Stormwater Technical Report

Multnomah County | Earthquake Ready Burnside Bridge Project

Portland, OR

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Earthquake Ready Burnside Bridge Stormwater Technical Report

Prepared for

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CERTIFICATION

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Contents

Executive Summary 1

1 Introduction 1

1.1 Project Location 1

1.2 Project Purpose 1

2 Project Alternatives 1

3 Definitions 2

4 Legal Regulations and Standards 3

4.1 Laws, Plans, Policies, and Regulations 3

4.1.1 Federal 3

4.1.2 State 3

4.1.3 Regional and Local 4

4.2 Design Standards 4

5 Affected Environment 5

5.1 Area of Potential Impact 5

5.2 Resource Identification and Evaluation Methods 8

5.2.1 Published Sources and Databases 8

5.2.2 Field Visits and Surveys 8

5.3 Existing Conditions 9

5.3.1 Stormwater System 9

5.3.2 Surface Water 12

5.3.3 Groundwater 13

5.3.4 Contaminated Sites 13

6 Impact Assessment Methodology and Data Sources 13

6.1 Long-Term Impact Assessment Methods 13

6.2 Short-Term Impact Assessment Methods 14

6.3 Indirect Impact Assessment Methods 14

6.4 Cumulative Impact Assessment Methods 14

7 Environmental Consequences 15

7.1 Introduction 15

7.2 Pre-Earthquake Impacts 15

7.2.1 Water Quality Treatment and Surface Water 15

7.2.2 Volume of Stormwater Runoff 15

7.2.3 No-Build 17

7.2.4 Enhanced Retrofit 17

7.2.5 Replacement, Short-span 18

7.2.6 Replacement, Long-span 19

7.2.7 Replacement with Couch Extension 20

7.3 Post-Earthquake Impacts 21

7.3.1 No-Build 21

7.3.2 Enhanced Retrofit 21

7.3.3 Replacement, Short-span 21

7.3.4 Replacement, Long-span 22

7.3.5 Replacement with Couch Extension 22

7.4 Construction Impacts 22
7.4.1 Without Temporary Bridge 22
7.4.2 With Temporary Bridge 23
7.4.3 Potential Off-Site Staging Areas 24
7.5 Cumulative Effects 24
7.5.1 No-Build Alternative 25
7.5.2 Build Alternatives 25
7.6 Compliance with Laws, Regulations, and Standards 25
7.7 Conclusion 26
8 Mitigation Measures 26
8.1 Water Quality Treatment and Surface Waters 26
8.2 Volume of Stormwater Runoff 27
9 Contacts and Coordination 28
10 Preparers 28
11 References 29

Tables

Table 1. Existing Stormwater Drainage Systems 10
Table 2. Net Increase in Impervious Area 16
Table 3. Impervious Areas within the API Discharge Location by Alternative 16
Table 4. Acres of Impervious Area within the API Treated and Untreated by Alternative 17
Table 5. Required Permits Related to Stormwater 25

Figures

Figure 1. Area of Potential Impact 7
Figure 2 Existing Stormwater Drainage Systems 11

Acronyms, Initialisms, and Abbreviations

API	Area of Potential Impact
BES	City of Portland Bureau of Environmental Services
CFR	Code of Federal Regulations
CIA	contributing impervious area
CSO	combined sewer overflow
CSZ	Cascadia Subduction Zone
DEQ	Oregon Department of Environmental Quality
EIS	environmental impact statement
EQRB	Earthquake Ready Burnside Bridge
FAHP	Federal Aid Highway Program
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
ODOT	Oregon Department of Transportation
OWRD	Oregon Water Resources Department
PAHs	polycyclic aromatic hydrocarbons
ROW	right-of-way
TAPE	Washington State Department of Ecology Technology Assessment Protocol – Ecology
TMDL	Total maximum daily loads
U.S.	United States
USC	United States Code
USGS	U.S. Geological Survey

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Executive Summary

As part of the Draft Environmental Impact Statement for the Earthquake Ready Burnside Bridge Project (Project), a Stormwater Technical Report has been prepared to identify and evaluate potential stormwater impacts within the Project's Area of Potential Impact. The stormwater impacts are similar for each construction alternative and all of the construction alternatives would result in a net increase of areas being treated to current water quality standards for new transportation projects.

The Retrofit Alternative would have the greatest impact to stormwater, as it would result in the lowest amount of area treated to current water quality standards. The alternative with the least impact to stormwater is the Couch Extension Alternative, as it would result in the highest amount of area treated to current water quality standards.

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1 Introduction

As a part of the preparation of the Environmental Impact Statement (EIS) for the Earthquake Ready Burnside Bridge (EQRB) Project, this technical report has been prepared to identify and evaluate stormwater impacts within the Project's Area of Potential Impact (API) and in downstream water bodies.

1.1 Project Location

The Project Area is located within the central city of Portland. The Burnside Bridge crosses the Willamette River connecting the west and east sides of the city. The Project Area encompasses a one-block radius around the existing Burnside Bridge and W/E Burnside Street, from NW/SW 3rd Avenue on the west side of the river and NE/SE Grand Avenue on the east side. Several neighborhoods surround the area including Old Town/Chinatown, Downtown, Kerns, and Buckman. Figure 1 shows the Project Area and API.

1.2 Project Purpose

The primary purpose of the Project is to build a seismically resilient Burnside Street lifeline crossing over the Willamette River that will remain fully operational and accessible for vehicles and other modes of transportation following a major Cascadia Subduction Zone earthquake. The Burnside Bridge will provide a reliable crossing for emergency response, evacuation, and economic recovery after an earthquake. Additionally, the bridge will provide a long-term safe crossing with low-maintenance needs.

2 Project Alternatives

The project alternatives are described in detail with text and graphics in the *EQRB Description of Alternatives Report* (Multnomah County 2021b). That report describes the alternatives' current design as well as operations and construction assumptions.

Briefly, the DEIS evaluates the No-Build Alternative and four Build Alternatives. Among the Build Alternatives there is an Enhanced Seismic Retrofit Alternative that would replace certain elements of the existing bridge and retrofit other elements. There are three Replacement Alternatives that would completely remove and replace the existing bridge. In addition, the DEIS considers options for managing traffic during construction. Nomenclature for the alternatives/options are:

- No-Build Alternative
- Build Alternatives:
    - Enhanced Seismic Retrofit (Retrofit Alternative)
    - Replacement Alternative with Short-span Approach (Short-span Alternative)
    - Replacement Alternative with I Long-span Approach (Long-span Alternative)

    - Replacement Alternative with Couch Extension (Couch Extension Alternative)
- Construction Traffic Management Options
    - Temporary Detour Bridge Option (Temporary Bridge) includes three modal options:
        - Temporary Bridge: All modes
        - Temporary Bridge: Transit, Bicycles and Pedestrians only
        - Temporary Bridge: Bicycles and Pedestrians only
    - Without Temporary Detour Bridge Option (No Temporary Bridge)

3 Definitions

The following terminology will be used when discussing geographic areas in the EIS:

- **Project Area –** The area within which improvements associated with the Project alternatives would occur and the area needed to construct these improvements. The Project Area includes the area needed to construct all permanent infrastructure, including adjacent parcels where modifications are required for associated work such as utility realignments or upgrades. For the EQRB Project, the Project Area includes approximately a one-block radius around the existing Burnside Bridge and W/E Burnside Street, from NW/SW 3rd Avenue on the west side of the river and NE/SE Grand Avenue on the east side.
- **Area of Potential Impact –** This is the geographic boundary within which physical impacts to the environment could occur with the Project alternatives. The API is resource-specific and differs depending on the environmental topic being addressed. For all topics, the API will encompass the Project Area, and for some topics, the geographic extent of the API will be the same as that for the Project Area; for other topics (such as for transportation effects) the API will be substantially larger to account for impacts that could occur outside of the Project Area. The API for stormwater is defined in Section 5.1.
- **Project Vicinity –** The environs surrounding the Project Area. The Project vicinity does not have a distinct geographic boundary but is used in general discussion to denote the larger area, inclusive of the Old Town/Chinatown, Downtown, Kerns, and Buckman neighborhoods.
- **Contributing Impervious Area (CIA) –** The impervious surfaces within the strict project limits, plus impervious surface owned or operated by Multnomah County, the City of Portland or the Oregon Department of Transportation (ODOT) outside the project limits that drain to the project via direct flow or discrete conveyance.

4 Legal Regulations and Standards

4.1 Laws, Plans, Policies, and Regulations

The following is a summary of federal, state, and local laws, regulations, plans, and policies that guide or inform the stormwater assessment.

4.1.1 Federal

- Clean Water Act (Water Pollution Control Act of 1972 and Amendments; 33 United States Code [USC] §1251 et seq.), and associated regulations codified at 40 Code of Federal Regulations (CFR) and 33 CFR - regulates discharges of pollutants into waters of the United States.
- The Endangered Species Act (Endangered Species Act of 1973 and Amendments; 16 USC §1531 et. seq.) - provides a framework to conserve and protect endangered and threatened species and their habitats.
- Fish and Wildlife Coordination Act (Fish and Wildlife Coordination Act of 1934 and Amendments, 16 USC §661 et. seq.) - protects fish and wildlife when federal actions result in the control of modification of a natural stream or body of water.
- The Safe Drinking Water Act (Safe Drinking Water Act of 1974 and Amendments; 42 USC §300f et. seq.) - protects public drinking water supplies throughout the United States.
- Magnuson-Stevens Fishery Conservation and Management Act (Fishery Conservation and Management Act of 1976 and Amendments; 16 USC §1801 et. seq.) – protects fisheries within the Exclusive Economic Zone.

4.1.2 State

- Oregon Department of Environmental Quality (DEQ), National Pollutant Discharge Elimination System (NPDES) MS4 Permit No. 101314 – prescribes all stormwater and allowable non-stormwater dischargers from the MS4 within the City of Portland urban services boundary to surface waters of the state.
- DEQ NPDES MS4 Permit No. 103004 – prescribes all stormwater and allowable non-stormwater discharges from the MS4 within the limits of the five County-operated Willamette River Bridges.
- Oregon's Statewide Planning Goals & Guidelines (Oregon Administrative Rule 660-015-0000):
    - Goal 6: Air, Water, and Land Resources Quality – protects the integrity of air, water, and land resources.
    - Goal 15: Willamette River Greenway – protects, conserves, enhances, and maintains the natural, scenic, historical, agricultural, economic, and recreational qualities of lands along the Willamette River.

4.1.3 Regional and Local

- Multnomah County Transportation System Plan Policy 20: Environment– avoids and minimizes impacts to the natural environment, fish, and wildlife habitat when applying roadway design standards.
- City of Portland Public Improvements Code Title 17 Public Improvements, Chapter 17.38 Drainage and Water Quality - provides for the effective management of stormwater, groundwater, and drainage, and to protect and improve water quality in the City of Portland.
- City of Portland NPDES Stormwater Discharge Permit No. 101314 - protects water quality of waters through regulation of point source discharges.
- City of Portland Environmental Services Best Management Practices: Erosion and Sediment Control – provides guidance for temporary and permanent erosion prevention, sediment control, and control of other development activities.

4.2 Design Standards

The most current versions of the following federal, state, and local design standards will be applied to stormwater design for the Project.

- Design standards in the Federal Aid Highway Program (FAHP) Programmatic Agreement
- ODOT FAHP Programmatic User's Guide
- ODOT Hydraulics Manual
- ODOT Standard Specifications for Construction
- Multnomah County Design Standards, Section 5 (Drainage)
- City of Portland Standard Construction Specifications
- City of Portland Bureau of Environmental Services (BES) Stormwater Management Manual
- City of Portland BES Sewer and Drainage Facilities Design Manual
- City of Portland Erosion, Sediment, and Pollutant Control Plan (Title 10 PCC)
- Washington State Department of Ecology Technology Assessment Protocol – Ecology (TAPE)

If there are differences between design criteria, the highest level of stormwater management specified will be used for design. The Project would be designed to meet or exceed the standards required by the FAHP Programmatic Agreement between the Federal Highway Administration and the National Marine Fisheries Service (NMFS) and the requirements provided in their respective NPDES Municipal Separate Storm Sewer System permits and associated Stormwater Management Manuals.

The following minimum design standards will apply to the Project:

- The Project will design to the City of Portland’s water quality design storm of 1.61 inches.
- Water quality treatment of the post-Project CIA is required. Per the FAHP, CIA is defined as all impervious surfaces within the strict project limits plus impervious surfaces owned or controlled by the transportation agency outside the project limits that drain to the project via direct flow or discrete conveyance.
- CIA that is drained by the combined stormwater-sanitary systems will require treatment prior to entering the systems.
- Water quality facilities are required to provide treatment for total suspended solids, polycyclic aromatic hydrocarbons (PAHs) and dissolved metals such as copper and zinc.
- Inlet spacing and conveyance systems will be designed using a minimum time of concentration of five minutes, and a rainfall intensity of 2.86 inches per hour (10-year return interval) per BES and ODOT standards.
- Because the existing stormwater-only system outfalls directly into the Willamette River, a large waterbody, neither the City of Portland, ODOT, nor FAHP requires flow control for stormwater-only drainage systems.
- Drainage systems that propose to connect to the combined stormwater-sanitary systems will require a downstream analysis to determine if detention will be required to prevent surcharging during the 25-year storm event per BES standards.
- Infiltration facilities will be incorporated into the design where feasible to provide pre-treatment and reduce downstream flows per BES standards.

5 Affected Environment

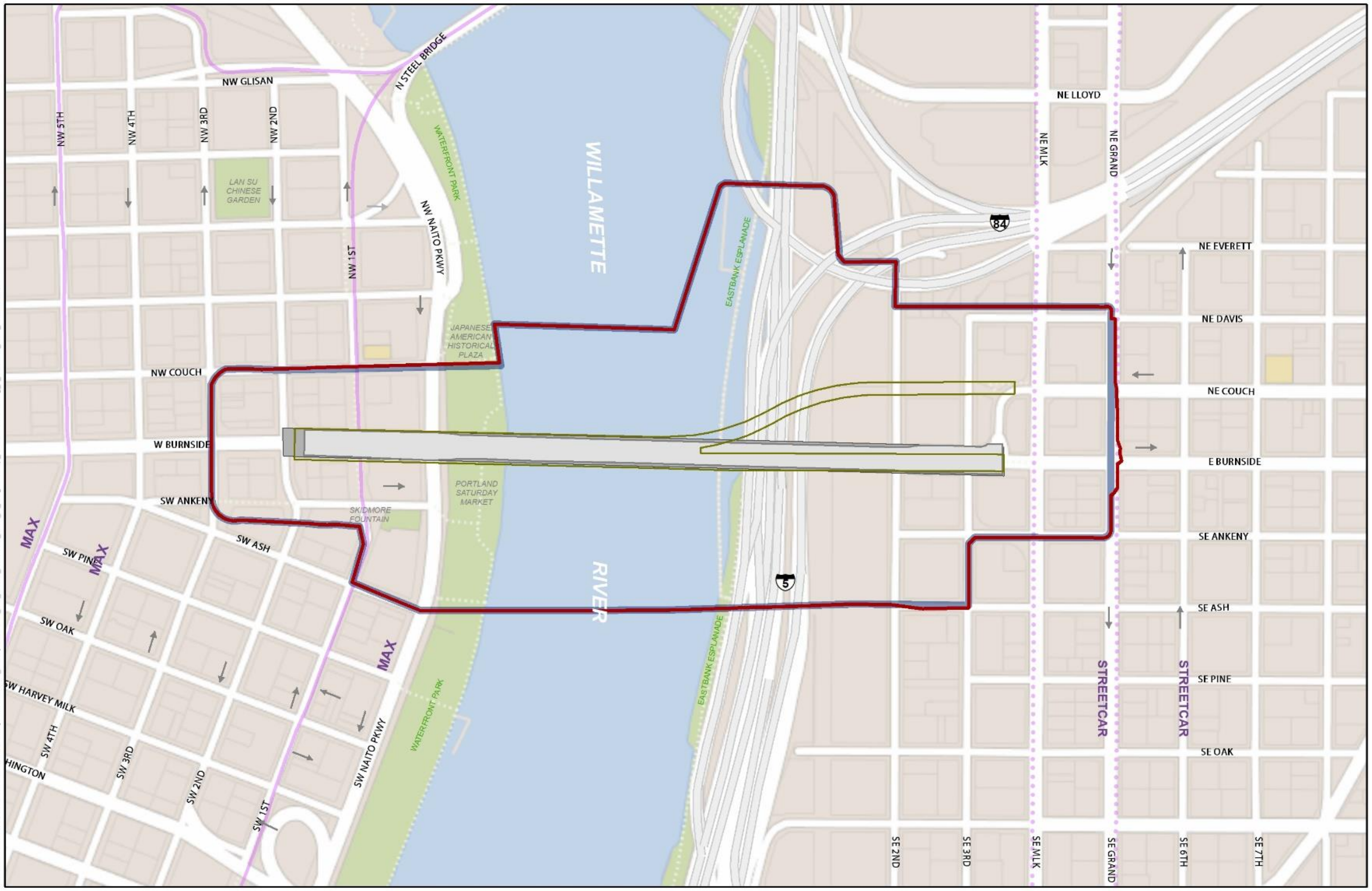
5.1 Area of Potential Impact

The API for the stormwater analysis is larger than the Project Area. The API will encompass the impervious areas within right-of-way (ROW) that drain to the Project Area, in addition to the Project Area (Figure 1). The API includes all of the areas that could be considered CIA for any of the alternatives. CIA would be created by any alternative that proposes any of the following activities:

- Creating additional impervious area
- Reconstructing (to subgrade) or realigning the existing roadway or other impervious areas
- Modifying existing drainage patterns
- Modifying existing conveyance system
- Creating new discharge locations

Potential stormwater impacts in the Willamette River downstream from the Project Area and outside the API will be further addressed during consultation with NMFS. The NMFS action area for stormwater will extend to the Pacific Ocean, but does not expand the API for the purpose of this analysis.

Figure 1. Area of Potential Impact



EARTHQUAKE READY BURNSIDE BRIDGE

Source:
City of Portland, Oregon
HDR, Parametrix

0 250 500 1,000 Feet

API
Project Area
Movable Bridge: NE Couch Connection
Enhanced Seismic Retrofit
Movable Bridge

Figure 1
Project Location
Stormwater

Earthquake Ready Burnside

5.2 Resource Identification and Evaluation Methods

5.2.1 Published Sources and Databases

The following sources were used to identify existing conditions and management resources of stormwater in the Project Area:

- Existing utility geographic information system data from local agencies including City of Portland Bureau of Transportation, BES, and Portland Water Bureau
- Multnomah County tax parcel ownership and lot dimensions
- As-builts provided by Multnomah County, ODOT, and the City of Portland for past projects within the Project Area
- The Oregon DEQ's list of water quality limited waterbodies (DEQ 2012) to determine if receiving waters are water quality limited
- The Oregon Water Resources Department (OWRD) well logs and the U.S. Geological Survey (USGS) Estimated Depth to Ground Water and Configuration of the Water Table in the Portland, Oregon Area Scientific Investigations Report 2008-5059 to determine approximate depth to groundwater within the Project limits (OWRD 2019; USGS 2008)
- Existing topographic information obtained from the City of Portland to determine the CIA and existing drainage sub-basins
- Existing soils and infiltration rates using the U.S. Department of Agriculture's Web Soil Survey (U.S. Department of Agriculture 2019), in addition to previous investigations obtained from the City of Portland
- The DEQ's quality hazards and environmental cleanup site database for contaminated sites within project boundaries

Existing topographic information and geographic information system data was used to estimate drainage patterns and CIA of the Build Alternatives for stormwater analysis.

The Build Alternatives was compared with the No-Build Alternative (baseline conditions) to determine how the Project may affect stormwater and impacts to base and peak flows in receiving waterbodies or drainage systems.

5.2.2 Field Visits and Surveys

Field visits were conducted to verify geospatial data of existing stormwater management facilities and outfalls. Field observations were also used to determine if additional stormwater management facilities were constructed since the time the geospatial data was updated.

5.3 Existing Conditions

5.3.1 Stormwater System

Water Quality Treatment and Volume

On the west side of the Willamette River, existing stormwater collection and conveyance within the API are developed and built-out, but water quality treatment is not present. Any stormwater-only systems currently connect to the City of Portland's combined sewer overflow systems and are chiefly conveyed to the Ankeny Pump Station. Stormwater runoff from the entire 7.1 acres of impervious area managed by the City of Portland or Multnomah County within the API is currently captured in this manner. Once the Ankeny Pump Station reaches capacity, flow spills over a weir into the West Side Combined Sewer Overflow (CSO) tunnel and is conveyed to the Swan Island CSO Pump Station. From there, the flow is pumped to the Columbia Boulevard Treatment Plant.

On the east side of the Willamette River existing stormwater collection and conveyance within the API is developed and built-out, but water quality treatment through stormwater planters is only provided for approximately 0.5 acres of the 10.0 acres of impervious area managed by the City of Portland or Multnomah County. The stormwater planters are assumed effective at removing total suspended solids, dissolved nutrients, and heavy metals. The API is drained by both stormwater-only systems and combined sewer overflow systems. The impervious area managed by the City of Portland or Multnomah County that drains to the stormwater-only system is 3.7 acres. Stormwater-only conveyance is generally east to west and terminates at an outfall located on the east bank of the Willamette River beneath the Burnside Bridge. The impervious area managed by the City of Portland or Multnomah County that drains to the combined stormwater-sanitary system is 6.4 acres. CSO conveyance terminates at the Columbia Boulevard Wastewater Treatment Facility. Much of the CSO flow is conveyed via the Peninsular Tunnel in this area. Additional flow is conveyed by the Alder Pump and Sullivan Pump Stations in adjoining areas. Once these systems reach capacity, flow is diverted to a large-diameter north-south conduit (i.e., East Side Big Pipe) to prevent overflow discharges to the Willamette River. As with the West Side Tunnel, flow is pumped to the Columbia Boulevard Treatment Plant via the Swan Island CSO.

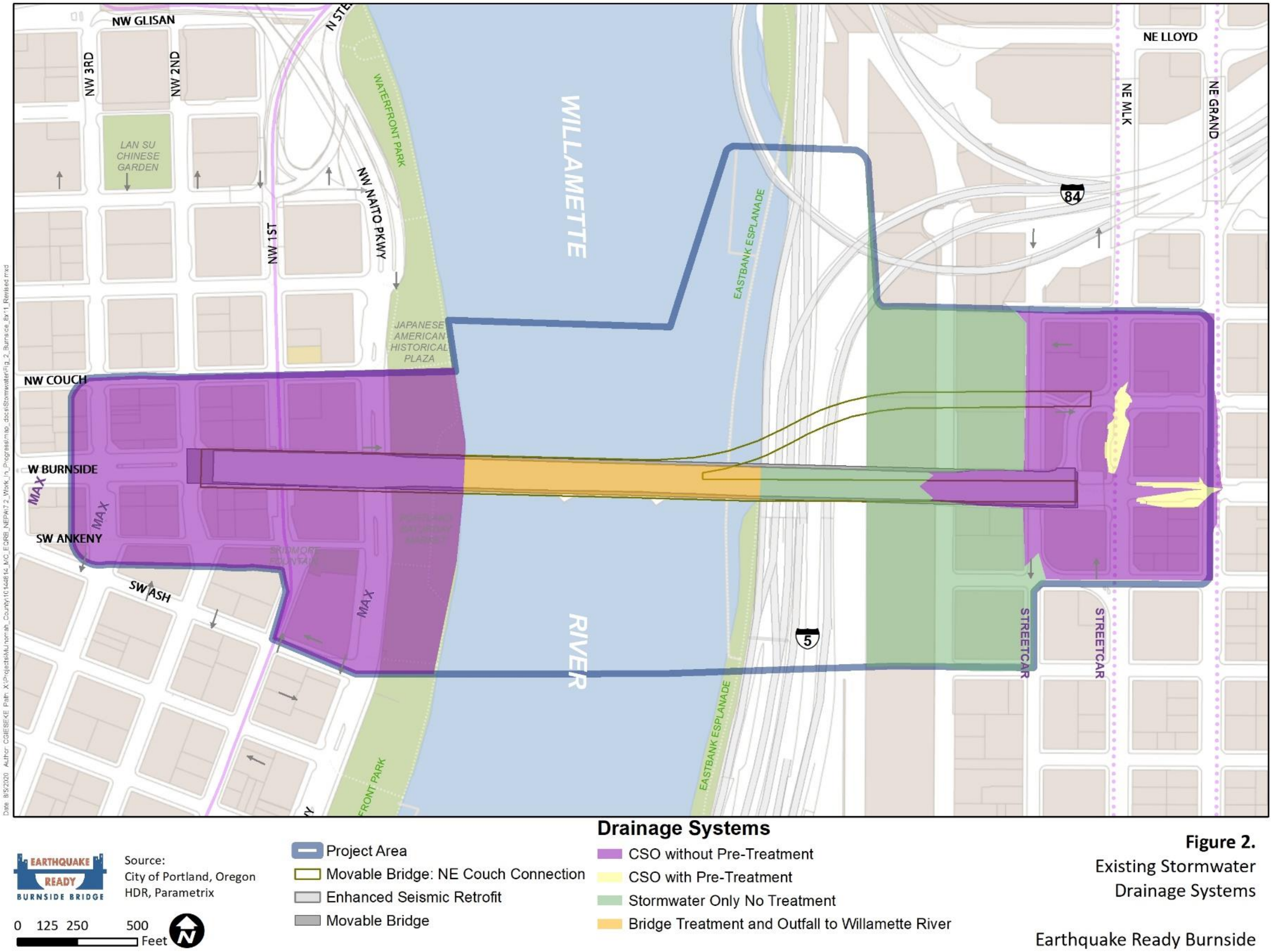
There is currently no certification stating that the Columbia Boulevard Wastewater Treatment Facility is capable of removing highway runoff pollutants, particularly metals.

Runoff from 1.6 acres of the existing bridge deck is currently collected by deck drains, treated in media cartridge filters, and discharged directly to the Willamette River. Runoff from 1.1 acres of the existing bridge deck is discharged to the CSO system on the west bank, 1.0 acre is discharged to the stormwater-only system on the east bank, and 0.6 acre is discharged to the CSO system on the east bank. The existing stormwater treatment facilities on the bridge are effective at treating runoff for total suspended solids and phosphorous, but are not on the TAPE general use level designation list for enhanced treatment and is not certified to remove heavy metals or other pollutants of concern. Table 1 summarizes the existing stormwater drainage system discharge locations mentioned above. Figure 2 displays the areas drained by each of the existing stormwater drainage systems.

Table 1. Existing Stormwater Drainage Systems

	CSO without Pre-Treatment (acres)	CSO with Pre-Treatment (acres)	Stormwater-Only No Treatment (acres)	Bridge Treatment and Outfall to Willamette River
West Bank	6.0	0.0	0.0	0.0
West Half Bridge Deck	1.1	0.0	0.0	0.8
East Half Bridge Deck	0.6	0.0	1.0	0.8
East Bank	5.2	0.5	2.7	0.0
Total within API	12.9	0.5	3.7	1.6

Figure 2 Existing Stormwater Drainage Systems



5.3.2 Surface Water

The Willamette River flows through the middle of the API. The stormwater runoff from the Project Area within ODOT ROW is discharged to the Willamette River. Portions of the Project Area within City ROW drain to the Willamette River: 1.6 acres of the existing bridge deck and 3.7 acres of managed impervious area collected via a stormwater-only system discharge to the Willamette River. Stormwater generated by roadways contains pollutants such as heavy metals, oils, PAHs, bacteria, and sediment, which adversely affect human health and other life within the receiving bodies of water. For a list of wildlife and vegetation species found in the Willamette River, see the *EQRB Vegetation, Wildlife, and Aquatic Species Technical Report* (Multnomah County 2021f).

According to DEQ, the Willamette River is listed as an impaired waterbody under Section 303(d) of the Clean Water Act for the following pollutants:

- Aldrin
- Aquatic weeds or algae
- Arsenic
- Bacteria
- Biological criteria
- Copper
- Dichlorodiphenyltrichloroethane (DDT) and DDT metabolite
- Dichloroethylene
- Dieldrin
- Dissolved oxygen
- Iron
- Lead
- Mercury
- Manganese
- Polychlorinated biphenyl and polycyclic aromatic hydrocarbon
- Pentachlorophenol
- pH
- Temperature
- Turbidity
- Tetrachloroethylene
- Turbidity
- Zinc

Of these pollutants, only bacteria, DDT, dieldrin, dissolved oxygen, mercury, temperature, and turbidity have currently approved total maximum daily loads (TMDLs; DEQ 2006). Stormwater that is directly discharged into the Willamette River or into a storm sewer that discharges to the Willamette River must be treated to reduce these pollutants of concern.

5.3.3 Groundwater

The OWRD databases show more than 700 wells located within Township 1 North Range 1 East, Sections 34 and 35, which are the one-square-mile sections that contain the API. Ninety-six percent of these wells are geotechnical explorations, two percent are monitoring wells, and two percent are water wells. A total of nine wells reported depth of water, which ranged between 10 and 156 feet below ground surface. Mean depth to groundwater was 59 feet below ground surface.

5.3.4 Contaminated Sites

Up to 69 sites within the Project Area are known or suspected to be contaminated (either soil or groundwater). The exact number is likely lower than 69 because some of the sites are counted on multiple databases used to compile the number of sites. Further information regarding these sites is provided in the *EQRB Hazardous Materials Technical Report* (Multnomah County 2021c). These sites may constrain placement of stormwater facilities within the API.

6 Impact Assessment Methodology and Data Sources

The impacts analysis addresses the direct long-term and direct short-term, indirect and cumulative stormwater and water quality impacts of the Project alternatives, including the No-Build Alternative.

6.1 Long-Term Impact Assessment Methods

The analysis of direct long-term stormwater impacts considered:

- Any of the Build Alternatives would result in impervious area that would require stormwater treatment, infiltration, disposal, and possibly detention. Water quality facilities would be designed to meet current regulatory requirements and treat existing areas that are currently discharged without treatment. A comparison of treated and untreated runoff from the impervious area managed by the City of Portland or Multnomah County within the API was made for each of the Project alternatives including the baseline conditions. Proposed changes in flow patterns were documented and impacts identified. Impervious area managed by the City of Portland or Multnomah County within the API that discharges to the Willamette River was compared for all of the Project alternatives, including the baseline conditions. Discharges into the combined stormwater-sanitary system were compared for all of the Project alternatives.

- Groundwater impacts are not expected to result from long-term and operational project activities associated with stormwater management. Water quality facility design, per the ODOT Hydraulics Manual and the City of Portland Stormwater Management Manual, incorporates a minimum distance from groundwater to protect groundwater quality. Additionally, water quality facilities may be designed with an impermeable membrane to protect groundwater quality.

6.2 Short-Term Impact Assessment Methods

The analysis of direct short-term stormwater impacts will consider:

- Construction activities for the Build Alternatives could increase sediment loads, if erosion and sediment control measures and construction best management practices are not implemented. Vegetation removal, demolition, soil compaction from heavy equipment, excavation, use of staging areas, and temporary construction work bridges are typical sources of increased sediment loads; and if uncontrolled, these would have adverse impacts on water quality in receiving waters. Other impacts that could result from construction activities include inadvertent releases of hazardous materials such as petroleum products, paint, or coatings.
- Groundwater impacts are not expected to result from demolition or construction activities. Staging may result in vegetation removal and soil compaction at staging sites, which could inhibit infiltration of groundwater; however, these areas would be small in size and would not present impacts to the groundwater system.

6.3 Indirect Impact Assessment Methods

Indirect impacts are caused by a specific action, and take place later in time or are further removed in distance, but are still reasonably foreseeable (40 CFR 1508.8). Indirect impacts to stormwater that may result from increased contamination stemming from project-induced increases in traffic that may occur during and after project construction will be assessed. As part of this task, the Land Use finding on induced traffic within the Project vicinity were reviewed.

6.4 Cumulative Impact Assessment Methods

The cumulative impacts analysis considered the Project's impacts combined with other past, present, and reasonably foreseeable future actions that would have environmental impacts in the Project vicinity. Based on the list of foreseeable transportation and other development projects that are anticipated to occur in the Project vicinity within the same time frame, as well as relevant past actions that have defined the Project vicinity, a qualitative analysis of potential cumulative effects was conducted for stormwater management impacts. The analysis of potential cumulative stormwater management impacts were examined for both near-term construction effects as well as long-term operational impacts.

7 Environmental Consequences

7.1 Introduction

The description of long-term Impacts is divided into (a) pre-earthquake impacts, and (b) impacts that would occur after the next Cascadia Subduction Zone (CSZ) earthquake (emergency response and longer-term recovery).

Any of the Build Alternatives would trigger stormwater management requirements. The difference between the alternatives comes from the quantities of impervious areas that are created and need to be treated, and existing impervious area that needs to be treated or would be converted from impervious to pervious.

7.2 Pre-Earthquake Impacts

Direct and indirect impacts to stormwater would result from the construction of any of the Build Alternatives. The Build Alternatives differ in the amount of impacts, such as the impervious areas that would receive water quality treatment, the volume of runoff needing to be detained, and the duration of any temporary stormwater measures required during construction.

7.2.1 Water Quality Treatment and Surface Water

The Project would impact water quality treatment through the required stormwater treatment triggered by the construction activities of any of the Build Alternatives. Any existing impervious area that was reconstructed or any newly created impervious area would require treatment of stormwater runoff that meets the design standards listed in Section 4.2. For all of the Build Alternatives this would result in a greater volume of stormwater runoff receiving treatment up to the current standards (Section 4.2), when compared to the No-Build Alternative. Table 2 provides comparisons between alternatives.

7.2.2 Volume of Stormwater Runoff

The Project would impact the volume of stormwater being discharged to the Willamette River and to the City of Portland's CSO system. Any of the Replacement Alternatives would increase the amount of impervious area, which would result in increased runoff volumes. The Retrofit Alternative would not create any additional impervious area. Areas that connect to stormwater-only systems would be required to verify the existing system has capacity for the proposed increases in flows or increase the capacity to meet the proposed flow requirements, but would not require detention. Areas that connect to the CSO would be required to mitigate the increased runoff volume through detention to meet the most current design standards outlined in the City of Portland BES Sewer and Drainage Facilities Design Manual. Detention would be achieved using underground vaults or pipes.

Table 2, Table 3, and Table 4 summarize the potential stormwater system impacts for any of the Build Alternatives compared to the No-Build Alternative. Table 2 compares the total amount of net impervious area created by each of the Build Alternatives.

Table 2. Net Increase in Impervious Area

Alternative	Net Increase in Impervious Area (acres)
No-Build	0.0
Enhanced Retrofit	0.0
Replacement, Short-span	0.9
Replacement, Long-span	0.9
Replacement with Couch Extension	2.2

There are five potential locations for the impervious areas within the API to drain. There are CSO systems on both the West and the East Banks of the river, there is an existing stormwater only system that drains a portion of the API on the East Bank, there are deck drains on the existing bridge that discharge directly to the river, and there is a proposed stormwater system in vicinity of Pier 1 to collect bridge deck runoff for any of the Build Alternatives. Table 3 summarizes the areas within the API that discharge to the different drainage systems. Note that not all alternatives propose the same amount of impervious areas, this is because the bridge deck footprints differ between alternatives.

Table 3. Impervious Areas within the API Discharge Location by Alternative

Alternative	West Bank CSO (acres)	West Bank Storm (acres)	East Bank CSO (acres)	East Bank Storm (acres)	Bridge Deck to River (acres)
No-Build	7.1	0.0	6.4	3.7	1.6
Enhanced Retrofit	6.6	1.2	6.4	4.5	0.0
Replacement, Short-span	6.6	1.6	6.4	5.0	0.0
Replacement, Long-span	6.6	1.6	6.4	5.0	0.0
Replacement with Couch Extension	6.6	2.3	6.0	5.1	0.0

Table 4 summarizes the amount of impervious area within the API that is currently or would be treated or not treated to the current water quality design standards for transportation projects within the Project Area. The totals of impervious area differ between alternatives. This is due to the different bridge deck footprints.

Table 4. Acres of Impervious Area within the API Treated and Untreated by Alternative

Alternative	Treated (acres)	Untreated (acres)
No-Build	0.5[a]	18.2
Enhanced Retrofit	6.3[a]	12.4[b]
Replacement, Short-span	7.5[a]	12.1[b]
Replacement, Long-span	7.5[a]	12.1[b]
Replacement with Couch Extension	8.7[a]	11.3[b]

[a] Is currently or would be treated to current regulatory standards for transportation projects

[b] Impervious area within the API that is not considered CIA and therefore does not require water quality treatment

7.2.3 No-Build

Under the No-Build Alternative direct adverse impacts on stormwater quality would continue. The No-Build Alternative would continue to discharge stormwater runoff treated to a lower standard than required to comply with the current minimum standards for new projects. Table 4 provides the acres of untreated impervious area for the No-Build Alternative.

7.2.4 Enhanced Retrofit

Direct Long-Term

The Retrofit Alternative and all the Build Alternatives would have long-term direct impacts to stormwater management. These Project impacts would create new impervious area or modify existing impervious area. Such activities would include reconstruction of the bridge deck, reconstruction or realignment of the roadway at either ends of the road deck, changing existing drainage patterns to cause runoff to discharge to a new location. Under any of the Build Alternatives, runoff from the bridge deck will be conveyed to either end of the bridge prior to being treated, this differs from existing conditions where the stormwater on the bridge deck is treated on the bridge deck and discharged directly to the Willamette River.

For the Retrofit Alternative, 0.5 acre of impervious area that currently discharges to the CSO system on the west bank would be re-routed to discharge into the Willamette River. This impervious area, located between Naito Parkway and the Willamette River, would be routed to a proposed water quality facility located near pier one, and would discharge to the river after being treated for water quality. The 0.7 acre of the existing west half of the bridge deck would also be treated at this facility. On the east bank of the river, 0.8 acre of additional area would be discharged through the stormwater-only system. To mitigate the flow increases, a downstream analysis would be performed to determine if the increases to the stormwater-only system would require upsizing of the existing pipes. Table 3 provides the comparison of runoff discharge locations between alternatives.

The Retrofit Alternative would increase the total impervious area within the API that receives stormwater quality treatment to the standards of current regulations and decrease the total untreated area. The area treated by the Retrofit Alternative would be 6.3 acres compared to 0.5 acres under existing conditions. The untreated area would be 12.4 acres versus 18.2 acres for existing conditions. Table 4 provides the acres of untreated impervious area for the alternatives. The untreated area for the Retrofit Alternative would be the impervious area within the Project Area that would not be considered CIA and would not require treatment due to the proposed Project.

The Retrofit Alternative and any of the Build Alternatives would not affect groundwater or contaminated sites. Under this alternative, there are no stormwater facilities that include infiltration into the subsurface. The soil under the bridge is assumed to be contaminated, and therefore unsuitable for infiltration.

Direct Short-Term

The Retrofit Alternative would have short-term direct impacts to stormwater management. During construction, temporary access and staging areas would be constructed by converting areas that are currently parks or structures into gravel lots. In addition to these temporary access and staging areas, the construction activities (such as excavation that would expose the underlying soils or demolition of existing structures) would create higher sediment loads on the existing roadways within the Project area that would potentially result in more pollutants being discharged through the stormwater system to the Willamette River from the Project Area. During construction, the roads used for the detour around the Project experience an increase in vehicular traffic and therefore higher pollutant loading. This impact would be offset by a reduction of vehicular traffic in the Project Area. As outlined in Section 8, BMPs would be implemented during construction to reduce this risk. This impact analysis is based on the assumption that all access roads and bridges constructed over the river would not drain to the existing stormwater drainage system and would be designed and maintained to not allow unmitigated discharges to the river. All areas converted to access or staging areas on either bank of the river would drain to the existing stormwater network.

Indirect

The project would neither induce development (see *EQRB Land Use Technical Report;* Multnomah County 2021d) nor increase traffic in the API post construction (see *EQRB Transportation Technical Report*; Multnomah County 2021e); therefore, there are no expected indirect effects to stormwater from the Retrofit Alternative.

7.2.5 Replacement, Short-span

The Short-span Alternative has two bridge lift variations: Bascule Lift and Vertical Lift. Impacts are the same for both variations of the Short-span Alternative.

Direct Long-Term

The Short-span Alternative would have direct impacts similar to the impacts described in Section 7.2.4 for the Retrofit Alternative. The main difference would be in the amount of increased impervious area created from the expanded bridge deck.

For the Short-span Alternative, 0.5 acre of impervious area that currently discharges to the CSO system on the west bank of the river and 1.3 acres of additional area would be discharged through the stormwater-only system on the east bank of the river. A downstream analysis would be performed to determine if the increases to the stormwater-only system would require upsizing. Table 3 provides a comparison of runoff discharge locations between alternatives.

The Short-span Alternative would increase the total impervious area within the API that receives stormwater quality treatment to the standards of current regulations and decrease the total untreated area. The total area treated by the Short-span Alternative would be 7.5 acres compared to 0.5 acres under existing conditions. The total untreated area would be 12.1 acres versus 18.2 acres for existing conditions. Table 4 provides the acres of untreated impervious area for the alternatives. The untreated area under the Short-span Alternative would be the impervious area within the Project Area that would not be considered CIA nor require treatment due to the proposed Project.

The Short-span Alternative would not affect groundwater or contaminated sites. Under this alternative, there are no stormwater facilities that include infiltration into the subsurface. The soil under the bridge is assumed to be contaminated, and therefore unsuitable for infiltration.

Direct Short-Term

The direct short-term impacts from construction of the Short-span Alternative are the same as the impacts for the Retrofit Alternative discussed in Section 7.2.4.

Indirect

The project would neither induce development (see *EQRB Land Use Technical Report*; Multnomah County 2021d) nor increase traffic in the API post construction (see *EQRB Transportation Technical Report*; Multnomah County 2021e); therefore, there are no expected indirect effects to stormwater from the Short-span Alternative.

7.2.6 Replacement, Long-span

The Long-span Alternative has two bridge lift variations: Bascule Lift and Vertical Lift. Impacts are the same for both variations of the Long-span Alternative.

Direct Long-Term

The direct impacts for the Long-span Alternative are the same as the impacts for the Short-span Alternative discussed in Section 7.2.5.

Direct Short-Term

The direct short-term impacts for the Long-span Alternative are the same as the impacts for the Short-span Alternative discussed in Section 7.2.5.

Indirect

The indirect impacts for the Long-span Alternative are the same as the impacts for the Short-span Alternative discussed in Section 7.2.5.

7.2.7 Replacement with Couch Extension

Direct Long-Term

The Couch Extension Alternative would have direct impacts similar to the Retrofit Alternative impacts described in Section 7.2.4. The differences would be in the amount of increased impervious area created from the expanded and realigned bridge deck, and from the changes in the vertical alignment of the bridge that would result in more water being conveyed to the west side of the bridge prior to treatment.

For the Couch Extension Alternative, 0.5 acre impervious area that currently discharges to the CSO system on the west bank of the river and 1.0 acre of additional area would be discharged through the stormwater-only system on the east bank of the river. To mitigate the flow increase, a downstream analysis would be prepared to determine if the increases to the stormwater-only system would require upsizing of the existing pipes. Table 3 provides the comparison of runoff discharge locations between alternatives.

The Couch Extension Alternative would increase the total impervious area within the API that receives stormwater quality treatment to the standards of current regulations and decrease the total untreated area. The total area treated by the Couch Extension Alternative would be 8.7 acres compared to 0.5 acre under existing conditions. The total untreated area would be 11.3 acres versus 18.2 acres for existing conditions. Table 4 provides the acres of untreated impervious area for the alternatives. The untreated area under the Couch Extension Alternative would be the impervious area within the Project Area that would not be considered CIA and does not require treatment due to the proposed Project.

The Couch Extension Alternative would not affect groundwater or contaminated sites. Under this alternative, there are no stormwater facilities that include infiltration into the subsurface. The soil under the bridge is assumed to be contaminated, and therefore unsuitable for infiltration.

Direct Short-Term

The short-term impacts for the Couch Extension Alternative are similar to those described for the Retrofit, Short-span, and Long-span Alternatives, but the temporary staging areas are larger. The Couch Extension Alternative would create 4.7 acres of temporary access or staging areas that drain to the existing drainage systems.

Indirect

There are no potential indirect effects to stormwater prior to a CSZ earthquake for the Couch Extension Alternative.

7.3 Post-Earthquake Impacts

7.3.1 No-Build

If an earthquake occurred under the No-Build Alternative, it would directly affect stormwater. The collapse of the bridge would include failure of the existing stormwater facilities on the bridge. The existing drainage pipes and structures on both banks of the river were not built to withstand the design seismic event. In the event of soil liquefaction, the existing drainage infrastructure could potentially float to the surface resulting in breaks and failures of the pipe joints, which would lead to failure of the drainage system. Failure of the drainage system would result in untreated stormwater entering the Willamette River.

7.3.2 Enhanced Retrofit

Direct

Under the Retrofit Alternative and all of the Build Alternatives' post-earthquake scenario, the bridge would not collapse and stormwater runoff would continue to be conveyed off the bridge deck under the proposed design. At the west or east ends of the bridge, the stormwater runoff would be routed through water quality treatment facilities. The proposed water quality facilities would discharge to the existing drainage infrastructure; however existing drainage pipes and structures were not built to withstand the design seismic event. In the event of soil liquefaction, the existing drainage infrastructure in the vicinity of the bridge could potentially float to the surface resulting in breaks and failures of the pipe joints, which would lead to failure of the drainage system. In the event that the existing drainage system fails, water quality treatment would no longer take place.

Indirect

Indirect impacts to stormwater post-earthquake scenario would occur in the Retrofit Alternative and any of the Build Alternatives. Because the Burnside Bridge would be one of the few bridges to remain useful in a post-earthquake scenario, it would be subjected to increased traffic loads that would lead to increased pollutant loads on the roadway and in stormwater runoff. This would result in decreased pollutant loads on the roadways used to access the other crossings that could no longer be used.

7.3.3 Replacement, Short-span

Direct

The direct impacts for the Short-span Alternative are the same as the direct impacts for the Retrofit Alternative discussed in Section 7.3.2.

Indirect

The indirect impacts for the Short-span Alternative are the same as the indirect impacts for the Retrofit Alternative discussed in Section 7.3.2.

7.3.4 Replacement, Long-span

Direct

The direct impacts for the Long-span Alternative are the same as the direct impacts for the Retrofit Alternative discussed in Section 7.3.2.

Indirect

The indirect impacts for the Long-span Alternative are the same as the indirect impacts for the Retrofit Alternative discussed in Section 7.3.2.

7.3.5 Replacement with Couch Extension

Direct

The direct impacts for the Couch Extension Alternative are the same as the direct impacts for the Retrofit Alternative discussed in Section 7.3.2.

Indirect

The indirect impacts for the Couch Extension Alternative are the same as the indirect impacts for the Retrofit Alternative discussed in Section 7.3.2.

7.4 Construction Impacts

7.4.1 Without Temporary Bridge

The previous sections describe each alternative based on scenarios without a temporary detour bridge. No additional impacts or changes to construction impacts would occur if a temporary bridge is not constructed.

Enhanced Retrofit

No additional impacts are anticipated without a temporary bridge for the Retrofit Alternative.

Replacement, Short-span

No additional impacts are anticipated without a temporary bridge for the Short-span Alternative.

Replacement, Long-span

No additional impacts are anticipated without a temporary bridge for the Long-span Alternative.

Replacement with Couch Extension

No additional impacts are anticipated without a temporary bridge for the Couch Extension Alternative.

7.4.2 With Temporary Bridge

Use of a temporary bridge during construction would lead to additional impacts to stormwater. A temporary bridge that includes vehicular or transit traffic would be required to meet current water quality treatment standards. A temporary bridge that only includes pedestrian and bicycle traffic would be required to meet current water quality treatment and volume control standards for the portion of the bridge located above land; the portion above water would be designed to not concentrate flow and to discharge directly to the river.

A temporary bridge that includes vehicular or transit traffic would reduce the foreseeable indirect impacts to the roads that make up the proposed detour routes for any of the Build Alternatives. These indirect impacts outside the API were discussed in Sections 7.2.4 and 7.2.5.

Enhanced Retrofit

Under the Retrofit Alternative and all of the Build Alternatives there are three options for a temporary bridge: one that includes all modes of traffic; one that includes transit, bicycles, and pedestrians; and one that includes only pedestrian and bicycle traffic.

The options that include all traffic modes or transit traffic would create 1.7 additional acres of impervious area. This does not include the lift section of the Temporary Bridge that would likely be grated and not capture any rainfall. The Project would be required to treat the stormwater runoff from the increased impervious area to current standards. Temporary treatment facilities would be located near the river so that the treated stormwater could be discharged to the Willamette River and not to the existing drainage systems on either bank of the river.

The option that includes only pedestrian and bicycle traffic would create 1.1 acres of impervious area. The bridge deck above the river would be designed to discharge runoff directly to the Willamette River without concentrating the flow. The portion of the bridge deck above land would capture and convey runoff to temporary treatment facilities located beneath the ends of the Temporary Bridge.

Replacement, Short-span

Impacts of a temporary bridge for the Short-span Alternative would be the same as the impacts from the Retrofit Alternative described above.

Replacement, Long-span

Impacts of a temporary bridge for the Long-span Alternative would be the same as the impacts from the Retrofit Alternative described above.

Replacement with Couch Extension

Impacts of a temporary bridge for the Couch Extension Alternative would be the same as the impacts from the Retrofit Alternative described above.

7.4.3 Potential Off-Site Staging Areas

The construction contractor may use one or more off-site staging areas, outside the bridge study area to store and and/or assemble materials that would then be transported by barge to the construction site. Off-site staging could occur with any of the alternatives. Whether, where, and how to use such sites would be the choice of the contractor and therefore the actual site or sites are unknown at this time and detailed analysis of impacts is not possible. To address this uncertainty, four possible sites have been identified that represent a much broader range of potential sites where off-site staging might occur. While the contractor could choose to use one of these or any other site, it is assumed that because of regulatory and time constraints on the contractor, any site they choose would need to be already developed with road and river access. It is also assumed that the contractor would be responsible for relevant permitting and/or mitigation required for use of a chosen site. The Draft EIS identifies the types of impacts that could occur from off-site staging, based on the above assumptions. This analysis is not intended to “clear” any specific site, but rather to disclose the general types of impacts based on the possible sites.

The four representative sites include:

- A Willamette Staging Option off Front Avenue
- B USACE Portland Terminal 2
- C Willamette Staging Option off Interstate Avenue
- D Ross Island Sand and Gravel Site

Based on the four potential sites identified, the types of stormwater impacts that could occur from off-site staging include higher traffic volumes and higher pollutant loading on streets used to access the sites. The sites would see an increase in sediment and pollutants from construction activities that would occur at the sites.

If a contractor chooses to use an off-site staging area, the following local, state, and federal regulations could apply Section 402 of the Clean Water Act as implemented by the NPDES permit program. Specifically, the off-site staging would need to comply with one or both of the following MS4 Permits issued by DEQ and the City of Portland:

1. No. 101314 – prescribes all stormwater and allowable non-stormwater dischargers from the MS4 within the City of Portland urban services boundary to surface waters of the state.
2. No. 103004 – prescribes all stormwater and allowable non-stormwater discharges from the MS4 within the limits of the five County-operated Willamette River Bridges.

7.5 Cumulative Effects

Cumulative effects result from the incremental impact of a specific action when added to other past, present, and reasonably foreseeable future actions. A number of actions have been and/or are likely to be undertaken that, when combined with any of the Build Alternatives, would have cumulative impacts on the stormwater within the API. Development within the Project Area has been taking place for approximately 150 years which has converted the historic vegetated land cover into what is a fully developed impervious area. Future development will continue in the area regardless of the No-Build or Build Alternatives for this Project. The Cumulative Impacts Approach Memorandum outlines past actions and trends that have shaped the current built, natural, and cultural environment in the study area, as well as lists the reasonably foreseeable City of Portland transportation projects.

7.5.1 No-Build Alternative

Under the No-Build Alternative, the cumulative effects would include the effects of past development actions and planned future transportation projects that affect stormwater. Under a No-Build Alternative, the cumulative effects would be the same as those described for the No-Build, post-earthquake scenario discussed in Section 7.3.1.

7.5.2 Build Alternatives

Under any of the Build Alternatives, there would be a net decrease in impervious area that does not receive treatment to current water quality standard levels. This would result in runoff from the API having less pollutants. Thus any of the Build Alternatives would not add new pollutants to current or future conditions or projects. Any future projects also would be required to meet current water quality standards.

7.6 Compliance with Laws, Regulations, and Standards

The Project would comply with all federal, state, and local laws and regulations listed in Section 4. Permits and authorizations required by these laws and regulations would be acquired before Project construction begins.

Table 5 presents the key stormwater-related permits related to water resources that must be obtained from federal, state, and local agencies for any Build Alternative selected.

Table 5. Required Permits Related to Stormwater

Permit/Authorization	Relevant Laws	Implementing Agency
Section 7 Consultation/Biological Opinion	Endangered Species Act (16 USC 1531)	NOAA Fisheries and USFWS
Magnuson Stevens Act Essential Fish Habitat Consultation	Fishery Conservation and Management Act (16 USC 1801)	NOAA Fisheries
Individual Permit	Clean Water Act (33 USC 1251–1387); Rivers and Harbors Act of 1899 (33 USC 403)	USACE
Water Pollution Control Facilities Permit	Clean Water Act (33 USC 1251–1387)	DEQ

Permit/Authorization	Relevant Laws	Implementing Agency
Removal-Fill Permit	Oregon's Removal-Fill Law (ORS 196.795-990)	DSL
National Pollutant Discharge Elimination System 1200-CA Stormwater Permit	Clean Water Act (33 USC 1251–1387)	DEQ
Supplemental Permit	City of Portland Zoning Code Title 33 Planning and Zoning, River Environmental Overlay Zone	City of Portland

NOAA = National Oceanic and Atmospheric Administration
USFWS = U.S. Fish and Wildlife Service

7.7 Conclusion

The No-Build Alternative would result in the greatest amount of impervious area within the Project area that would not receive treatment to the current NMFS standards.

Any of the Build Alternatives would increase the amount of impervious area within the Project area that would be treated to the current NMFS standards.

Overall, the Build Alternative with the greatest permanent direct impacts to stormwater would be the Retrofit Alternative. All of the Build Alternatives would result in a decrease of untreated impervious area generated within the API, but the Retrofit Alternative would decrease the amount of untreated area the least for all the Build Alternatives.

Overall, the Build Alternative with the least permanent direct impacts to stormwater would be the Couch Extension Alternative. This alternative would create the most new impervious area, but would also result in the smallest amount of area that is not treated to current NMFS standards. See Table 4 for summary of impervious areas treated or untreated by alternative.

8 Mitigation Measures

Mitigation measures will be implemented to avoid, minimize, reduce, or compensate impacts to stormwater that would result from a Build Alternative.

8.1 Water Quality Treatment and Surface Waters

Any of the new or modified impervious areas resulting from the Build Alternatives would be considered CIA. These areas would be mitigated using stormwater management facilities to reduce the levels of pollutants discharged to receiving waters. The stormwater quality measures considered were those approved for use by the NMFS as the permitting agency. For all of the Build Alternatives, there are areas of untreated impervious area within the API that are not considered CIA because the Project does not propose to reconstruct the pavement or make changes to the existing drainage patterns in those areas and the areas do not drain to any of the areas altered by the Project.

Various stormwater treatment methods approved for use by NMFS and the City of Portland were conceptually evaluated as part of this analysis. Final stormwater facility designs would occur during the engineering phase of the Project. To treat the entire CIA for the project using above-ground biofiltration methods, two 8-foot-wide and 220-foot-long bioswales would be required. The bioswales would need to be constructed with a minimum slope of 2 percent and located in areas that would provide adequate sunlight for vegetation to grow and at elevations allowing runoff to be conveyed to the facilities. Due to the required size of the facilities and limited available suitable locations, an engineered bioswale would not be feasible on the west bank of the project. On the east bank of the project a facility would need to be located in one of the parcels acquired for construction access either north or south of the bridge. Because all parcels acquired for construction access are anticipated to be redeveloped at a later date, placement of a bioswale of the dimensions listed above would not be proposed as part of the Project.

Due to the urban nature of the Project and costs associated with using ROW for stormwater treatment, the use of underground manufactured stormwater treatment facilities was evaluated. To meet NMFS treatment requirements, the manufactured facilities would need to be listed on ODOT's Qualified Projects List and certified for enhanced treatment by the State of Washington's Technology Assessment Protocol – Ecology program. The enhanced treatment certification means the facility is capable of 80 percent removal of total suspended solids, 30 percent removal of dissolved copper, and 60 percent removal of dissolved zinc. These manufactured facilities would be underground vaults that could be located in paved areas, which would allow facilities to be placed within areas that see vehicular traffic or bicycle and pedestrian traffic. The exact location of vaults would be dependent on providing safe maintenance access, treating the proposed CIA for the project, and the capacity to connect to existing drainage systems. Final locations of the vaults would be determined during the engineering phase of the Project and would require input from NMFS, the City of Portland, and Multnomah County. Conceptual locations of the vaults are provided for each of the alternatives in the *EQRB Bridge Replacement Technical Report* (Multnomah County 2021a).

Prior to construction starting, an approved erosion and sediment control plan would be required. During construction BMPs listed in the most current version of the City of Portland Erosion, Sediment, and Pollutant Control Plan would be implemented to prevent runoff with sediment or other pollutants from reaching drainage systems or the Willamette River.

8.2 Volume of Stormwater Runoff

For the portions of the project that contribute to the City of Portland's CSO system, any increases in flow would be required to be mitigated through detention using underground pipes or vaults. For any of the Build Alternatives, these facilities would be designed to meet the design criteria in the most current version of the City of Portland BES Sewer and Drainage Facilities Design Manual.

The mitigation measures outlined above apply to all Build Alternatives. Differences between the Build Alternatives would include the amount of required mitigation, locations of mitigation, and duration of temporary mitigation due to differences in areas of CIA requiring treatment, locations of CIA requiring treatment, proposed construction and staging areas, and durations of construction between the alternatives.

9 Contacts and Coordination

Project work will include an extensive public involvement and agency coordination effort including local jurisdictions and neighborhoods within the Project Area.

At the appropriate time, local, state, and federal agencies and local organizations will be notified of the intent to prepare an EIS through the Federal Register and other Project outreach activities. Interested agencies and organizations will have the opportunity to review and comment on the stormwater analysis through the course of the Project, including during the public comment period for the Draft EIS.

During the impacts analysis, the following agencies were invited to review the report and provide comments related to stormwater:

Organization
BES
Confederated Tribes of Grand Ronde
ODOT/NOAA Liaison
ODOT
FHWA
Portland Parks and Recreation
USACE

10 Preparers

Name	Professional Affiliation [firm]	Education [degree or certification]	Years of Experience
Cory Gieseke	HDR, Inc.	B.S., Environmental Engineering	7
Christine Higgins	CASSO Consulting, Inc.	B.S., Civil Engineering	25

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