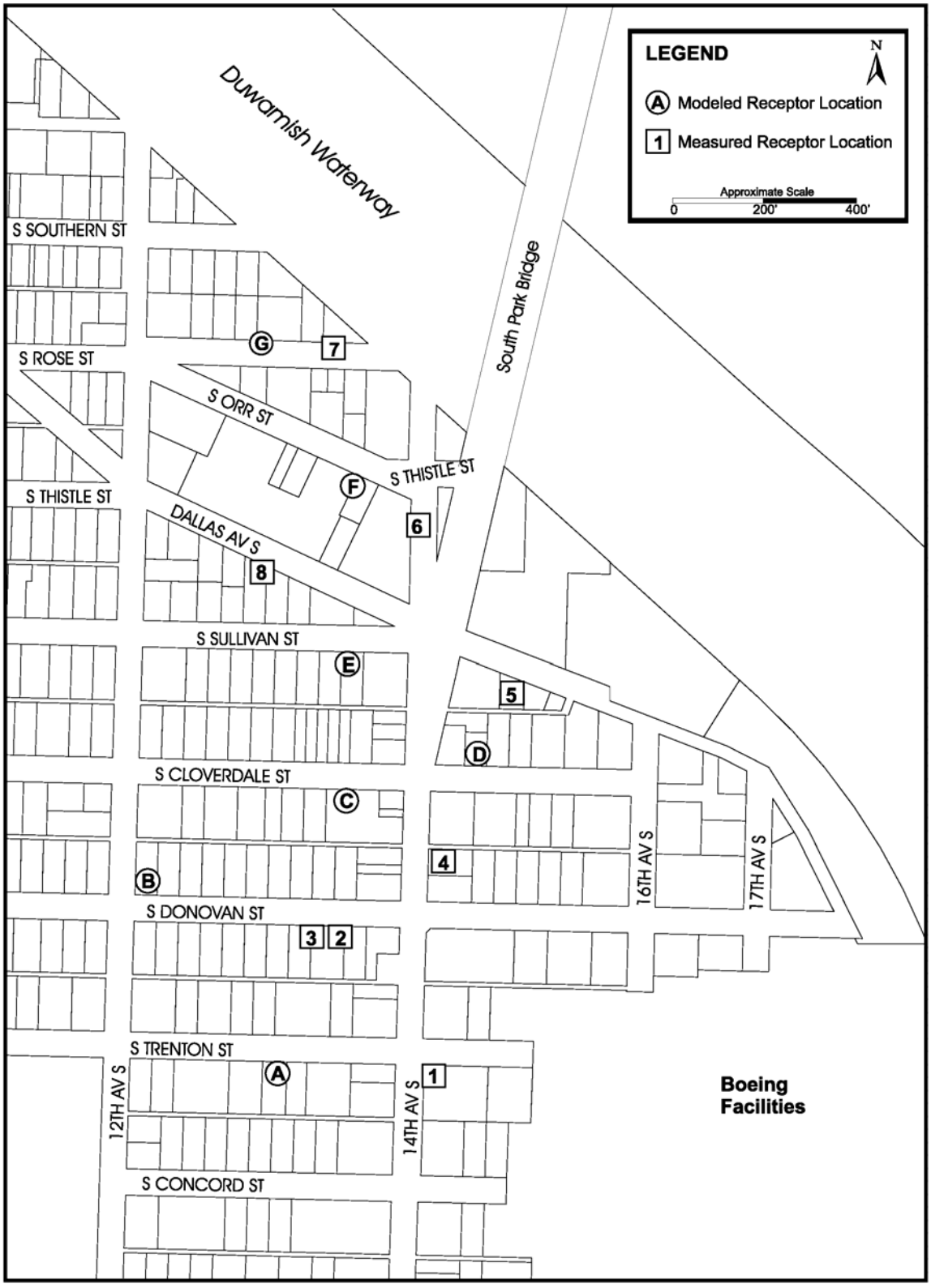


Figure 3-42
Noise Measurement and Mode

The threshold for minor damage to fragile buildings is approximately 100 VdB. The damage threshold may be reduced by 5 VdB for extremely fragile old buildings. Buses and trucks frequently generate approximately 65 VdB at 25 feet. Heavy construction equipment, such as large bulldozers and loaded trucks, frequently generate between 85 and 87 VdB at 25 feet. Pile driving may generate between 104 and 112 VdB at 25 feet. Under ordinary conditions, these typical vibration level values are reduced by 6 VdB at 50 feet and 12 VdB at 100 feet. So, potential damage from vibration is conservatively expected for fragile buildings closer than 25 feet and potentially up to 100 feet during construction pile driving activities.

3.10.2 Environmental Impacts

Construction Impacts

For each of the project alternatives, including the No Action Alternative, the computer model indicated that nearby receptors would experience temporary noise impacts during construction and/or demolition activities. Based on the regulatory definition of noise impacts, these temporary noise impacts would extend primarily along 14th Avenue S. for the length of the proposed project alternative. For the No Action and the Rehabilitation alternatives, the impacts would extend south to at least S. Sullivan Street. The impacts for the Bascule Bridge would extend to at least S. Cloverdale Street, and the Mid-Level Fixed-Span Bridge Alternative impacts would extend to at least S. Donovan Street. Receptors affected for the High-Level Fixed-Span Bridge Alternative would be on 14th Avenue S. south to at least S. Trenton Street, west on S. Trenton Street, and north again on 12th Avenue S. to S. Cloverdale Street.

In all cases, no noise vibration impacts are expected under any of the project alternatives, including the No Action Alternative. For the South Park Bridge Project, construction activities are not expected to cause vibration damage. Heavy construction is not expected within 25 feet of vibration sensitive structures. And, pile driving is not expected within 100 feet of sensitive structures. Since these distances are greater than the proximity values that can cause vibration damage, no impacts are expected to affect nearby structures.

Operation

Noise impacts also would occur for some of the project alternatives during the operation phase of the project. Traffic noise impacts occur at several of the modeled sites for each of the alternatives, as listed in Table 3-17. Noise impacts occur when operational noise levels approach or exceed the traffic noise impact criteria adopted from the FHWA.

Table 3-17. Noise Modeling Results by Project Alternative

Site	Residence Represented	Existing (L_{eq})	No Action (L_{eq})	Rehabilitation (L_{eq})	Bascule Bridge (L_{eq})	Mid-Level Fixed-Span Bridge (L_{eq})	High-Level Fixed-Span Bridge (L_{eq})
1	2 *	**68**	**68**	**70**	**70**	**70**	**70**
2	4	64	63	**66**	**66**	**66**	65
3	0 **	64	63	**66**	**66**	**66**	65
4	4	**72**	**71**	**74**	**74**	**74**	**68**
5	2	64	62	**66**	**66**	65	65
6	1	63	59	65	**70**	65	61
7	5	61	58	62	63	64	63
8 (24 HR)	4	62	62	64	65	64	64
A	4	62	62	64	64	64	**73**
B	4	64	64	65	65	65	**69**
C	4	**69**	**69**	**70**	**70**	**70**	65
D	2	**66**	64	**68**	**67**	**67**	**68**
E	2	**66**	64	**67**	**68**	**67**	65
F	3	62	60	64	65	**66**	65
G	4	60	58	62	62	62	62

Notes:
Bold numbers approach or exceed the FHWA traffic noise impact criteria.
Sites 1 through 8 were measured and modeled; Sites A through G were only modeled.
24 HR = 24-hour noise reading.
Some Build L_{eq} values are less than Existing L_{eq} values due to the bridge shielding noise from the sites.
*Hospital use, equivalent residences per FHWA Noise Evaluation Procedures for Existing State Highways Directive 22-22 (WSDOT 1987).
**No residences are considered at this location because Site 3 was taken to describe aviation noise.

Source: Parsons Brinckerhoff 2004d.

Existing noise levels at 5 of the 15 modeled sites and representing 14 residences approach or exceed the FHWA criteria. In contrast, only 3 modeled sites (representing 10 residences) would approach or exceed the FHWA criteria for the No Action Alternative. A total of 5 modeled sites (representing 16 residences) would approach or exceed the FHWA criteria for the High-Level Fixed-Span Bridge Alternative. The computer model indicated 8 sites (representing 20 residences) for the Rehabilitation Alternative and 8 sites (representing 21 residences) for the Mid-Level Fixed-Span Bridge Alternative would approach or exceed the FHWA criteria. A total of 9 sites (representing 21 residences) would approach or exceed the FHWA criteria for the Bascule Bridge Alternative. So, noise impacts for the Rehabilitation and the Bascule Bridge alternatives appear to have the more substantial noise impacts during operation. However, in all cases, the highest future predicted noise level is well below 80 dBA where damage to hearing may begin to occur.

3.10.3 Secondary and Cumulative Impacts

Secondary Impacts

The noise analysis for this project considered potential secondary impacts based on the transportation demand forecasting model, which includes the effects of traffic capacity constraints on the transportation system. There are no foreseeable secondary noise impacts associated with the project.

Cumulative Impacts

The noise analysis includes the effects of both the proposed South Park Bridge improvements and the other regional baseline transportation improvements. Aside from temporary construction noise from other proposed projects in the area (i.e. Duwamish Waterway sediment cleanup, dredging, shoreline restoration; 14th Avenue S. paving; and Seattle drainage improvements) there would be no increase in noise levels long-term. Because ambient noise levels in the affected area are not assumed to increase substantially in the future, the noise analysis captures the cumulative effects of noise within the affected area. As such, there would be no adverse cumulative noise effects resulting from the construction of the proposed South Park Bridge Project.

3.10.4 Mitigation Measures

Generally, noise can be controlled and/or mitigated at three locations relative to the source of the noise: (1) at the source (e.g., with mufflers and quieter engines); (2) along the noise path, with barriers; and (3) at the receptor, with insulation. Noise abatement per applicable federal regulation is necessary only where frequent human use occurs and where a lower noise level would have benefits (USDOT 1982). The following sections discuss potential mitigation measures for anticipated construction and operation noise impacts.

Construction

Construction noise could be reduced by using enclosures or walls to surround noisy equipment, installing mufflers on engines, substituting quieter equipment or construction methods, minimizing operation time, and/or locating equipment farther from sensitive receptors. To reduce construction noise at nearby receptors, the following mitigation measures could be incorporated into construction plans and contractor specifications:

- Limiting construction activities to between 7 a.m. and 10 p.m. on weekdays and between 9 a.m. and 10 p.m. on weekends would reduce construction noise levels during sensitive nighttime hours.
- Equipping construction equipment engines with adequate mufflers, intake silencers, and engine enclosures would reduce their noise by 5 to 10 dBA (EPA 1971).

- Specifying the quietest equipment available would reduce noise by 5 to 10 dBA.
- Requiring contractors to use Occupational Safety and Health Administration (OSHA)-approved ambient sound-level sensing backup alarms would reduce disturbances to nearby residents from backup alarms during quieter periods.
- Turning off construction equipment during prolonged periods of non-use would eliminate noise from construction equipment during those periods.
- Requiring contractors to maintain all equipment and train their equipment operators would reduce noise levels and increase operational efficiency.
- Locating stationary equipment away from receiving properties would decrease noise from that equipment in relation to the increased distance.
- Constructing temporary noise barriers or curtains around stationary equipment that must be located close to residences would decrease noise levels at nearby sensitive receptors.

No noise vibration impacts are expected during construction, so mitigation measures would not be needed.

Operation

A variety of mitigation measures can be effective at reducing traffic noise impacts. For example, noise impacts from the long-term operation of the project could be reduced by implementing traffic management measures: acquiring land as buffer zones, constructing noise barriers or berms, and insulating public use or nonprofit institutional structures. These mitigation measures were evaluated for their potential to reduce noise impacts from the proposed alternatives, and the results of the evaluation are summarized below.

For receptors determined to exceed the FHWA noise abatement criteria, noise mitigation is evaluated. The evaluation of mitigation is a two-step process. First the mitigation is evaluated to determine if it is feasible, or if it is possible to provide the mitigation in such a way that it would provide a substantial noise reduction. Second, it is evaluated for reasonableness. The reasonableness evaluation considers both the cost per benefited receptor and the preferences of the affected community.

Many factors are evaluated to determine whether or not mitigation would be feasible and/or reasonable. Determination of feasibility includes whether the mitigation could achieve a noise reduction of at least 7 dBA $L_{eq}(h)$ at the closest receptors. Determination of reasonability includes: the number of sensitive receptors benefited by at least 3 dBA $L_{eq}(h)$; the cost-effectiveness of the mitigation; and concerns such as aesthetics, safety, and the desires of nearby residents.

Noise barriers were found not feasible or reasonable along the eastern and western sides of all alternatives considered. Noise insulation of the Sea Mar Community Health Center for the High-Level Fixed-Span Bridge Alternative was found to be possibly feasible and requires further analysis. Predicted impacts for each alternative were modeled in greater detail, and the results of this modeling are discussed in detail in the mitigation section of Appendix S, *Noise Technical Report* (Parsons Brinckerhoff 2004d).

Generally, insulation of buildings could be feasible for public use or nonprofit institutional structures; however, it is not applicable to privately owned structures. Noise insulation could be used to reduce interior noise levels at the Sea Mar Community Health Center (Receptor 1). Because noise insulation is only effective at reducing interior levels, it is less preferable than other mitigation measures.

Predicted traffic-related noise impacts at the Sea Mar Community Health Center are based upon exterior noise measurements and future traffic noise modeling. Interior noise levels have not been measured or predicted for the future, but the likelihood of interior traffic-related noise impacts for all alternatives is anticipated to be low.

Prior to issuance of the Final EIS, a discussion between King County and Sea Mar Community Health Center representatives should address whether either party desires additional noise evaluation of the interior of the Medical Clinic Building.

3.11 Utilities

This section describes the potential impacts to utilities and a number of mitigation measures recommended to avoid, reduce, or minimize these potential impacts. A detailed assessment of utility impacts has not been conducted. The full extent of potential impacts to utilities would be assessed during the preliminary and final design phases. For additional, more detailed information, see Appendix T, *Utilities Technical Report* (RoseWater Engineering 2004).

3.11.1 Affected Environment

The project area is in an urban environment. The South Park Bridge spans the Duwamish Waterway on 14th/16th Avenue S. Boeing Plant 2 is located on the north side of the waterway and the South Park community is located on the south side. Rehabilitation or replacement of the bridge could affect utilities in the project corridor, including utilities on East Marginal Way S., 16th Avenue S. north of the bridge, 14th Avenue S. south of the bridge, S. Trenton Street, and 12th Avenue S. In addition, utilities crossing the project corridor could be affected.

Public utilities in the project area include the following: water, sanitary sewer, storm sewer, natural gas, electricity, telephone, and fiber optics. These utilities serve nearby residential, commercial, and industrial land uses. Most of the privately owned utilities in the project area are on the Boeing property and include fuel oil, steam, industrial waste, and specialized communications cables. Table 3-18 provides a summary of types of existing utilities in the project area.

Table 3-18. Existing Utilities and Agencies

Utility	Owner	Agency/Purveyor
Natural Gas	Puget Sound Energy	Puget South Energy
Water	City of Seattle City of Tukwila	Seattle Public Utilities Tukwila Water Utility
Sanitary Sewer	City of Seattle City of Tukwila King County	Seattle Public Utilities Tukwila Sewer Utility Dept. of Natural Resources and Parks
Storm sewer	City of Seattle King County King County City of Tukwila	Seattle Public Utilities Dept. of Natural Resources and Parks Department of Transportation Tukwila Surface Water Utility
Fuel Oil	Boeing Facilities	Private
Telephone	Qwest	Qwest
Electrical	City of Seattle	Seattle City Light
Fiber Optic	Multiple Owners	Multiple Purveyors
Steam	Boeing Facilities	Private

Source: RoseWater Engineering 2004.

Utilities in the project area are primarily located in the public right of way. Some utilities are overhead, such as the power lines mounted on wood poles along 14th Avenue S. Others are located underground, either in the right of way or on private property, such as the Boeing property (see Figure 3-43). In addition, some of the utilities span the Duwamish Waterway, either overhead or buried in the channel sediments. No utilities are attached to the bridge, except those used in the bridge control tower. Stormwater facilities and sanitary sewers are also discussed in Section 3.12 Water Resources.

3.11.2 Environmental Impacts

Under the Build Alternatives, short-term impacts to utilities would occur during construction. No operational impacts are anticipated for any of the alternatives. Utilities that would be affected by construction may need to be abandoned in place, temporarily or permanently relocated, or newly constructed. Temporary disruptions in service could also occur. If relocation is necessary, utilities previously located above ground may be moved underground. Each alternative, except the No Action Alternative, would require replacement of the local streetlight system and bridge electrical operation system. During the project design phase, construction sequencing would be reviewed to determine if any temporary utility relocations would be necessary. A summary of construction impacts for each alternative is provided below.

No Action Alternative

Impacts to utilities would be minor and would include abandoning existing water, sewer, and electrical lines that serve the bridge towers. Seattle City Light electrical lines in the project area would not be affected.

Rehabilitation Alternative

The local electrical distribution system between the Duwamish Waterway and S. Sullivan Street may be affected due to bridge rehabilitation and associated road improvements. In the South Park community, construction disturbances would extend south to about S. Sullivan Street. It is proposed that existing utility lines that serve the bridge would be upgraded. The Rehabilitation Alternative would result in more impacts on utilities than the No Action Alternative, but fewer impacts than the new bridge alternatives.

Bascule Bridge Alternative

North of the Duwamish Waterway, overhead electrical lines along the west side of 16th Avenue S. may be affected due to associated road improvements. In the South Park community, overhead electrical lines and distribution feeder lines from the Duwamish Waterway south to about S. Cloverdale Street may need to be relocated.

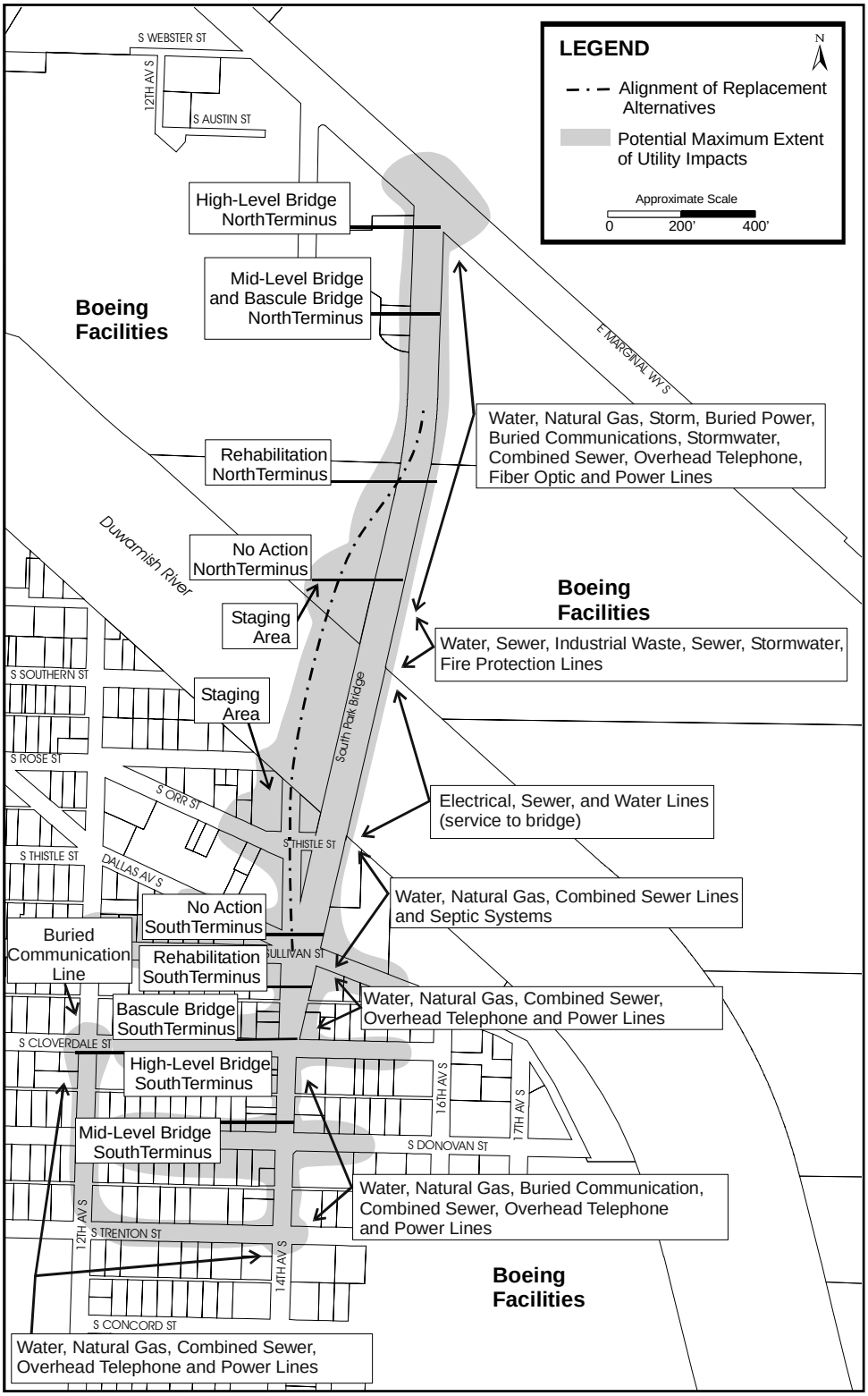


Figure 3-43
Potential Impacts to Utilities

Construction would affect water, combined sewer, sanitary sewer, stormwater, septic systems, fiber optics, electrical, and several other utilities associated with the Boeing property. In addition, impacts could extend east or west of 14th Avenue S. at S. Orr Street, Dallas Avenue S., and S. Sullivan Street.

Removal of the existing bridge would have the same impacts to utilities as described for the No Action Alternative. The Bascule Bridge Alternative would result in more impacts on utilities than the Rehabilitation Alterative, but fewer impacts than the other new bridge alternatives.

Mid-Level Fixed-Span Bridge Alternative

North of the Duwamish Waterway, overhead electrical lines on the west side of 16th Avenue S. may need to be relocated due to associated road improvements. South of the waterway, overhead electrical lines on 14th Avenue S. may also need to be relocated.

Ground disturbances during construction would extend south to S. Donovan Street and could extend slightly east or west of all cross streets north of S. Donovan Street. Construction impacts would affect water, combined sewer, sanitary sewer, stormwater, septic systems, fiber optics, electrical, natural gas, secondary service lines, and several other utilities located on the Boeing property. In addition, utilities would be affected with removal of the existing bridge as described above for the No Action Alternative.

Due to the higher bridge elevation (approximately 65 feet) and associated road regrading, utility impacts would extend further north and south than the Rehabilitation or Bascule Bridge alternatives. Therefore, the Mid-Level Fixed-Span Bridge Alternative is expected to result in more impacts on utilities than the Rehabilitation or Bascule Bridge alternatives but fewer impacts than the High-Level Fixed-Span Bridge Alternative.

High-Level Fixed-Span Bridge Alternative

North of the Duwamish Waterway, overhead electrical lines on the west side of 16th Avenue S. may need to be relocated due to associated road improvements. South of the waterway, overhead electrical lines on 14th Avenue S. may also need to be relocated. Electrical lines that serve the Boeing facility could be temporarily affected.

In the South Park community, construction disturbances would extend south on 14th Avenue S. to S. Trenton Street, west on S. Trenton Street, and north on 12th Avenue S. to S. Cloverdale Street. In addition, impacts could extend slightly east or west of all cross streets along this corridor. Impacts would affect water, combined sewer, sanitary sewer, stormwater, septic systems, fiber optics, electrical, natural gas, secondary service lines, and various other utilities associated with Boeing Plant 2. This alternative would also require providing new

street drainage on the new S. Trenton Street and 12th Avenue S. connector road. The removal of the existing bridge also would affect utilities as described for the No Action Alternative.

This alternative would reach further north and south than the other build alternatives. Therefore, the High-Level Fixed-Span Bridge Alternative is expected to result in more impacts to utilities.

3.11.3 Secondary and Cumulative Impacts

Secondary Impacts

With proper planning and notification to utility providers of planned construction activities and potential disruptions to existing utilities associated with the proposed South Park Bridge Project, there should be no secondary impacts to utilities or their customers in the South Park community or elsewhere. Furthermore, since there are no long-term utility impacts, adverse or beneficial effects, there would be no long-term secondary impacts.

Cumulative Impacts

Potential cumulative impacts to utilities from each bridge alternative are anticipated. Any construction activities associated with the proposed South Park Bridge Project and construction activities associated with any other proposed project in the project area (see Section 3.1 Introduction) could worsen the adverse effects on utility providers and their customers. Proper planning and coordination with all project construction activities should minimize or eliminate any potential problems. In particular, construction period conflicts could arise between the South Park Bridge Project and the City of Seattle 14th Avenue S. paving and street lighting improvements as well as the Seattle Public Utilities plans to improve the drainage system in the South Park area.

Long term, the relocation of some underground utilities associated with the bridge project could constrain the methods and locations of future utilities and/or replacements. Together, the South Park Bridge Project and these proposed projects should cumulatively improve utility services in the South Park community.

3.11.4 Mitigation Measures

Mitigation for Construction Impacts

Utility providers and the three local government jurisdictions that would be affected by the project would be contacted prior to construction to confirm the location of all existing utilities. King County would coordinate with utility providers to avoid or minimize any potential service interruptions. The following measures should be implemented to avoid, reduce, or minimize construction impacts on utilities:

- As part of final engineering efforts, verify and prepare composite utility maps.
- Prior to the start of construction activities, establish communication protocols and procedures with potentially affected utility owners to ensure appropriate coordination and response to emergencies in the event that utilities are inadvertently damaged during construction.
- Coordinate all planned utility work associated with the construction of the selected alternative with others on the project team knowledgeable of other related construction issues, including hazardous materials, archaeological and historical resources, water resources, transportation, and business impacts. Coordinate mitigation measures related to these other environmental issues with those developed to avoid, reduce, and minimize potential impacts to utilities.
- Conduct the abandonment, temporary relocation, permanent relocation, and construction of all new utilities in compliance with all applicable rules and regulations from regulatory agencies and purveyors.
- Require temporary erosion and sedimentation controls for trench excavation and earthwork removal.
- Comply with local government jurisdiction (City of Seattle, King County, and City of Tukwila) building codes, fire codes, design standards, and other requirements applicable to all design aspects of the utility system, stations, and maintenance facilities.
- Continue to meet and coordinate closely with both local municipal agencies and private utility providers to supply acceptable and safe relocation of manholes and other access points used for ongoing utility maintenance.
- Use utility access standards for repair and maintenance of utilities.
- Use industry standard methods to reduce impact of construction vibration on underground pipes and special infrastructure concerns, such as lead pipe joints.
- Comply with applicable utility policies as specified in adopted operational comprehensive plans, including those provisions related to levels of service, conservation strategies, and coordination of service providers. Discuss the possibility of undergrounding relocated above-ground utilities with local jurisdictions and purveyors to improve the visual appearance of the South Park community.

- Coordinate closely with utility owners to determine appropriate measures to protect utilities against potential ground settlement at the aerial, fill, and at-grade sections.
- Work with property and business owners to maintain access as much as possible to property/business during construction.
- Provide “Business Open” and other signs as necessary during utility work and construction of the selected bridge alternative.
- Coordinate with any archaeological and historical resource preservation work and any pre-existing and new hazardous materials work. The findings of these coordination efforts may result in additional utility re-routes and/or alternative measures to ensure that utility services are minimally interrupted.

Mitigation for Operational Impacts

No operational impacts are anticipated and no mitigation measures are necessary or proposed. The existing utilities will be verified and documented prior to the start of construction activities. All affected utilities would be restored to their preconstruction operational modes.

3.12 Water Resources

Potential impacts to water resources are discussed in this section. Existing conditions of stormwater quantity, water quality, floodplain, channel stability, and groundwater are described. Potential construction and operation impacts for these issues are evaluated. Mitigation measures for potential adverse impacts, secondary or indirect impacts, and cumulative impacts to water resources are presented. For additional, more detailed information, see Appendix U, *Water Resources Technical Report* (Parametrix 2004b).

3.12.1 Affected Environment

The primary water resource that would be affected by the removal, rehabilitation, or replacement of the South Park Bridge is the Duwamish Waterway. This waterway is used for industrial, commercial, and recreational purposes. The South Park Bridge is within the intertidal zone 1.3 mile from the upstream limit of the dredged waterway maintained by the U.S. Army Corps of Engineers. Over the years, the Duwamish Waterway has been severely impacted by previous dredging and filling activities. Currently, the waterway consists of a straightened river channel with narrow intertidal mud flats extending to steep middle and upper intertidal shorelines.

Flow in the Duwamish Waterway is regulated by the operation of the Howard Hanson Dam in the headwaters of the Green River. Characterized by wet and dry seasons, discharge of the river varies seasonally. The wet season extends from November to July and the dry season from August to October. The mean monthly flow rate varies from 400 cubic feet per second (cfs) in August to 2,600 cfs in January. According to the Federal Emergency Management Agency (FEMA), the maximum regulated flow for the 100-year recurrence interval is 12,000 cfs at the project site.

The Duwamish Waterway at the site of the South Park Bridge is within a regulated floodway. Constructed levees and dikes line portions of the waterway. Shoreline structures at Boeing Plant 2 on the north side of the waterway function as a constructed dike. The floodway width is 450 feet between the constructed levees/dikes. The area to the landward side of the levees/dikes is not within a regulated floodplain. The bridge approach piers on either side of the waterway are protected from the 100-year flood by the levees. The constructed levees on either side of the waterway, along with the regulation of flood flows from Howard Hanson dam, have effectively disconnected the floodplain from the river.

Stormwater flows in the area north of the Duwamish Waterway are currently collected in a dedicated stormwater system and conveyed to existing stormwater outfalls located underneath the existing South Park Bridge on the Boeing Plant 2 property. Currently, no stormwater detention is provided prior to discharge into the Duwamish Waterway. Stormwater flows in the area south of the Duwamish

Waterway are collected in a system of catch basins that connect directly to the City of Seattle's sewer and stormwater system. A detailed investigation into stormwater flows north of the Duwamish Waterway will be conducted as part of preliminary engineering to ensure a clear understanding of potential impacts on stormwater from the selected alternative.

Stormwater flows from the existing bridge decks flow to the north and south. The northern flows are conveyed in gutters to an existing stormwater system. The southern flows are conveyed in gutters to catch basins that connect to the combined sewer system or flow to the Duwamish Waterway, depending on the surrounding topography. Currently, stormwater inlets on the existing bridge are not functional.

The Duwamish Waterway is on Ecology's 303(d) list of impaired and threatened water bodies as defined in the federal Clean Water Act [33 USC 1251 e seq.]. The waterway is listed for multiple parameters at various sites in the vicinity of the South Park Bridge. At the project site, the waterway exceeds standards for sediment management [WAC 173-204] and pH (outside the range of 6.5 to 8.5). In the project vicinity, the Duwamish Waterway also has high temperatures and low dissolved oxygen (DO) levels during summer low-flow periods.

The Duwamish Waterway at the South Park Bridge is partially within the Lower Duwamish Waterway (LDW) Superfund Site. Additional information about the project site sediment quality, relative to the Superfund Site, is provided in Appendix X, *Hazardous Materials Technical Report* (Wilbur Consulting 2004a). Additional information on the LDW site can be found at http://yosemite.epa.gov/r10/cleanup.nsf.

The area south of the Duwamish Waterway is characterized as having a high susceptibility to groundwater contamination according to the King County Department of Natural Resources due to historical industrial use in the area. Detailed information about the quality of groundwater in the project vicinity is provided in the *Preliminary Site Investigation Report* (Wilbur Consulting 2004b). The project site, however, is not within a sole source aquifer or a wellhead protection area. The general direction of groundwater flow in the floodplain is towards the waterway. The direction may vary locally depending upon the nature of subsurface material and proximity to the waterway. In addition, high tides can cause temporary groundwater flow reversal.

Regulatory Requirements

The project area is partially located within the LDW Superfund Site. Therefore, all construction and/or demolition activities would need to be reviewed for consistency with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Ecology's Model Toxics Control Act (MTCA) and Sediment Management Standards (SMS). In addition, the proposed project

would need to be reviewed for consistency with the goals and policies of Region 10 EPA and Ecology's management of the Superfund Site.

Stormwater discharged to the Duwamish Waterway would need to comply with the requirements of the *Ecology Stormwater Manual for Western Washington* (*Ecology Manual*) (Ecology 2001). In addition, local ordinances apply to stormwater management within the three jurisdictions that govern the project site—King County, City of Tukwila, and City of Seattle. A preliminary list of required federal, state, and local permits and approvals is provided in the SEPA Fact Sheet as well as the Summary of this Draft EIS document.

The Duwamish Waterway is exempt from flow control requirements of King County, the City of Seattle, the City of Tukwila, and the *Ecology Manual* because it discharges to tidal- and salt-influenced waters. Basic water quality treatment, however, is required for any discharge of stormwater to the Duwamish Waterway.

The Duwamish Waterway is within a federally designated floodway at the bridge crossing. Federally designated floodways are regulated by local jurisdictions, counties, or cities. In the project area, the Duwamish Waterway is regulated by King County to the south and the City of Tukwila to the north. Floodway conveyance of the bridge opening must meet the requirements for flood hazard areas in the King County Sensitive Areas Ordinance and Chapter 16.52 "Floodplain Management" in the Tukwila Municipal Code.

3.12.2 Environmental Impacts

Potential impacts from the construction and operation of the proposed project are described in this section. These impacts include stormwater quantity, water quality, the floodplain, channel stability, and groundwater.

Stormwater Quantity

The Build Alternatives would require new stormwater facilities due to new or increased impervious area (see Table 3-19). The new stormwater facilities would consist of curbs, bridge drains, and catch basins to collect and convey the storm runoff. If possible, this conveyance system would use the existing stormwater outfalls on the north and south banks of the waterway. However, new outfalls may need to be constructed on one or both banks. Construction of new outfall(s) would be the responsibility of King County. Design of an outfall would be based on the topographic basin that it would serve. Table 3-19 shows the runoff volume for the conveyance design event (the 25-year return frequency event) for each alternative.

Table 3-19. Total New and Improved Impervious Area

Alternative	Existing Area (acres)	Total New and Improved Area (acres)	Total Stormwater Runoff for 25-Year Event (acre-feet)
No Action	2	0.0	None
Rehabilitation	2	2	0.5
Bascule Bridge	2	4	1.0
Mid-Level Fixed-Span Bridge	2	5	1.3
High-Level Fixed-Span Bridge	2	7	1.8
Note: The total new and improved impervious areas include the bridge associated local streets and proposed staging areas. Impervious area calculations are approximate and will be updated during the project design phase.			

Source: Parametrix 2004b.

Water Quality

Construction Impacts

In-water construction activity related to the Build Alternatives and demolition under the No Action Alternative would temporarily increase turbidity and the suspension of sediment, some of it contaminated, into the Duwamish Waterway. Activities that could result in water quality degradation include the removal of the existing bridge and pier protection structures, construction of new bridge foundations and supports, and construction staging.

Suspension of sediments in the water would be minimized through the use of cofferdams, caissons, or temporary casings. Cofferdams would be used to isolate the work area from the river flow, thereby reducing the potential for sediment entrainment, or transport, in river water. The suspension of sediments into the flow of the waterway would be an unavoidable adverse impact associated with each of the alternatives. The amount of sediments entrained in the water as a result of construction would likely be minor relative to the background level.

The No Action Alternative would result in the least amount of disturbance to the waterway as only the existing structure would be removed. The Bascule Bridge Alternative would have the greatest potential to increase the turbidity of the water due to the larger footprint of the foundations for the lifting mechanism housings and the necessity to drill more support pilings. The Rehabilitation Alternative would be similar because the replacement footprint is nearly the same as for the Bascule Alternative. The sediment disturbance potential of the Mid-Level Fixed-Span Bridge and High-Level Fixed-Span Bridge alternatives would be similar to each other and less than the Rehabilitation and Bascule Bridge alternatives.

Concrete work in the waterway could impact water quality as the waterway currently exceeds state water quality standards for sediment management and pH. The potential for this impact to occur would be reduced by limiting the amount of time that the water is exposed to the curing concrete. Spill control measures would be used to minimize the release of petroleum, paint, concrete, and other potentially toxic materials during the construction over and near the river.

To minimize impacts associated with stormwater runoff during construction on land, temporary erosion and sedimentation control (TESC) measures would be employed.

Operation Impacts

Under the Build Alternatives, stormwater runoff would discharge into the Duwamish Waterway. Potential operational impacts to water quality include pollutant loading from traffic use and spills. Stormwater flow patterns beyond the project area are not expected to change.

Water quality impacts to the Duwamish River from bridge runoff were estimated based on projected traffic volumes for each alternative. Pollutant loading from the bridge would increase at the project site with increased traffic volume. The King County Travel Demand Model predicts higher traffic volumes for the Bascule Bridge, Mid-Level Fixed-Span Bridge, and High-Level Fixed-Span Bridge alternatives compared to the Rehabilitation Alternative. For additional information, see Appendix K, *Transportation Technical Report* (Parsons Brinckerhoff 2004g).

The pollutant loading analysis first used the FHWA methodology (FHWA 1990) to determine pollutant loads for the Rehabilitation Alternative. This analysis determined the pollutant-generating impervious surface (PGIS) area for the alternative is 1.40 acres (see Table 3-19). Pollutant loads for the Replacement Bridge Alternatives were scaled up from the Rehabilitation Alternative in proportion to predicted increases in traffic volume. Annual pollutant loads of oil and grease, copper, lead, zinc, and total suspended solids (TSS) resulting from both treated and untreated stormwater runoff for each of the alternatives were estimated (see Table 3-20).

Based on predicted increases in traffic volume, the High-Level Fixed-Span Bridge, Mid-Level Fixed Span Bridge, and Bascule Bridge alternatives would result in a pollutant load to the Duwamish Waterway approximately 1.12 times greater than the Rehabilitation Alternative. The No Action Alternative would eliminate pollutant loading from the South Park Bridge due to the closing and removal of the existing bridge. However, the net impacts to the Duwamish Waterway would be approximately equivalent among all alternatives, since any reduction or increase in traffic volume at the South Park Bridge would be reflected in an approximately equal and opposite effect at other bridges crossing the Duwamish Waterway.

Table 3-20. Pollutant Loading Summary

Pollutant	Alternative	Annual Mass Loading [lb/year]	
		Untreated	Treated[1]
Oil & Grease	No Action	0	0
	Rehabilitation	259	Unknown[2]
	Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridges	290	Unknown[2]
Total Copper	No Action	0	0
	Rehabilitation	0.69	0.17 – 0.34[3]
	Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridges	0.77	0.19 – 0.39[4]
Total Lead	No Action	0	0
	Rehabilitation	9.3	2.31 – 4.63[3]
	Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridges	10.4	2.59 – 5.18[4]
Total Zinc	No Action	0	0
	Rehabilitation	5.9	1.48 – 2.97[3]
	Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridges	6.6	1.66 – 3.33[4]
Total Suspended Solids	No Action	0	0
	Rehabilitation	1875	375[3]
	Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridges	2100	420[4]

Notes:

[1]Basic treatment assumed. Pollutant loadings were reduced assuming treatment efficiencies from Table B-1 in Appendix B of Appendix S, *Water Resources Technical Report* (Parametrix 2004b).

[2]The *Ecology Manual* does not assign a treatment goal for oil and grease, and removal efficiencies of BMPs is not well documented. Therefore, oil and grease mass loadings after treatment are designated "unknown."

[3]Annual mass loadings computed using the FHWA procedure (FHWA 1990).

[4]Calculated by multiplying the range for Rehabilitation Alternative by the factor of 1.12, based on predicted increases in traffic volume for the Bascule Bridge, Mid-Level Fixed-Span Bridge, and High-Level Fixed-Span Bridge alternatives.

Source: Parametrix 2004b.

Stormwater draining to the Duwamish Waterway would require water quality treatment prior to discharge. Ecology recommends BMPs for stormwater treatment. Under the Basic Treatment menu in the *Ecology Manual*, recommended BMPs include media filter, biofiltration swale, filter strip, basic wetpond, wetvault, stormwater treatment wetland, and combined detention/wetpool facility. Due to the limited area available for treatment, media filters and wetvaults are the most reasonable methods for implementation.

Waterway Floodplain

The project site is within a federally designated and locally regulated floodway. As such, new construction projects are prohibited from causing an increase in the water surface elevation of the river for the 100-year peak flow rate. The U.S. Army Corps of Engineer's River Analysis System (HEC-RAS, Version 3.0) was used to evaluate floodway conveyance impacts associated with each alternative. A model was developed of the reach of the Duwamish Waterway encompassing the project site and upstream and downstream adjacent cross-sections. The water surface elevation of the 100-year peak flow rate in the Duwamish Waterway was calculated for both pre-project and post-project conditions for each of the alternatives.

The Bascule Bridge Alternative would result in a slightly higher water surface elevation (0.01 foot) for the 100-year peak flow rate. All other alternatives would result in a slightly lower water surface elevation due to fewer and/or smaller in-water structures. Because the Duwamish Waterway is a zero rise floodway, mitigation would be required for the Bascule Bridge Alternative.

Waterway Channel Stability

Riverbed aggradation (sedimentation) and degradation (scouring) were evaluated for potential impacts to channel and stream bank stability during the operation phase of the proposed project. Flow velocities (see Table 3-21) and shear stresses (see Table 3-22) were calculated using the HEC-RAS model under several hydraulic conditions for each alternative.

Under the Build Alternatives, it is unlikely that the piers would require armoring with riprap due to the relatively low velocities and shear stresses in the waterway. Integrated streambank stabilization procedures could provide habitat features and protect the levees.

Given that the channel substrate is comprised primarily of finer materials with some cohesion, flow conditions would lead to erosion. Due to the location of the bridge in the intertidal zone and the regulation of flows in the waterway by the Howard Hanson Dam, sedimentation also would occur. The channel bottom would shift periodically, depending on the tides and flow rates. For all alternatives, it is anticipated that the Army Corps of Engineers would not require dredging in addition to the current dredging program.

Groundwater

None of the alternatives would affect a sole source aquifer, aquifer flow direction, recharge area or rate, or water supply recharge area. Potential water quality impacts to groundwater would be limited to potential spills of hazardous material. The identification and/or handling of hazardous materials, including potentially contaminated sediment, is discussed in Appendix X, *Hazardous Materials Technical Report* (Wilbur Consulting 2004a).

Table 3-21. Total Average Channel Velocity at Bridge for 100-Year Peak Flow Rate (feet per second)

Tidal Elevation (feet NAVD88)	Existing Bridge	No Action[1]	Rehabilitation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge
11.78	2.44	1.29	2.44	2.69	1.38	1.37
10.00	2.69	1.42	2.69	2.94	1.51	1.51
8.00	3.02	1.59	3.02	3.26	1.71	1.71
6.00	3.43	1.80	3.43	3.62	1.94	1.94
4.00	3.95	2.06	3.95	4.04	2.22	2.22
2.00	4.61	2.39	4.61	4.56	2.58	2.58
0.00	5.44	2.81	5.44	5.17	3.05	3.04
-2.00	6.38	3.34	6.38	5.91	3.63	3.63
-4.00	7.40	3.96	7.40	6.71	4.31	4.31
-6.00	8.57	4.62	8.57	7.58	5.03	5.02
-8.00	9.65	5.20	9.65	8.39	5.68	5.67

Note:
[1]Data for the No Action Alternative were taken from a cross-section approximately 175 feet upstream from the project area.

Source: Parametrix 2004b.

Table 3-22. Total Average Shear Stress at Bridge for 100-Year Peak Flow Rate (pounds per square foot)

Tidal Elevation (feet NAVD88)	Existing Bridge	No Action[1]	Rehabilitation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge
11.78	0.05	0.01	0.05	0.06	0.01	0.01
10.00	0.06	0.01	0.06	0.07	0.02	0.02
8.00	0.08	0.02	0.08	0.09	0.02	0.02
6.00	0.10	0.02	0.10	0.11	0.03	0.03
4.00	0.14	0.03	0.14	0.13	0.04	0.04
2.00	0.19	0.04	0.19	0.18	0.06	0.06
0.00	0.27	0.06	0.27	0.23	0.08	0.08
-2.00	0.36	0.09	0.36	0.30	0.12	0.12
-4.00	0.50	0.13	0.50	0.39	0.17	0.16
-6.00	0.68	0.18	0.68	0.51	0.23	0.23
-8.00	0.88	0.23	0.88	0.64	0.30	0.30

Note:
[1]Data for the No Action Alternative were taken from a cross-section approximately 175 feet upstream from the project area.

Source: Parametrix 2004b.

3.12.3 Secondary and Cumulative Impacts

Secondary Impacts

Other activities resulting from the completed project could result in secondary or indirect impacts. A new outfall on the south side of the South Park Bridge may need to accommodate tributary offsite drainage that currently discharges to the combined sewer system. The water quantity and quality impacts associated with the additional drainage discharge to the Duwamish Waterway would require additional environmental review but would be a benefit to the community. In addition, the lower water surface elevation for the 100-year peak flow rate for all of the alternatives except the Bascule Bridge Alternative would indirectly improve the flood management capacity of the Duwamish Waterway.

Cumulative Impacts

Future development and roadway improvements in the project vicinity may have a cumulative affect on stormwater quantities in areas surrounding the new bridge. The final bridge design would consider cumulative stormwater quantities to the extent possible.

The construction associated with the Duwamish Waterway sediment cleanup possibly could occur within the time frame of the proposed bridge construction of the proposed bridge project. Though specific plans are unknown at this time, the sediment cap would be designed to improve water quality in the Duwamish Waterway. The design and construction of the selected bridge alternative would be conducted to complement the planned sediment cap to avoid recontamination. This project combined with the Seattle Public Utilities plans to improve drainage in South Park and the Duwamish shoreline restoration project would all help to improve water quality.

The Duwamish maintenance dredging helps to maintain the navigability of the channel. The proposed construction or operation of the Build Alternatives would not affect the frequency of this dredging.

No adverse cumulative impacts are anticipated.

3.12.4 Mitigation Measures

Stormwater Quantity

Conveyance measures should be implemented to minimize impacts on stormwater quantity. Please refer to Section 3.15 Hazardous Materials for a discussion of spill control and prevention measures. For the Replacement Bridge Alternatives, a new conveyance system would be designed and sized in accordance with applicable standards. No additional mitigation is proposed.

Water Quality

Construction Impacts

TESC measures would be implemented during construction for all construction activities associated with each of the alternatives. BMPs listed in the *Ecology Manual* would be employed including, but not limited to, silt fence, straw matting, and temporary sedimentation pond.

An SWPP would be prepared to describe water quality protection measures during construction.

The Hydraulic Project Approval issued by the Washington Department of Fish and Wildlife would likely prohibit in-water construction during the spring in-water closure period from February 15 to July 15. This period may be expanded based on additional analysis (see Section 3.13 Fish, Wildlife, and Vegetation). This action would avoid impacts to fisheries, especially the substantial populations of juvenile Chinook and other salmon that migrate past the site.

For the in-water construction of pier columns and foundations and removal of existing structures, cofferdams would be installed to isolate the work area. The cofferdam would be intended to prevent flow from the waterway from entering the work area. As such, they are designed to be waterproof. Unless the bottom of the work area is sealed, however, groundwater can enter from below. The specific type of cofferdam would be selected by the contractor and would be documented in the approved SWPP. The cofferdams would effectively impound any sediment-laden water, thereby minimizing impacts to the waterway. Alternatively, casings would be used for drilling piers to reduce water quality impacts.

Once the cofferdams are installed, the work area would be dewatered using a pump. The water would be pumped to a pond or tank for appropriate treatment and disposal. The collected water would be tested for adherence to State water quality standards. If permitted, uncontaminated water would be discharged directly to the sanitary sewer system. Alternatively, water meeting the water quality standards would be returned to the Duwamish Waterway. Contaminated water would be shipped offsite for proper disposal in a hazardous waste treatment facility. The specific construction protocols and thresholds for collected stormwater and dewatering would be described in the approved SWPP.

Operational

It is assumed that the stormwater from the project site would be discharged to the Duwamish Waterway. If possible, existing stormwater outfalls on the south and north ends of the bridge would be used. However, a new outfall may need to be constructed on either or both banks of the waterway at the bridge crossing.

Stormwater treatment would be required for runoff from pollutant-generating surfaces discharging to the Duwamish Waterway. The Basic Treatment water

quality menu in the *Ecology Manual* applies to stormwater draining to the Duwamish Waterway.

The following water quality BMPs are listed under the Basic Treatment menu in the *Ecology Manual* for treating stormwater:

- Bio-infiltration swale
- Infiltration
- Media filters
- Biofiltration swales
- Filter strips
- Basic wetpond
- Wetvault
- Stormwater treatment wetland
- Combined detention and wetpool facilities

Given the lack of available undeveloped land in the project area, the BMPs that can be located in underground vaults would appear to be the most reasonable. BMPs that can be placed in underground vaults include media filter and wetvault. The vaults would be located underneath the bridge approaches or adjacent to the road within the road right of way. The size of the selected facility type(s) would vary depending on the amount of pollution-generating impervious surface area receiving treatment. In general, the more pollutant-generating surface area, the larger the facility required. The facilities would be designed to treat only stormwater from the project site.

Low-impact development techniques for managing and treating stormwater would be encouraged and implemented, if possible. Because the bridge and surrounding area is mostly impervious, implementation of low-impact development techniques would require conversion of existing impervious surfaces to pervious surfaces as well as rehabilitation of soils.

Waterway Floodway

As described above, mitigation would be required to avoid operation impacts to the floodway for the Bascule Bridge Alternative. No mitigation was specifically evaluated as part of this analysis. Mitigation measures would be provided, as required, including reconfiguring the piers for improved hydraulic performance.

Waterway Channel Stability

Estimation of total channel aggradation or degradation was not conducted to determine possible mitigation measures. A more detailed scour analysis would need to be conducted during the preliminary design phase for the selected alternative.

The channel velocities and shear stresses that would result from each alternative would be relatively low even under high flow and low tide conditions. Therefore, the potential for erosion would be minimal. In addition, the scour potential would likely be minimal, relative to the riverbed aggradation and degradation resulting from tidal effects and upstream watershed sediment load.

Disturbed portions of the streambank and levee would be stabilized using integrated techniques, such as bioengineering, that consider structural integrity as well as habitat features of the streambank.

Groundwater

The potential for hazardous material spills, and control and handling of contaminated groundwater, is discussed in Appendix X, *Hazardous Materials Technical Report* (Wilbur Consulting 2004a). No adverse impacts to groundwater are anticipated.

3.13 Fish, Wildlife, and Vegetation

This section describes the potential impacts to fish, wildlife, and vegetation that would result from the proposed bridge alternatives. The discussion includes an overview of the existing natural environment in the vicinity of the bridge and identification of endangered, threatened, and proposed species and designated habitat. The impact issues addressed in this section include construction sedimentation, creosote-treated timber piles, shading, new shoreline habitat, and disturbance of contaminated sediments. Specific impact minimization measures and BMPs are identified to address potential impacts.

The assessment of impacts to fish, wildlife, and vegetation focused on the existing bridge site and the immediate vicinity within approximately 0.25 mile of the project area. Impacts to the Duwamish Waterway were also assessed for approximately 0.5 mile downstream. As discussed below, project-related activities are not anticipated to have an appreciable impact on existing habitat features and wildlife beyond this distance. For additional, more detailed information, see Appendix V, *Fish, Wildlife, and Vegetation Technical Report* (Parametrix 2004a).

3.13.1 Affected Environment

Terrestrial Habitat and Birds

The South Park Bridge is located in the middle of the highly urbanized Seattle metropolitan area. Surrounding land uses are characterized by industrial, commercial, and residential development (see Figure 3-44). The natural habitat in the project area has been extensively altered through human activity. Urban landscapes in the form of landscaped backyards, parks, street trees, and undeveloped steep slopes are the primary terrestrial habitats in the vicinity of the project area.

Because of the very urbanized environment, birds are the most common terrestrial wildlife in the project area. Bird species using the Duwamish Waterway in the vicinity of the South Park Bridge include several species of gulls, mergansers, and western grebe. Bald Eagles and osprey are not known to nest within the vicinity but do forage along the river shorelines. The nearest known osprey nesting site is over one mile southeast of the bridge. Other birds present in the project vicinity include those species that are adapted to urban development (i.e., crow, starling, and killdeer), and as such, they are common throughout the Seattle metropolitan area.

Figure 3-44
Habitat Features

Aquatic Habitats and Fish

The Duwamish Waterway is the lower channelized estuarine segment of the Green-Duwamish River basin that extends south from Elliott Bay and then east to the Cascade Mountains. The shorelines of the waterway are heavily armored with bulkheads and rock embankments both upstream and downstream of the South Park Bridge. The river channel is composed primarily of silt and mud, though the intertidal periphery of the river channel also provides a muddy sand habitat.

Although most aquatic habitat in the project area was constructed through previous dredging and filling of the estuarine tideflats, the existing intertidal riverbed area currently functions in a manner substantially similar to natural tideflats (see Figure 3-45). These tideflats produce insects (chironomids) and epibenthic zooplankton that provide food for young salmon and other fishes. The salinity of the estuarine waterway is variable depending on tide stage and river discharge. Aquatic vegetation is limited to diatoms that grow on much of the intertidal substrate. These diatoms provide a forage base for epibenthic zooplankton, which provide prey for young salmon as they migrate through the area.

Figure 3-45
Tideflats Downstream of Bridge

More specifically, The National Oceanic & Atmospheric Administration (NOAA) Fisheries has recently defined essential fish habitat for Pacific Coast salmonids, and the general definition includes estuarine habitat provided by the Duwamish Waterway. In particular, the muddy sand habitat near the South Park Bridge supports juvenile salmon during their migration to the ocean (see Figure 3-46).

The aquatic habitats along the waterway support a number of species of fish. Yearling Chinook, coho, and steelhead migrate under the South Park Bridge but are less shoreline-oriented than the sub-yearling Chinook and chum salmon. Other estuarine fish also use this habitat for juvenile rearing. Sculpins and starry flounder are found in the area. Adult salmon and cutthroat trout return through the channel and migrate upstream under the bridge to their spawning areas in the Green River. These species, however, do not have specific habitat requirements as

they migrate past the project site. Table 3-23 lists all of the fish species likely to be found in the vicinity of the bridge.

Figure 3-46
Muddy Sand Habitat Downstream of Bridge

Riparian Habitat

Riparian vegetation at the project site is sparse or absent. This vegetation consists primarily of small amounts of Himalayan blackberries, grasses, and other non-native vegetation in narrow bands along portions of the shorelines.

On the south shoreline, vegetation grows up to the existing bridge, including directly in its shadow. The south shoreline east (upstream) of the existing bridge has a ramp and marina that exclude riparian vegetation. Trees are generally absent in the riparian zone downstream, excluding Kellogg Island (2.5 miles downstream). A few deciduous trees occur downstream in the residential area on the south side of the waterway and at the Duwamish Waterway Park located at the north end of 10th Avenue S.

The Boeing facilities on the north side of the waterway extend to or over the edge of the waterway. Blackberries and perennials grow at the edge of the parking area and adjacent to the bridge. Downstream of the existing bridge, there is a narrow

strip of grasses, perennials, and blackberries located between developed area and the river channel (see Figure 3-46).

Table 3-23. Fish Species Likely to Occur at the South Park Bridge Site

Common Name	Scientific Name	Occurrence
Pacific lamprey	*Entosphenus tridenatus*	Occasional
Pacific herring	*Clupea harengus pallasi*	Rare
Chum salmon	*Oncorhynchus keta*	Common
Chinook salmon (ESA listed species)	*Oncorhynchus tshawytscha*	Common
Coho salmon (ESA species of concern – may be listed in future)	*Oncorhynchus kisutch*	Common
Pink salmon	*Oncorhynchus gorbuscha*	Common every other year
Sockeye salmon	*Oncorhynchus nerka*	Occasional
Rainbow/steelhead	*Oncorhynchus mykiss*	Common
Cutthroat trout	*Oncorhynchus clarki clarki*	Occasional
Bull trout (Dolly Varden) (ESA listed species)	*Oncorhynchus confluentus (malma)*	Rare
Mountain whitefish	*Prosopium williamsoni*	Occasional
Northern pikeminnow	*Ptychocheilus oregonensis*	Occasional
Longnose dace	*Rhinichthys cataractae*	Common
Specled dace	*Rhinichthys osculus*	Occasional
Largescale sucker	*Catostomus macrocheilus*	Common
Threespine stickleback	*Gasterosteus aculeatus*	Common
Shiner perch	*Cymatogaster aggregatea*	Occasional
Prickley sculpin	*Cottus asper*	Occasional
Buffalo sculpin	*Enophrys bison*	Occasional
Pacific staghorn sculpin	*Leptocottus armatus*	Common
Starry flounder	*Platichthys stellatus*	Occasional

Source: Parametrix 2004a.

Endangered-Species-Act-Listed Species and Critical Habitat

Under the ESA, several wildlife species found in the project area are provided special protection as federally listed species. Chinook salmon and bull trout are listed as threatened in the Puget Sound area. The bald eagle is also listed as threatened**.** The following sections describe federally listed species of concern and

other sensitive wildlife species inhabiting the project area. These species are presented in alphabetical order, not in order of importance.

Chinook Salmon

Federally listed Chinook salmon occur within the immediate project area. Juvenile Chinook salmon rear in the entire accessible length of the Green-Duwamish River. The sub-yearling Chinook salmon rely on the shallow shoreline habitat during their migration, which increases their sensitivity to alterations of that habitat. Much early rearing also takes place in the river basin's estuarine waters, with the lower Duwamish River and Elliott Bay providing rearing and migration habitat. The project area is within an area that has been proposed for designation as critical habitat area for Chinook salmon by NOAA Fisheries.

Bull Trout

On rare occasions, federally listed bull trout may occur in the project area. A sustaining population, however, does not appear to exist within the Green-Duwamish River system. The U.S. Fish and Wildlife Service considers the stock status of bull trout in the river basin to be unknown.

A small number of bull trout have been observed in the Green-Duwamish River system. The individuals observed are likely anadromous sub-adults and adults migrating into the lower river from other Puget Sound river systems for short periods of foraging. No bull trout reproduction is known to occur within the Duwamish River.

Habitat requirements and limiting factors for bull trout in the Puget Sound Management Unit, which includes the project area, were provided by the U.S. Fish and Wildlife Service in the *Draft Recovery Plan for Coastal-Puget Sound Distinct Population Segment of Bull Trout* (U.S. Fish and Wildlife Service 2004). The Draft Recovery Plan designates the Lower Green River (Soos Creek downstream to RM11) for foraging, migration, and over-wintering habitat for bull trout. This segment of the river is more than five miles upstream of the South Park Bridge. The Duwamish-Green River, however, is not one of the eight core management areas designated by the Draft Recovery Plan because the habitat does not support every lifestage of the species and no sustaining local population has been determined to use the river system.

Bald Eagle

The federally listed threatened bald eagle may use the project area. Nesting bald eagles are not found within the project area. However, wintering bald eagles may be present from October 31 to March 31. There are no trees at the project site large enough to be bald eagle perch trees. A few large poplar trees occur in the South Park neighborhood near the project site, but away from the river and the bridge site. Resident bald eagles may forage in the vicinity of the site at any time during the year as they do along most of the region's urban shorelines. Critical habitat has not been designated for bald eagles.

3.13.2 Fish Species of Local Concern

Coho Salmon

The coho salmon is a species of concern under ESA. The coho salmon fry in the Duwamish River basin are dependent on the availability of quality river habitat for growth and typically use side channels, wetlands, and off-channel sloughs for over-wintering and rearing. Adult coho enter the Duwamish River from mid-August through December, with peak migration activity in November. Coho salmon may occur in the project area.

Cutthroat Trout

Cutthroat trout in Puget Sound are not currently listed under ESA. They were proposed for listing, but listing was determined not to be warranted. They are included in this discussion because of public concern and their potential for future listing. In the Green-Duwamish River basin of Puget Sound, which includes the project area, adult cutthroat trout begin spawning migrations from July to January, with peak in October and November. Some sea-run cutthroat trout remain in fresh water after spawning, but most return to Puget Sound.

3.13.3 Environmental Impacts

Impacts Common to All Alternatives

Aquatic and Riparian Habitat Impacts

At a minimum, all of the alternatives would result in similar construction impacts from the removal of in-water piles, protection fenders, and concrete pier foundations supporting the existing bridge. The primary impacts from this activity would be the physical displacement of in-water and shoreline habitat during construction, the temporary disturbance of aquatic species from noise and vibration, and temporary increases in localized turbidity from disturbance of sediments that cannot be fully contained. These impacts would be minimized through the use of in-water containment measures such as construction caissons.

The in-water impact location would either be just within the existing bridge alignment for the Rehabilitation or No Action alternatives, or in that area as well as on an alignment adjacent to the existing bridge for construction of any of the Replacement Bridge Alternatives.

The potential aquatic impacts would vary among the alternatives based on the amount of in-water and riparian area disturbed or altered, the duration and intensity of construction activities, and the in-water footprint of each alternative following construction.

Direct aquatic impacts would be primarily confined to the construction footprint. Installation and removal of caissons and piles would disturb surface substrate resulting in displacement of small amounts of sediment to adjacent areas. Short-term localized turbidity would occur during these activities. Diatom production

would likely resume within weeks following displacement or disturbance of a substrate in shallow water. BMPs would minimize potential spills or release of materials into the water.

Some disturbance of contaminated surface sediment would be unavoidable within the construction area due to in-water demolition and construction activities associated with each of the project alternatives. The sediments would likely be contaminated based on their location within an area that has been designated a Superfund Site by the EPA. Minor amounts of mobilized sediment that cannot be fully contained by appropriate impact minimization measures would not be expected to be redistributed extensively beyond the immediate project area. Final design and development of construction activities and sequencing for the selected alternative would provide measures to control and monitor contaminated sediment redistribution. In addition, more specific measures to address this issue will be developed in conjunction with the appropriate resource agencies following the selection of a preferred alternative. For additional information on contamination, please see Appendix X, *Hazardous Materials Technical Report* (Wilbur Consulting 2004a).

Because of the relatively high ambient noise levels from the surrounding industrial and commercial land uses, additional noise from project-related construction activity is not anticipated to displace foraging birds that may use the Duwamish Waterway and the associated habitat.

After construction, shading impacts would vary slightly with different bridge widths and heights depending on the alternative. The three Replacement Bridge Alternatives would produce a slightly greater shading impact on the estuarine habitat due to a wider bridge structure. Bridge widths vary from 52 feet for the No Action Alternative (until the bridge is removed) and Rehabilitation Alternative, but would increase to 68 feet for the Replacement Bridge Alternatives. However, since no aquatic vegetation and only a small amount of exotic riparian vegetation occur in the project area, impacts would be minimal. Diatom production is not likely to be measurably reduced by the shading from the bridge structures at heights of 34 feet (Rehabilitation and Bascule Bridge alternatives), 65 feet (Mid-Level Fixed-Span Bridge Alternative), and 100 feet (High-Level Fixed-Span Bridge Alternative).

Each of the alternatives would improve overall aquatic and riparian habitat conditions at the project site by removing substantial amounts of existing creosote-treated timbers and piles from the project site. The replacement of these bridge components would involve using steel and concrete structural elements. This would result in some restoration of previously degraded habitat. Riparian habitat improvement also would occur with each alternative through site restoration of previously degraded habitat following construction activities for a small portion of the Duwamish River. In particular, habitat restoration would

improve conditions at the site for young salmonids during their rearing migration through the project area.

Impacts related to noise and vibration, increase turbidity, and riverbank excavations are also discussed in Sections 3.10 Noise, 3.12 Water Resources, and 3.14 Geology and Soils.

Terrestrial Habitat and Wildlife Impacts

No appreciable impacts to terrestrial habitats or wildlife are anticipated due to the very low habitat value and wildlife use within the project area. However, to the extent that terrestrial habitat would be affected, the High-Level Fixed-Span Bridge Alternative would cover a substantially greater area than the other alternatives.

Endangered-Species-Act-Listed Species and Critical Habitat

Under ESA, Chinook salmon and bull trout are listed as threatened in the Puget Sound area. The bald eagle is also listed as threatened**.** The project area is within a proposed designated critical habitat area for Chinook salmon per the December 14, 2004 announcement in the Federal Register by NOAA Fisheries. The project area is also located within the area proposed for critical habitat for bull trout per the June 24, 2004 announcement in the Federal Register by the U.S. Fish and Wildlife Service.

The proposed alternatives would not have long-term adverse effects to ESA federally listed species, species of concern, or their critical habitat. However, each alternative would result in impacts to riparian vegetation adjacent to the existing bridge during rehabilitation, construction of a replacement bridge, and/or demolition of the existing bridge. The riparian vegetation that would be affected includes small amounts of Himalayan blackberries, grasses, and other non-native vegetation. The muddy sand habitat that supports juvenile salmon and other species would also be affected and is discussed in detail below for each alternative. Impacts to juveniles migrating through the project site would generally be avoided through a combination of timing of in-water construction activities and use of BMPs.

Analysis of Specific Effects by Alternative

No Action Alternative

The No Action Alternative would result in continued use of the existing structure for the foreseeable future. Ultimately, the existing bridge, creosote-treated timbers, and associated approach structures would be removed. Disturbance of the muddy sand habitat and riparian vegetation would occur in the immediate vicinity of the existing bridge to accommodate a cofferdam, if needed. Restoration of the disturbed shoreline areas would be provided. No temporary docks would be needed for this alternative. No adverse impacts to fish and wildlife habitat would occur following removal of the existing bridge.

Rehabilitation Alternative

The Rehabilitation Alternative would involve many of the same bridge removal techniques as the No Action Alternative. However, the Rehabilitation Alternative would not involve in-water work outside the footprint of the existing bridge and fender system except for the construction of temporary docks on either side of the waterway downstream of the existing bridge.

The Rehabilitation Alternative would include replacement of the existing bascule piers at the same locations as the existing piers, minimizing impacts to muddy sand habitat. In comparison, the Replacement Bridge Alternatives would require construction of new piers downstream from the existing bridge, which would impact previously undisturbed muddy sand habitat.

Temporary construction trestles also would be constructed adjacent to the bridge to facilitate construction activities associated with rehabilitation. The temporary trestles would disturb sediment by driving and removing temporary support piles within the same approximate area as the alignment of the Replacement Bridge Alternatives. Following construction, existing habitat conditions would be maintained except that the creosote-treated timber and piles would be removed and replaced with non-toxic materials. Construction impacts would be mitigated through actions to minimize sediment disturbance, appropriate containment measures, and timing restrictions. The site would be disrupted for a longer period of time than with the No Action Alternative—32 months compared to only 8 months. Restoration of disturbed shoreline areas would be provided following bridge rehabilitation. New habitat would be created west (downstream) of the existing bridge.

Construction Impacts of the Replacement Bridge Alternatives

The impacts occurring during construction of the Replacement Bridge Alternatives would be very similar. Each would involve similar types of in-water activities for bridge removal and construction, with some differences in the size of the in-water construction footprint, and the duration of in-water construction activities. Construction would occur immediately downstream from the existing bridge prior to its removal. Temporary docks would be constructed adjacent to the replacement bridges to provide a working platform during construction. New concrete shafts or piles would be placed to support the foundations of the new bridge. Temporary construction trestles would be constructed adjacent to the replacement bridge to facilitate construction activities. Construction impacts would be mitigated through actions to minimize sediment disturbance, appropriate containment measures, and timing restrictions. Impacts of construction, slight increase in shading, and removal of creosote-treated timber would be similar for each alternative.

As with the Rehabilitation Alternative, fish would likely avoid the immediate vicinity of the construction activity during periods that involve disruption of the bottom, movement of large objects within the water, and placement or removal of

large objects within the water. Minor actions such as movement of vessels (such as barges delivering construction materials) would not disturb the activity of the young fish, except directly adjacent to the activity. The Hydraulic Project Approval issued by the Washington Department of Fish and Wildlife will place restrictions on in-water construction activities during the spring closure period of February 15 to July 15 when young salmon are most likely to be present at the project site. These permit conditions would minimize impacts from in-water construction to young salmonids.

Permanent Impacts of the Replacement Bridge Alternatives

Permanent impacts would primarily depend on the locations and numbers of support piers for each Replacement Bridge Alternative. The Mid-Level Fixed-Span Bridge and the High-Level Fixed-Span Bridge alternatives would have similar foundation designs and would occupy substantially less space (approximately 5 percent of existing) within the river than the existing bascule pier (8,200 square feet). However, the Bascule Bridge Alternative would have larger piers than the existing bascule piers and no in-water approach piers. The new bascule piers, however, would cover approximately 30 percent more bottom area than the existing piers. Therefore, permanent impacts to the existing muddy sand habitat under the Bascule Bridge Alternative would be greater than the Mid-Level Fixed-Span Bridge and the High-Level Fixed-Span Bridge alternatives.

Shading impacts of the Replacement Bridge Alternatives would be least with the High-Level Fixed-Span Bridge Alternative and greatest with the Bascule Bridge Alternative due to the difference in elevation above the waterway. However, these differences among the alternatives would be small in light intensity within the bridge shadow area. With each Replacement Bridge Alternative, the amount and characteristics of the new habitat provided as an impact minimization measure would be expected to be similar. Restoration of disturbed shoreline areas would be provided following construction of the new bridge. The Replacement Bridge Alternatives would create new habitat within the existing bridge right of way.

3.13.4 Secondary and Cumulative Impacts

Secondary Impacts

No secondary impacts to fish and wildlife were identified based on other reasonably foreseeable activities that could occur as a result of any of the project alternatives.

Cumulative Impacts

No foreseeable future action is expected to occur in the vicinity of the project site that would measurably add to any unmitigated adverse effects of the proposed project. Other proposed activities include the Duwamish Waterway sediment cleanup, maintenance dredging, and the shoreline restoration (see Section 3.1 Introduction). These projects may be constructed within approximately the same

time period as the South Park Bridge Project. Although adverse cumulative effects to fish could occur to the extent that activities associated with the Duwamish Shoreline Restoration Project take place at the same time as construction of the South Park Bridge project, coordination and appropriate BMPs should make those impacts negligible. In the long term, there would be beneficial cumulative impacts from improved fish habitat for these projects. The maintenance dredging upstream of the project area is not expected to cause adverse cumulative effects in combination with temporary sediment disturbance from bridge construction activities. Based on recent environmental analysis for maintenance dredging (U.S. Army Corps of Engineers 2003), impacts to water quality and fish are very limited in extent and duration. Permit requirements and appropriate BMPs should effectively limit any potential for downstream effects that could combine with similar impacts during bridge construction.

In addition, the Wastewater Treatment Division of King County has been working on combined sewer overflow (CSO) issues in the Duwamish River. The agency's source control program is reducing discharge of contaminants to the Duwamish River from CSOs. But, there are no CSOs in the project vicinity, so there would be no cumulative effects.

Overall, long-term, beneficial cumulative impacts would result from these several projects, including the proposed Seattle drainage improvements in the South Park community, when combined with new shallow water and riparian habitat that would be constructed adjacent to the selected bridge alternative as part of the mitigation for the selected bridge alternative.

3.13.5 Impact Minimization Measures

For each alternative, construction impacts are expected to affect water quality, aquatic and riparian habitat and wildlife, and federally listed fish species. These impacts would be minimized through implementation of BMPs and compliance with construction methods stipulated in applicable project construction permits. In addition, BMPs would be used to minimize the potential release of petroleum, paint, concrete, and other potentially toxic materials during construction over and near the Duwamish Waterway.

Under the No Action Alternative and all of the Replacement Bridge Alternatives, removal of the existing bridge would provide an opportunity to construct new shallow water habitat within the existing bridge alignment. This would provide an overall improvement in riparian and aquatic habitat. King County also proposes to construct new shallow water and riparian habitat downstream of the existing bridge for the Rehabilitation Alternative. New habitat would be designed to improve habitat functions for juvenile salmonids as well as general aquatic production.

In addition, for the Mid-Level Fixed-Span Bridge and High Level Fixed-Span Bridge alternatives, the first on-land piers would be set back about 85 feet from the waterway. This distance combined with the increased height of these alternatives would allow for planting of native riparian vegetation under the bridge and along the shoreline. The new riparian habitat would support juvenile salmonids and juveniles of other fishes that may be present at the project site. Waterfowl and shorebirds could also benefit from the new shoreline habitat.

During preliminary design of the preferred alternative, input from appropriate individuals, tribes, and resource agencies will be considered in the process of developing final restoration elements. Construction of any new aquatic or riparian habitat would occur at completion of the construction of the replacement bridges and removal of the existing bridge. The Port of Seattle would be consulted regarding shoreline habitat enhancement or restoration proposed on Port-owned property.

For any alternative, conditions of the Hydraulic Project Approval (a required construction permit) may require that in-water construction be avoided during the period of February 15 to July 15 when juvenile fish are most likely to be in the vicinity of the bridge. The in-water restriction period could be expanded based on the additional analysis of species listed under ESA, following selection of a preferred alternative. Isolation of construction activities from the water would occur during the period closed to in-water construction.

3.14 Geology and Soils

This section describes the geologic conditions present along the South Park Bridge project corridor and discusses geotechnical design and construction issues, related impacts, and mitigation measures. For additional, more detailed information, see Appendix W, *Geology and Soils Technical Report* (Shannon & Wilson 2004).

3.14.1 Affected Environment

The project area is located in the Duwamish River valley, a broad, glacially carved trough bounded by upland areas to the east and west. The valley is filled with a complex sequence of glacial and nonglacial sediments that overlie bedrock.

The project corridor is generally underlain by relative soft or loose Holocene fill, marsh, alluvium, and estuarine deposits that extend to considerable depths in most places. More competent (load-bearing), glacial soils, and bedrock underlie these less competent soils. The depth to these more competent soils and rock varies considerably in the project vicinity. The subsurface conditions at the south end of the project area near S. Trenton Street differ significantly from those along the rest of the corridor in that competent, glacial soils, and bedrock exist at a relatively shallow depth.

Groundwater levels along most of the project corridor are within 10 to 12 feet of the ground surface. The groundwater is tidally influenced and fluctuates as much as 11 feet near the Duwamish Waterway. The magnitude of fluctuations decreases away from the waterway.

The project area is located in a moderately active tectonic province. The area has been subjected to numerous earthquakes of low to moderate strength and occasionally to strong shocks during the 165-year recorded history in the Pacific Northwest. The project area is located within the Seattle Fault Zone, which consists of four or more east-west-trending faults that coalesce to a deep master, south-dipping fault. Earthquake-induced geologic hazards that may affect any given site include liquefaction and related effects, landsliding, soft-soil ground motion amplification, and fault surface rupture (see Figure 3-47).

3.14.2 Environmental Impacts

This section discusses potential impacts to the soils- and geology-related aspects of the environment that could result from the proposed alternatives. These impacts would be related to the effect of the construction and/or operation of new or rehabilitated structures on existing features in the project area. These impacts also include those related to construction activities for removal of the existing structure. Considering the close proximity of the proposed horizontal alignments

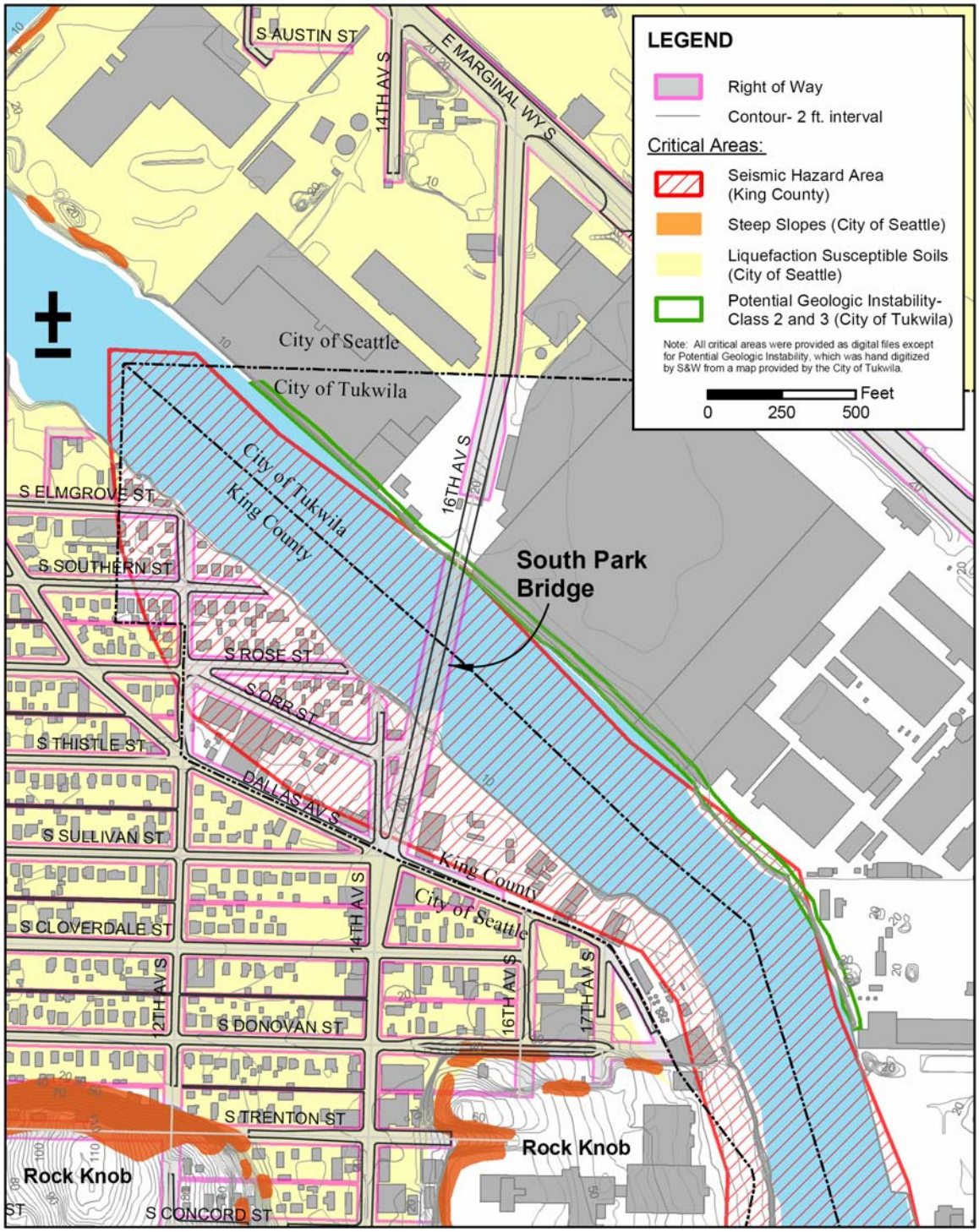


Figure 3-47
Critical Areas Map

for the Rehabilitation Alternative and Replacement Bridge Alternatives, impacts related to these alternatives would be similar. The magnitude of impacts would be greater, however, with increasing area of construction disturbance.

Construction Impacts

Construction activity impacts differ from operation impacts in that the impact takes place during construction or within a short period of time after construction, and therefore are temporary. Construction impacts do not exist long term. For the No Action and Rehabilitation Bridge alternatives, construction activities would include removal of the existing bridge and fill placement in areas currently occupied by the bridge. For the Replacement Bridge Alternatives, construction activities would include removal of the existing bridge within the corridor of the new alignment. For the Rehabilitation and Replacement Bridge alternatives, the anticipated construction activities would include fill placement, retaining walls, and new structures. The construction activities would result in short-term soils- and geology-related impacts to the project area.

The following potential impacts are common to all of the Build Alternatives. As noted below, some of these impacts would also occur for the No Action Alternative.

Erosion and Sediment Control

Construction of all project alternatives, including the No Action Alternative, would require land clearing, grubbing, removal of topsoil, and other site preparation work. Since the project area would be located mostly within the existing bridge alignment and public road right of way, construction would create minimal impacts. Areas beneath the proposed fills and structures that were not cleared during construction of the original bridge would be cleared and grubbed of all vegetation and debris and stripped of all organic topsoil. The area of land needing to be cleared is expected to be small. The debris resulting from clearing and stripping would be removed from the project area or stockpiled for later use in landscaped areas, as appropriate. This material would not be suitable for reuse as structural fill because of the high organic content.

The prepared ground surface would have high erosion potential if exposed during the rainy season or in the presence of surface water. Areas that are disturbed during construction would be subject to increased erosion if proper control measures were not used. The surface water flow across exposed soil would remove sediment and deposit it in downslope areas. The amount of erosion and sedimentation would depend on the amount of soil exposed and/or disturbed, weather conditions and/or groundwater conditions, and the erosion control measures implemented. Eroding surface soils and run-off could flow into stormwater drains, into existing culverts, and/or onto adjacent properties or streets.

Within construction areas, the tires and tracks of heavy equipment could sink into the soft surface soil if no work pad is present. The tires of the construction vehicles could also carry soil onto roadways when leaving construction areas.

While there is potential for the impacts discussed above to occur, these impacts can be mitigated through proper design and construction.

Fill Embankments

Fill embankments constructed for the Build Alternatives over the recent Holocene deposits could cause settlement. Settlement of fill embankments for approaches could impact underlying and adjacent utilities or structures as well as walls or structures constructed on the fill embankment.

Deep Foundations

Because of the depth of loose/soft soils and the anticipated bridge loads, deep foundations would be required to support the new bridge structures for all of the Build Alternatives. Drilled shafts or driven piles are proposed to support the bridge structures. Impacts associated with these foundation types are discussed below.

Drilled shafts would be installed with equipment that causes relatively little vibration. Because of the depth of soft soil at the site, open-hole excavation methods would be difficult. Caving or sloughing of soil within the open-hole excavations could impact adjacent structures and buried utilities.

Temporary docks with deep foundations would be used for construction within the Duwamish Waterway for all of the Build Alternatives. Driven steel piles proposed for the temporary dock would be suitable to support the bridge foundation as an alternative to drilled shafts based on a test pile program performed at the sites (Shannon & Wilson 2003b, Shannon & Wilson 2004).

Pile driving for construction of the temporary dock and/or new bridge foundation would result in temporary noise and construction vibration impacts at the project site and in the vicinity. The vibration caused by driving the piles through the soils at the site could impact existing facilities depending on proximity to construction activities. These impacts could consist of settlement (within 20 feet of pile driving), cracking of pavements or structures, and/or slope failures. Piles driven to support the temporary dock would be cut off at the mudline level after bridge rehabilitation or replacement is completed.

For all of the Build Alternatives, a cofferdam around the new foundation or a steel casing would be required for in-water construction of the pile cap. Depending on the extent of fine sediments encountered and disturbed during in-water construction for cofferdam and temporary dock-related work, water quality of the Duwamish Waterway could be temporarily degraded.

Drainage in Construction Areas

During construction activities associated with all of the project alternatives, including the No Action Alternative, poor drainage practices could result in drainage of surface water onto unstable slopes. This would result in slope instability of the riverbank, erosion, or other adverse impacts to adjacent properties. These impacts can be mitigated through proper design and construction practices.

Pavements

Construction traffic activities associated with all of the project alternatives, including the No Action Alternative, could cause settlement, potholes, cracks, or other distress to existing adjacent roadways that were not designed for loads of heavy construction equipment.

Operational Impacts

General

For the No Action Alternative, the only operational impacts would be related to the new fill that would be placed after removal of structural elements of the existing bridge. The Replacement Bridge Alternatives would have the same operation impact because they also would require removal of the existing bridge after the construction of the new bridge is complete.

The Rehabilitation and Replacement Bridge alternatives would be designed based on the available subsurface information, design procedures, agency criteria, and the existing site conditions. The Rehabilitation and Replacement Bridge alternatives would be designed for a soft rock peak ground acceleration (PGA) of 0.33g. However, if an earthquake occurs that results in a higher site PGA than 0.33g, site structures could be impacted.

Seismic Considerations

The project area crosses recent fill and Holocene deposits that are susceptible to liquefaction and associated effects. The typical effects of liquefaction include loss of bearing capacity for shallow foundations, reduction in lateral and vertical capacities of deep foundations, ground surface settlements, lateral spreading, and embankment instability or slumping.

Considering the current condition of the existing bridge, and the fact that the existing timber piles supporting the north bascule pier are likely bearing within the Holocene deposits based on adjacent soil borings, the effects of liquefaction would have the most impact on the existing bridge structure. No structure would exist for the No Action Alternative. The new foundations for the Rehabilitation Alternative and the deep foundations of the Replacement Build Alternatives would all involve installing deep foundations that bear in the underlying glacial deposits and/or bedrock. No soils- or geology-related direct impacts are anticipated for these alternatives. For the No Action Alternative, prior to removal

of the existing bridge, the existing timber piles supporting the bridge, especially the piles supporting the north bascule pier, may experience additional settlement resulting in additional damage to the existing bridge structure.

New Fill

Constructing approaches for the Rehabilitation Alternative and the Replacement Bridge Alternatives would require as much as 15 feet of structural fill. Because of the limited right of way, retaining walls are under consideration to retain the fills needed for construction of the north and south approaches of the project. In addition, the No Action Alternative and the Replacement Bridge Alternatives would require fill to backfill areas where the structural elements of the existing bridge would be removed.

As discussed previously, soft Holocene deposits are present along some sections of the project corridor. In these sections, the new fill could cause settlements on the order of 3 to 5 inches during the first few years after construction based on existing soil conditions. This settlement could result in pavement distress, drainage problems, and other roadway problems. In areas where peat and soil deposits containing numerous organics are present, an additional secondary compression could cause long-term ongoing settlement problems on the order of 0.5 to 1.5 inches. If utilities are located near or beneath settlement areas, damage to utilities could occur.

Permanent Drainage

Increased impervious surface area resulting for the Rehabilitation and Replacement Bridge alternatives would increase water flow to the existing stormwater system. For further discussion of impacts resulting from increased flow, see Section 3.12 Water Resources and see Appendix U, *Water Resources Technical Report* (Parametrix 2004b).

3.14.3 Secondary and Cumulative Impacts

Secondary Impacts

No adverse soils-related, secondary impacts of the No Action Alternative are anticipated. Construction activities associated with the Build Alternatives could cause erosion or slope instability, which could result in discharges into the existing drainage system. No long-term secondary effects are expected.

Secondary impacts associated with hazardous material are discussed in Section 3.15 Hazardous Materials and Appendix X, *Hazardous Materials Technical Report* (Wilbur Consulting 2004a).

Cumulative Impacts

The planned or ongoing neighboring projects that could contribute to anticipated cumulative geology and soils impacts include the following: the Duwamish

Waterway sediment cleanup, the Duwamish Waterway maintenance dredging, the shoreline restoration project, the 14th Avenue S. paving and street lighting improvements, and Seattle Public Utilities drainage improvements (see Section 3.1 Introduction). Based on available information, no adverse soils and geology cumulative impacts are anticipated with the above projects and the South Park Bridge Project. Coordination should be performed with these projects before and during the construction phases of any of the projects to ensure no adverse effects.

3.14.4 Mitigation Measures

The following is a list of recommended mitigation measures for construction and operation impacts to soils- and geology-related issues.

Construction

- Use BMPs to reduce erosion and sediment transport including: construction staging barrier berms, filter fabric fences, temporary sediment detention basins, and slope coverings to contain sediment onsite.

- Prepare a TESC plan in accordance with the WSDOT *Highway Runoff Manual* (WSDOT 2004).

- Re-vegetate disturbed areas that will not be paved or otherwise permanently covered to minimize erosion, e.g., mulching or hydroseeding.

- Use structural controls to prevent sediment from leaving the construction area, e.g., gravel work pads, silt fences, temporary ditches and sediment ponds, covered truck loads, and clean tires as equipment leaves the site.

- Implement temporary erosion and sediment control measures that comply with the WSDOT *Highway Runoff Manual* (WSDOT 2004) and follow the National Pollutant Discharge Elimination System guidelines administered by Ecology before any demolition, clearing, grading, or construction activities begin.

- Use lightweight fill materials to avoid stress on underlying compressible soils and use mechanically stabilized earth walls to retain fill. Use structural fill to replace soft subgrades, where identified.

- Drill shafts and use casings in the upper unstable soils to minimize the caving of soils, migration of contaminated materials, and generation of contaminated soils. If temporary casings are used, they should be cleaned of potentially contaminated soil and water that may adhere to avoid the spread of contamination.

- Use low-vibration and low-noise pile-driving equipment for the construction of the temporary dock and/or bridge foundations to mitigate potential noise and vibration effects on nearby land uses.

- Slope all fill and pavement areas to drain away from construction areas to prevent ponding of water and softening of subgrade soils.

- Conduct pre-construction surveys of structures within 100 feet of pile driving to assess potential noise vibration damage and monitor vibration during construction activities.

Operation

- Design new structural elements considering the seismicity of the site and the American Association of State Highway and Transportation Officials (AASHTO) criteria presented in the Seventeenth Edition of the *Standard Specifications for Highway Bridges* (AASHTO 2002) to minimize potential long-term seismic damage.

- Use ground improvements to minimize potential risks of liquefaction of Holocene deposits, e.g., "Earthquake Drains," compaction grouting, and grouting and admixture methods.

- Design permanent drainage facilities for anticipated capacities for slopes, walls, fills, etc. Vaults may be needed to reduce sediment loads of drainage water.

Additional mitigation measures for stormwater runoff are discussed in Section 3.12 Water Resources.

3.15 Hazardous Materials

This section describes the potential impacts associated with existing hazardous materials contamination or resulting hazardous materials contamination from construction or operation of the proposed South Park Bridge Project. Public records were researched and a windshield survey was conducted for properties in the project corridor. This information identified 15 properties in the project corridor that are known or suspected to be contaminated. Some of these properties would be acquired for project construction activities; others would be affected by construction activities for one of the proposed project alternatives. A number of mitigation measures are recommended to avoid, minimize, or reduce the potential effects of such hazardous materials impacts. For additional, more detailed information, see Appendix X, *Hazardous Materials Technical Report* (Wilbur Consulting 2004a).

3.15.1 Affected Environment

Project Area

The South Park Bridge on 14th/16th Avenue S. is a north-south arterial that crosses the Duwamish Waterway south of downtown Seattle, Washington. The existing bridge was constructed in the early 1930s and replaced a wooden bridge crossing at 14th Avenue S. The street name changes from 16th Avenue S. to 14th Avenue S. at the mid-span of the South Park Bridge. The mid-span of the bridge also is a local government jurisdictional boundary. The South Park Bridge's northern half is located within the City of Tukwila and its southern half is located within King County. Surrounding land both to the north and south are located within the city limits of Seattle.

The project area for the South Park Bridge Project extends along 14th/16th Avenue S. from the intersection of East Marginal Way S. and 16th Avenue S. south to the intersection of 14th Avenue S. and S. Trenton Street. The project area continues west along S. Trenton Street to 12th Avenue S. and north again to S. Cloverdale Street. The project area is also referred to as the project corridor.

Properties with Potential Risks

To focus analysis on properties that could be affected by the rehabilitation or replacement of the South Park Bridge, a site screening process was developed and implemented to identify properties with known or suspected construction issues. Efforts included research on historical industrial and commercial land use, regulatory agency database lists and file reviews, and a windshield survey of the properties.

In total, 58 hazardous materials sites were identified in the project corridor. Most of these sites are located on individual parcels of land. For others, more than one hazardous materials site may be located on the same parcel of land. For example,

two businesses may be located on the same parcel and both may individually be listed as a separate hazardous materials site. The 58 sites in the project corridor are located on the 50 parcels shown in Figure 3-48.

In the project corridor, a total of 43 hazardous materials sites of the 58 sites were eliminated from further consideration. The research indicated that these sites were located downgradient of the proposed project impact area, distant from the planned right-of-way acquisition for the South Park Bridge alternatives, or did not pose substantial potential for environmental or construction risks based on the site's reported environmental history.

Of the remaining 15 hazardous materials sites (see Figure 3-49), some are known to be substantially contaminated and others are considered to be reasonably predictable properties where contamination could occur. Substantially contaminated properties are typically large or have large volumes of contaminated materials. They may have a long history of industrial or commercial land use and/or may have contaminants that are persistent or difficult and expensive to manage. Reasonably predictable properties have recognized environmental conditions based on existing data, predicted conditions based on onsite observation, previous experience with similar sites, or by using best professional judgment. These sites are typically small, the contaminants are localized and relatively non-toxic, or abatement/remediation activities are routine (e.g., asbestos abatement or petroleum hydrocarbon contaminated soil remediation).

The following is a description of the 3 substantially contaminated and 12 reasonably predictable properties located in the project corridor. These properties are organized from north to south along the project corridor. (The addresses of these sites may not be comparable to property addresses used in other sections of this EIS as these are the addresses on record and not necessarily the parcel addresses recorded by the King County Assessor's Office.)

Substantially Contaminated Properties

- **Boeing Plant 2 (Sites 5 & 7)**—Boeing Plant 2 is a 107-acre aircraft manufacturing and assembly facility that has been in operation since the mid-1930s. Soil and groundwater contamination beneath the facility and sediment contamination along the plant's shoreline of the LDW Superfund Site have been documented. In 1994, the EPA and Boeing signed an Administrative Order of Consent that requires Boeing to investigate and perform corrective action at Plant 2 under the Resource Conservation and Recovery Act (RCRA). Boeing is currently investigating and performing corrective action cleanups for soil, groundwater, and sediment. In addition, Boeing has begun a corrective-measures study to evaluate and select final cleanup actions for the Plant 2 facility and the sediments in the LDW Superfund Site adjacent to the facility. For this study, both Site 5 and Site 7 are discussed as if they were a single site.

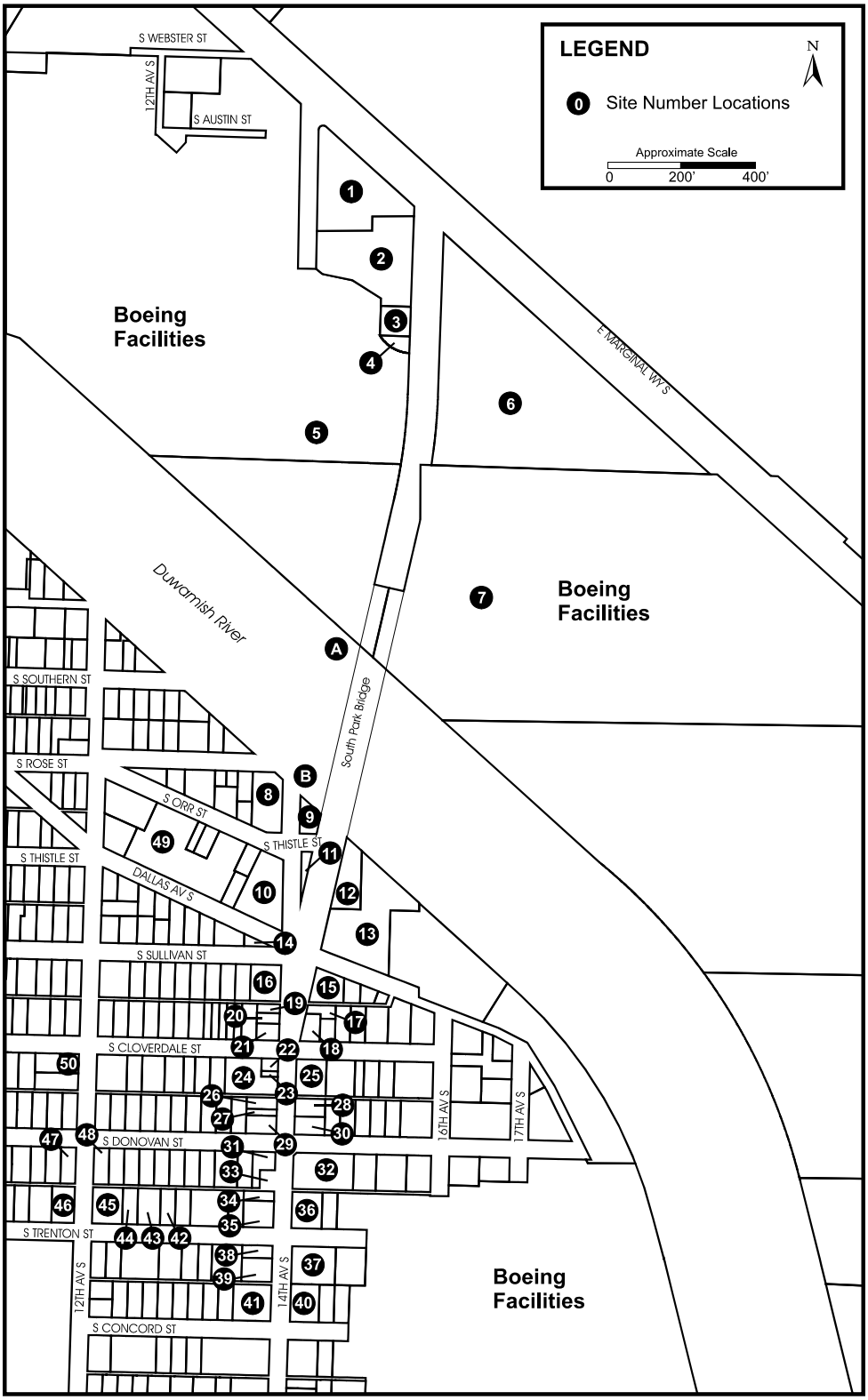


Figure 3-48
Hazardous Materials Site Number Locations

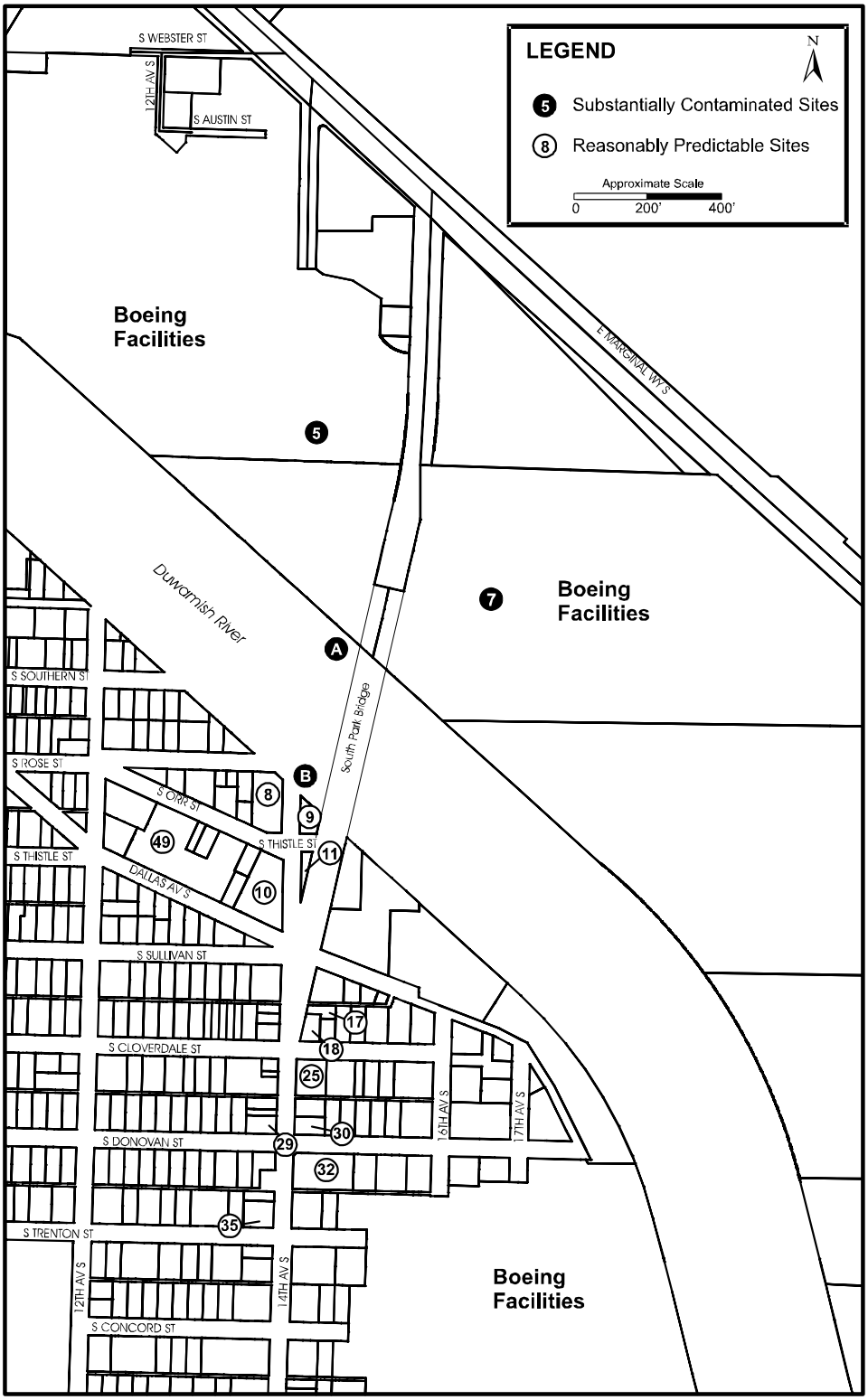


Figure 3-49
Hazardous Materials Substantially Contaminated and Reasonably Predictable Sites

- **Sediments within the LDW (Sites A & B)**—The LDW is listed as a Superfund Site. It is currently in the initial phases of investigation for cleanup of sediments and upland source areas. The northern shore is referred to as Site A and the southern shore is referred to as Site B. For this report, the sediments for Site A and Site B are discussed as two separate sites.

Reasonably Predictable Properties

- **1289 S. Rose Street (Site 8)**—At this boat repair yard located behind a residence, ship maintenance and repair activities, as well as hull cleaning and painting, were conducted in the open without a surface seal. Historic aerial photographs show heavy staining on the ground surface prior to placement of the existing asphalt surface. There is a high probability of soil and stormwater contamination at the site.

- **1400 S. Thistle Street (Site 9)**—Ship maintenance and repair activities, as well as hull cleaning and painting, were conducted in the open on this site without a surface seal. There is a high probability of soil and stormwater contamination at the site.

- **8456 14th Avenue S. (Site 10)**—The northern portion of this property was used as a boat repair yard. Ship maintenance and repair activities, as well as hull cleaning and painting, were conducted in the open without a surface seal. There is a high probability of soil and stormwater contamination at the site.

- **1401 S. Thistle Street (Site 11)**—Land uses at this site include a junkyard and a single-family residence. The field survey recorded several abandoned vehicles are located on the property. In addition, several hundred plastic containers are stored onsite.

- **8520 14th Avenue S. (Site 17)**—This site is a former gasoline service station. A leaking underground storage tank and petroleum contamination are recorded for this site.

- **8524 14th Avenue S. (Site 18)**—This is an existing auto repair and service station. A leaking underground storage tank and petroleum contamination are recorded for this site.

- **8600 14th Avenue S. (Site 25)**—The Napoli Pizzeria restaurant site is listed in the Ecology records. The records, however, do not indicate that the property owner currently participates in dangerous waste activities. Based on a site visit conducted from public areas, there is high potential that asbestos containing materials (ACMs) and lead-based paint (LBP) materials are present in the building structure due to age of the structure**.**

- **8621 14th Avenue S. (Site 29)**—This site is a former auto repair shop and service station. A leaking underground storage tank and petroleum contamination are reported for the site. Based on a field survey conducted from public areas, there is high potential that ACMs and LBP materials are present in the building structure due to its age**.**

- **8620 14th Avenue S. (Site 30)**—This is the site of a former dry cleaning business with a long operational history. Chemical containers are stored on the property. Based on a site visit conducted from public areas, there is high potential that ACMs and LBP materials are present in the building structure due to its age**.**

- **8700 14th Avenue S. (Site 32)**—This site is a former Chevron service station and former machine shop. A leaking underground storage tank and petroleum contamination in soil and groundwater are recorded for the site. In addition, the site is listed as having released chlorinated solvents into the soil. A warehouse currently occupies the site.

- **8721 14th Avenue S. (Site 35)**—This site has had multiple property owners. Research of past land uses indicates that previous property owners and/or businesses operating on the site may have handled hazardous materials.

- **8410 Dallas Avenue S. (Site 49)**—The Spencer Industries, Inc., an aircraft part manufacturing facility, was historically located on this site. Public files report releases of chlorinated solvents and contamination of the groundwater on this site.

In summary, a substantial number of the properties located in the project corridor are known to be contaminated or could reasonably be predicted to be contaminated. Three of the sites—Boeing Plant 2 Site (Sites 5 and 7 together) and the LDW Site A and Site B—are considered to be substantially contaminated properties. The Boeing site is under RCRA Corrective Action and the other two sites have been listed as a Superfund Site. An additional 12 sites are considered to be reasonably predictable properties. Contaminated soil, groundwater, and sediment are expected at the substantially contaminated sites and many of the reasonably predictable properties. Examples of expected soil and groundwater contaminants include petroleum products, metals, PCBs, and chlorinated solvents. All of the structures that are located within the project corridor were constructed when ACMs and LBP materials were commonly used.

3.15.2 Environmental Impacts

Based on the conceptual engineering plans for each of the proposed project alternatives and the anticipated demolition activities associated with the No Action Alternative, hazardous materials impacts are anticipated. The research and field

survey data collected on the project corridor indicate both substantially contaminated and reasonably predictable contaminated properties would be affected. The following paragraphs describe the types and extent of these impacts.

Specific Construction Impacts

Table 3-24 lists sites known to be substantially contaminated and suspected to be contaminated and indicates which of those sites would be of concern for each of the project alternatives. More specific information about the type and nature of these sites and their respective contamination issues is discussed for each alternative below.

Table 3-24. Substantially and Suspected Contaminated Sites by Bridge Alternative

Site Number Locations	No Action	Rehabilitation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge
5 & 7 (Boeing)		X	X	X	X
A	X	X	X	X	X
B	X	X	X	X	X
8		X	X	X	X
9		X	X	X	X
10		X	X	X	X
11		X	X	X	X
17			X	X	X
18			X	X	X
25		X	X	X	X
29				X	X
30				X	X
32					X
35					X
49		X	X	X	X

No Action Alternative

The No Action Alternative would not require property acquisition. The proposed future demolition and removal of the bridge, however, would disturb sediments in the Duwamish Waterway. As such, Sites A and B in the LDW would be affected. These impacts would be very low in comparison to the other project alternatives but of great risk as these two sites are listed in the LDW Superfund Site.

Rehabilitation Alternative

The construction of the Rehabilitation Alternative would require the acquisition of three properties. These properties include Sites 8, 9, and 11. These sites are reasonably predictable properties. The two LDW Sites A and B would also be affected and these are substantially contaminated sites. Sites 5, 7, 10, 25, and 49 could also affect construction because of past use of hazardous materials on the sites and their close proximity. These impacts would be low in comparison to the other project alternatives.

Bascule Bridge Alternative

The construction of the Bascule Bridge Alternative would require the acquisition of a total of seven properties. These properties include the following hazardous materials sites: Sites 5, 7, 8, 9, 10, and 11. These sites include both substantially contaminated properties as well as reasonably predictable properties. The two LDW Sites A and B would also be disturbed by in-water construction activities and these sites again are substantially contaminated. Sites 17, 18, 25, and 49 could also affect construction because of past hazardous material use on the site and their close proximity. In comparison to the other alternatives, these impacts would be moderate.

Mid-Level Fixed-Span Bridge Alternative

The construction of the Mid-Level Fixed-Span Bridge Alternative would require the acquisition of a total of 14 properties. These properties include the following hazardous materials sites: Sites 5, 7, 8, 9, 10, 11, 17, and 18. The two LDW Sites A and B would again be disturbed by the in-water construction activities. Together, these sites include both substantially contaminated and reasonably predictable properties. Sites 25, 29, 30, and 49 could also affect construction because of past hazardous material use on these sites and their close proximity. In comparison to the other alternatives, these impacts would be substantial involving 13 of the 15 identified hazardous material sites.

High-Level Fixed-Span Bridge Alternative

The construction of the High-Level Fixed-Span Bridge Alternative would require acquisition of a total of 39 properties. These properties include the following hazardous materials sites: Sites 5, 7, 8, 9, 10, 11, 17, 18, 25, 29, 30, 32, and 35. The in-water construction activities would also disturb the LDW Sites A and B. Site 49 could also affect construction because of past hazardous material use on the site and its close proximity. This alternative would affect or would be affected by all of the 15 hazardous materials sites in the project corridor. The hazardous materials impacts resulting from this alternative would be substantial compared to the other project alternatives.

Common Construction Impacts

In addition to the specific construction impacts of each of the proposed project alternatives discussed above, the general types of activities involved in the

construction and/or demolition associated with the project alternatives would result in hazardous material impacts. These impacts include the following:

- Depending upon the foundations selected to support the bridge structure, it is possible that contaminated groundwater could be encountered during construction.

- Surface water impacts are anticipated due to disturbance to sediments of the Duwamish Waterway.

- The non-hazardous constituents in the aquifer near the LDW contain high concentrations of iron and manganese, which commonly create problems for direct disposal of dewatering effluent to the publicly owned treatment works (POTW). Dewatering efforts will likely require pre-disposal treatment.

- Construction excavation could encounter contaminated soils or sediments as well as buried drums or containers containing contaminated materials.

- Soil erosion and other uncontrolled releases of potentially hazardous materials could negatively affect surface waters during construction and/or demolition.

- Building material demolition debris could contain regulated substances, including ACM and LBP, and would require special disposal.

- Construction excavation activities or the management of contaminated materials (i.e., soils, groundwater, sediment, surface water, and vapors) could expose workers to health and safety risks. Demolition of the bridge also could expose workers to potential inhalation of spores from bird droppings, which can infect workers with histoplasmosis (a fungal infection usually affecting the lungs).

- Public health could be at risk, albeit very low, due to activities associated with construction, including the transport of contaminated materials. Such risks are primarily associated with the accidental offsite release of contaminated materials. Releases may affect surface water, groundwater, public drinking water, or local air quality.

Additional Construction Impacts

Additional hazardous materials impacts could occur for each of the proposed project alternatives. Construction and/or demolition activities could create liability risks, delay the project schedule, and affect project cost. These issues are highlighted below.

Liability Risks

- Acquisition (purchase or easements) of contaminated properties would result in cleanup liabilities.

- Construction or demolition activities on or near the LDW Sites A and B as well as the Boeing Plant 2 sites would have a high potential to create environmental liabilities.

- A potential spill and/or release to the environment during construction activities at the Boeing Plant 2 could directly or indirectly enter the LDW, which could result in cleanup costs, damages costs, and/or potential fines.

- Construction and/or demolition activities could encounter offsite contamination that originates from properties not acquired, but could nevertheless result in cleanup liabilities.

Construction Schedule and Costs

- If a property with unknown/known contamination is acquired or an easement is obtained, construction activities could be delayed until the contaminated media is characterized, excavated, stockpiled, and properly disposed.

- A delay in construction may occur if unknown contamination and/or drums and containers are encountered during construction activities. The portion of the South Park Bridge project area that extends from East Marginal Way S. to the intersection of 14th Avenue S. and Dallas Avenue S. is the area with the highest potential for containing unknown pockets of contamination.

- Construction staging activities may be affected by close proximity to contaminated materials. Alternative construction techniques may need to be used to minimize potential impacts.

- If contamination were encountered during construction activities, special handling, disposal, and characterization of dewatering effluent and soils would be required and the project proponent would be responsible for proper planning and management of any regulated hazardous wastes.

Operational Impacts

Construction of the project would improve traffic operations along the entire project corridor and Seattle's Duwamish industrial area. Hazardous material waste from normal operations of the South Park Bridge would primarily be associated with runoff of contaminants entrained in stormwater. Contaminants likely to be in stormwater runoff include fuel, lubricants, heavy metals, compounds from tires, and automobile engine coolants, such as ethylene glycol. Stormwater and water

quality treatment facilities should be designed to collect and retain pollutants from traffic operations. Additional operational impacts could include maintenance painting of the bridge. For additional information, see the discussion of water quality impacts in Section 3.12 Water Resources.

3.15.3 Secondary and Cumulative Impacts

Secondary Impacts

Secondary impacts could occur to the extent that offsite activities associated with project construction may result in adverse impacts beyond the project area. Foreseeable impacts are generally associated with trucks transporting hazardous materials (e.g., contaminated oil, sediment, or water) offsite for proper treatment or disposal, such as accidental spills, potential releases resulting from traffic accidents, fugitive dust emissions from wheels and cargo, increased air pollution in the surrounding area from construction vehicle exhaust emissions. With proper mitigation measures and construction BMPs, these effects would be limited. It is not anticipated that these effects would be substantial adverse effects.

Cumulative Impacts

No substantial adverse cumulative impacts from hazardous materials are expected for any of the project alternatives. Other projects evaluated that could lead to potential cumulative impacts include the Duwamish Waterway sediment cleanup, 14th Avenue S. paving and street lighting improvements, and the proposed Seattle drainage improvements. Minor effects could occur if care is not taken in the construction of proposed new underground utilities to prevent the spread of contamination along the trenches where new utilities are installed. Generally, a net benefit to ongoing development projects in the same area is expected, including additional removal and cleanup of contaminated materials. It will be important, however, to coordinate the bridge design and construction plans with any environmental restoration efforts to ensure that the design and construction is consistent with these projects, especially any remedial activities associated with the LDW Superfund Site and/or Boeing Plant 2 RCRA cleanup activities.

3.15.4 Mitigation Measures

The following is a list of proposed mitigation measures to avoid, reduce, or minimize potential hazardous material impacts.

- Use the results of pre-acquisition site investigations (using WSDOT PSI guidelines) to determine fair market property values that consider potential long-term cleanup costs.

- Coordinate with EPA and Ecology early in the construction planning process to ascertain federal and state Superfund authorities within the project area.

- Characterize the hazardous chemical content of groundwater and the non-hazardous chemical makeup of groundwater within the South Park Bridge project area prior to construction activities.

- Develop options for construction activities that minimize or avoid intercepting the groundwater table.

- Locate existing monitoring wells within the South Park Bridge project area prior to commencing any excavation work. Depending upon construction activities, monitoring wells may need to be removed or relocated. Relocating the wells and/or excavation work could impact ongoing monitoring activities, cleanup activities, and/or natural attenuation goals established in a site cleanup plan.

- Prepare and implement a Spill Prevention, Control, and Countermeasures (SPCC) Plan to prevent and mitigate potential impacts to water resources from the potential release of hazardous materials.

- Prior to any site investigations, demolition, excavation, or other construction activities, prepare health and safety plans consistent with all applicable federal, state, and local rules and regulations. Safety plans will address worker health and safety, as well as emergency response issues.

- To protect the public, provide procedures in health and safety plans to prevent or minimize public exposure to any unanticipated release of hazardous materials, i.e., construction site security fencing, site access, equipment and materials transport. These plans will also include protocols for agency notification in the event of an accidental release affecting either the onsite or offsite environment.

- Prior to the start of any onsite construction activities, require that contractors inform workers of potential health and safety risks and ensure that all workers either have or will receive appropriate levels of hazardous materials training in accordance with applicable rules and regulations. In addition, contractors will be required to provide workers with appropriate protective equipment before any field activities begin.

- Develop a comprehensive recycling plan to minimize disposal of demolition debris.

- Prepare a contaminated media contingency plan that would provide specific guidance for managing contaminated media during construction activities for the selected alternative. The contaminated media contingency plan should address risk-based cleanup and recommend provisions for field screening options, notification requirements, and soil stockpile management. Recommend 20,000 square feet containment area in the

staging areas of both sides of the Duwamish Waterway (Wilbur Consulting 2004b).

Consider conducting any necessary cleanup activities prior to construction in order to mitigate long-term cleanup costs. In addition, see Section 3.12 Water Resources for a discussion of recommended mitigation measures for stormwater impacts. Additional information can be found in Appendix U, *Water Resources Technical Report* (Parametrix 2004b).

3.16 Major Unavoidable Adverse Impacts

Proposed mitigation measures would reduce most potential environmental impacts to a less than significant level. However, each of the alternatives would result in some major unavoidable adverse impacts.

For the No Action Alternative, the existing South Park Bridge would be demolished and removed sometime before 2027. This alternative would result in the permanent loss of the bridge, which is a listed resource on the NRHP. This alternative would not be consistent with local or regional transportation or South Park neighborhood planning goals and policies. The removal of the bridge would affect the ability to provide fire protection and emergency medical services to the South Park community as well as other nearby industrial and residential neighborhoods. This alternative would result in disproportionate though not necessarily high impacts on minority, Hispanic/Latino, or low-income populations who reside, work, or operate businesses in the community. As such, this alternative would be in compliance with federal and State anti-discrimination laws, regulations, and guidance (including Title VI of the Civil Rights Act of 1964 and Presidential Executive Order 12898 on environmental justice).

The proposed Rehabilitation Alternative would restore the existing historic South Park Bridge. The proposed repairs, refurbishments, and reconstruction, however, would not meet the Secretary of Interior's standards for rehabilitation for historic resources. The historic properties that make the bridge eligible for NRHP listing would be lost. The proposed construction of the bridge also requires bridge closure for approximately 30 months, which could jeopardize the economic long-term viability of the business district and the community. These disproportionate effects on minority populations would be temporary during construction and mitigation could reduce the severity of these impacts. As such, this alternative would be consistent with federal and State anti-discrimination laws, regulations, and guidance (including Title VI of the Civil Rights Act of 1964 and Presidential Executive Order 12898 on environmental justice).

The Bascule Bridge Alternatives would result in the permanent loss of the historic bridge structure. Required property acquisition would affect seven properties. This would likely affect minority property owners, business owners, low-income employees, and residents. These impacts, however, would not likely be high, so this alternative would be consistent with federal and State anti-discrimination laws, regulations, and guidance (including Title VI of the Civil Rights Act of 1964 and Presidential Executive Order 12898 on environmental justice.)

The Mid-Level Fixed-Span Bridge Alternative would result in the permanent loss of the historic bridge structure. This alternative would not be consistent with the South Park neighborhood land use planning goals and policies. The length of the bridge and its structure and lighting would introduce new barriers into the community and would affect community cohesion. The 65-foot vertical clearance

of the bridge would affect upstream marine-dependent businesses, including Delta Marine Industries. A total of 14 properties would need to be acquired, which would disproportionately affect minority property owners, business owners, low-income employees, and residents. There is strong community opposition to this alternative due to the potential substantial loss of businesses in the community business district (see Chapter 4 Public and Agency Coordination). These effects would likely be disproportionate to minority populations, but it is unknown if these effects would be high. As such, this alternative may not be in compliance with federal and State anti-discrimination laws, regulations, and guidance (including Title VI of the Civil Rights Act of 1964 and Presidential Executive Order 12898 on environmental justice).

The High-Level Fixed-Span Bridge Alternative would result in a number of major unavoidable adverse impacts. Like the other alternatives, the construction of this alternative would result in the permanent loss of the existing NRHP-listed historic South Park Bridge. In addition, this alternative would require demolition or removal of the NRHP-eligible South Park Hall located at 8611/13 14th Avenue S./1251 S. Cloverdale Street. The alternative would introduce a very high physical barrier and the associated light and glare from the new bridge and connector roadway into the community. This would forever adversely affect the visual quality of the community. This action would not be consistent with adopted land use planning goals and policies due to the substantial displacement of land uses. In total, an estimated 39 properties would be acquired. The alternative would adversely affect the social fabric and cohesion to the South Park community. The required acquisition of commercial properties and the many businesses located in buildings on these properties on 14th Avenue S. would affect six out of eight blocks of this Hispanic/Latino business district. This would affect the South Park community as well as the larger Hispanic/Latino community in the Seattle metropolitan area. The alternative would also require acquisition of buildings owned by the Sea Mar Community Health Clinic, a non-profit organization dedicated to serving the Hispanic, minority, and low-income communities in the Seattle region. There is strong community opposition against this alternative due to the potential substantial loss of businesses in the community business district (see Chapter 4 Public and Agency Coordination). This alternative would cause high and disproportionate impacts on members of minority populations residing, working, and operating businesses in South Park. As such, this alternative would not comply with federal and State anti-discrimination laws, regulations, and guidance (including Title VI of the Civil Rights Act of 1964 and Presidential Executive Order 12898 on environmental justice).

3.17 Irreversible and Irretrievable Commitment of Resources

The implementation of any of the Build Alternatives described in this document would require the commitment of natural, physical, human, and fiscal resources. For each of these alternatives, this commitment would be irretrievable and irreversible in the sense that once committed, the resources devoted to construction of the proposed project would no longer be available for other activities. Additional right of way required to rehabilitate or replace the bridge would reflect an irreversible commitment.

Although mitigation measures are proposed to minimize these losses, any commitment to land use would reflect an irreversible choice to alter the physical features of the land and displace the current use of that land. Because the land is currently in industrial, residential, and commercial use, the proposed project would result in little or no loss of natural resources.

Considerable amounts of labor, energy, and highway construction materials, such as cement, aggregate, and bituminous material, would be expended in constructing the bridge and new roadway. These resources are generally in good supply, and the proposed project would diminish but not deplete overall supplies. It is, therefore, not expected to substantially impact their availability for future uses. Project construction would also involve a one-time expenditure of state and federal funds that would not be retrievable.

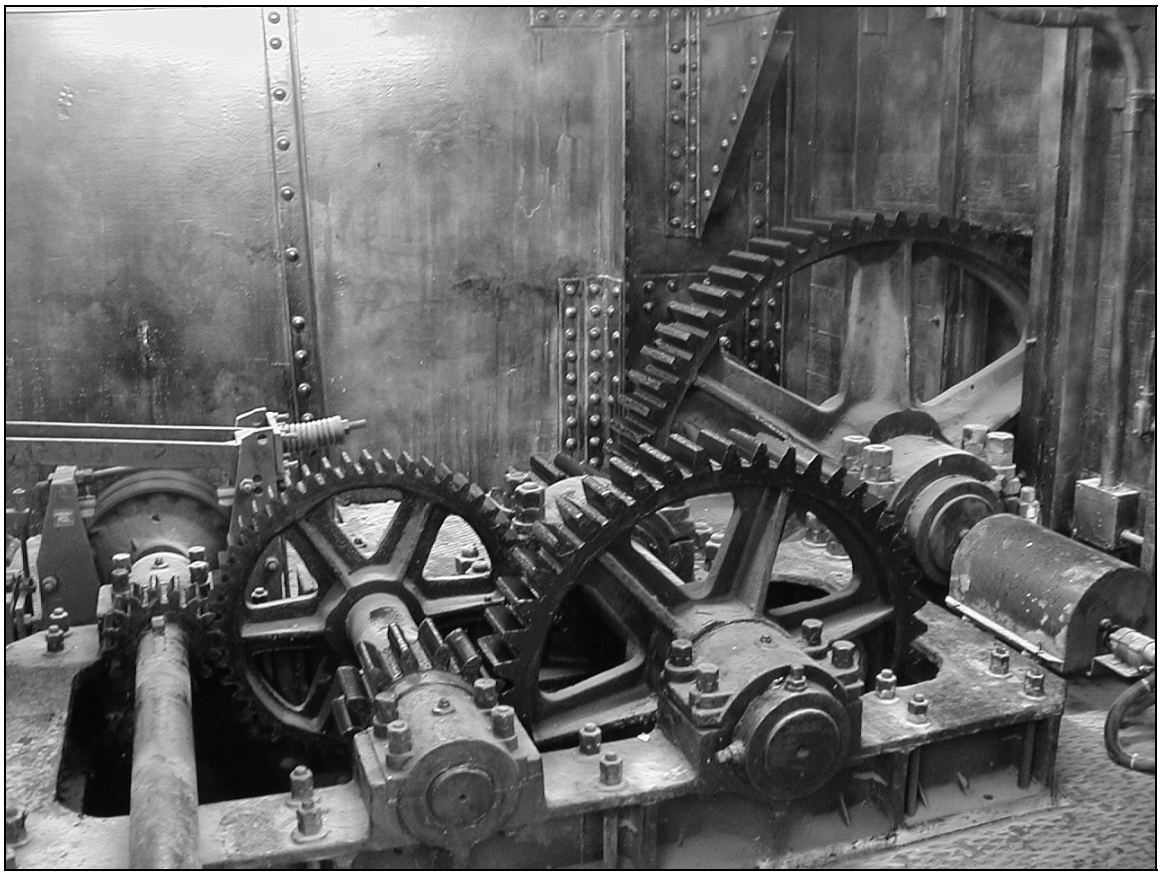
The commitment of these resources is based on the concept that residents in the immediate area, region, and state would benefit from repair or replacement of the South Park Bridge. These benefits are expected to consist of improved accessibility and safety, time savings, and a greater availability of quality services. Therefore, these benefits are anticipated to outweigh the commitment of the resources used in the construction.

3.18 Relationship of Short-Term Uses of Environment and Long-Term Productivity

The proposed project would have short- and long-term impacts on elements of the built and natural environment. During construction, temporary impacts on noise levels, air quality, and local traffic are expected. Residences and businesses in the project area would experience congestion and impacts associated with noise and dust from construction. Businesses could experience economic hardships due to a decline in patron purchases. Contaminated materials may be encountered during construction. Delays related to construction activities and traffic detours would likely occur at this time. The Rehabilitation Alternative would require bridge closure and detour for approximately 30 months; for the other Build Alternatives, there would be short-term temporary closures and detours during the construction period.

Long-term impacts would result from the displacement of residential, retail, wholesale, distribution, and commercial uses. Between 2 and 39 parcels would be affected, depending on the alternative selected. These impacts would be offset against the benefit of maintaining access and connectivity to the community and the region. Both the rehabilitation or replacement bridge alternatives would increase operational reliability for both the near-term and the long-term 75-year life of the structure. Furthermore, the community and the region would not have to endure a potential catastrophic loss of the bridge as a result of a future seismic event. The proposed project is part of current local and regional transportation plans.

This page intentionally blank



CHAPTER 4

PUBLIC AND AGENCY COORDINATION

Chapter 4 Public and Agency Coordination

Coordination with members of the public, government agencies, and tribal representatives has included scoping meetings, public meetings, a community advisory group (CAG), and an agency project advisory committee (PAC). Additional coordination activities have been conducted with many of the property and business owners on 14th Avenue S. These activities are summarized below.

4.1 Public and Agency Scoping

As part of the environmental review process and the preparation of this document, federal and state environmental regulations require project proponents to provide tribes, government agencies, and members of the public opportunity to provide input on the proposed project. In particular, the objectives are to solicit comments on the proposed project alternatives and the environmental issues to be analyzed. This process of soliciting comments at the start of the preparation of an EIS document is called "scoping." The comments are used to help define the depth and breadth of environmental analysis to be presented in an EIS.

For the South Park Bridge Project, formal scoping was initiated through publication and issuance of government legal notices. To comply with National Environmental Policy Act (NEPA) federal regulations, a Notice of Intent was published in local newspapers as well as the Federal Register. To comply with the Washington SEPA regulations, a Determination of Significance and a Scoping Notice were published in local newspapers and sent to the Washington Department of Ecology. These notices described the proposed objectives of the project, the alternatives to be evaluated in the EIS, and the major environmental issues pertinent to the proposed project. For this project, the Notice of Intent was published on February 7, 2002, and the Determination of Significance and Scoping Notice were published on February 14, 2002.

Two scoping meetings were conducted in the South Park community on February 28, 2002. One meeting was held during daytime hours for representatives of government agencies and tribes. A separate meeting was held during evening hours for members of the public. Written and verbal comments received through the scoping process were reviewed by King County. Comments received during the scoping meeting held for members of the public included the following:

- South Park businesses would be negatively affected by land acquisition, construction detours, and temporary closure of the bridge during rehabilitation.
- The South Park residential community could be adversely affected if a number of businesses fail or are displaced.
- Traffic, especially trucks serving nearby industrial uses, could increase due to bridge improvements.

- Increased traffic could increase accidents.
- Adjacent commercial buildings could be damaged due to vibration caused by increased truck traffic.
- Steep slopes of the bridge deck for the two fixed-span bridge alternatives could increase noise levels due to the use of air breaks.
- The historic South Park Bridge would be removed for some alternatives and scoping meeting attendees questioned the legality of demolishing a federally listed historic structure.
- The social fabric of the community, especially the Hispanic/Latino residents, could be adversely affected.
- Boat traffic in the Duwamish Waterway as well as upstream marine-dependent businesses, such as the Delta Marine boat manufacturer, would be adversely affected if a 65-foot fixed-span bridge were constructed.
- Hazardous materials would be disturbed by construction activities since the South Park Bridge is located in a Superfund Site.

Key agency and tribal comments included the following:

- The specific road standards to be used to design the bridge structure and roadway cross-section may not meet all applicable standards due to conflicting jurisdictional standards.
- Construction activities could affect endangered fish species in the Duwamish Waterway.
- Construction activities could disturb contaminated soil sediments in the Duwamish Waterway.
- Boat navigation in the Duwamish Waterway could be restricted below federal agency adopted vertical clearances for the navigation channel.
- Regarding “usual and accustomed” fishing and tribal fishing rights, a representative from the Muckleshoot Tribe expressed concern that project construction could interfere with tribal fishing activities in the Duwamish Waterway.

4.2 Public Meetings

To date, two public meetings have been held concerning the South Park Bridge Project. The first opportunity for members of the public to learn about the proposed South Park Bridge Project actually began before the scoping meetings were held. A public workshop was held in the South Park community on January 17, 2002 (see Figure 4-1). At this meeting, nine preliminary alternatives were presented. The primary purpose of this meeting was to allow members of the public to ask

questions about these alternatives, to provide an opportunity for the public to contribute to the screening and alternatives selection process, and to educate the public on the anticipated environmental impact analysis to be conducted.

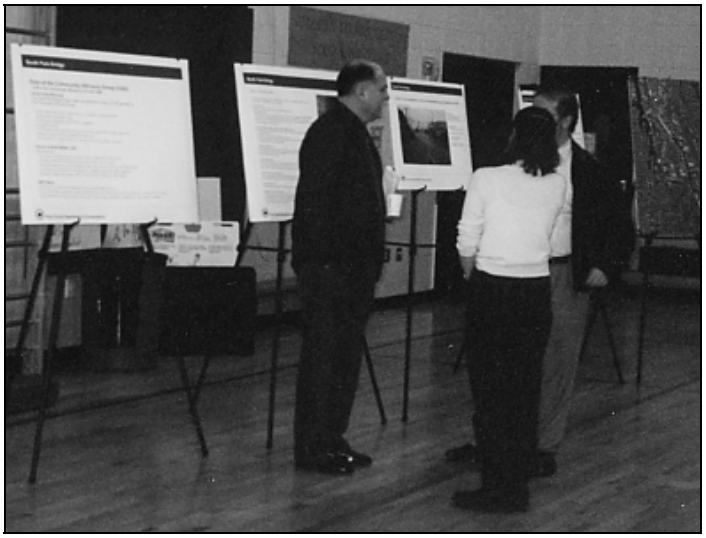


Figure 4-1
Workshop #1—Public Discussion of Preliminary Alternatives

A second public workshop was held on June 19, 2002. This meeting occurred following the initial screening to compare and contrast the nine preliminary alternatives. At this meeting, the five proposed project alternatives to be evaluated in detail in the EIS were presented. Members of the public were encouraged to ask questions and to provide input on the outcome of the initial screening process. Future opportunities for public involvement are also planned, including a combined public hearing and workshop following publication of the Draft EIS in the fall of 2005.

Several activities were undertaken at these public meetings to specifically encourage participation and input from the many Hispanic/Latino persons living in the community. From the analysis presented in Section 3.6.1 Affected Environment, the vast majority of persons who speak foreign languages in the home speak Spanish. The two other foreign languages most commonly spoken are Cambodian and Vietnamese. Less than 1,000 persons and less than 5 percent of the South Park community, primarily speak the same foreign language in the home. Considering an estimated 40 percent of the residents were born in Spanish-speaking countries, public notices were published in “Siete Dias,” a local Spanish newspaper. Handouts and newsletters about the project were published in English and Spanish. In addition, a bilingual translator attended both public workshop meetings as well as the public scoping meeting held on February 28, 2002.

Public concerns were expressed and written comments were submitted at both of the workshop public meetings. Many of the same comments were made at each meeting. In particular, the comments expressed concern about traffic and access to, around, and out of the community. There was concern about potential impacts to the land uses on 14th Avenue S., as well as the South Park Marina, Delta Marine, the historic South Park Bridge, and the residents of the community. Others commented that a separate bicycle trail would be preferable to a steep path jointly used by both bicyclists and pedestrians. There also was concern about the scale, visual impacts, and aesthetics of a replacement bridge structure compared to the existing bridge.

The most frequent comments addressed potential impacts to businesses on 14th Avenue S. The public was concerned about potential effects on the retail core, reduction in retail space, the number of businesses affected, changes in traffic flow and speeds that might affect the viability of the commercial district, construction impacts on shopping, access to health care providers at the Sea Mar Community Health Center, and the overall relationship of the community and the commercial district. These comments highlight the integral relationship between the business district and the residents of the community. In addition, members of the public commented that these potential impacts are contrary to the goal to preserve and enhance the community's retail core, which is expressly stated in the *South Park Residential Urban Village Plan* (South Park Planning Committee 1998). In large part to minimize these types of impacts, public comments generally supported rehabilitation of the existing bridge or construction of a new bascule bridge.

A public meeting will also be held approximately one month after the Draft EIS is issued in order to give the public an opportunity to comment on the Draft EIS and to obtain updated project information. This informal, open-house-style meeting will be held in the South Park neighborhood. Project staff will be available at the meeting to answer questions and facilitate public comments. In addition to providing opportunities for written comments, a court reporter will be available to record oral comments. A translator will be available for anyone needing assistance providing comments or obtaining information in Spanish.

4.3 Community Advisory Group (CAG)

Establishing the CAG was a significant component of the public involvement plan for the South Park Bridge Project. A total of 17 individuals were chosen by King County from a group of applicants to participate in the CAG. Selected individuals represent a wide range of community stakeholder interests and public concerns. The group is comprised of South Park residents, property owners, business owners, and representatives of neighborhood and business organizations active in the community.

The CAG meets periodically with the project team to be briefed on the progress of the project, to ask questions, and to provide input (see Figure 4-2). A bilingual English-Spanish translator attends each meeting to facilitate communication with a Spanish-speaking member of the CAG. The CAG meetings in 2002 were held on April 10, May 21, June 4, June 11, and October 29. Meetings in 2003 were held on January 7 and November 18. Meetings in 2004 were held on April 6, April 20, May 4, and June 22.

Additional CAG meetings are planned for the future. A key objective of those meetings will be to get input from the CAG in order to develop more detailed mitigation measures for the project alternative that is selected for further evaluation in the Final EIS. Particularly following publication of the Draft EIS and then the selection of a preferred alternative. These subsequent meetings will provide opportunities to get additional input from the CAG in order to develop more detailed mitigation measures and address specific design issues for the preferred alternative.

Figure 4-2
CAG Meeting—April 6, 2004

Many discussion topics have been covered at the CAG meetings. County representatives have met with the CAG during the formulation of the initial nine preliminary alternatives, the screening of the alternatives, and the development of conceptual engineering for the five alternatives evaluated in the EIS. In addition, the CAG members have been briefed on public comments received at the workshop public meetings, the changes in the project schedule, the analysis of potential environmental impacts presented in the technical reports prepared to support the preparation of the Draft EIS, and funding issues pertaining to future rehabilitation or replacement of the bridge.

These meetings also provide representatives of the community with opportunities to voice their concerns about the project. The CAG members have expressed a number of concerns about the potential impacts that would result from each of the project alternatives. The members have expressed a desire to rehabilitate the existing historic bridge. As second choice, they have supported the selection of the Bascule Bridge Alternative, as it would be similar in size and function to the existing historic bridge structure but would have increased capacity. In addition, a new bascule bridge would not require that the existing bridge be closed for more than two years, which could adversely impact many 14th Avenue S. businesses. The members also suggested that a new bascule bridge could be constructed to look similar to the existing bridge.

CAG members have expressed concern that the other project alternatives would adversely impact the community commercial district, the surrounding residential neighborhood, and overall community cohesion (see Figure 4-3). The CAG members have repeatedly expressed concern about potential short-term and/or long-term reduction in on-street parking, decreased access to public bus transportation, loss of revenue to local businesses, displacement of businesses, construction noise impacts, and adverse impacts to navigation traffic and upstream water-dependent business and economic development.

To better assess some of these issues raised by the CAG and the potential impacts resulting from the proposed Build Alternatives, the project team conducted a survey of businesses on 14th Avenue S. (Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2005a). The findings of the survey, including the unsolicited comments on the project, are discussed in Section 4.5.2 Survey of South Park Businesses and will be used to develop mitigation measures for the preferred alternative.

Figure 4-3
CAG Members Discussing
Potential Impacts of Alternatives

Lastly, several members of the CAG have voiced concern that delays in selection of the preferred alternative could be discouraging commercial property owners from making additional property investments. They were concerned that such behavior could be detrimental to the entire commercial district.

4.4 Agency Project Advisory Committee (PAC)

As part of the environmental review process, King County periodically has met with the PAC. This committee is comprised of members of various agencies that have regulatory jurisdiction over the proposed South Park Bridge Project. The primary purpose of these meetings is to give a status report of the project, answer questions, and solicit comments at key points in project development. The PAC is the Interdisciplinary Team (IDT) required under NEPA implementation guidelines and provides technical support to the project team.

To date, the PAC has met on January 10, February 20, May 9, May 23, and October 10, 2002. These dates correspond to the following key benchmarks in the project schedule: (1) introduction of the project prior to agency scoping, (2) report on public and agency comments received during the scoping process, (3) screening of the preliminary alternatives, (4) selection of the alternatives to be evaluated in the EIS, and (5) preliminary findings of the draft technical reports. King County also held an additional PAC meeting on May 25, 2004, to solicit additional input for the Draft EIS. Coordination with the PAC is planned at critical future steps in the environmental review process.

4.5 Additional Miscellaneous Coordination Activities

Additional coordination activities were conducted with 14th Avenue S. property owners and business owners. These activities are described in brief below.

4.5.1 Meeting with 14th Avenue S. Property Owners

On December 3, 2002, King County hosted a meeting with owners of property fronting on 14th Avenue S. Most of these properties have small businesses located in the buildings on these properties. The businesses would be affected by land acquisition, construction traffic detours, considerable displacement of existing on-street parking for some alternatives, and long-term rerouting of traffic in the commercial district for some alternatives.

The purpose of this meeting was to review the project alternatives, review the schedule for the preparation of the EIS, and generally describe the steps for acquisition of right of way and land. A good portion of the meeting was dedicated to questions and answers. In addition, there were a number of issues raised by meeting attendees that addressed both potential impacts of the project alternatives as well as potential measures that could mitigate impacts of project alternatives and, at the same time, improve the South Park business district.

A key point of concern was that the preliminary conceptual plans showed S. Sullivan Street would be closed to traffic following construction of several of the alternatives. Attendees pointed out the need to keep S. Sullivan Street open to serve industrial property located on S. Sullivan Street west of 14th Avenue S. The attendees also mentioned to the project team that this goal is called out in the *South Park Residential Urban Village Plan* (South Park Planning Committee 1998). Subsequent to this meeting, changes were made to the conceptual plans to revise the intersection of S. Sullivan Street and Dallas Avenue S. (see Chapter 2 The Project Alternatives).

Parking issues were also discussed at some length. Property owners called attention to the current insufficient number of on-street parking for retail customers on 14th Avenue S. The attendees suggested that unused portions of property acquired to construct a new bridge could be used to develop additional parking in the commercial district. In addition, attendees suggested a number of potential future uses of the site of the existing bridge should it be removed as proposed for the Replacement Bridge Alternatives. These suggestions included constructing a parking lot, a plaza, a small park, or additional retail shops. Attendees saw such improvements as helpful in revitalizing the South Park business district.

Many of the attendees voiced their opinion that the High-Level Fixed-Span Bridge Alternative should not be considered due to the severe adverse impacts that this alternative would have on the community's commercial district. Others were concerned about the changes in traffic patterns that would occur under this alternative, including road closures, diminished access to the South Park Bridge, and routing of bridge traffic through a residential neighborhood via S. Trenton Street and 12th Avenue S. Attendees felt this alternative would have an overall adverse effect on the entire community.

4.5.2 Survey of South Park Businesses

A non-scientific survey was also conducted of South Park businesses located on 14th Avenue S. during the late spring of 2003 (Parsons Brinckerhoff 2003c). This survey was supplemented with surveys of additional 14th Avenue S. businesses in December 2004 (Parsons Brinckerhoff 2005a). The goal of this survey effort was to help assess potential impacts to businesses, especially minority-owned and -operated (employees) businesses. The survey respondents were also asked to identify their particular concerns about the proposed rehabilitation or replacement of the existing South Park Bridge. In addition, the data was used to assess the potential effects displaced businesses and jobs would have on the South Park community.

The survey did not collect data from every business located on 14th Avenue S., only those between the Duwamish Waterway south eight blocks to S. Director Street. A total of 35 businesses were successfully surveyed, including the

supplemental effort in December 2004. Responses, however, were not recorded for every question on every survey form. Some business owners may not have been available during the time the survey was being conducted, owners may have refused to participate, or owners may not have returned the survey form. Spanish and Vietnamese translators were provided, as needed, to assist business representatives in understanding and responding to the questions. Follow-up phone calls were also made to get survey forms completed.

A report and supplemental analysis were prepared to summarize the findings of the survey work (Parsons Brinckerhoff 2003c, Parsons Brinckerhoff 2005a). Key findings of the survey include the following:

- There are an estimated 38 businesses located in the eight blocks that comprise the South Park business district. Businesses have been at their current location for less than one year and up to 56 years with the average an estimated 11 years.
- The businesses include retail shops, retail and commercial services, and light industrial uses serving the local as well as regional metropolitan area. An estimated 50 percent own their premises and nearly 80 percent have fewer than 10 employees.
- Nearly 60 percent of the businesses in the South Park business district are owned by persons who consider themselves to be either a racial minority (non-White) and/or ethnic minority (primarily Hispanic/Latino).
- Approximately 76 percent of all of the full- and part-time employees working at businesses in the South Park business district are considered either a racial minority and/or an ethnic minority.
- More than 60 percent of the businesses believe the majority of their customers are either a racial minority and/or an ethnic minority. Businesses that particularly cater to the retail and service needs of the local and regional Hispanic/Latino community comprise an estimated 31 percent of the district businesses.
- Business owners and managers were concerned about how construction activities would affect the visibility of their building, property access, customer parking, and overall viability of their business.
- Generally, the business owners and managers preferred the Rehabilitation or Bascule Bridge alternatives, but in any event, they were concerned about the length of time needed to make a decision.
- The respondents reported they had no interest in relocating their business and felt their business would not be successful if relocated away from the South Park community.

- The business owners and managers felt that substantial adverse effects to the business district would not only hurt the South Park community but would resonate across the Hispanic/Latino community in the region.

4.6 Summary

Since 2002, King County has conducted a large number and variety of public and agency coordination activities concerning the South Park Bridge. There have been scoping meetings, workshops, and periodic meetings with both a CAG and a PAC. In addition, because of the considerable concern about potential impacts to the property owners and businesses located on 14th Avenue S., special meetings were conducted with these stakeholders and surveys were conducted to assess perceptions of potential adverse impacts to South Park businesses.

Members of the community, through a number of forums, have repeatedly expressed their concern about potential impacts to their community and, especially, the eight-block commercial district on 14th Avenue S. They are particularly concerned about potentially substantial right of way acquisition associated with the High-Level Fixed-Span Bridge Alternative. They want to preserve and enhance their community commercial district, which many see as the core, or focus, of the South Park community. The residents, business owners, and property owners see impacts of any sort that require the acquisition of property and demolition of existing buildings on 14th Avenue S. as contrary to established community goals. The fact that these comments and concerns expressed at the various public forums focus on community interests, rather than the particular concerns of individual property owners, is a strong indication of the strength of community cohesion in South Park.

Following selection of the preferred alternative and during preliminary engineering, King County will again be having a series of meetings with representatives of government agencies, the PAC, the CAG, and members of the public. The purpose of these meetings will be to address their previously expressed concerns for the proposed project. The objective will be to develop specific mitigation measures to complement the preferred alternative.

CHAPTER 5

SECTION 4(f) EVALUATION

Chapter 5 Draft Section 4(f) Evaluation

5.1 Introduction

In accordance with Section 4(f) of the 1996 Department of Transportation Act, FHWA may not approve "the use of land from a significant publicly owned park, recreation area, wildlife or waterfowl refuge, or any significant historic site unless a determination is made that there is no feasible and prudent alternative to the use of land from the property; and the action includes all possible planning to minimize harm to the property resulting from such use" [23 CFR 771.135].

The purpose of this evaluation is to demonstrate that (1) the proposal to rehabilitate or replace the South Park Bridge will result in the use of Historic Properties, but that (2) there is no feasible and prudent alternative to such use, and (3) the proposal includes all possible planning to minimize harm to the properties. Such planning has been coordinated through the process prescribed by both the NEPA and Section 106 of the NHPA, as prescribed in 36 CFR 800.3(b).

5.2 Proposed Action

The South Park Bridge Project is a proposal by the King County Department of Transportation (KCDOT) to rehabilitate or replace the existing South Park Bridge. A detailed discussion of the need for this project is presented in Chapter 1 Purpose and Need for the Project of this Draft EIS document. Some of the key reasons why the proposed project is needed are noted here.

This movable span bridge is an historic structure that has spanned the Duwamish Waterway since 1931. The bridge is an important transportation link between the South Park neighborhood of Seattle on the south side of the waterway and other parts of Seattle and Tukwila's Duwamish industrial area on the north. However, the South Park Bridge is nearing the end of its functional life. The bridge structure is in poor condition, has ongoing deterioration, and experiences movement of its concrete foundation elements. Moreover, there is risk of structural damage to the bridge during future seismic events. Maintaining reliable operation of the movable span to accommodate both waterway navigation and traffic crossing the bridge is increasingly challenging and expensive. Therefore, the purpose of the proposed action is to find the most reasonable long-term solution to address the deteriorated condition and increasing seismic vulnerability of the South Park Bridge in order to maintain the important transportation link provided by the bridge.

5.3 Project Alternatives

The five alternatives evaluated in the Draft EIS are briefly described below. These alternatives are described in greater detail in Chapter 2 The Project Alternatives. Additional information regarding the impacts and mitigation associated with each

alternative is described more fully in Chapter 3 Affected Environment and Environmental Consequences.

5.3.1 No Action

Evaluation of a No Action Alternative is required under both SEPA and NEPA. A No Action Alternative generally does not involve significant activity, and it is intended to provide a baseline condition for the analysis of impacts for comparison to the other alternatives. For the purposes of the South Park Bridge Project EIS, however, it is assumed that the No Action Alternative would include continued deterioration, closure, and eventual removal of the existing bridge structure per U.S. Coast Guard regulations.

The removal of the existing bridge would result in direct disturbance to the project site primarily from staging activities and ground disturbance from bridge foundation and approach removal. These construction impacts would be limited to the existing bridge site, and construction BMPs would minimize impacts to the surrounding area. However, removing the bridge would result in long-term social and economic impacts that will be more difficult to mitigate.

5.3.2 Rehabilitation Alternative

The principal objective of the Rehabilitation Alternative is to restore the existing bridge such that it would have a future 75 years of use, similar to a newly constructed bridge. Secondarily, the rehabilitation activities proposed were intended to meet federal guidelines for the rehabilitation of historic structures set forth by the U.S. Department of the Interior (DOI) to the greatest extent feasible. In other words, this alternative seeks to restore as much of the existing structure as possible in its current location. Based on the conceptual engineering for this alternative, however, the foundation for the existing bridge would need to be entirely reconstructed and, therefore, is not consistent with the DOI rehabilitation criteria. Consequently, the historic integrity of the existing bridge would be adversely affected under this alternative.

Staging and construction activities associated with the Rehabilitation Alternative would be more intensive and of longer duration than impacts for the No Action Alternative. Similar mitigation measures would be used to minimize the extent and duration of construction impacts; however, there would still be direct impacts to the 14th Avenue S. Red Brick Road Remnant. The extended length of bridge closure would result in economic and social impacts during construction that would also result in long-term impacts to the South Park community.

5.3.3 Bascule Bridge Alternative

The Bascule Bridge Alternative proposes to build a new movable span bridge immediately downstream of the existing bridge. Of the three Replacement Bridge

Alternatives, this alternative would result in a new bridge that would be the most similar in scale to the existing bridge. This alternative could also incorporate historic design features, if desired. This alternative, however, would require the removal of the existing bridge. This alternative could affect the setting of buildings adjacent to the bridge and would have direct physical impacts on the 14th Avenue S. Red Brick Road Remnant.

Construction impacts for the Bascule Bridge Alternative would include the direct impacts from removing the existing bridge and constructing a new bridge next to the existing bridge. This would eliminate the Red Brick Road Remnant in its current location. The design of the new bascule bridge would be done in a manner that minimizes its long-term impacts on the surrounding area. Of the three Replacement Bridge Alternatives, the new bascule bridge would have the least adverse effects on the South Park community and Section 4(f) resources because of its similarity to the existing bridge.

5.3.4 Mid-Level Fixed-Span Bridge Alternative

The Mid-Level Fixed-Span Bridge Alternative consists of building a new bridge structure immediately downstream of the existing bridge. This bridge would not have a movable span. With a proposed 65-foot vertical clearance from the waterway high water level, this alternative would accommodate most of the current waterway usage. Because the bridge deck of this alternative would be approximately 30 feet higher than the existing bridge, the new structure would extend southward into the neighborhood business area of the South Park community. The new bridge alignment and approach structures would have direct physical effects on the 14th Avenue S. Red Brick Road Remnant, as well as indirect adverse effects on the historic South Park Hall (1251 S. Cloverdale Street/8611/13 14th Avenue S.). Indirect effects (e.g., visual impacts) of the new bridge will not have an adverse effect on other historic properties. The existing bridge will also need to be removed, resulting in an adverse effect.

The construction impacts associated with the Mid-Level Fixed-Span Bridge Alternative would be similar to those of the Bascule Bridge Alternative, although the extent would increase along the 14th Avenue S. corridor to include its intersection with S. Cloverdale Street. This alternative would have greater long-term impacts to the South Park community and potentially to other historic properties in the project vicinity because of its increased height and the direct encroachment of the bridge approach ramp into the South Park business district. Although mitigation measures will be taken to reduce many of the impacts, the increased height and increased extent of the bridge and its approaches will result in greater impacts than the Rehabilitation or Bascule Bridge alternatives.

5.3.5 High-Level Fixed-Span Bridge Alternative

The High-Level Fixed-Span Bridge Alternative would be a non-movable structure with 100 feet of vertical clearance from the waterway high water level. It is expected that this clearance would accommodate all of the existing waterway traffic but may not accommodate all future marine traffic. This structure would be approximately 65 feet higher than the existing bridge. It would have the greatest potential effect on historic Section 4(f) resources compared to the other project alternatives. The historic properties directly affected would include the properties noted for the Mid-Level Fixed-Span Bridge Alternative (i.e., the existing bridge, the Red Brick Road Remnant, and South Park Hall). Due to the more imposing scale of this alternative, however, direct impacts would be more substantial and indirect impacts also would increase.

The High-Level Fixed-Span Bridge Alternative would have substantially greater construction and long-term impacts than the other alternatives because of its increased height and the increased length of the bridge and its approaches. Mitigation would be developed to minimize the impacts from construction and long-term impacts. However, this alternative would have major impacts on the South Park community that cannot be fully mitigated.

5.4 Section 4(f) Resources

The possible Section 4(f) resources that are addressed in this Section 4(f) evaluation include 15 properties that may be used by one or more of the alternatives. These resources are considered to be historically significant and include: (1) the South Park Bridge, which is currently listed on the National Register of Historic Places; (2) Boeing Plan 2 which was previously determined to be eligible; and (3) an additional 13 properties in the project study area that have been determined eligible for NRHP listing by the Office of Archaeological and Historical Preservation following their review of the recommendations as documented in Appendix P, *Cultural and Historical Resources Technical Report* (Historical Research Associates 2004). Related agency coordination letters are also included in Appendix E Agency Coordination.

The locations of the 15 historic properties are provided in Figure 5-1. Additional information regarding these 15 properties as Section 4(f) resources is also provided in Table 5-1. No other potential Section 4(f) resources (significant publicly owned park, recreation area, or wildlife or waterfowl refuge land) have yet been identified that would be adversely affected by the project alternatives.

However, no subsurface archaeological testing has been undertaken due to the inaccessibility of the ground beneath paved areas, but such investigation has been recommended once a preferred alternative has been selected. The preparation of a phased identification is also recommended to address the high potential for archaeological resources in the project area. The phased identification would

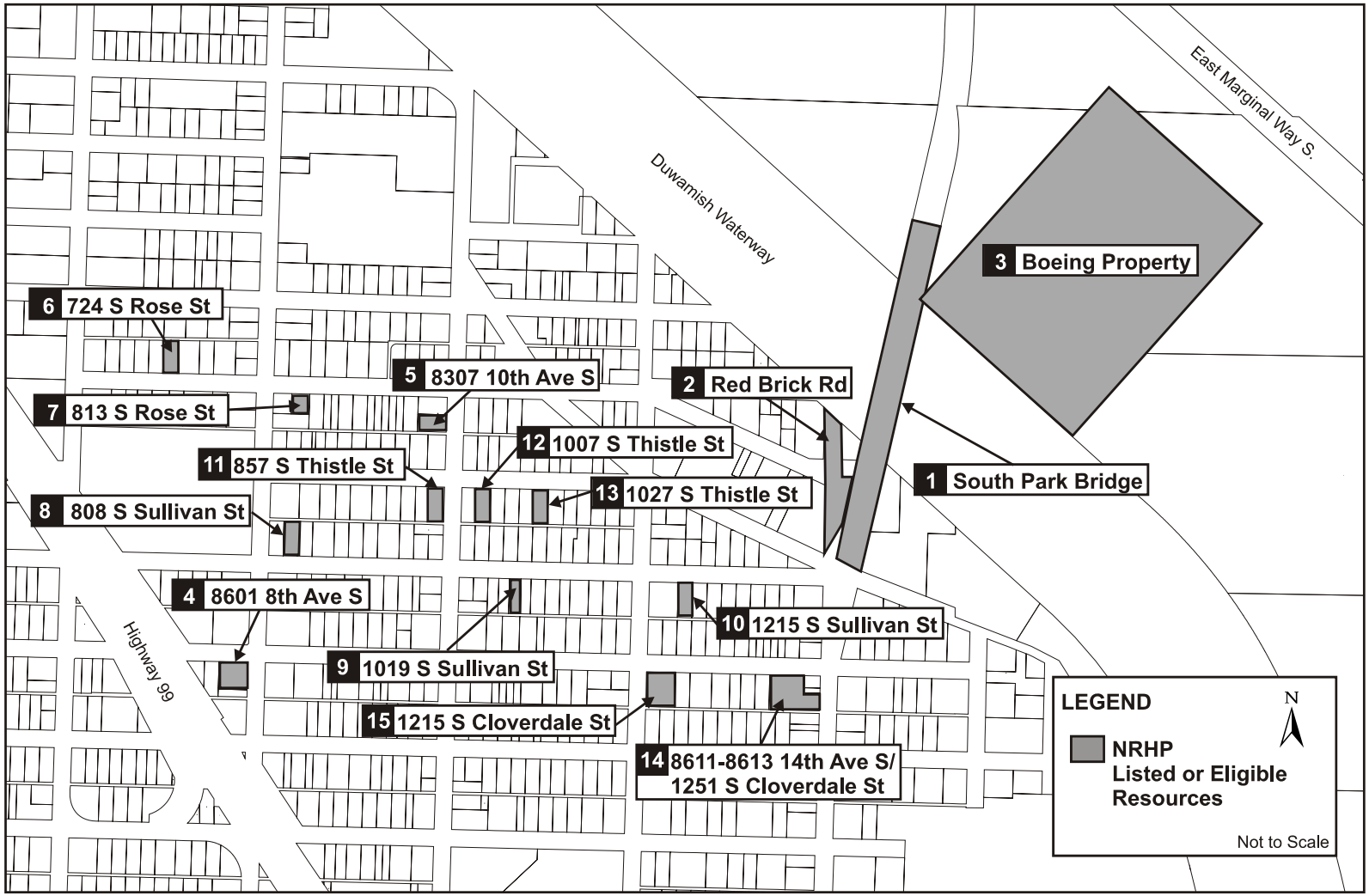


Figure 5-1
Location of Section 4(f) Resources in the Study Area

Table 5-1. Section 4(f) Resources

Map ID #	Address	Date Built	Description
1	South Park Bridge	1931	The movable span bridge is listed on the NHRP primarily due to the historical significance of its Scherzer rolling lift design, the only extant example of that bridge type in Washington State.
2	14th Avenue S. (Red Brick Road Remnant)	1913	This segment of street is a remnant of a memorial roadway from the Duwamish Waterway to Tacoma and one of the few stretches of unpaved brick roadway remaining in King County.
3	Boeing Plant 2	1936	A group of industrial facilities that comprise the Boeing Company's second manufacturing facility. These facilities are historically significant as the place where military aircraft were manufactured during World War II.
4	8601 8th Avenue S.	1908	Substantially unaltered two-story brick commercial building that is South Park's only surviving example of the ambitious commercial development that took place following the extension of streetcar service to Seattle and incorporation of the South Park community during the first decade of the 20th century.
5	8307 10th Avenue S.	c. 1905	Two-story house is an outstanding, intact example of a gable-front vernacular house with folk interpretation of the Queen Anne style. The architectural significance combined with its setting contributes to an historic streetscape.
6	724 S. Rose Street	c. 1914	Excellent example of Craftsman bungalow residence that characterized early 20th century South Park.
7	813 S. Rose Street	c. 1898	Outstanding example of American Foursquare house that contributes to the historic streetscape and understanding of vernacular architecture.
8	808 S. Sullivan Street	c. 1920	Good, intact example of a modest Craftsman bungalow exemplifies evolution of 20th century vernacular housing.
9	1019 S. Sullivan Street	c. 1890	Vernacular residential structure is one of the oldest intact structures in South Park, thereby providing information about 19th century vernacular architecture and insight into settlement of South Park.
10	1215 S. Sullivan Street	c. 1910	Excellent, intact example of a Craftsman cottage.
11	857 S. Thistle Street	c. 1905	Unusual two-story residence is unique in South Park and representative of vernacular manifestations of economic prosperity.

Table 5-1. Section 4(f) Resources (continued)

Map ID #	Address	Date Built	Description
12	1007 S. Thistle Street	c. 1905	Intact example of a Craftsman cottage that contributes to historic streetscape and knowledge of early 20th century South Park.
13	1027 S. Thistle Street	c. 1895	Excellent example of a modest Queen Anne cottage and one of South Park's oldest intact houses. Contributes to knowledge of South Park and survival of historic streetscape.
14	8611/8613 14th Avenue S./1251 S. Cloverdale Street (South Park Hall)	1927	A two-story, three-part commercial block building with brick façade that was historically a center for commercial and social activity in South Park.
15	1215 S. Cloverdale Street	c. 1905	Intact Queen Anne style cottage and one of the few remaining examples of this type in the South Park community.

Source: Historical Research Associates 2004.

define the additional efforts that will be taken to identify the presence of subsurface resources that are not currently accessible, as well as the additional potential for affecting those resources. There may be archaeological sites identified during pre-construction testing and/or during construction monitoring. Should such sites be identified, they will be dealt with programmatically, through compliance with the terms set forth in a PA that will be developed as part of the NHPA process [36 CFR 800.6(c)].

5.5 Impacts on Section 4(f) Resources

The potential impacts on the subject Section 4(f) resources would vary by alternative. Table 5-2 summarizes how each of the five alternatives would affect the various Section 4(f) resources.

5.6 Rationale for Removal of Existing Bridge

The "use" (as defined in Section 4(f) regulations) of the existing South Park Bridge structure is unavoidable under each of the five alternatives. The Rehabilitation Alternative use would be based on loss of historic integrity due to reconstruction of significant bridge features, rather than the complete removal of the existing bridge structure as proposed for the Replacement Bridge Alternatives. Furthermore, the No Action Alternative would require removal of the bridge per U.S. Coast Guard regulations pertaining to non-operational bridges over navigation channels. The underlying need to rehabilitate or replace the existing bridge is driven by the fact that the existing bridge is in very poor condition structurally and there is significant potential for operational or structural failure, particularly in the event of future seismic events. Detailed discussions of these issues follow.

5.6.1 Existing Conditions

In spite of substantial ongoing repair and maintenance work, the South Park Bridge is nearing the end of its useful life. The most significant structural problems are occurring due to the manner in which the main bascule pier foundations were constructed over 74 years ago. The wood pilings supporting the north bascule pier were set in pre-jetted holes for most of their depth, and the piles were not driven into the dense glacial soils beneath the alluvial soils underlying the bridge. This is causing ongoing pier settlement and lateral movement between piers, which results in misalignment of the bridge deck centerlocks. Chemical decomposition of the concrete is occurring, which is weakening bridge elements. These conditions are causing extensive cracking and spalling, especially in the bascule piers due to constant exposure to water. Moreover, the bridge has been damaged by earthquakes in the past and is at risk of sustaining future damage in the event of another earthquake.

Table 5-2. Effects on Section 4(f) Resources

Section 4(f) Resources	No Action	Rehabilitation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge
South Park Bridge	**Use would occur.** Existing bridge would eventually be removed.	**Use would occur.** Foundations and other elements would be reconstructed rather than restored (loss of integrity).	**Use would occur.** Existing bridge would be removed.	**Use would occur.** Existing bridge would be removed.	**Use would occur.** Existing bridge would be removed.
14th Avenue S. Red Brick Road Remnant	**No use would occur.** No disturbance of brick roadway or adverse effect on setting.	**Use would occur.** Intensive construction activities on brick road site would have temporary direct impacts.	**Use would occur.** Brick road removed and new bridge constructed directly over brick road site.	**Use would occur.** Brick road removed and new bridge constructed directly over brick road site.	**Use would occur.** Brick road removed and new bridge constructed directly over brick road site.
Boeing Plant 2	**No use would occur.** Although removal of existing bridge could have a minor effect on setting.	**No use would occur.** Although setting could be temporarily affected by construction effects.	**No use would occur.** Indirect change to setting and association would not constitute an adverse effect.	**No use would occur.** Indirect change to setting and association would not constitute an adverse effect.	**No use would occur.** Indirect change to setting and association would not constitute an adverse effect.
8611/8613 14th Avenue S./1251 S. Cloverdale Street (South Park Hall)	**No use would occur.** No direct physical effects and no appreciable impact on setting or association.	**No use would occur.** No direct physical effects and no appreciable impact on setting or association.	**No use would occur.** No direct physical effects and no appreciable impact on setting or association.	**Use would occur.** New bridge approach ramp would affect setting and association.	**Use would occur.** Changes to street for bridge construction would have adverse effects on setting and association. Building would be six feet from the 20-foot tall bridge abutment and acquisition is assumed.

Table 5-2. Impacts on Section 4(f) Resources (continued)

Section 4(f) Resources	No Action	Rehabilitation	Bascule Bridge	Mid-Level Fixed-Span Bridge	High-Level Fixed-Span Bridge
1215 S. Cloverdale Street	**No use would occur.** No direct physical effects and no appreciable effect on setting or association.	**No use would occur.** No direct physical effects and no appreciable effect on setting or association.	**No use would occur.** No direct physical effects, and no appreciable effect on setting or association.	**No use would occur.** Indirect change to setting and association would not constitute an adverse effect.	**No use would occur.** Indirect effects from changes to street configuration for bridge access would not constitute an adverse effect.
Archaeological Sites (not yet identified)	**No use would occur.** Excavation would only affect previously disturbed areas.	**Unknown** Further subsurface testing and monitoring if selected as preferred alternative.	**Unknown** Further subsurface testing and monitoring if selected as preferred alternative.	**Unknown** Further subsurface testing and monitoring if selected as preferred alternative.	**Unknown** Further subsurface testing and monitoring recommended if selected as preferred alternative.

5.6.2 Rehabilitation Alternative

The Rehabilitation Alternative was approached with the goal of restoring the existing bridge in a manner that satisfies federal requirements for rehabilitation of historic structures to the greatest extent possible, as well as satisfying current transportation and seismic design standards. The federal rehabilitation guidelines used are set forth in the Secretary of Interior‘s Standards for Rehabilitation and Guidelines for Rebuilding Historic Buildings. A key objective under the rehabilitation guidelines concerns the need to repair rather than replace deteriorated historic features.

The engineering analysis conducted to develop the proposed Rehabilitation Alternative that satisfied applicable design requirements and rehabilitation guidelines is documented in the *Rehabilitation Feasibility Study Technical Memorandum, South Park Bridge Project* (Parsons Brinckerhoff 2003a). The *Rehabilitation Feasibility Study* analyzed two options. The primary difference between the options is the manner in which the in-water bascule piers would be rehabilitated.

Option 1 consists of repairing the existing bascule pier foundations using a “collar” design. This approach reinforces the base of the existing pier foundation by surrounding it with drilled shaft concrete elements and a new post-tensioned footing cap. However, Option 1 was not considered to be a reasonable approach for various reasons. Moreover, the *Rehabilitation Feasibility Study* concluded that the uncertain existing condition of the substructure concrete and footings would result in a less predictable remaining service life. This option also would require the use of difficult and higher-risk construction methods (i.e., drilling through existing pile caps and the potential differential settlement of the existing footing during construction). Consequently, Option 1 would entail substantial additional risks due to uncertainties regarding its constructability and long-term reliability. Option 1 would also substantially change the appearance of the existing bascule piers, which would further diminish its historic qualities.

Option 2 involves replacing the existing bascule piers with entirely new pilings and concrete foundation and pier column elements in the same location. Although the existing bascule piers would be removed, the dimensions and appearance of the new bascule piers would be very similar to the existing structures. Option 2 was determined to be a feasible and prudent approach based on all of the design constraints and relevant engineering considerations. Under either option, the Rehabilitation Alternative would restore elements of the existing bridge, but not completely enough to avoid the loss of its historic integrity.

5.6.3 No Action and Replacement Bridge Alternatives

The U.S. Coast Guard has the primary regulatory authority regarding the navigation channel of the Duwamish Waterway and the disposition of the existing

bridge in the event that it is no longer operational. This could occur under the No Action Alternative or the Replacement Bridge Alternatives.

Permanent bridge closure would be required in the event that it is either no longer possible to open and close the bridge (i.e., mechanical failure) or continued deterioration or damage compromise the load capacity of the bridge beyond the point where it can be used safely (i.e., structural failure). From the standpoint of structural vulnerability due to the chemical deterioration and seismic risk and regulatory compliance, leaving the bridge open indefinitely in order to accommodate waterway users is not an allowable option. Conversely, it would be unacceptable to leave the bridge in the stronger closed position because it would interfere with existing navigation use of the Duwamish Waterway. Similarly, construction of a new bridge would terminate use of the existing bridge. As a non-operational bridge, agency regulations would require removal of the existing bridge structure. Therefore, in the case of the No Action Alternative and the Replacement Bridge Alternatives, the existing bridge would need to be removed.

5.7 Avoidance Alternatives

As discussed above, no feasible and prudent alternatives have been identified that would either (1) avoid the need to remove the existing NRHP-listed South Park Bridge or (2) allow for bridge restoration in a manner that would retain its historical integrity. As noted below, consideration was also given to alternative alignments farther from the existing bridge that may have avoided impacts to other Section 4(f) properties. In particular, alternative alignments farther from the existing bridge may have avoided impacts to the 14th Avenue South Red Brick Road Remnant or Boeing Plant 2. As noted below, other alternative alignments were not considered feasible and prudent.

Potential alignment alternatives were considered upstream and downstream of the existing bridge location during the EIS alternatives development and screening process. Other than immediately downstream of the existing bridge, however, no feasible and prudent alternative alignments were identified. The primary constraint is the extensive industrial development on the north side of the Duwamish Waterway. Boeing facilities extend at least a quarter of a mile upstream and downstream of the existing bridge alignment. The substantially increased right of way acquisition expense and other potential compensation for impacts to Boeing were not considered feasible and prudent, given there is an existing alignment through Boeing facilities at the existing bridge site.

A new bridge crossing site substantially farther downstream was not considered feasible and prudent because it would require substantial re-routing of arterial traffic through other residential streets in the South Park neighborhood (e.g., 8th Avenue S.). Such re-routing would also isolate the existing South Park commercial core from the arterial through-traffic that helps sustain many of the existing businesses.

No feasible and prudent alternative farther upstream was identified due to Boeing operations or other significant industrial land uses through which an entirely new roadway and bridge approach would need to encroach. At best, S. Cloverdale Street could be extended east through several existing businesses in South Park. However, in addition to reconfiguring the main traffic flow through the east side of the South Park neighborhood, such an alignment would likely involve the use of a highly contaminated site along the Duwamish Waterway. The additional extent and intensity of impacts from an alternative alignment upstream of the existing bridge were not considered feasible and prudent.

The ongoing structural deterioration of the bridge will eventually result in bridge closure and subsequent removal pursuant to U. S. Coast Guard regulations to avoid conflicts with waterway navigation. As described above, conceptual engineering was done to develop a Rehabilitation Alternative that would attempt to satisfy applicable standards for maintaining the historical integrity of the existing bridge structure. The result of that effort was a determination that the substantial level of existing bridge reconstruction required to meet structural standards would not be consistent with the U.S. Secretary of Interior Standards for Rehabilitation of an historic structure. The construction activities associated with the Rehabilitation Alternative would also have temporary direct impacts on the 14th Avenue S. Red Brick Road Remnant. However, careful documentation, as well as in-place reconstruction and enhancement, of that historic property would mitigate for the use associated with direct disturbance during construction. This mitigation would allow for adequate restoration of the historical qualities of the 14th Avenue S. Red Brick Road Remnant following construction of the Rehabilitation Alternative.

5.8 Coordination

Coordination with tribes, government agencies, organizations, and members of the public has occurred as part of the Draft EIS process for the South Park Bridge Project. The public has been kept informed about the project, including the potential implications for the future of the historic South Park Bridge. Public involvement was initiated with a public workshop on January 17, 2002. Formal notices were published regarding the intent to prepare an EIS for the proposed project pursuant to both NEPA and SEPA. Public and agency scoping meetings were held February 2002. A CAG was also formed to provide more focused input from various community interests, including historic preservation issues. A PAC was also formed to facilitate input from relevant government agencies that would be directly affected, including the cities of Seattle and Tukwila.

These coordination activities have resulted in ongoing input from a wide range of stakeholders throughout the various stages of project development, environmental impact assessment, and publication of the Draft EIS. King County has incorporated the input from these coordination efforts into the development of

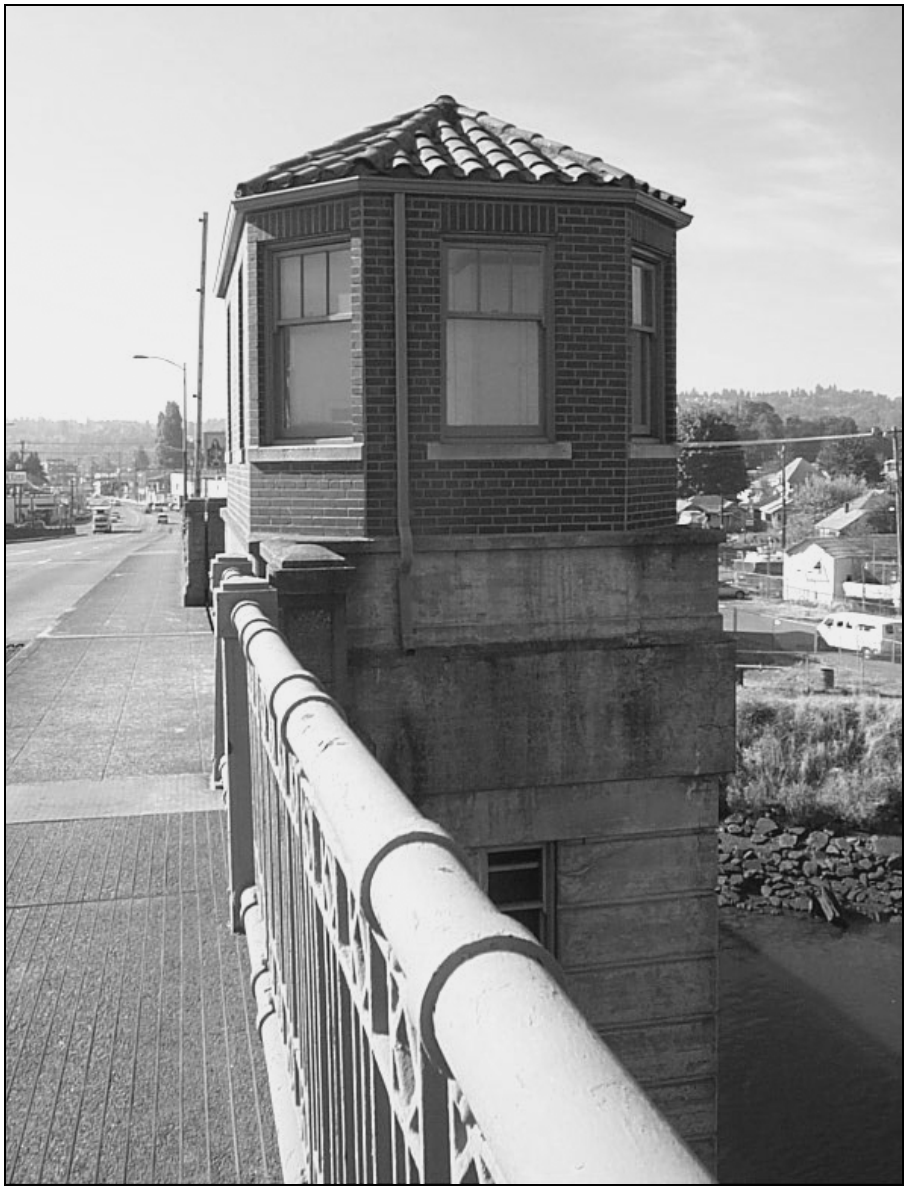
project alternatives and the evaluation of potential effects on Section 4(f) resources.

The initial technical evaluation of relevant Section 4(f) resources (historic properties and potential archaeological resources) has been addressed through the preparation of the *Cultural and Historical Resources Technical Report* (Historical Research Associates 2004). The technical report includes archival and background research and both archaeological and historical field surveys of the study area. The analysis by HRA incorporates input that was obtained through coordination with Boeing, a group of long-time South Park residents (i.e., oral interviews), and technical specialists in historic preservation and archaeology from both King County and WSDOT.

Additional coordination has also been pursued through the parallel process required for compliance with Section 106 of the NHPA of 1966 [USC 1966, as amended] and implementing regulations 36 CFR 800. The Section 106 process has been formally initiated with the State of Washington's OAHP via WSDOT and FHWA. WSDOT subsequently contacted the Muckleshoot Tribe and the Suquamish Tribe to elicit their input as consulting parties under Section 106; however, no response was received.

5.9 Conclusion

As a result of review through Section 106 of the NHPA, FHWA has determined that all of the proposed alternatives, including the No Action Alternative, will result in a Section 4(f) use. And, there are no feasible and prudent alternatives to the use of the Section 4(f) property(ies). Since no preferred alternative has yet been selected, it is not possible to determine yet exactly how each property will be used. When an alternative is selected, however, all possible planning to minimize harm to the property(ies) resulting from the Section 4(f) use will be pursued. The specific mitigation measures will be addressed once the preferred alternative is selected.



REFERENCES

References

This chapter includes references in the Draft EIS. At the top of this list, under the subheading General References, is a complete list of key technical reports prepared for the South Park Bridge Project. Following the General References section, references are listed by chapter and section as they appear in the document. For this reason, references listed in individual chapters or sections may duplicate references listed under General References. Such duplicate references are listed identically.

General References

Historical Research Associates, Inc., 2004. *Cultural and Historical Resources Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. August 2004.

Osborn Pacific Group, Inc., 2004. *Visual Assessment Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 2004.

Parametrix, Inc., 2004a. *Fish, Wildlife and Vegetation Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 2004.

—, 2004b. *Water Resources Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004.

Parsons Brinckerhoff, Inc., 2002. *Summary Technical Memo—Alternatives Development and Screening, South Park Bridge Project*. Prepared for King County Department of Transportation. September 6, 2002.

—, 2003a. *Rehabilitation Feasibility Study Technical Memorandum, South Park Bridge Project.* Prepared for King County Department of Transportation. May 2003.

—, 2003b. *Conceptual Plans, South Park Bridge Project.* Prepared for King County Department of Transportation. June 2003.

—, 2003c. *Survey of 14th Avenue South Businesses, South Park Bridge Project*. Prepared for King County Department of Transportation. August 23, 2003.

—, 2003d. *Structural Alternatives Study, South Park Bridge Project.* Prepared for King County Department of Transportation. November 2003.

—, 2004a. *Air Quality Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 2004.

—, 2004b. *Economics Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 2004.

—, 2004c. *Land Use Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004

—, 2004d. *Noise Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004.

—, 2004e. *Relocations Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004.

—, 2004f. *Social Elements Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004.

—, 2004g. *Transportation Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. April 2004.

—, 2005a. *Survey of 14th Avenue South Businesses Supplemental Analysis, South Park Bridge Project.* Prepared for King County Department of Transportation. July 2005.

—, 2005b. *South Park Bridge Project—Trends in Property Values Memo*. August 12, 2005.

RoseWater Engineering, Inc., 2004. *Utilities Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 26, 2004.

Shannon & Wilson, Inc., 2003a. *Geotechnical Report for Conceptual Engineering, South Park Bridge Project.* Prepared for King County Department of Transportation. May 2003.

—, 2003b. *Geotechnical Report, Phase II, South Park Bridge Project.* Prepared for King County Department of Transportation. November 2003.

—, 2004. *Geology and Soils Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 2004.

Wilbur Consulting, Inc. (WCI), 2004a. *Hazardous Materials Technical Report and Appendices, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004.

—, 2004b. *Preliminary Site Investigation Report, South Park Bridge Project*. Prepared for King County Department of Transportation. July 2004.

Code of Federal Regulations (CFR), 2002. 23 CFR Part 710.409. *Right-of-Way and Real Estate: Disposals.* Washington, D.C., as amended, March 2002.

—. 49 CFR Part 24. *Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs.* Washington, D.C.

Executive Order 12898, Presidential, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.* Washington, D.C. 1994.

King County, 2002c. *Bridge Inspection Report.* August 1, 2002.

Parsons Brinckerhoff, Inc., 2002. *Summary Technical Memo—Alternatives Development and Screening, South Park Bridge Project*. Prepared for King County Department of Transportation. September 6, 2002.

—, 2003a. *Rehabilitation Feasibility Study Technical Memorandum, South Park Bridge Project.* Prepared for King County Department of Transportation. May 2003.

—, 2003d. *Structural Alternatives Study, South Park Bridge Project.* Prepared for King County Department of Transportation. November 2003.

—, 2004e. *Relocations Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004.

Revised Code of Washington (RCW), Chapter 8.26, Relocation Assistance—Real Property Acquisition Policy Act of 1971, as amended. 2004.

Sverdrup Corporation, 1994. *14th/16th Avenue South Bridge Rehabilitation/ Design Report for the King County Department of Transportation.* Bellevue, Washington. November 1994.

United States Code (USC), 1998. *42 USC 4601: Uniform Relocation Assistance and Real Property Acquisition Policies for Federal and Federally Assisted Programs.* Washington, DC. January 1998.

Washington Administrative Code (WAC), 2004. Chapter 468-100, *Uniform Relocation Assistance and Real Property Acquisition*. Olympia, Washington. March 2004.

Washington State Department of Transportation (WSDOT), 2004. *Title VI of Civil Rights Act of 1964 Uniform Relocations Act.* Olympia, Washington. March 2004.

Chapter 1

Code of Federal Regulations (CFR). 23 CFR Part 650.405, *Bridges, Structures, and Hydraulics: Eligible Projects.* Washington, D.C. April 2001. URL <http://www.fhwa.dot.gov/hep/>.

Entranco, Inc., 1999. *Environmental Review Report: 16th Avenue South Bridge Replacement.* Bellevue, Washington. July 1999.

King County, 2002c. *Bridge Inspection Report.* August 1, 2002.

—, 2002d. *King County Daily Bridge Log.* April 1, 2001, to April 30, 2002.

Palmer, K.A. and C.S. Palmer, 1996. "14th Avenue South Bridge." King County Landmark Registration Form. Seattle, Washington. 1996.

Parsons Brinckerhoff, Inc., 2002. *Summary Technical Memo–Alternatives Development and Screening.* Prepared for King County Department of Transportation. September 6, 2002.

—, 2003a. *Rehabilitation Feasibility Study Technical Memorandum, South Park Bridge Project.* Prepared for King County Department of Transportation. May 2003.

—, 2003b. *Conceptual Plans, South Park Bridge Project.* Prepared for King County Department of Transportation. June 2003.

—, 2003d. *Structural Alternatives Study, South Park Bridge Project.* Prepared for King County Department of Transportation. November 2003.

—, 2004g. *Transportation Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. April 2004.

Seattle Department of Transportation (SDOT), 2001. *Traffic Counts and Calculation of Average Daily Traffic for 16th Avenue S. North of the South Park Bridge.* Seattle, Washington. 2001.

Soderberg, L., 1980. *Historic Bridges and Tunnels in Washington State.* National Register of Historic Places Inventory: Nomination Form. On file at Washington State Office of Archaeology and Historic Preservation, File name: Thematic #2. Olympia, Washington. 1980.

Sverdrup Corporation, 1994. *14th/16th Avenue South Bridge Rehabilitation/ Design Report for the King County Department of Transportation.* Bellevue, Washington. November 1994.

Chapter 2

Code of Federal Regulations (CFR). 23 CFR Part 650.405, *Bridges, Structures, and Hydraulics: Eligible Projects.* Washington, D.C. April 2001. URL <http://www.fhwa.dot.gov/hep/>.

—. 23 CFR Part 771.111, *Early Coordination, Public Involvement, and Project Development.* Washington, D.C. URL <http://www.fhwa.dot.gov/hep/>.

Entranco, Inc, 1999. *Environmental Review Report: 16th Avenue South Bridge Replacement.* Bellevue, Washington. July 1999.

Parsons Brinckerhoff, Inc., 2002. *Summary Technical Memo—Alternatives Development and Screening, South Park Bridge Project.* Prepared for King County Department of Transportation. September 6, 2002.

—, 2003b. *Conceptual Plans, South Park Bridge Project*. Prepared for King County Department of Transportation. June 2003.

—, 2003d. *Structural Alternatives Study, South Park Bridge Project.* Prepared for King County Department of Transportation. November 2003.

Sverdrup Corporation, 1994. *14th/16th Avenue South Bridge Rehabilitation/ Design Report for the King County Department of Transportation.* Bellevue, Washington. November 1994.

Wilbur Consulting, Inc. (WCI), 2004b. *Preliminary Site Investigation Report, South Park Bridge Project*. Prepared for King County Department of Transportation. July 2004.

Chapter 3

Section 3.1 Introduction

Louie, Cliff, 2005. City of Seattle Department of Neighborhoods Planner. Personal communication with Jim Sussex, King County Road Services Division Environmental Engineer and Betsy Minden, Parsons Brinckerhoff Lead Environmental Planner. June 30, 2005.

Seattle Department of Finance (SDOF), 2004. *2005–2010 Adopted Capital Improvement Program, Ordinance 121660*. Signed November 30, 2004.

Seattle Public Utilities (SPU), 2005. *2004 Comprehensive Drainage Plan.* Seattle, Washington. Adopted January 3, 2005.

King County, 1998. Department of Transportation, *Bicycling Guidemap.* Seattle, Washington. 1998.
URL <http://apps01.metrokc.gov/www/kcdot/roads/bikemap.cfm>.

Parsons Brinckerhoff, Inc., 2003c. *Survey of 14th Avenue South Businesses, South Park Bridge Project*. Prepared for King County Department of Transportation. August 23, 2003.

—, 2004g. *Transportation Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. April 2004.

—, 2005a. *Survey of 14th Avenue South Businesses Supplemental Analysis, South Park Bridge Project.* Prepared for King County Department of Transportation. July 2005.

Transportation Research Board (TRB), 2000. *Highway Capacity Manual 2000.* Washington, D.C. December 2000.

Section 3.3 Relocations

Cain and Scott, 2004. *The Cain and Scott Report, Market Overview Spring/Summer 2004* from URL <http://www.cainandscott.com>. Cain and Scott. Seattle, Washington. July 22, 2004.

Code of Federal Regulations (CFR). 49 CFR Part 24. *Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs.* Washington, D.C.

Colliers, 2004. *South King County Office Market Report 2004; Second Quarter 2004 Industrial Market Overview; and Puget Sound Retail Investment Report, 2003* at URL <http://www.colliersmn.com>. Colliers International. Seattle, Washington. July 22, 2004.

Economic Development Council of Seattle and King County (EDC), 2004. *Office, Industrial, and Retail Market Summaries (3rd Quarter 2003).* URL <http://www.edc-sea.org>. Seattle-King County EDC. Seattle, Washington. July 22, 2004.

King County, 2002a. King County Assessor's Records, Real Property Characteristics and Assessor's Maps. Seattle, Washington.

—, 2002b. *Affordable Housing: An Annual Bulletin Tracking Housing Costs in King County.* Prepared by the King County Office of Budget. December 2002. URL <http://www.metrokc.gov/budget/affhsg/02/affhsg02.htm>.

Louie, Cliff, 2005. City of Seattle Department of Neighborhoods Planner. Personal communication with Jim Sussex, King County Road Services Division Environmental Engineer and Betsy Minden, Parsons Brinckerhoff Lead Environmental Planner. June 30, 2005.

Parsons Brinckerhoff, Inc., 2003c. *Survey of 14th Avenue South Businesses, South Park Bridge Project*. Prepared for King County Department of Transportation. August 23, 2003.

—, 2004e. *Relocations Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 2004.

—, 2005a. *Survey of 14th Avenue South Businesses Supplemental Analysis, South Park Bridge Project.* Prepared for King County Department of Transportation. July 2005.

Rental Association of Puget Sound, 2004. Online rental listings search at URL <http://www.rha-ps.com>. Rental Association of Puget Sound. Seattle, Washington. July 22, 2004.

Revised Code of Washington (RCW), Chapter 8.26, Relocation Assistance—Real Property Acquisition Policy Act of 1971, as amended. 2004.

Seattle, City of, 2002a. *Table of Net Housing Unit Growth in Urban Centers and Villages*, Seattle Strategic Planning Office. Seattle, Washington.

—, 2004. *2005–2008 Consolidated Plan for Housing and Community Development*. Seattle, Washington. November 10, 2004.

Seattle Post Intelligencer (Seattle PI), 2002a. George Foster, "A Bridge Too Far Gone Badly Needs Rebuilding." *Seattle Post-Intelligencer*. January 17, 2002.

—, 2002b. Phuong Cat Le, "City's Attention Turns To Keeping Its Little Mainstreets Healthy." *Seattle Post-Intelligencer.* July 22, 2002.

Trammel Crow, 2002. *Market Scope: Puget Sound Region*. Trammel Crow Company. Seattle, Washington.

United States Code (USC), 1998. *42 USC 4601: Uniform Relocation Assistance and Real Property Acquisition Policies for Federal and Federally Assisted Programs.* Washington, DC. January 1998.

Washington Administrative Code (WAC), 2004. Chapter 468-100, *Uniform Relocation Assistance and Real Property Acquisition*. Olympia, Washington. March 2004.

Windermere Real Estate Services Company, 2004. Search for properties tool at URL <http://www.windermere.com/index.cfm?fuseaction=listing>. July 22-23, 2004.

Section 3.4 Land Use

King County, 2001. *King County Comprehensive Plan 2000.* Seattle, Washington. Adopted February 12, 2001; updated December 29, 2003.

Louie, Cliff, 2005. City of Seattle Department of Neighborhoods Planner. Personal communication with Jim Sussex, King County Road Services Division Environmental Engineer and Betsy Minden, Parsons Brinckerhoff Lead Environmental Planner. June 30, 2005.

Parsons Brinckerhoff, Inc., 2004c. *Land Use Technical Report, South Park Bridge Project*. Prepared for the King County Department of Transportation. February 2004.

—, 2004e. *Relocations Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004.

—, 2005b. *South Park Bridge Project—Trends in Property Values Memo*. August 12, 2005.

Puget Sound Regional Council (PSRC), 1990. *Vision 2020*. Seattle, Washington. Approved 1990, amended 1993, updated 1995.

—, 2001. *Destination 2030*. Seattle, Washington. Approved May 24, 2001.

—, 2003. *2003 Sub-County (Small Area) Forecasts of Population and Employment, Central Puget Sound Region*. Seattle, Washington. December 19, 2003.

Seattle, City of, 1999. *Greater Duwamish Manufacturing and Industrial Center Plan.* Greater Duwamish Planning Committee. Seattle, Washington. 1999.

—, 2001. *Seattle's Comprehensive Plan.* Office of Strategic Planning. Seattle, Washington. 2001

—, 2004. *2005–2008 Consolidated Plan for Housing and Community Development*. Seattle, Washington. November 10, 2004.

South Park Planning Committee, 1998. *South Park Residential Urban Village Plan.* Seattle, Washington. 1998.

Seattle Post Intelligencer (Seattle PI), 2002a. George Foster, "A Bridge Too Far Gone Badly Needs Rebuilding." *Seattle Post-Intelligencer*. January 17, 2002.

—, 2002b. Phuong Cat Le, “City’s Attention Turns To Keeping Its Little Mainstreets Healthy.” *Seattle Post-Intelligencer.* July 22, 2002.

Tukwila, City of, 1995. *Tukwila Comprehensive Plan.* Tukwila, Washington. Adopted 1995, amended 2003.

Washington, State of, 1990. *Growth Management Act.* Olympia, Washington. 1990.

Section 3.5 Economics

Code of Federal Regulations (CFR). 49 CFR Part 24. *Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs.* Washington, D.C.

Crow, Guy, 2002. South Park Marina. Telephone conversation. 25 September 2002.

Crowley Marine Services, 2002. Tim (unknown last name) at dispatch. Telephone conversation. 19 September 2002.

Ellefsen, Frank, 2002. Island Tug and Barge. Telephone conversation. 20 September 2002.

Greater Duwamish Planning Committee, 1999. *Greater Duwamish Manufacturing and Industrial Center Plan.* Seattle, Washington. 1999.

Jones, Igor, 2002. Delta Marine Industries. Telephone conversation. 25 September 2002.

Keane, Thomas F, 1996. “The Economic Importance of the National Highway System.” Public Roads On-Line. Spring 1996. U.S. Department of Transportation, Federal Highway Administration, Research, Development, and Technology Turner-Fairbank Highway Research Center. 3 October 2002. URL <http://www.tfhrc.gov/pubrds/spring96/p96sp16.htm>.

King County, 2002d. *King County Daily Bridge Log.* April 1, 2001, to April 30, 2002.

Langjahr, Joe, 2002. Foss Maritime Company. Telephone conversation. 19 September 2002.

Llanos, Annette, 2002. Duwamish Yacht Club. Telephone conversation. 2 October 2002.

Louie, Cliff, 2005. City of Seattle Department of Neighborhoods Planner. Personal communication with Jim Sussex, King County Road Services Division Environmental Engineer and Betsy Minden, Parsons Brinckerhoff Lead Environmental Planner. June 30, 2005.

Manson Construction Company (Manson), 2002. Telephone conversation. September 2002.

Parsons Brinckerhoff, Inc., 2003c. *Survey of 14th Avenue South Businesses, South Park Bridge Project.* Prepared for King County Department of Transportation. August 23, 2003.

—, 2004b. *Economics Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 2004.

—, 2004e. *Relocations Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004.

—, 2005a. *Survey of 14th Avenue South Businesses Supplemental Analysis, South Park Bridge Project.* Prepared for King County Department of Transportation. July 2005.

Puget Sound Regional Council (PSRC), 2001. *Destination 2030*. Seattle, Washington. Approved May 24, 2001.

—, 2002. *2001 Population and Employment Forecasts, Central Puget Sound Region.* August 2002.
URL <http://www.psrc.org/datapubs/forecasts 2001.htm>.

Revised Code of Washington (RCW), Chapter 8.26, Relocation Assistance—Real Property Acquisition Policy Act of 1971, as amended. 2004.

Schrewsbury, Rick, 2002. Western Tugboat. Telephone conversation. 19 September 2002.

Seattle, City of, 2004. *2005-2008 Consolidated Plan for Housing and Community Development*. Seattle, Washington. November 10, 2004.

—, 2005. *City of Seattle Comprehensive Plan: Towards a Sustainable Seattle*. Seattle, Washington. January 2005.

South Park Planning Committee, 1998. *South Park Residential Urban Village Plan.* Seattle, Washington. 1998.

United States Code (USC), 1998. *42 USC 4601: Uniform Relocation Assistance and Real Property Acquisition Policies for Federal and Federally Assisted Programs.* Washington, DC. January 1998.

U.S. Bureau of the Census (U.S. Census), 2000. *Census of Population and Housing, 2000 (100% & Sample Survey)*, URL < http://factfinder.census.gov/jsp/saff/SAFFInfo.jsp?_ pageId= gn6_datasets_intro >.

Washington Administrative Code (WAC), 2004. Chapter 468-100, *Uniform Relocation Assistance and Real Property Acquisition*. Olympia, Washington. March 2004.

Section 3.6 Social Elements

Code of Federal Regulations (CFR). 49 CFR Part 24. *Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs.* Washington, D.C.

Federal Highway Administration (FHWA), 1998. Order 6640.23, *FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.* McLean, Virginia. December 2, 1998.

Parsons Brinckerhoff, Inc., 2003c. *Survey of 14th Avenue South Businesses, South Park Bridge Project*. Prepared for King County Department of Transportation. August 23, 2003.

—, 2004f. *Social Elements Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 2004.

—, 2005a. *Survey of 14th Avenue South Businesses Supplemental Analysis, South Park Bridge Project.* Prepared for King County Department of Transportation. July 2005.

Presidential Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.* Washington, D.C. 1994.

Puget Sound Regional Council (PSRC), 2003. *2003 Sub-County (Small Area) Forecasts of Population and Employment, Central Puget Sound Region*. Seattle, Washington. December 19, 2003.

Revised Code of Washington (RCW), Chapter 8.26, Relocation Assistance—Real Property Acquisition Policy Act of 1971, as amended. 2004.

South Park Planning Committee, 1998. *South Park Residential Urban Village Plan.* Seattle, Washington. 1998.

United States Code (USC), 1998. *42 USC 4601: Uniform Relocation Assistance and Real Property Acquisition Policies for Federal and Federally Assisted Programs.* Washington, DC. January 1998.

U.S. Bureau of the Census (U.S. Census), 1990. *Census of Population and Housing, 1990 (100% & Sample Survey)*, URL < http://factfinder.census.gov/jsp/saff/ SAFFInfo.jsp?_pageId= gn6_datasets_intro >.

—, 2000. *Census of Population and Housing, 2000 (100% & Sample Survey)*, URL < http://factfinder.census.gov/jsp/saff/SAFFInfo.jsp?_ pageId= gn6_datasets_intro >.

Washington Administrative Code (WAC), 2004. Chapter 468-100, *Uniform Relocation Assistance and Real Property Acquisition*. Olympia, Washington. March 2004.

Section 3.7 Cultural and Historical Resources

Carter, J. A. 1997. Historical Maps Relative to Archaeologically Sensitive Areas for the City of Tukwila Manufacturing/Industrial Center. Letter report to Vernon Umetsu, City of Tukwila. 1997.

Code of Federal Regulations (CFR). 36 CFR Part 60.4, *National Register of Historic Places, Criteria for Evaluation.* Washington, D.C. URL <http://www.fhwa.dot.gov/hep/>.

—. 36 CFR Part 67, *Historic Preservation Certifications Pursuant to Sec. 48(g) and Sec. 170(h) of the Internal Revenue Code of 1986 (1997)*. Washington, D.C. URL <http://www.fhwa.dot.gov/hep/>.

—. 36 CFR Part 800, *Protection of Historic Properties.* Washington, D.C. Amended August 5, 2004. URL <http://www.fhwa.dot.gov/hep/>.

de Boer, Trent. 2004. Archeologist with WSDOT who oversaw excavations at Tse-Whitzen in Port Angeles. Personal communications with Fennelle Miller, King County Road Services Division Archeologist. January–May, 2005.

Hartmann, Glenn. 2005. Principal Investigator at Western Shores Heritage Services, who excavated at Tse-Whitzen in Port Angeles. Personal communications with Fennelle Miller, King County Road Services Division Archeologist. January–May, 2005.

Historical Research Associates, Inc., 2004. *Cultural and Historical Resources Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. August 2004.

Lentz, F., 2000. "Boeing Plant 2: Assessment of Historical Significance." Prepared by Florence K. Lentz, Cultural Resource Consulting for The Boeing Company.

Le Tourneau, Phil. 2005. Co-Principal Investigator with BOAS, Inc., who directed testing and excavations at a site in Tukwila. Personal communications with Fennelle Miller, King County Road Services Division Archeologist. January–May, 2005.

Parsons Brinckerhoff, Inc., 2003a. *Rehabilitation Feasibility Study Technical Memorandum, South Park Bridge Project.* Prepared for King County Department of Transportation. May 2003.

—, 2003b. *Conceptual Plans, South Park Bridge Project.* Prepared for King County Department of Transportation. June 2003.

—, 2003d. *Structural Alternatives Study, South Park Bridge Project.* Prepared for King County Department of Transportation. November 2003.

Shannon & Wilson, Inc., 2003b. *Geotechnical Report, Phase II, South Park Bridge Project.* Prepared for King County Department of Transportation. November 2003.

Sullivan, M. and Trueblood, S. 1991. *Survey Report: Central and South Park. 1991 Certified Local Government Planning Grant.* Prepared by the City of Seattle, Office of Urban Conservation. Prepared for Washington State Office of Archaeology and Historic Preservation. Olympia, Washington, 1991.

United States Code (USC), 1966. *Section 106 of the National Historic Preservation Act (NHPA) of 1966*, as amended through 2000. URL <http://www2.cr.nps.gov/laws/NHPA1966.htm>.

Washington State Office of Archaeology and Historic Preservation (OAHP), 2001. *Washington's National Register Guide*. July 2001 (pp 16-18).

—, 2005. Letter addressed to Craig Holstine, Washington State Department of Transportation, regarding Determination of Eligibility. Dated January 28, 2005.

Waterman, T.T., 1920. *Puget Sound Geography.* Unpublished manuscript on file at Pacific Northwest Collections, Allen Library, University of Washington. Seattle, Washington.

White, R., 2002. The Boeing Company, personal communication with Cathy Bialas, Connie Walker Gray, and Patrick O'Bannon, Historical Research Associates, Inc. Thursday, July 11, 2002.

Section 3.8 Visual Assessment

Osborn Pacific Group, Inc., 2004. *Visual Assessment Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 2004.

Seattle, City of, 2001. *Seattle's Comprehensive Plan.* Office of Strategic Planning. Seattle, Washington. 2001

South Park Planning Committee, 1998. *South Park Residential Urban Village Plan.* Seattle, Washington. 1998.

Section 3.9 Air Quality

Associated General Contractors of Washington (AGCW), 1997. *Guide to Handling Fugitive Dust from Construction Projects*. Seattle, Washington. 1997.

Code of Federal Regulations (CFR). 40 CFR Part 50, *National Primary and Secondary Ambient Air Quality Standards (1997).* Washington, D.C. URL <http://www.fhwa.dot.gov/hep/>.

—. 40 CFR Part 93, *Determining Conformity of Federal Actions to State or Federal Implementation Plans (1997).* Washington, D.C. URL <http://www.fhwa.dot.gov/hep/>.

Parsons Brinckerhoff, Inc., 2004a. *Air Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 2004.

Puget Sound Clean Air Agency (PSCAA) (formerly Puget Sound Air Pollution Control Agency), 1994. *Regulation 1 of the Puget Sound Air Pollution Control Agency*. Seattle, Washington. 1994.

Washington Administrative Code (WAC), 1996. Chapter 173-175. *Dam Safety*. Olympia, Washington. 1996.

—, 1996. Chapter 173-470. *Ambient Air Quality Standards for Particulate Matter*. Olympia, Washington. 1996.

—, 1996. Chapter 173-474. *Ambient Air Quality Standards for Sulfur Oxides.* Olympia, Washington. 1996.

Washington State Department of Transportation (WSDOT), 2004. *Environmental Procedures Manual, M31-11*. Olympia, Washington. March 2004.

Section 3.10 Noise and Vibration

Environmental Protection Agency (EPA), U.S., 1971. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*. Washington, D.C.

—, 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. Report Number 550/9-74-004. Washington, D.C.

Federal Transit Administration (FTA), U.S. Department of Transportation, 1995. *Transit Noise and Vibration Impact Assessment*. Washington, D.C.

King County Code. Section 12.88.020, *Maximum permissible sound levels*. Seattle, Washington.

—. Section 12.88.040, *Construction and equipment operation.* Seattle, Washington.

—. Section 12.90.010, *Sounds created by operation of motor vehicles.* Seattle, Washington.

—. Section 12.90.060, *Motor vehicle exemptions*. Seattle, Washington.

Parsons Brinckerhoff, Inc., 2004d. *Noise Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 2004.

Seattle Municipal Code. Chapter 25.08, *Noise Control*. Seattle, Washington.

U.S. Department of Transportation (USDOT), Federal Highway Administration, 1972. *The Audible Landscape: A Manual for Highway Noise and Land Use*. Washington, D.C.

—, 1982. "Procedures for Abatement of Highway Traffic Noise and Construction Noise." *Federal-Aid Highway Program Manual.* Volume 7, Chapter 7, Section 3. Washington, D.C.

Washington Administrative Code (WAC), 1989. Chapter 173-60. *Maximum Environmental Noise Levels*. Olympia, Washington.

Washington State Department of Transportation (WSDOT), 1987. *Directive D22-22. Noise Evaluation Procedures for Existing Highways*. Olympia, Washington.

Section 3.11 Utilities

RoseWater Engineering, Inc., 2004. *Utilities Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 26, 2004.

Department of Ecology (Ecology), Washington State, 2001. *Stormwater Management Manual for Western Washington.* Publication 99-15. Olympia, Washington. August 2001.

Federal Highway Administration (FHWA), 1990. *Pollutant Loadings and Impacts from Highway Stormwater Runoff,* Volumes 1-4. Publication 90-257551. McLean, Virginia. April 1990.

Parametrix, Inc., 2004b. *Water Resources Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004.

Parsons Brinckerhoff, Inc., 2004g. *Transportation Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004.

Washington Administrative Code (WAC), 1995. Chapter 173-204. *Sediment Management Standards.* Olympia, Washington. 1995.

Wilbur Consulting, Inc., 2004a. *Hazardous Materials Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004.

—, 2004b. *Preliminary Site Investigation Report, South Park Bridge Project*. Prepared for King County Department of Transportation. July 2004.

Section 3.13 Fish, Wildlife, and Vegetation

Parametrix, Inc., 2004a. *Fish, Wildlife and Vegetation Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 2004.

U.S. Army Corps of Engineers, 2003. *Biological Assessment FY 2004-2005 Maintenance Dredging, Upper Duwamish Waterway, Seattle Harbor, Washington. Seattle, Washington.* July 11, 2003.

U.S. Fish and Wildlife Service, 2004. *Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout (Salvelinus confluentus).* Portland, Oregon. May 2004.
URL <http://pacific.fws.gov/bulltrout/jcs/documents/PugetSdpt1.pdf>

Wilbur Consulting Inc., 2004a. *Hazardous Materials Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004.

Section 3.14 Geology and Soils

American Association of State Highway and Transportation Officials (AASHTO), 2002. *Standard Specifications for Highway Bridges,* 17th Edition ("The Bridge Book"). 2002.

Parametrix, Inc., 2004b. *Water Resources Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004.

Shannon & Wilson, Inc., 2003b. *Geotechnical Report, Phase II, South Park Bridge Project.* Prepared for King County Department of Transportation. November 2003.

—, 2004. *Geology and Soils Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 2004.

Washington State Department of Transportation (WSDOT), 2004. *Highway Runoff Manual, M 31-16.* Olympia, Washington. March 2004.

Wilbur Consulting, Inc., 2004a. *Hazardous Materials Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004.

Section 3.15 Hazardous Materials

Parametrix, Inc., 2004b. *Water Resources Technical Report, South Park Bridge Project.* Prepared for King County Department of Transportation. February 2004.

Wilbur Consulting, Inc. (WCI), 2004a. *Hazardous Materials Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. February 2004.

—, 2004b. *Preliminary Site Investigation Report, South Park Bridge Project*. Prepared for King County Department of Transportation. July 2004.

Sections 3.16 through 3.18

Executive Order 12898, Presidential, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.* Washington, D.C. 1994.

Washington State Department of Transportation (WSDOT), 2004. *Title VI of Civil Rights Act of 1964 Uniform Relocations Act.* Olympia, Washington. March 2004.

Chapter 4

Parsons Brinckerhoff, Inc., 2003c. *Survey of 14th Avenue South Businesses, South Park Bridge Project*. Prepared for King County Department of Transportation. August 23, 2003.

—, 2005a. *Survey of 14th Avenue South Businesses Supplemental Analysis, South Park Bridge Project.* Prepared for King County Department of Transportation. July 2005.

South Park Planning Committee, 1998. *South Park Residential Urban Village Plan.* Seattle, Washington. 1998.

Chapter 5

Code of Federal Regulations (CFR), 2004. 36 CFR 800.3. *Protection of Historic Properties: Initiation of the Section 106 Process.* Washington, D.C. 2004.

—, 2004. 36 CFR 800.6. *Protection of Historic Properties: Resolution of Adverse Effects.* Washington, D.C. 2004.

Historical Research Associates, Inc. (HRA), 2004. *Cultural and Historical Resources Technical Report, South Park Bridge Project*. Prepared for King County Department of Transportation. August 2004.

Parsons Brinckerhoff, Inc., 2003a. *Rehabilitation Feasibility Study Technical Memorandum, South Park Bridge Project.* Prepared for King County Department of Transportation. May 2003.

United States Code (USC), 1966. *Section 106 of the National Historic Preservation Act (NHPA) Act of 1966*, as amended through 2000. URL <http://www2.cr.nps.gov/laws/NHPA1966.htm>.

INDEX

Index

Air Quality Technical Report, 3-127

air quality, 3-83, 3-127, 3-128, 3-129, 3-130, 3-131, 3-191, 3-199

animals, 1-15, 2-6, 2-12, 3-1, 3-88, 3-159, 3-162, 3-166, 3-167, 3-170, 3-172, 3-173, 5-1, 5-4

aquifers, 3-151, 3-156, 3-191

archaeological resources, 3-89, 3-90, 3-91, 3-92, 3-93, 3-94, 3-95, 3-97, 3-100, 3-101, 3-102, 3-103, 3-148, 3-149, 5-4, 5-8, 5-10, 5-14

area of potential effect, 1-14, 3-13, 3-47, 3-57, 3-58, 3-67, 3-89, 3-90, 3-91, 3-92, 3-93, 3-94, 3-95, 3-97, 3-100, 3-101, 3-102, 3-104, 3-124, 3-136, 5-4, 5-14

bicycling, 1-3, 1-11, 1-14, 2-3, 2-4, 2-11, 2-17, 2-26, 3-4, 3-13, 3-15, 3-16, 3-23, 3-27, 3-64, 3-67, 3-74, 3-75, 3-79, 3-81, 3-83, 3-85, 3-86, 3-120, 3-125, 4-4

Boeing, 1-8, 1-10, 1-13, 1-14, 2-3, 2-9, 2-12, 2-17, 2-18, 2-32, 3-2, 3-5, 3-8, 3-11, 3-12, 3-13, 3-17, 3-20, 3-21, 3-24, 3-28, 3-31, 3-35, 3-48, 3-49, 3-53, 3-55, 3-56, 3-57, 3-59, 3-70, 3-75, 3-77, 3-78, 3-79, 3-80, 3-81, 3-82, 3-90, 3-92, 3-93, 3-94, 3-95, 3-97, 3-101, 3-102, 3-103, 3-104, 3-105, 3-107, 3-110, 3-111, 3-143, 3-144, 3-146, 3-150, 3-165, 3-184, 3-188, 3-189, 3-192, 3-193, 5-4, 5-6, 5-9, 5-12, 5-13, 5-14

bridge closure, 1-8, 2-11, 2-31, 2-32, 3-27, 3-38, 3-47, 3-60, 3-62, 3-64, 3-76, 3-77, 3-86, 3-110, 3-196, 3-199, 5-2, 5-12, 5-13

census information, 3-45, 3-57, 3-58, 3-70, 3-71, 3-72, 3-73

churches, 3-136

Community Advisory Group, 3-65, 3-81, 4-1, 4-4, 4-5, 4-6, 4-9, 4-10, 5-13

community, South Park, 3-68, 3-72, 3-73

comprehensive plans, 1-3, 1-14, 3-8, 3-43, 3-45, 3-46, 3-47, 3-52, 3-126, 3-148

congestion, 2-9, 3-4, 3-8, 3-9, 3-10, 3-11, 3-12, 3-16, 3-17, 3-18, 3-19, 3-20, 3-24, 3-25, 3-26, 3-75, 3-83, 3-199

construction impacts, 2-6, 2-7, 2-33, 3-15, 3-26, 3-61, 3-64, 3-75, 3-85, 3-86, 3-127, 3-129, 3-130, 3-138, 3-144, 3-146, 3-147, 3-153, 3-159, 3-168, 3-171, 3-173, 3-177, 3-189, 3-190, 3-191, 4-4, 5-2, 5-3, 5-9

Cultural and Historical Resources Technical Report, 3-89, 3-93, 3-94, 5-4, 5-14

cultural resources, 1-15, 2-6, 3-1, 3-89, 3-90, 3-91, 3-92, 3-93, 3-94, 3-100, 3-103, 3-104, 5-4, 5-14

cumulative impacts, 3-1, 3-3, 3-24, 3-52, 3-63, 3-67, 3-84, 3-124, 3-130, 3-140, 3-147, 3-150, 3-158, 3-173, 3-181, 3-193

Department of Ecology, Washington State, 3-127, 3-134, 3-151, 3-152, 3-155, 3-159, 3-160, 3-181, 3-187, 3-193, 4-1

displacements, 2-18, 2-22, 2-26, 3-28, 3-30, 3-31, 3-37, 3-38, 3-39, 3-40, 3-41, 3-43, 3-45, 3-48, 3-49, 3-50, 3-61, 3-62, 3-63, 3-65, 3-77, 3-78, 3-79, 3-80, 3-81, 3-82, 3-86, 3-168, 3-197, 3-199, 4-6, 4-7

drainage, 3-3, 3-24, 3-40, 3-50, 3-63, 3-84, 3-140, 3-147, 3-158, 3-173, 3-179, 3-180, 3-181, 3-182, 3-193

drinking water, 3-191

Duwamish River, 1-1, 1-11, 3-2, 3-56, 3-72, 3-86, 3-89, 3-90, 3-91, 3-92, 3-154, 3-163, 3-167, 3-168, 3-169, 3-173, 3-175

Duwamish Waterway, 1-1, 1-3, 1-8, 1-10, 1-11, 1-13, 1-14, 2-4, 2-5, 2-6, 2-7, 2-9, 2-11, 2-12, 2-18, 2-22, 2-26, 2-30, 2-32, 2-36, 3-1, 3-2, 3-3, 3-5, 3-8, 3-15, 3-21, 3-22, 3-23, 3-24, 3-31, 3-43, 3-47, 3-48, 3-49, 3-50, 3-52, 3-55, 3-56, 3-59, 3-63, 3-67, 3-70, 3-75, 3-76, 3-77, 3-78, 3-79, 3-80, 3-81, 3-84, 3-88, 3-91, 3-92, 3-100, 3-105, 3-107, 3-123, 3-124, 3-125, 3-140, 3-143, 3-144, 3-146, 3-150, 3-151, 3-152, 3-153, 3-154, 3-155, 3-156, 3-158, 3-159, 3-162, 3-163, 3-164, 3-165, 3-169, 3-172, 3-173, 3-175, 3-178, 3-181, 3-183, 3-189, 3-191, 3-193, 3-195, 4-2, 4-8, 5-1, 5-6, 5-11, 5-12, 5-13

earthquakes, 1-1, 1-6, 1-7, 1-8, 2-10, 2-11, 3-175, 3-179, 3-182, 3-199, 5-1, 5-8, 5-11, 5-12

Economics Technical Report, 3-52

EIS, draft, 1-1, 1-15, 2-1, 2-9, 3-1, 3-152, 4-3, 4-4, 4-5, 4-7, 5-1, 5-13

EIS, final, 3-142

environmental impacts, 1-15, 2-1, 2-5, 3-1, 3-15, 3-30, 3-45, 3-59, 3-73, 3-74, 3-108, 3-128, 3-138, 3-144, 3-152, 3-168, 3-175, 3-188, 3-196, 4-3, 4-5, 5-13

environmental justice, 3-72, 3-73, 3-76, 3-77, 3-78, 3-80, 3-82, 3-88, 3-196, 3-197

erosion, 3-148, 3-154, 3-156, 3-161, 3-177, 3-179, 3-180, 3-181, 3-191

Federal Highway Administration, 2-4, 2-5, 3-73, 3-105, 3-127, 3-132, 3-135, 3-136, 3-138, 3-139, 3-141, 3-154, 3-155, 5-1, 5-14

fire, 3-8, 3-25, 3-67, 3-70, 3-75, 3-86, 3-148, 3-196

fish, 1-1, 1-3, 1-15, 2-9, 2-12, 2-35, 3-1, 3-72, 3-88, 3-159, 3-162, 3-163, 3-164, 3-166, 3-167, 3-168, 3-170, 3-171, 3-172, 3-173, 3-174, 4-2

Fish, Wildlife, and Vegetation Technical Report, 3-162

floodplains, 3-89, 3-91, 3-150, 3-151, 3-152, 3-156

freight movement, 1-3, 1-11, 1-13, 1-14, 2-18, 2-30, 3-4, 3-5, 3-8, 3-13, 3-15, 3-16, 3-21, 3-22, 3-60, 3-62, 3-64, 3-110, 3-111, 3-127, 3-131, 3-133, 3-138, 3-141, 3-181, 3-193, 4-1, 4-2

Geology and Soils Technical Report, 3-175

geology, 1-15, 2-6, 2-17, 3-1, 3-2, 3-24, 3-50, 3-63, 3-84, 3-124, 3-125, 3-131, 3-140, 3-151, 3-153, 3-154, 3-156, 3-158, 3-159, 3-160, 3-161, 3-168, 3-169, 3-170, 3-171, 3-172, 3-175, 3-177, 3-178, 3-179, 3-180, 3-181, 3-182, 3-184, 3-187, 3-188, 3-191, 3-192, 3-193, 3-194, 4-2, 5-8

grading, 3-91, 3-92, 3-97, 3-131, 3-181

Greater Duwamish Planning, 3-57

groundwater, 3-150, 3-151, 3-152, 3-156, 3-159, 3-161, 3-175, 3-177, 3-184, 3-188, 3-191, 3-194

habitats, 2-6, 2-7, 2-9, 2-12, 3-3, 3-88, 3-121, 3-122, 3-127, 3-156, 3-161, 3-162, 3-163, 3-164, 3-165, 3-166, 3-167, 3-168, 3-169, 3-170, 3-171, 3-172, 3-173, 3-174

Hazardous Materials Technical Report, 3-151, 3-156, 3-161, 3-169, 3-180, 3-183

hazardous materials, 1-15, 2-9, 2-32, 3-1, 3-2, 3-63, 3-72, 3-88, 3-124, 3-148, 3-149, 3-151, 3-153, 3-156, 3-158, 3-159, 3-161, 3-162, 3-169, 3-180, 3-181, 3-183, 3-184, 3-185, 3-186, 3-188, 3-189, 3-190, 3-191, 3-192, 3-193, 3-194, 3-199, 4-2, 5-13

historical resources, 1-1, 1-10, 2-3, 2-4, 2-6, 2-10, 2-12, 2-17, 2-35, 3-1, 3-76, 3-78, 3-79, 3-81, 3-87, 3-89, 3-90, 3-91, 3-92, 3-93, 3-94, 3-95, 3-96, 3-97, 3-98, 3-100, 3-101, 3-102, 3-103, 3-104, 3-120, 3-123, 3-124, 3-125, 3-126, 3-136, 3-148, 3-149, 3-151, 3-183, 3-187, 3-196, 3-197, 4-2, 4-4, 4-5, 5-1, 5-2, 5-3, 5-4, 5-6, 5-7, 5-8, 5-11, 5-12, 5-13, 5-14

housing, 3-29, 3-40, 3-41, 3-45, 3-50, 3-67, 3-74, 3-83, 3-85, 5-6

King County, 1-1, 1-3, 1-6, 1-8, 1-10, 1-11, 1-14, 1-15, 2-3, 2-6, 2-9, 2-11, 3-29, 3-41, 3-42, 3-4, 3-8, 3-12, 3-13, 3-15, 3-22, 3-25, 3-27, 3-43, 3-45, 3-47, 3-50, 3-52, 3-56, 3-57, 3-64, 3-67, 3-70, 3-86, 3-87, 3-89, 3-91, 3-93, 3-94, 3-98, 3-102, 3-103, 3-133, 3-134, 3-135, 3-142, 3-143, 3-147, 3-148, 3-151, 3-152, 3-154, 3-173, 3-183, 3-184, 4-1, 4-4, 4-6, 4-7, 4-9, 4-10, 5-1, 5-6, 5-13, 5-14

Land Use Technical Report, 3-43

land use, 1-10, 1-15, 2-5, 2-6, 2-18, 2-22, 2-26, 2-30, 3-1, 3-4, 3-5, 3-23, 3-28, 3-31, 3-37, 3-38, 3-43, 3-45, 3-47, 3-48, 3-49, 3-50, 3-51, 3-52, 3-67, 3-70, 3-83, 3-87, 3-125, 3-130, 3-134, 3-143, 3-162, 3-169, 3-182, 3-183, 3-184, 3-187, 3-188, 3-196, 3-197, 3-198, 4-4, 5-13

low income households, population, 3-41, 3-45, 3-50, 3-55, 3-73, 3-74, 3-76, 3-77, 3-78, 3-80, 3-82, 3-83, 3-88, 3-196, 3-197

minority households, population, 3-29, 3-30, 3-31, 3-37, 3-53, 3-54, 3-55, 3-72, 3-73, 3-76, 3-77, 3-78, 3-79, 3-80, 3-82, 3-83, 3-84, 3-88, 3-196, 3-197, 4-8, 4-9

Muckleshoot Tribe, 3-56, 3-72, 3-88, 3-92, 4-2, 5-14

National Register of Historic Places, 1-10, 3-89, 3-93, 3-94, 3-95, 3-96, 3-97, 3-98, 3-99, 3-100, 3-101, 3-102, 3-196, 3-197, 5-4, 5-12

Native American, 3-56, 3-72, 3-76, 3-77, 3-78, 3-80, 3-82, 3-88, 3-89, 3-90, 3-91, 3-92, 3-103, 3-174, 4-1, 4-2, 5-13, 5-14

natural gas, 3-143, 3-146

NEPA, 3-89, 4-1, 4-6, 5-1, 5-2, 5-13

Noise Technical Report, 3-132, 3-142

noise, 1-15, 3-132, 3-133, 3-134, 3-135, 3-136, 3-138, 3-139, 3-140, 3-141, 3-142, 3-168, 3-169, 3-170, 3-182, 3-199, 4-2, 4-6

parking, 2-12, 3-4, 3-12, 3-15, 3-16, 3-20, 3-21, 3-26, 3-27, 3-28, 3-31, 3-32, 3-34, 3-35, 3-40, 3-48, 3-49, 3-52, 3-54, 3-55, 3-59, 3-64, 3-65, 3-87, 3-88, 3-107, 3-165, 4-6, 4-7, 4-9

parks/recreation, 2-9, 3-51, 3-57, 3-58, 3-67, 3-73, 3-74, 3-86, 3-87, 3-125, 3-136, 3-143, 3-162, 5-1, 5-4

pedestrians, 1-3, 1-11, 1-14, 2-2, 2-3, 2-4, 2-11, 2-17, 2-22, 2-26, 3-4, 3-13, 3-15, 3-16, 3-23, 3-27, 3-40, 3-64, 3-65, 3-67, 3-74, 3-75, 3-76, 3-78, 3-79, 3-81, 3-83, 3-85, 3-86, 3-107, 3-121, 3-126, 4-4

police, 3-70, 3-86

Project Advisory Committee, 4-1, 4-6, 4-7, 4-9, 4-10, 5-13

property acquisition, 1-15, 2-6, 2-18, 2-22, 2-26, 2-32, 2-35, 2-36, 3-20, 3-25, 3-28, 3-30, 3-31, 3-32, 3-35, 3-37, 3-38, 3-39, 3-40, 3-43, 3-45, 3-49, 3-51, 3-52, 3-55, 3-59, 3-60, 3-61, 3-65, 3-76, 3-77, 3-78, 3-79, 3-80, 3-82, 3-83, 3-84, 3-85, 3-94, 3-95, 3-100, 3-101, 3-102, 3-184, 3-189, 3-190, 3-192, 3-193, 3-196, 3-197, 4-1, 4-7, 4-10, 5-9, 5-12

public meetings, 3-55, 3-85, 3-136, 4-1, 4-2, 4-3, 4-4, 4-5

public services, 3-67, 3-70, 3-74, 3-75, 3-76, 3-78, 3-79, 3-81, 3-83, 3-86

public transit, 1-3, 1-11, 1-14, 2-4, 2-30, 3-4, 3-13, 3-14, 3-15, 3-16, 3-22, 3-27, 3-51, 3-52, 3-67, 3-73, 3-74, 3-75, 3-76, 3-78, 3-79, 3-81, 3-83, 3-86, 3-87, 3-125, 3-133, 3-138, 4-6

Puget Sound Energy, 3-143

Puget Sound Regional Council, 3-4, 3-45

Red Brick Road, 2-6, 3-94, 3-95, 3-97, 3-98, 3-99, 3-100, 3-102, 3-105, 3-125, 5-2, 5-3, 5-4, 5-6, 5-9, 5-12, 5-13

relocation, 1-15, 2-22, 2-35, 3-1, 3-22, 3-27, 3-28, 3-29, 3-30, 3-38, 3-40, 3-41, 3-43, 3-48, 3-49, 3-55, 3-59, 3-65, 3-85, 3-87, 3-94, 3-95, 3-104, 3-144, 3-147, 3-148

Relocations Technical Report, 3-28, 3-48

retaining walls, 2-26, 2-30, 2-35, 3-125, 3-126, 3-177, 3-180

right of way, 2-9, 2-30, 2-32, 2-36, 3-28, 3-30, 3-38, 3-47, 3-48, 3-65, 3-84, 3-85, 3-87, 3-95, 3-100, 3-101, 3-134, 3-144, 3-16, 3-25, 3-26, 3-160, 3-172, 3-177, 3-180, 3-184, 3-198, 4-7, 4-10, 5-12

schools, 3-67, 3-72, 3-86, 3-88, 3-136

Seattle, city of, 1-1, 1-3, 1-6, 1-8, 1-10, 1-13, 1-14, 2-3, 2-5, 2-7, 2-8, 3-2, 3-3, 3-8, 3-11, 3-13, 3-24, 3-25, 3-28, 3-29, 3-40, 3-43, 3-45, 3-47, 3-50, 3-52, 3-53, 3-55, 3-56, 3-57, 3-58, 3-63, 3-65, 3-67, 3-70, 3-72, 3-73, 3-74, 3-77, 3-78, 3-80, 3-81, 3-82, 3-83, 3-84, 3-86, 3-88, 3-89, 3-92, 3-93, 3-94, 3-100, 3-103, 3-122, 3-126, 3-133, 3-134, 3-140, 3-143, 3-144, 3-147, 3-148, 3-151, 3-152, 3-158, 3-162, 3-173, 3-174, 3-175, 3-181, 3-183, 3-192, 3-193, 3-197, 5-1, 5-6, 5-13

Secretary of Interior, 2-11, 3-196, 5-11, 5-13

Section 4(f) resources, 1-15, 3-89, 5-1, 5-3, 5-4, 5-5, 5-6, 5-8, 5-9, 5-12, 5-14

sewer, 3-143, 3-144, 3-146, 3-151, 3-158, 3-159, 3-173

Social Elements Technical Report, 3-67

social services, 3-53, 3-58, 3-67, 3-72, 3-74, 3-80, 3-82, 3-83, 3-85, 3-88

South Park Hall, 3-94, 3-95, 3-97, 3-99, 3-100, 3-101, 3-102, 3-197, 5-3, 5-4, 5-7, 5-9

stormwater, 2-18, 3-3, 3-144, 3-146, 3-150, 3-151, 3-152, 3-153, 3-154, 3-155, 3-158, 3-159, 3-160, 3-177, 3-180, 3-182, 3-187, 3-192, 3-195

study area, 1-14, 3-13, 3-47, 3-57, 3-58, 3-67, 3-124, 3-136, 5-4, 5-14

Suquamish Tribe, 3-72, 3-88, 3-92, 5-14

surface water, 3-177, 3-179, 3-191

taxes, 3-61, 3-62

television, 3-85, 3-86

transportation network, 1-3, 1-10, 1-13, 3-8, 3-11, 3-16, 3-17, 3-20, 3-25, 3-47, 3-59

Transportation Technical Report, 3-4, 3-24, 3-154

travel patterns, 3-4, 3-17, 3-23, 3-59, 3-75

Tukwila, city of, 1-8, 1-10, 3-8, 3-11, 3-25, 3-43, 3-45, 3-47, 3-86, 3-91, 3-92, 3-103, 3-133, 3-143, 3-148, 3-152, 3-183, 5-1, 5-13

U.S. Army Corps of Engineers, 1-11, 3-2, 3-150, 3-156, 3-173

U.S. Coast Guard, 1-3, 1-11, 2-4, 2-11, 2-30, 3-61, 3-64, 5-2, 5-8, 5-11, 5-13

Utilities Technical Report, 3-143

vegetation, 3-88, 3-125, 3-126, 3-127, 3-135, 3-159, 3-162, 3-164, 3-165, 3-169, 3-170, 3-174, 3-177

vibration, 3-65, 3-101, 3-102, 3-104, 3-132, 3-136, 3-138, 3-141, 3-148, 3-178, 3-182, 4-2

Visual Assessment Technical Report, 3-104

Washington Heritage Register, 3-89, 3-93, 3-94, 3-98

Water Resources Technical Report, 3-150, 3-155, 3-180, 3-195

waterway traffic, 1-1, 1-3, 1-6, 1-10, 1-11, 2-9, 2-22, 2-30, 2-36, 3-2, 3-12, 3-32, 3-52, 3-55, 3-56, 3-57, 3-59, 3-61, 3-63, 3-72, 3-76, 3-79, 3-110, 3-111, 3-172, 3-187, 4-2, 5-4

wells, 3-194

wetlands, 3-168

zoning, 3-30, 3-31, 3-37, 3-38, 3-43, 3-44, 3-45, 3-48, 3-49, 3-52

APPENDICES

Appendix A Principal Contributors

Name and Title Participation	Education	Professional Discipline	Professional Experience
FHWA			
Jim Leonard, P.E. EIS Coordination and Review	M.P.A., Public Administration B.A., Environmental/ Engineering	Urban Area Engineer	43 years
WSDOT			
Brian Hasselbach Environmental Policy Branch Manager	B.S., Civil Engineering B.S., Biology	Environmental Policy Branch Manager	7 years
Ed Conyers, PE Northwest Region Local Programs Engineer		Licensed Civil Engineer in Washington State	24 years
King County Department of Transportation (Lead Agency)			
Tim Lane, P.E. Senior Project Manager	B.S., Civil Engineering	Supervising Engineer	25 years
Trinh Truong, P.E. Project Manager	B.S., Civil Engineering	Senior Engineer	19 years
Jim Sussex Environmental Project Lead	M.A., Planning B.A., Geography	Environmental Engineer	14 years
Parsons Brinckerhoff Quade and Douglas, Inc.			
Einer Handeland, P.E. Project Manager	M.S., Civil Engineering B.S., Civil Engineering	Senior Consulting Engineer	38 years
Yuhe Yang, P.E., S.E. Deputy Project Manager	M.S., Civil Engineering B.S., Civil Engineering	Supervising Structural Engineer	20 years
Betsy Minden, A.I.C.P. EIS Preparation Task Lead, Social	M.U.P., Urban Planning B.A., Biology	Lead Environmental Planner	24 years
Jeff Buckland, A.I.C.P. Land Use, Relocations	M.R.P., Regional Planning B.A., Geography	Senior Environmental Planner	15 years
Angela Findley, A.I.C.P. Economics	M.S., Forest Resources B.A., Mathematics	Senior Environmental Planner	11 years
Patrick Romero Air, Noise	M.S., Environmental Policy and Mgmt B.S., Environmental Science	Environmental Planner	6 years
Tony Lo, P.E. Transportation	M.S., Civil Engineering	Senior Transportation Planner	8 years

Name and Title Participation	Education	Professional Discipline	Professional Experience
Parametrix, Inc. (Fish, Wildlife, & Vegetation and Water Quality)			
Don Weitkamp, Ph.D.	Ph.D., Fish Biology	Principal Biologist	32 years
Ken Ludwa, P.E.	M.S., Civil Engineering	Water Resources Engineer	10 years
Nick von Stackelberg, P.E.	B.S., Civil Engineering	Water Resources Engineer	9 years
Shannon & Wilson (Geology & Soils)			
Ming-Jiun (Jim) Wu, Ph.D., P.E.	Ph.D., Civil Engineering	Senior Vice President	32 years
Hisham Sarrieddine, P.E.	M.S., Civil Engineering	Associate Engineer	15 years
Travis Deane, P.E.	M.S., Civil Engineering	Principal Engineer	12 years
Ted Hopkins, P.E.	M.S., Geology	Principal Engineer	16 years
Wilbur Consulting, Inc. (Hazardous Materials)			
J. Scott Wilbur, P.G.	M.S., Geochemistry	President	26 years
Historical Research Associates, Inc. (Cultural & Historical)			
Patrick O'Bannon, Ph.D.	Ph.D., U.S. History	Director, Cultural Resources Division	25 years
Connie Walker-Gray	M.U.P., Urban Planning	Research Historian	6 years
Alex Maass	Ph.D. Candidate, Archaeology	Project Archaeologist	10 years
Catherin Bialas	B.A., Anthropology	Research Archaeologist	6 years
Osborn Pacific Group, Inc. (Visual)			
Linda Osborn, A.S.L.A.	B.L.A., Landscape Architecture	Principal Landscape Architect	28 years
Stacy Thomas Winnick, A.S.L.A.	B.S.L.A., Landscape Architecture	Senior Landscape Architect	25 years
RoseWater Engineering, Inc. (Utilities)			
McLelland J. Smith, P.E.	M.S., Civil Engineering	Project Manager	28 years
Patricia A. Buchanan, P.E.	M.S., Civil Engineering	Civil Engineer	4 years

Appendix B Studies Performed

Conceptual engineering plans, studies, and technical reports completed during the planning and evaluation of the proposed project alternatives of this project contain additional information that supports the conclusions presented in this Draft EIS. These materials are mostly contained on a CD Rom in Appendix F of this document. In addition, they are available for review at the King County and Seattle public libraries and at the following location:

Map and Records Center
King County Department of Transportation
Road Services Division
201 South Jackson Street, Suite 0106
Seattle, Washington 98104-3855
Telephone: (206) 296-6548
Hours: 8:30 a.m. to 4:30 p.m. Monday–Friday

Technical Information

Air Quality Technical Report. Prepared by Parsons Brinckerhoff, Inc. February 2004.

Conceptual Plans. Prepared by Parsons Brinckerhoff, Inc. June 2003.

Cultural and Historical Resources Technical Report. Prepared by Historical Research Associated, Inc. Updated August 2004.

Economics Technical Report. Prepared by Parsons Brinckerhoff, Inc. February 2004.

Fish, Wildlife, and Vegetation Technical Report. Parametrix, Inc. February 2004.

Geology and Soils Technical Report. Prepared by Shannon & Wilson, Inc. February 2004.

Geotechnical Report, Phase II. Prepared by Shannon & Wilson, Inc. November 2003.

Geotechnical Report for Conceptual Engineering. Prepared by Shannon & Wilson, Inc. May 2003.

Hazardous Materials Technical Report and Appendices. Prepared by Wilbur Consulting, Inc. February 2004.

Noise Technical Report. Prepared by Parsons Brinckerhoff, Inc. February 2004.

Land Use Technical Report. Prepared by Parsons Brinckerhoff, Inc. February 2004.

Preliminary Site Investigation Report. Prepared by Wilbur Consulting, Inc. July 2004.

Rehabilitation Feasibility Study Technical Memorandum. Prepared by Parsons Brinckerhoff, Inc. May 2003.

Relocations Technical Report. Prepared by Parsons Brinckerhoff, Inc. February 2004.

Social Elements Technical Report. Prepared by Parsons Brinckerhoff, Inc. February 2004.

South Park Bridge Project—Trends in Property Values Memo. Prepared by Parsons Brinckerhoff, Inc. August 12, 2005.

Structural Alternatives Study. Prepared by Parsons Brinckerhoff, Inc. November 2003.

Summary Technical Memo—Alternatives Development and Screening. Prepared by Parsons Brinckerhoff, Inc. September 6, 2002.

Survey of 14th Avenue South Businesses. Prepared by Parsons Brinckerhoff, Inc. August 22, 2003.

Survey of 14th Avenue South Businesses Supplemental Analysis. Prepared by Parsons Brinckerhoff, Inc. July, 2005.

Transportation Technical Report. Prepared by Parsons Brinckerhoff, Inc. April 2004.

Utilities Technical Report. Prepared by RoseWater Engineering, Inc. February 2004.

Visual Assessment Technical Report. Prepared by Osborn Pacific Group, Inc. February 2004.

Water Resources Technical Report. Prepared by Parametrix, Inc. February 2004.

Appendix C Draft EIS Distribution List

Federal Agencies

Army Corps of Engineers
Coast Guard
Department of the Interior
Environmental Protection Agency
Federal Highway Administration
Fish and Wildlife Service
National Marine Fisheries Service

Native American Tribes

Muckleshoot Indian Tribe
Suquamish Indian Tribe
Duwamish Tribe

State of Washington Agencies

Department of Ecology
Department of Fish and Wildlife
Department of Transportation
Washington Sate Office of Archaeology and Historic Preservation

Regional Agencies

Puget Sound Clean Air Agency
Puget Sound Regional Council
Regional Transit Authority

Other Jurisdictions

City of Seattle
City of Tukwila

Ports

Port of Seattle

School Districts

Seattle School District

Libraries

King County Library System
1111 110th Avenue NE
Bellevue, WA 98004

White Center Library
11220 16th Avenue SW
Seattle, WA 98146

Seattle Public Library
1000 4th Avenue
Seattle, WA 98104

Delridge Library
5423 Delridge Way SW
Seattle, WA 98106

Highpoint Library
3411 SW Raymond Street
Seattle, WA 98188

Utilities

Puget Sound Energy
Qwest Communications
Seattle City Light
Seattle Public Utilities

King County

Ron Sims, King County Executive
Dow Constantine, District #8, King County Council
Dwight Pelz, District #6, King County Council
Bailey Deiongh, Manager, King County Office of Civil Rights
King County Office of Cultural Resources
King County Department of Development and Environmental Services
King County Fire Marshall
King County Sheriff's Office
King County Department of Transportation
King County Wastewater Treatment Division
King County Water and Land Resources Division

Citizen Advisory Group Members

Mayra Ayala
Geoff Belau
Jorge Correa
Charlie Cunniff
Juan Garcia
Doug Greason
Charlie Harris
Leah Hyatt-Porco
Ron Johnson
Anna Marti
Pat McGarry
Tim McNeil
Adrian Moroles
Jordan Perrine
Michael Prime
Eugene Wasserman
Richard White

This page intentionally blank

Appendix D Miscellaneous

[Reserved for future use.]

This page intentionally blank

Appendix E Agency Coordination

Agency coordination and consultation letters related to the proposed South Park Bridge Project contained in this appendix are listed below:

1. State of Washington, Office of Community Development, Office of Archaeology and Historic Preservation—re: South Park Bridge Project EIS Cultural Resources Inquiry, King County, letter dated November 20, 2002

2. Muckleshoot Tribe—re: King County South Park Bridge Project, letter dated August 27, 2002

3. Suquamish Tribe—re: King County South Park Bridge Project, letter dated August 27, 2002

4. State of Washington, Office of Archaeology and Historic Preservation—re: Determination of Eligibility, letter dated January 28, 2005

5. State of Washington, Office of Archaeology and Historic Preservation—re: Adverse Effect, letter dated January 28, 2005

This page intentionally blank

STATE OF WASHINGTON

OFFICE OF COMMUNITY DEVELOPMENT

Office of Archaeology and Historic Preservation

1063 S. Capitol Way, Suite 106 - Olympia, Washington 98501
(Mailing Address) PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 Fax Number (360) 586-3067

November 20, 2002

Mr. John Heinley, P.E.
Washington State Department of Transportation
P.O. Box 47300
Olympia, Washington 98504-7300

In future correspondence please refer to:
Log: 061002-01-FHWA
Re: South Park Bridge Project EIS Cultural Resources Inquiry, King County

Dear Mr. Heinley:

Thank you for contacting Washington State Historic Preservation Officer (SHPO) Allyson Brooks regarding the above referenced action. This consultation is in adherence to the National Historic Preservation Act of 1966 (as amended) and implementing regulations 36 CFR Part 800.4. From your correspondence, I understand that the King County Road Services Division proposes to replace or rehabilitate the South Park Bridge, listed in the National Register of Historic Places as the 14th Avenue South Bridge.

In response and on behalf of the SHPO, OAHP staff members Rob Whitlam, State Archaeologist, and myself have reviewed the proposed Area of Potential Effect (APE) and concur with the boundaries of the APE as delineated on the map attached to your correspondence. In addition to our concurrence on the APE, we note the six pages of petition signatures supporting rehabilitation of the historic bridge. In view of this strong level of interest, we recommend that Washington State Department of Transportation (WSDOT) work with King County and the Federal Highway Administration (FHWA) to implement a public participation process in adherence to 36 CFR Part 800.2. This process is advised in order to fully address historic preservation issues related to this action and that may be of concern to interested parties. It is also recommended that the federal Advisory Council on Historic Preservation (ACHP) also be notified of this action and the potential for a high level of public interest.

Thank you for the opportunity to review and comment on the project APE. Should there by any questions, I may be reached at 360-586-3073 or gregg@cted.wa.gov.

Sincerely,

Gregory Griffith
Deputy State Historic Preservation Officer

Cc: Julie Koler
David Leighow

Washington State
Department of Transportation
Douglas B. MacDonald
Secretary of Transportation

Transportation Building
310 Maple Park Avenue S.E.
P.O. Box 47300
Olympia, WA 98504-7300

360-705-7000
TTY: 1-800-833-6388
www.wsdot.wa.gov

August 27, 2002

The Honorable John Daniels, Jr., Chairperson
Muckleshoot Tribe
39015 172nd Ave. SE
Auburn, WA 98092

ATTN: Ms. Melissa Calvert

King County
South Park Bridge Project

Dear Chairperson Daniels:

The Federal Highways Administration (FHWA) and the Washington State Department of Transportation Highways and Local Programs Division (H&LPD) are proposing to develop an undertaking to address an identified transportation need in King County. Proposed activities include either the rehabilitation or replacement of the existing South Park Bridge. The county is currently preparing an Environmental Impact Statement, in accordance with the National Environmental Policy Act, to select a preferred alternative. It is my understanding that the county has already initiated informal discussions with the Tribe, regarding this project. A project description is enclosed.

In order to ensure that we take into account the effects of this undertaking on properties listed in or eligible for listing in the National Register of Historic Places, the FHWA is initiating formal Section 106 consultation pursuant to 36 CFR 800.2(a)(4). Recognizing the government-to-government relationship, which FHWA has with the tribe, the FHWA will continue to play a key role in this undertaking as the responsible Federal agency.

Your response to this letter, acknowledging your interest in participating in this undertaking as a consulting party and identifying key tribal contacts, is greatly appreciated. Please provide a response by October 4, 2002, so that we may discuss this undertaking and the area of potential effects.

Please contact Jim Sussex, King County DOT, at (206) 296-8737 or myself at (360) 705-6975 or hasselb@wsdot.wa.gov, should you have any questions.

Sincerely,

Brian Hasselbach
Environmental Engineer
Highways & Local Programs Division

BH:ac
Enclosures
cc: Terry Paananen, NW Region, NB82-121
Jim Leonard, FHWA, 0943
Jim Sussex, King County DOT

Washington State
Department of Transportation
Douglas B. MacDonald
Secretary of Transportation

Transportation Building
310 Maple Park Avenue S.E.
P.O. Box 47300
Olympia, WA 98504-7300

360-705-7000
TTY: 1-800-833-6388
www.wsdot.wa.gov

August 27, 2002

The Honorable Bennie J. Armstrong, Chairperson
Suquamish Tribe
P.O. Box 498
Suquamish, WA 98392

ATTN: Mr. Charlie Sigo

King County
South Park Bridge Project

Dear Chairperson Armstrong:

The Federal Highways Administration (FHWA) and the Washington State Department of Transportation Highways and Local Programs Division (H&LPD) are proposing to develop an undertaking to address an identified transportation need in King County. Proposed activities include either the rehabilitation or replacement of the existing South Park Bridge. The county is currently preparing an Environmental Impact Statement, in accordance with the National Environmental Policy Act, to select a preferred alternative. It is my understanding that the county has already initiated informal discussions with the Tribe, regarding this project. A project description is enclosed.

In order to ensure that we take into account the effects of this undertaking on properties listed in or eligible for listing in the National Register of Historic Places, the FHWA is initiating formal Section 106 consultation pursuant to 36 CFR 800.2(a)(4). Recognizing the government-to-government relationship, which FHWA has with the tribe, the FHWA will continue to play a key role in this undertaking as the responsible Federal agency.

Your response to this letter, acknowledging your interest in participating in this undertaking as a consulting party and identifying key tribal contacts, is greatly appreciated. Please provide a response by October 4, 2002, so that we may discuss this undertaking and the area of potential effects.

Please contact Jim Sussex, King County DOT, at (206) 296-8737 or myself at (360) 705-6975 or hasselb@wsdot.wa.gov, should you have any questions.

Sincerely,

Brian Hasselbach

Brian Hasselbach
Environmental Engineer
Highways & Local Programs Division

BH:ac
Enclosures
cc: Terry Paananen, NW Region, NB82-121
Jim Leonard, FHWA, 0943
Jim Sussex, King County DOT

STATE OF WASHINGTON

Office of Archaeology and Historic Preservation

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
(Mailing Address) PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 Fax Number (360) 586-3067

January 28, 2005

Mr. Craig Holstine
Washington State Department of Transportation
6639 Capitol Blvd. S
Tumwater, WA 98501
Post Office Box 47300
Olympia, WA 98504-7332

RECEIVED
FEB 0 1 2005
ENVIRONMENTAL AFFAIRS POINT PLAZA

Re: Determination of Eligibility

Dear Mr. Holstine:

Thank you for contacting the Washington State Office of Archaeology and Historic Preservation (OAHP). The properties listed below have been reviewed on behalf of the State Historic Preservation Officer under provisions of Section 106 of the National Historic Preservation Act of 1966 (as amended) and 36 CFR Part 800. My review is based upon documentation contained in your communication.

Log #	Project	Response:
012805-27-FHWA	*Single family residence* *1437 Donovan St., Seattle*	*DOE - NOT Eligible*
012805-28-FHWA	*South Park Community Services Center* *8201 10th Ave S., Seattle*	*DOE - NOT Eligible*
012805-29-FHWA	*Red Brick Road* *14th Avenue S between Dallas Ave S and the Duwamish River, Seattle*	*DOE - Determined Eligible*
012805-30-FHWA	*South Park Hall* *8631 14th Ave S, Seattle*	*DOE – Determined Eligible*
012805-31-FHWA	*Single family residence* *1251 Cloverdale Ave S., Seattle*	*DOE - Determined Eligible*
012805-32-FHWA	*Single family residence* *8307 10th Ave S., Seattle*	*DOE - Determined Eligible*
012805-33-FHWA	*single family residence* *724 S Rose St., Seattle*	*DOE - Determined Eligible*
012805-34-FHWA	*Single family residence* *813 S Rose St., Seattle*	*DOE - Determined Eligible*
012805-35-FHWA	*Single family residence* *808 S Sullivan St., Seattle*	*DOE - Determined Eligible*
012805-36-FHWA	*Single family residence* *1019 S Sullivan St., Seattle*	*DOE - Determined Eligible*
012805-38-FHWA	*Single family residence* *1215 S Sullivan St., Seattle*	*DOE - Determined Eligible*
012805-40-FHWA	*single family residence* *1007 S Thistle St., Seattle*	*DOE - Determined Eligible*

012805-41-FHWA	*Single family residence* *1027 S Thistle St., Seattle*	*DOE - Determined Eligible*
012805-42-FHWA	*Single family residence* *8601 8th Ave S., Seattle*	*DOE - Determined Eligible*
012805-43-FHWA	*Single family residence* *857 S Thistle St., Seattle*	*DOE - Determined Eligible*

Please note that _13_ of the above properties have been determined eligible for the National Register. As such further review is required of alterations (such as change in windows, siding, doors, the addition of insulation, etc..) to these properties under Section 106. Please fill out an Attachment B for each eligible property, then return the forms to Stephen Mathison, our Historic Architect, for his review before any of the work is completed on these buildings.

Thank you for the opportunity to review and comment. If I may be of any assistance regarding the determination of eligibility of the properties, please feel free to contact anytime.

Sincerely

Russell Holter
Project Compliance Reviewer
(360) 586-3533
russellh@cted.wa.gov

STATE OF WASHINGTON

Office of Archaeology and Historic Preservation

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
(Mailing Address) PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 Fax Number (360) 586-3067

January 28, 2005

Mr. Craig Holstine
Cultural Resources Specialist
Washington State Department of Transportation
6639 Capitol Blvd. S
Tumwater, WA 98501
Post Office Box 47300
Olympia, WA 98504-7332

RECEIVED
FEB 0 1 2005
ENVIRONMENTAL AFFAIRS POINT PLAZA

In future correspondence please refer to:
Log: 061002-01-FHWA
Property: SOUTH PARK BRIDGE NEPA COOPERATING STATUS
Re: ADVERSE EFFECT

Dear Mr. Holstine:

Thank you for contacting the Washington State Office of Archaeology and Historic Preservation (OAHP). The above referenced project has been reviewed on behalf of the State Historic Preservation Officer under provisions of Section 106 of the National Historic Preservation Act of 1966 (as amended) and 36 CFR Part 800. My review is based upon documentation contained in your communication.

We concur that the current project, as proposed, will have an "ADVERSE EFFECT" on the following National Register eligible or listed historic and cultural resources:

South Park Bridge;
the Red Brick Road segment of 14th Ave S between Dallas and the Duwamish River, and;
South Park Community Hall.

We concur that the current project as proposed will have a "NO ADVERSE EFFECT" on the following National Register eligible or listed historic and cultural resources including the Boeing Plant #2 and all of the commercial and residential properties listed in the Cultural Resources Survey conducted by HRA Inc., dated August 2004, including those two properties located at 1437 Donovan Street and the South Park Community Services Center which no longer possess enough integrity to warrant a determination of eligibility.

We would like to be invited to participate in the 4(f) consultation process and look forward to working with you in finding creative ways to avoid, minimize or mitigate the abovementioned Adverse Effect through a Memoranda of Agreement.

Thank you for the opportunity to review and comment. Should you have any questions, please feel free to contact me.

Sincerely,

Russell Holter
Project Compliance Reviewer
(360) 586-3533
russellh@cted.wa.gov

Cc: Julie Koler (King Co.)

Appendix F Appendix Volumes I-VI (CD)

The contents of Appendix Volumes I-V are listed below and are reproduced on the CD inserted on the last page of this appendix. The first table below lists the technical reports prepared in support of this Draft EIS in alphabetical order and provides the appendix volume and letter for each report. The second table lists the appendix volumes and letter of each technical report in order in the technical appendices. The subsequent pages provide page numbers in the individual appendix volume PDFs for each technical report and the several chapters comprising the reports. *(Note: Page numbers listed on the following pages are not the printed page numbers at the bottom of pages in the technical reports but rather the PDF-designated page numbers.)*

Appendices By Title	Volume	Appendix
Air Quality Technical Report	Vol IV	Appendix R
Cultural and Historical Resources Technical Report and Appendices	Vol III	Appendix P
Economics Technical Report	Vol II	Appendix N
Fish, Wildlife, and Vegetation Technical Report	Vol V	Appendix V
Geology and Soils Technical Report	Vol V	Appendix W
Hazardous Materials Technical Report and Appendices	Vol VI	Appendix X
Land Use Technical Report	Vol II	Appendix M
Noise Technical Report	Vol IV	Appendix S
Relocations Technical Report	Vol II	Appendix L
Social Elements Technical Report	Vol II	Appendix O
Transportation Technical Report	Vol II	Appendix K
Utilities Technical Report	Vol IV	Appendix T
Visual Assessment Technical Report	Vol III	Appendix Q
Water Resources Technical Report	Vol V	Appendix U
Engineering Reports		
Conceptual Plans	Vol I	Appendix J
Rehabilitation Feasibility Study Technical Memo	Vol I	Appendix H
Structural Alternatives Study	Vol I	Appendix I
Summary Technical Memo—Alternatives Development and Screening	Vol I	Appendix G

Volume	Appendix	Appendices by Volume & Appendix Number
Vol I	Appendix G	Summary Technical Memo—Alternatives Development and Screening
Vol I	Appendix H	Rehabilitation Feasibility Study Technical Memo
Vol I	Appendix I	Structural Alternatives Study
Vol I	Appendix J	Conceptual Plans
Vol II	Appendix K	Transportation Technical Report
Vol II	Appendix L	Relocations Technical Report
Vol II	Appendix M	Land Use Technical Report
Vol II	Appendix N	Economics Technical Report
Vol II	Appendix O	Social Elements Technical Report
Vol III	Appendix P	Cultural and Historical Resources Technical Report and Appendices
Vol III	Appendix Q	Visual Assessment Technical Report
Vol IV	Appendix R	Air Quality Technical Report
Vol IV	Appendix S	Noise Technical Report
Vol IV	Appendix T	Utilities Technical Report
Vol V	Appendix U	Water Resources Technical Report
Vol V	Appendix V	Fish, Wildlife, and Vegetation Technical Report
Vol V	Appendix W	Geology and Soils Technical Report
Vol VI	Appendix X	Hazardous Materials Technical Report and Appendices

Appendix Volume I

Appendix G Summary Technical Memo—Alternatives Development and Screening 7

Executive Summary *15*
1. Introduction *17*
2. Purpose and Need Statement *20*
3. Existing Conditions and Previous Studies *23*
4. Design Criteria and Project Alternatives *28*
5. Evaluation of the Alternatives *35*
6. Conclusions and Recommendations *55*
Figures *59*
Attachment *77*

Appendix H Rehabilitation Feasibility Study Technical Memo 111

Executive Summary *121*
1. Introduction *124*
2. Existing Structure Condition *126*
3. Rehabilitation Options *143*
4. Conceptual Cost Estimates *168*
5. Remaining Service Life *171*
6. Comparisons and Recommendation *173*
References *175*
Appendices *178*

Appendix I Structural Alternatives Study 193

Summary *203*
1. Introduction *204*
2. Existing Conditions at South Park Bridge *206*
3. Proposed Structural Design Parameters *210*
4. Rehabilitation of Existing Bridge *213*
5. Fixed-Span Bridge Replacement Alternative *214*
6. Bascule Bridge Alternative *236*
7. Geotechnical Considerations *243*
8. Retaining Walls *243*
9. Bridge Aesthetics *244*
10. Construction Considerations *252*
11. Conceptual Cost Estimate *262*
References *263*
Appendix *264*

Appendix J Conceptual Plans 283

Cover Sheet / Vicinity Map / Index *285*
Legend and Abbreviations *287*
Bascule Bridge Alternative *289*
Mid Level Fixed Span Bridge Alternative *309*
High Level Fixed Span Bridge Alternative *330*

Appendix Volume II

Appendix K Transportation Technical Report 7
1. Executive Summary *17*
2. Introduction *19*
3. Studies and Coordination *59*
4. Methodology *61*
5. Affected Environment *71*
6. Impacts *83*
7. Mitigation *107*
References *111*
Appendices *113*

Appendix L Relocations Technical Report 127
1. Executive Summary *137*
2. Introduction *141*
3. Studies and Coordination *181*
4. Methodology *183*
5. Affected Environment *185*
6. Impacts *187*
7. Mitigation *205*
References *209*

Appendix M Land Use Technical Report 211
1. Executive Summary *221*
2. Introduction *225*
3. Studies and Coordination *265*
4. Methodology *267*
5. Affected Environment *269*
6. Impacts *285*
7. Mitigation *291*
References *293*
South Park Bridge Project—Trends in Property Values *295*

Appendix N Economics Technical Report 297
1. Executive Summary *307*
2. Introduction *317*
3. Studies and Coordination *357*
4. Methodology *359*
5. Affected Environment *361*
6. Impacts *376*
7. Mitigation *393*
References *395*
Appendices *397*
Survey of 14th Avenue S. Businesses Supplemental Analysis *443*

Appendix O Social Elements Technical Report 463
1. Executive Summary *473*
2. Introduction *489*
3. Studies and Coordination *529*
4. Methodology *531*
5. Affected Environment *535*
6. Impacts *565*
7. Mitigation *591*
References *595*
Appendices *597*

Appendix Volume III

Appendix P Cultural and Historical Resources Technical Report and Appendices 7

1. Executive Summary *17*
2. Introduction *21*
3. Studies and Coordination *60*
4. Methodology *95*
5. Affected Environment *102*
6. Impacts *138*
7. Mitigation *151*
References *153*
Appendices Volume *159*

Appendix Q Visual Assessment Technical Report 601

1. Executive Summary *611*
2. Introduction *623*
3. Studies and Coordination *663*
4. Methodology *665*
5. Affected Environment *667*
6. Impacts *685*
7. Strategies for Mitigation *717*
References *725*
Appendices *727*

Appendix Volume IV

Appendix R Air Quality Technical Report 7

1. Executive Summary *17*
2. Introduction *25*
3. Studies and Coordination *65*
4. Methodology *71*
5. Affected Environment *77*
6. Impacts *83*
7. Mitigation *87*
8. Conformity Determination *89*
References *91*
Appendix *95*

Appendix S Noise Technical Report 399

1. Executive Summary *409*
2. Introduction *411*
3. Studies and Coordination *451*
4. Methodology *459*
5. Affected Environment *465*
6. Impacts *469*
7. Mitigation *475*
References *483*
Appendices *485*

Appendix T Utilities Technical Report 519

1. Executive Summary *529*
2. Introduction *533*
3. Studies and Coordination *573*
4. Methodology *575*
5. Affected Environment *577*
6. Impacts *587*
7. Mitigation *599*
References *601*

Appendix Volume V

Appendix U Water Resources Technical Report 7

1. Executive Summary.....17
2. Introduction 23
3. Studies and Coordination 67
4. Methodology 69
5. Affected Environment.....75
6. Impacts.....87
7. Mitigation 103
References.....107
Appendices.....109

Appendix V Fish, Wildlife, and Vegetation Technical Report..... 133

1. Executive Summary.....141
2. Introduction 137
3. Studies and Coordination 197
4. Methodology 199
5. Affected Environment.....201
6. Impacts.....217
7. Mitigation 223
References.....225
Appendix 231

Appendix W Geology and Soils Technical Report..... 239

1. Executive Summary.....249
2. Introduction 255
3. Studies and Coordination 295
4. Methodology 299
5. Affected Environment.....301
6. Impacts.....319
7. Mitigation 325
References.....333

Appendix Volume VI

Appendix X Hazardous Materials Technical Report and Appendices.....7
1. Executive Summary.....*19*
2. Introduction.....*29*
3. Studies and Coordination.....*69*
4. Methodology.....*73*
5. Affected Environment.....*75*
6. Impacts.....*83*
7. Mitigation.....*101*
References.....*117*
Appendices Volume.....*119*

This page intentionally blank

Appendix Volumes I-VI CD Rom

This page intentionally blank