

# Table of Contents

Summary .....	S-1
What is being proposed and why? .....	S-1
What are the possible solutions to meet the project purpose?.....	S-6
What would be the consequences of the different alternatives? .....	S-18
What is the preferred alternative? .....	S-27
What are the unresolved issues? .....	S-30
How the Draft EIS is organized.....	S-37
<b>1 Purpose and Need for the Project .....</b>	<b>1-1</b>
1.1 Why are we considering the Burnside Bridge Project? .....	1-1
1.2 Location, Setting, and History.....	1-1
1.3 Purpose of the Project .....	1-1
1.4 Need for the Project.....	1-3
1.5 Application of the Purpose and Need in Alternatives Identification and Screening.....	1-8
<b>2 Project Alternatives .....</b>	<b>2-1</b>
2.1 Overview of the Process Used to Identify and Narrow Alternatives and Options .....	2-1
2.1.1 Multnomah County Bridges Capital Improvement Plan and EQRB Feasibility Study.....	2-1
2.1.2 Informal Scoping and Screening.....	2-2
2.2 Alternatives Carried Forward to the Draft EIS .....	2-3
2.2.1 No-Build Alternative .....	2-3
2.2.2 Build Alternatives – Common Elements of Operations and Design .....	2-5
2.2.3 Enhanced Seismic Retrofit Alternative .....	2-6
2.2.4 Replacement Alternatives .....	2-10
2.2.5 Temporary Bridge Option .....	2-13
2.2.6 No Temporary Bridge Option.....	2-14
2.2.7 Construction Activities .....	2-14
2.2.8 Cost Estimates.....	2-17
2.3 Preferred Alternative .....	2-21
<b>3 Affected Environment and Environmental Consequences .....</b>	<b>3-1</b>
3.1 Transportation.....	3-1
3.1.1 Affected Environment .....	3-1
3.1.2 Impacts from Bridge Alternatives.....	3-10
3.1.3 Impacts from Construction Traffic Management Options .....	3-18
3.1.4 Construction Impacts on Safety.....	3-34
3.1.5 Potential Off-Site Staging Areas.....	3-36
3.1.6 Mitigation.....	3-36
3.2 Navigation .....	3-39
3.2.1 Affected Environment .....	3-39
3.2.2 Impacts from Bridge Alternatives.....	3-41
3.2.3 Impacts from Potential Off-Site Staging Areas .....	3-42
3.2.4 Impacts from Construction Traffic Management Options .....	3-43
3.2.5 Mitigation.....	3-43

3.3	Acquisitions and Relocations .....	3-44
3.3.1	Affected Environment .....	3-44
3.3.2	Impacts from the Bridge Alternatives .....	3-49
3.3.3	Impacts from Construction Traffic Management Options .....	3-53
3.3.4	Mitigation.....	3-54
3.4	Land Use.....	3-55
3.4.1	Affected Environment .....	3-55
3.4.2	Impacts from the Bridge Alternatives .....	3-58
3.4.3	Impacts from Construction Traffic Management Options .....	3-62
3.4.4	Mitigation.....	3-62
3.5	Economics .....	3-65
3.5.1	Affected Environment .....	3-65
3.5.2	Long-Term Impacts from the Bridge Alternatives .....	3-65
3.5.3	Short-term Impacts from the Build Alternatives .....	3-68
3.5.4	Impacts from Potential Off-Site Staging Areas .....	3-70
3.5.5	Impacts from Construction Traffic Management Options .....	3-70
3.5.6	Mitigation.....	3-70
3.6	Public Services .....	3-71
3.6.1	Affected Environment .....	3-71
3.6.2	Impacts from Bridge Alternatives.....	3-76
3.6.3	Impacts from Construction Traffic Management Options .....	3-78
3.6.4	Mitigation.....	3-79
3.7	Utilities .....	3-80
3.7.1	Affected Environment .....	3-80
3.7.2	Impacts from the Bridge Alternatives.....	3-81
3.7.3	Impacts from Construction Traffic Management Options .....	3-90
3.7.4	Mitigation.....	3-91
3.8	Social and Neighborhood Resources .....	3-91
3.8.1	Affected Environment .....	3-91
3.8.2	Impacts from the Bridge Alternatives.....	3-94
3.8.3	Impacts from Construction Traffic Management Options .....	3-100
3.8.4	Mitigation.....	3-101
3.9	Environmental Justice .....	3-103
3.9.1	Environmental Justice Background and Definition .....	3-103
3.9.2	Regulatory Context .....	3-103
3.9.3	Methodology and Data Sources .....	3-104
3.9.4	Public Involvement.....	3-105
3.9.5	Affected Environment .....	3-107
3.9.6	Impacts from Bridge Alternatives.....	3-116
3.9.7	Project Benefits .....	3-120
3.9.8	Mitigation.....	3-121
3.10	Parks and Recreation .....	3-121
3.10.1	Affected Environment .....	3-121
3.10.2	Impacts from Bridge Alternatives.....	3-123
3.10.3	Impacts from Construction Traffic Management Options .....	3-133
3.10.4	Section 4(f) Preliminary Determinations of Use.....	3-134
3.10.5	Mitigation.....	3-135
3.11	Historic and Archaeological Resources .....	3-137
3.11.1	Affected Environment .....	3-137
3.11.2	Impacts from Bridge Alternatives .....	3-145
3.11.3	Impacts from Construction Traffic Management Options .....	3-147
3.11.4	Section 4(f) Preliminary Determinations of Use.....	3-147
3.11.5	Mitigation.....	3-148

3.12	Visual and Aesthetic Resources .....	3-152
3.12.1	Affected Environment .....	3-152
3.12.2	Impacts from the Bridge Alternatives.....	3-156
3.12.3	Impacts from Construction.....	3-165
3.12.4	Mitigation.....	3-166
3.13	Geology.....	3-166
3.13.1	Affected Environment .....	3-166
3.13.2	Impacts from the Bridge Alternatives.....	3-169
3.13.3	Impacts from Construction Traffic Management Options .....	3-171
3.13.4	Mitigation.....	3-171
3.14	Water Quality .....	3-172
3.14.1	Affected Environment .....	3-172
3.14.2	Impacts from the Bridge Alternatives.....	3-176
3.14.3	Impacts from Construction Traffic Management Options .....	3-178
3.14.4	Mitigation.....	3-178
3.15	Floodplain and River Hydraulics .....	3-180
3.15.1	Affected Environment .....	3-180
3.15.2	Impacts from Bridge Alternatives.....	3-183
3.15.3	Impacts from Construction Traffic Management Options .....	3-188
3.15.4	Mitigation.....	3-188
3.16	Vegetation, Wildlife, and Aquatic Resources.....	3-191
3.16.1	Affected Environment .....	3-191
3.16.2	Impacts from the Bridge Alternatives.....	3-197
3.16.3	Impacts from Construction Traffic Management Options .....	3-202
3.16.4	Mitigation.....	3-202
3.17	Wetlands and Waters .....	3-204
3.17.1	Affected Environment .....	3-204
3.17.2	Impacts from the Bridge Alternatives.....	3-204
3.17.3	Impacts from Construction Traffic Management Options .....	3-216
3.17.4	Mitigation.....	3-216
3.18	Noise and Vibration.....	3-218
3.18.1	Affected Environment .....	3-218
3.18.2	Impacts from Bridge Alternatives.....	3-218
3.18.3	Impacts from Construction Traffic Management Options .....	3-224
3.18.4	Mitigation.....	3-225
3.19	Air Quality .....	3-227
3.19.1	Affected Environment .....	3-227
3.19.2	Impacts from the Bridge Alternatives.....	3-227
3.19.3	Impacts from Construction Traffic Management Options .....	3-229
3.19.4	Mitigation.....	3-229
3.20	Hazardous Materials .....	3-231
3.20.1	Affected Environment .....	3-231
3.20.2	Impacts from Bridge Alternatives.....	3-233
3.20.3	Impacts from Construction Traffic Management Options .....	3-235
3.20.4	Mitigation.....	3-236
3.21	Cumulative Effects .....	3-237
3.21.1	Transportation.....	3-237
3.21.2	Navigation .....	3-237
3.21.3	Land Use and Right of Way.....	3-238
3.21.4	Economics .....	3-238
3.21.5	Public Services .....	3-238
3.21.6	Utilities .....	3-239
3.21.7	Social, Neighborhoods and Environmental Justice .....	3-239
3.21.8	Parks and Recreation .....	3-239

## EARTHQUAKE READY BURNSIDE BRIDGE

3.21.9 Cultural Resources .....	3-239
3.21.10 Visual and Aesthetics .....	3-240
3.21.11 Soils and Geology .....	3-240
3.21.12 Wetlands, Waters, Hydraulics, Vegetation and Aquatic Resources .....	3-241
3.21.13 Noise and Vibration .....	3-241
3.21.14 Air Quality .....	3-242
3.21.15 Hazardous Materials .....	3-242
3.21.16 Climate Change .....	3-242
3.22 The Relationship of Local Short-Term Impacts and Use of Resources and the Maintenance of Long-Term Productivity .....	3-245
3.23 Irreversible and Irrecoverable Commitments of Resources Which Would be Involved in the Proposed Action.....	3-245

## List of Figures

Figure S-1. Frequency and Magnitude of CSZ Earthquakes .....	S-2
Figure S-2. Project Area .....	S-3
Figure S-3. Potential for Bridge and Road Structure Collapse/Failure.....	S-4
Figure S-4. Simulation of Existing Burnside Bridge after CSZ Earthquake.....	S-5
Figure S-5. Crossing Alternatives.....	S-7
Figure S-6. Enhanced Seismic Retrofit Alternative .....	S-9
Figure S-7. Enhanced Seismic Retrofit Alternative – Structures Replaced and Retrofitted.....	S-9
Figure S-8. Lane Configurations.....	S-10
Figure S-9. Replacement Alternative Short-Span Approach.....	S-12
Figure S-10. Replacement Alternative with Long-Span Approach.....	S-13
Figure S-11. Replacement Alternative with Couch Extension.....	S-14
Figure S-12. Example of Temporary Bridge for Short-Span Alternative .....	S-15
Figure S-13. Full Closure of Bridge During Construction .....	S-16
Figure S-14. Build Alternatives' Bridge Supports Located in Geological Hazard Zones.....	S-20
Figure S-15. Temporary Park Impact Areas.....	S-26
Figure S-16. Examples of Potential Long-Span Approach Bridge Types and Movable Span Bridge Types.....	S-31
Figure S-17. Eastbank Esplanade Access New Ramp Concept.....	S-33
Figure 1.3-1. Project Area .....	1-2
Figure 1.4-1. Frequency and Magnitude of CSZ Earthquakes.....	1-3
Figure 1.4-2. Risk of Bridge and Overpass Collapse .....	1-4
Figure 1.4-3. Seismic Vulnerability of Downtown Bridge Approaches .....	1-6
Figure 2.2-1. Enhanced Seismic Retrofit Alternative.....	2-7
Figure 2.2-2. Enhanced Seismic Retrofit Alternative – Structures Replaced and Retrofitted .....	2-8
Figure 2.2-3. Lane Configurations .....	2-9
Figure 2.2-4. Replacement Alternative Short-Span Approach .....	2-11
Figure 2.2-5. Replacement Alternative with Long-Span Approach .....	2-12
Figure 2.2-6. Replacement Alternative with Couch Extension .....	2-13
Figure 2.2-7. Example of Temporary Bridge for the Short-Span Alternative .....	2-14
Figure 3.1-1. Direct API .....	3-3
Figure 3.1-2. Indirect API.....	3-4
Figure 3.1-3. Existing Conditions Cross Sections .....	3-6
Figure 3.1-4. Existing Transit Network .....	3-7
Figure 3.1-5. Pedestrian Existing Conditions .....	3-8
Figure 3.1-6. Existing Bicycle Facilities .....	3-9
Figure 3.1-7. Future Build Bicycle Network – Replacement Alternative with Short-Span and Long-Span .....	3-15
Figure 3.1-8. Potential Bicycling Detour Routes during Closure of the Vera Katz Eastbank Esplanade .....	3-25
Figure 3.1-9. Potential Pedestrian Detour Routes during Closure of the Vera Katz Eastbank Esplanade .....	3-26
Figure 3.1-10. Potential Bicycling Detour Routes during Closure of the Burnside Bridge .....	3-27
Figure 3.1-11. Potential Pedestrian Detour Routes during Closure of the Burnside Bridge .....	3-28
Figure 3.2-1. Distribution of River Users .....	3-39
Figure 3.2-2. Elevation and Corresponding Horizontal Clearance for Each River User Type .....	3-40
Figure 3.2-3. Horizontal Clearance between Bridge Piers and Upriver/Downriver Bridge Width .....	3-41

## EARTHQUAKE READY BURNSIDE BRIDGE

Figure 3.3-1. Property Reference .....	3-47
Figure 3.4-1. Existing Land Use .....	3-56
Figure 3.4-2. Existing Zoning.....	3-57
Figure 3.4-3. Potential Redevelopment Lots .....	3-63
Figure 3.5-1. Economics Reference Areas and API.....	3-66
Figure 3.6-1. Direct Impact API .....	3-72
Figure 3.6-2. Existing Point Resources .....	3-73
Figure 3.8-1. Direct Impact API .....	3-92
Figure 3.8-2. Community Facilities in Project Area .....	3-93
Figure 3.9-1. Direct Impact API .....	3-108
Figure 3.9-2. Minority Populations by Census Tract .....	3-111
Figure 3.9-3. Low-Income Populations by Census Tract .....	3-113
Figure 3.9-4. Point-in-Time Homeless Count Estimates by Neighborhood (2019) .....	3-115
Figure 3.10-1. Parks .....	3-122
Figure 3.10-2. Temporary Park Impact Areas .....	3-125
Figure 3.10-3. Governor Tom McCall Waterfront Park Improvements.....	3-128
Figure 3.10-4. Vera Katz Eastbank Esplanade Park Improvements .....	3-129
Figure 3.10-5. Pier Locations in Governor Tom McCall Waterfront Park and near the Vera Katz Eastbank Esplanade.....	3-131
Figure 3.10-6. Burnside Skatepark with Temporary Bridge Impacts .....	3-134
Figure 3.11-1. Cultural Resources Analysis APE Boundaries and Historic Districts .....	3-138
Figure 3.11-2. Locations with Archaeological Potential.....	3-139
Figure 3.11-3. Location of Highlighted Resources .....	3-141
Figure 3.11-4. Burnside Bridge – Looking Northeast .....	3-142
Figure 3.11-5. Portland Harbor Wall and the Associated Ankeny Pump Station – Looking Southwest.....	3-143
Figure 3.11-6. Central Fire Station No. 1 – Looking West.....	3-143
Figure 3.11-7. The White Stag Sign – Looking West .....	3-144
Figure 3.11-8. Burnside Skatepark – Looking West.....	3-145
Figure 3.12-1. Area of Visual Effect.....	3-153
Figure 3.12-2. Landscape Units .....	3-154
Figure 3.12-3. Long-Span Alternative Looking West.....	3-158
Figure 3.12-4. Renderings of Views Looking West .....	3-160
Figure 3.12-5. Renderings of Views Looking East .....	3-163
Figure 3.12-6. Proposed Eastbank Esplanade Access Ramp .....	3-164
Figure 3.13-1. Geology Analysis Direct Impact API .....	3-167
Figure 3.13-2. Liquefaction Susceptibility in the API.....	3-168
Figure 3.14-1. Water Quality Area of Potential Impact and Project Area.....	3-173
Figure 3.14-2. Existing Stormwater Drainage Systems.....	3-175
Figure 3.14-3. Potential Water Quality Facility Locations.....	3-179
Figure 3.15-1. Direct Impact API .....	3-181
Figure 3.15-2. Willamette River Depths and Scour Patterns.....	3-184
Figure 3.16-1. Area of Potential Impact – Vegetation, Wildlife, and Aquatic Resources .....	3-192
Figure 3.16-2. Existing Vegetation in the API.....	3-193
Figure 3.16-3. Existing Shallow Water Habitat in the Project Area and API .....	3-195
Figure 3.17-1. Ordinary High Water Mark within the API .....	3-205
Figure 3.17-2. Temporary In-Water Impacts – Enhanced Retrofit .....	3-208

Figure 3.17-3 Permanent In-Water Impacts – Enhanced Retrofit .....	3-209
Figure 3.17-4 Temporary In-Water Impacts –Short-Span Alternative .....	3-210
Figure 3.17-5. Permanent In-Water Impacts – Short-Span Alternative.....	3-211
Figure 3.17-6 Temporary In-Water Impacts – Long-Span Alternative .....	3-212
Figure 3.17-7 Permanent In-Water Impacts – Long-Span Alternative .....	3-213
Figure 3.17-8 Temporary In-Water Impacts – Couch Extension .....	3-214
Figure 3.17-9 Permanent In-Water Impacts – Couch Extension.....	3-215
Figure 3.18-1. API for Noise and Vibration.....	3-219
Figure 3.18-2. Existing Conditions, Measurement Locations and Receivers, and Noise-Sensitive Land Use Near West Approach.....	3-220
Figure 3.18-3. Existing Conditions, Measurement Locations and Receivers, and Noise-Sensitive Land Use Near East Approach.....	3-221
Figure 3.20-1. Hazardous Materials API and Priority Hazardous Material Sites.....	3-232

## List of Tables

Table S-1. Major Bridge Elements by Alternative.....	S-11
Table S-2. Structure Below Ordinary High Water.....	S-21
Table S-3. Additional Approximate Temporary Construction Impacts with Use of Temporary Bridge .....	S-26
Table 2.2-1. Major Bridge Elements by Alternative .....	2-7
Table 2.2-2 Construction Impacts, Closure Extents, and Timeframes by Build Alternative .....	2-18
Table 3.1-1. Data Resources.....	3-1
Table 3.1-2. No-Build and Build Average Daily Volumes Across the Burnside Bridge – 2045 .....	3-10
Table 3.1-3. Comparison of Active Transportation Volume and Bicyclist Level of Traffic Stress (BLTS) .....	3-12
Table 3.1-4. Traffic Volumes and D/C Ratios with Full Closure – Westbound AM Peak Hour .....	3-18
Table 3.1-5. Traffic Volumes and D/C Ratios with Full Closure – Eastbound PM Peak Hour .....	3-19
Table 3.1-6. Travel Times with No Temporary Bridge – Westbound AM Peak Hour.....	3-19
Table 3.1-7. Travel Times with No Temporary Bridge – Eastbound PM Peak Hour.....	3-20
Table 3.1-8. Full Closure + I-5 Rose Quarter Closure Portland Streetcar Segment Level Operating Speeds and Travel Times – Eastbound A Loop .....	3-22
Table 3.1-9. Full Closure + I-5 Rose Quarter Closure Portland Streetcar Segment Level Operating Speeds and Travel Times – Westbound B Loop .....	3-23
Table 3.1-10. Anticipated Parking Closures for the Build Alternatives.....	3-30
Table 3.1-11. All Modes Temporary Bridge Travel Times – Westbound AM Peak Hour.....	3-31
Table 3.1-12. All Modes Temporary Bridge Travel Times – Eastbound PM Peak Hour .....	3-32
Table 3.1-13. Bicyclist Level of Traffic Stress due to Construction Impacts by Scenario .....	3-35
Table 3.1-14. Pedestrian Intersection Crossing Risk Score and Change in Intersection Approach Crossings Due to Construction Impacts by Scenario .....	3-35
Table 3.1-15. Summary of Proposed Construction-phase Mitigation Measures for All Alternatives and Options .....	3-37
Table 3.2-1. Proposed Clearances.....	3-41
Table 3.2-2. Horizontal Clearance Requirements of Impacted Tug and Barge River Users .....	3-43
Table 3.3-1. Impacted Properties .....	3-44
Table 3.3-2. Business Displacements and Property Acquisitions by Build Alternative .....	3-49
Table 3.3-3. Common Impacts .....	3-49
Table 3.3-4. Off-Site Staging Parcels .....	3-53
Table 3.3-5. Potential Mitigation for the Build Alternatives.....	3-54
Table 3.3-6. Potential Mitigation for Construction Traffic Management .....	3-54
Table 3.4-1. Existing Land Uses in the API.....	3-55
Table 3.4-2. Land Use Types Permanently Converted to Transportation Use by Alternative .....	3-59
Table 3.4-3. Land Use Types with Temporary Construction Use by Alternative.....	3-60
Table 3.4-4. List of Potential Redevelopment Lots.....	3-64
Table 3.5-1. Comparison of Safety Economic Impacts from Build Alternatives .....	3-67
Table 3.5-2. Economic Impact of Construction without a Temporary Bridge for Multnomah County, Total Over Construction Period.....	3-69
Table 3.5-3. Economic Impact of Construction without a Temporary Bridge for Oregon, Total Over Construction Period .....	3-70
Table 3.6-1. Long-Term Impact Mitigation.....	3-79
Table 3.7-1. Project Area Utility Owners .....	3-80
Table 3.7-2. Build Alternative Short-Term (Construction) Impacts.....	3-82
Table 3.7-3. Potential Mitigation for the Build Alternatives.....	3-91

Table 3.8-1. Impacted Properties – Long-Term .....	3-96
Table 3.8-2. Impacted Properties – Temporary.....	3-97
Table 3.9-1. Minority Populations within the API and County .....	3-109
Table 3.9-2. Minority Populations within Census Tracts .....	3-109
Table 3.9-3. Low-Income Populations within the API and County .....	3-112
Table 3.9-4. Displacements and Acquisitions by Alternative.....	3-117
Table 3.10-1. Construction Timing with Parks and Recreation Resources.....	3-126
Table 3.10-2. Summary of Section 4(f) Use Types and Documentation Type, by Alternative.....	3-134
Table 3.10-3. Long-Term Impact Mitigation .....	3-135
Table 3.11-1. Summary of Section 4(f) Use Types and Documentation Type, by Alternative.....	3-148
Table 3.11-2. Burnside Skatepark Potential Mitigation Measures .....	3-150
Table 3.12-1. Visual Identity Aspects .....	3-152
Table 3.12-2. Aspects of Visual Perception .....	3-156
Table 3.12-3. Summary of Impacts to Visual Quality .....	3-165
Table 3.13-1. Comparison of Shafts Needed for Each Build Alternative .....	3-169
Table 3.14-1. Existing Stormwater Drainage Systems.....	3-174
Table 3.14-2. Net Increase in Impervious Surface and Acres of Treated and Untreated Impervious Area within the API .....	3-176
Table 3.15-1. Estimated Floodway Encroachment.....	3-185
Table 3.15-2. Estimated Percent Increase in Scour Length.....	3-185
Table 3.15-3. API Floodplain Encroachment (Outside of the Floodway) .....	3-187
Table 3.15-4. Estimated Temporary Floodway Encroachment .....	3-190
Table 3.16-1. Species Status Amphibians and Reptiles with a Potential Range in the API .....	3-194
Table 3.16-2. ESA-Listed Threatened and Endangered Fish Species in the Lower Willamette River .....	3-196
Table 3.16-3. Temporary Construction Activities Causing Impacts to Vegetation, Wildlife, and Aquatic Species for All Build Alternatives.....	3-199
Table 3.16-4. Permanent Impacts to Vegetation, Wildlife, and Aquatic Species for All Build Alternatives .....	3-200
Table 3.16-5. Required Permits, Compliance, and Authorizations Related to Vegetation, Wildlife, and Aquatic Species .....	3-201
Table 3.16-6. Additional Approximate Temporary Construction Impacts with Use of Temporary Bridge .....	3-202
Table 3.17-1. Comparison of Permanent and Temporary Structures below the Ordinary High Water Mark .....	3-206
Table 3.17-2. Temporary Bridge Construction Impacts.....	3-216
Table 3.18-1. Construction Activities and Predicted Noise Levels .....	3-222
Table 3.18-2. Distance from Construction for Potential Damage for Building/Structural Categories .....	3-223
Table 3.18-3. Distance from Construction for Potential Annoyance for Land Use Categories .....	3-223
Table 3.19-1. Annual Average Daily Traffic for Existing and Future Conditions .....	3-228
Table 3.20-1. Priority Hazardous Materials Sites within the API.....	3-233

## Attachments

- A Acronyms and Abbreviations
- B References
- C List of Preparers
- D List of Supporting Technical Documentation
- E List of Distribution and Notice of Availability
- F Agency Letters
- G Detailed Graphics of Alternatives
- H Preferred Alternative Evaluation Process and Results
- I Summary of Permits and Clearances Needed
- J Summary of Potential Mitigation
- K Summary of Public Involvement and Agency Coordination
- L Index
- M Draft Section 4(f) Analysis
- N Planning and Environmental Linkages Strategy and Progress Documentation through November 2020
- O Cost Risk Assessment Summaries