City-County Work Plan: Eastbank Esplanade Ramp Connection Study (Final)

Multnomah County | Earthquake Ready Burnside Bridge Project

Portland, OR

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Earthquake Ready Burnside Bridge City-County Work Plan: Eastbank Esplanade Ramp Connection Study (Final)

Prepared for

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Acronyms

ADA	Americans with Disabilities Act
BAT	Business Access and Transit
CE	Categorical Exclusion
CEI/CA	Construction Engineering & Inspection/Construction Administration
City	City of Portland, Oregon
County	Multnomah County, Oregon
CSZ	Cascadia Subduction Zone
CTF	Community Task Force
DEQ	Department of Environmental Quality
DSL	Department of State Lands
EIS	Environmental impact statement
EQRB	Earthquake Ready Burnside Bridge
ESA	Endangered Species Act
FAHP	Federal-Aid Highway Program
FHWA	Federal Highway Administration
JPA	Joint Permit Application
MLK	Martin Luther King Jr.
NACTO	National Association of Transportation Officials
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NMFS	National Marine Fisheries Service
ODOT	Oregon Department of Transportation
PBOT	Portland Bureau of Transportation
PE	Preliminary Engineering
Project	Earthquake Ready Burnside Bridge
ROD	Record of Decision
SHPO	State Historic Preservation Office
SL	Senior Leadership
TSP	Transportation System Plan
UPRR	Union Pacific Railroad
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Services

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Executive Summary

Memorandum Purpose

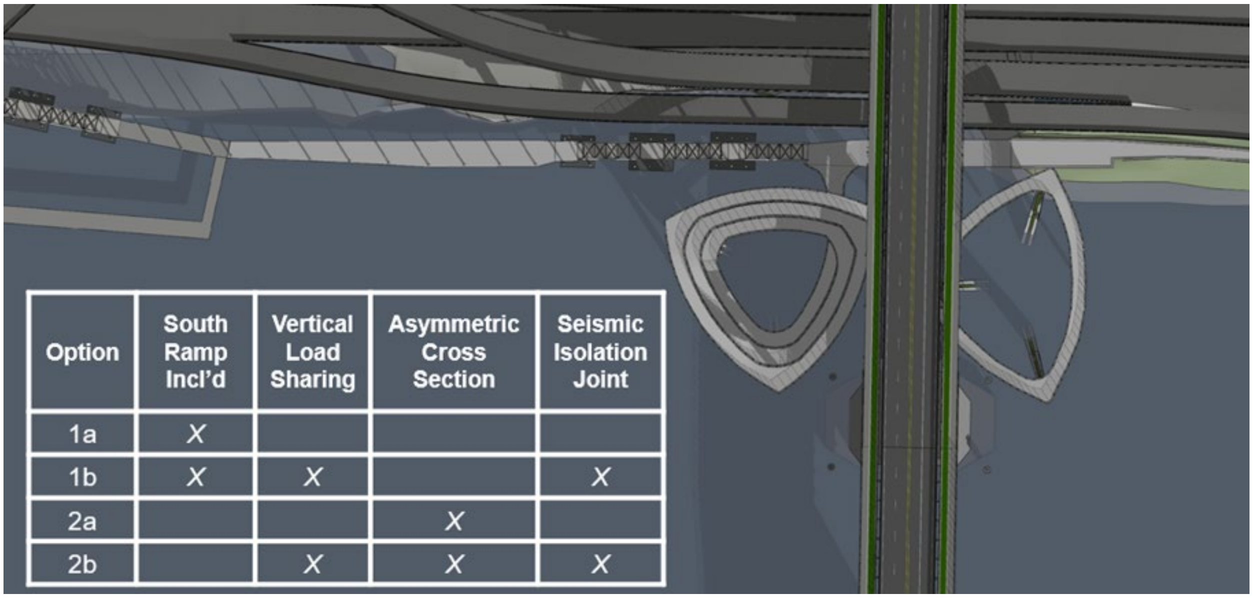
In preparation for the Earthquake Ready Burnside Bridge (EQRB) Project's Final Design phase, this memorandum serves to document the technical considerations, along with pros and cons, of a range of possible Eastbank Esplanade Ramp Connections. As developed and adopted by the joint City of Portland (City) and Multnomah County (County) Senior Leadership (SL) committee for this work, the purpose of this document is to jointly determine the: (1) Cost; (2) Environmental; (3) Timeline; and (4) Impacts or trade-offs of any (or no) changes to the connection between the EQRB replacement and the Eastbank Esplanade to better inform decision makers as they determine the feasibility and political implications for those potential options and select an option to advance.

To achieve this purpose, multiple meetings were conducted between the City, County, and other agency stakeholders were conducted to gather information and support the development of features and costs. This memorandum assembles the comprehensive data collected on the topic, describes the relevant technical considerations developed by the City and its engineering consultant for its preferred ramp concept, documents the identified impacts and their conceptual refinements to reduce the overall Project cost, and provides a summary of findings for decisions makers to select determination on whether a connection option will be advanced in the near future.

City Ramp Concept and Study Options

The Eastbank Esplanade ramp connection would provide a new multi-use pedestrian and bicycle path, connecting users between EQRB and the Vera Katz Eastbank Esplanade. Using the City's preferred concept as the basis, with some modifications to reduce the overall Project cost, the Portland Bureau of Transportation (PBOT) wishes to refine the total project costs by considering the options shown in Figure 1. To make an accurate comparison, the same facility widths, materials, etc. were kept the same across all Options (1a, 1b, 2a, and 2b).

Figure 1. Eastbank Esplanade Ramp Connection Options



Option	South Ramp Incl'd	Vertical Load Sharing	Asymmetric Cross Section	Seismic Isolation Joint
1a	X			
1b	X	X		X
2a			X	
2b		X	X	X

Ramp Connection Options:

- Option 1a – Ramp connection on both sides of the bridge without any structural dependency on the Burnside Bridge.
- Option 1b – Ramp connection on both sides of the bridge with some structural dependency / reliance on the Burnside Bridge to support the ramp portion suspended under the bridge and the last ramp span framing into the bridge. It also includes a seismic isolation joint to prevent seismic interaction effect between the ramp and bridge during a large earthquake.
- Option 2a – Ramp connection on only the north side of the bridge without any structural dependency / reliance on the Burnside Bridge. The costs also include an asymmetric EQRB cross section that allows two-way bicycle traffic on the north side of the bridge.
- Options 2b – Ramp connection on only the north side of the bridge with some structural dependency / reliance on the Burnside Bridge to support the last ramp span framing into the bridge. The costs also include an asymmetric EQRB cross section that allows two-way bicycle traffic on the north side of the bridge, as well as a seismic isolation joint to prevent seismic interaction effect between the ramp and bridge during a large earthquake.

Summary of Findings

Total Project Cost

Total Project costs were developed for each of the options described above and using a range of cost parameters and variables. The costs range from $132.7 million, which assumes the mid-point of construction is in 2031 and that both the north and south ramps are constructed, to $98.4 million, which assumes a mid-point of construction is in 2029 and that only the north ramp is constructed while relying on the Burnside Bridge to carry some of the ramp load. The table also provides an un-escalated cost range if the ramp options were constructed in 2023. A summary of the cost range is provided in Table 1.

Table 1. Average Total Project Costs

The "Average" cost is the mean of the low and high costs for each option as defined in Section 3 of the report.

	Average Total Project Cost for each Construction Midpoint (Note: Average is the mean of the results for the High and Low Factors)		
Option	**2023 $**	**2029 $**	**2031 $**
Option 1a	$102.8M	$124.5M	$132.7M
Option 1b	$98.7 M	$119.4M	$127.3M
Option 2a	$86.3M	$104.6M	$111.4M
Option 2b	$81.3M	$98.4M	$105.0M

NEPA Pathways, Environmental Considerations, and Implementation Timelines

On August 15, 2023, County staff, the County's consulting team, and City personnel met to discuss options for the Eastbank Esplanade spiral ramp connection concept and potential National Environmental Policy Act (NEPA) processes, permitting pathways, and related timelines that might be utilized to provide for construction of the ramp connection.

Two options were considered that assume incorporating federal funds, thus creating a federal NEPA nexus. A third option was explored that consisted of locally-funds only, thus avoiding the federal NEPA nexus. The following lists those options, with a summary of various NEPA and permit-related findings described in more detail in Section 4.3.

- Option 1 assumes that the new ramp connection is incorporated into County EQRB NEPA documents. A complete list of anticipated permits is provided in Table 9.
    - **NEPA and Related Approvals:** In this scenario, the new connection would be incorporated into the County's EQRB NEPA documentation (under the existing project Purpose and Need) after the Record of Decision (ROD) is issued and prior to the construction phase commencing. The incorporation of the new connection's design and analysis of its related impacts would likely require additional supplemental NEPA documentation as determined by a Federal Highway Administration (FHWA) NEPA re-evaluation. The re-evaluation and any required supplemental NEPA analysis would require additional technical analysis and reports for the ramp connection, creation, and issuance of supplemental NEPA documents, potential additional public comment periods and issuance of an amended ROD. The supplemental NEPA process would also likely require re-initiation of consultation with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) for potential impacts to threatened and endangered fish species due to the ramp in-water structures. Extensive re-initiation of the

Section 106 process is unlikely given that the existing ramp and the Eastbank Esplanade are not historic resources. The most likely extensive coordination would involve resolving impacts to the Eastbank Esplanade as a Section 4(f) resource. The selection of reconnecting the existing stairs to the new Burnside Bridge under the Selected Alternative of the current draft ROD represents the environmentally preferable alternative, which is required to be identified under 40 CFR 1505.2(b). At this time, a decision about whether to maintain or remove the existing stairway is not known but will be made early in the Final Design phase.

  - **Federal Permits:** With the need for a supplemental NEPA approval to the EQRB project post-ROD, it is likely that the completion of the Final Design phase would be delayed until NEPA approval is complete. Moreover, coordination would be needed with federal and state permitting agencies including U.S. Army Corps of Engineers (USACE), U.S. Coast Guard (USCG), and the Department of Environmental Quality (DEQ) for revisions to any permit applications pending or permits issued.
  - **State and Local Permits:** The delay of final design would also impact the timeline for obtaining remaining state or local permit approvals especially those from the City of Portland, which are procured during the final design phase. Regarding the City's floodplain development regulations (Title 24 and 33) and related permitting, the additional in-water ramp structure would likely result in a rise in base flood elevation in the Willamette River. In addition, future City code changes related to cut/fill requirements in the floodplain would need to be considered and accommodated. With respect to the City's land use and zoning permits, the in-water structure would occupy a larger area of the river column and riverbed than the currently Selected Alternative with greater impacts to shallow-water and riverine habitat along the east side of the Willamette River. The additional ramp structure both in-water and adjacent to the Willamette River exacerbate the challenge of finding additional types and areas of mitigation that could offset project impacts. With regard to the Department of State Lands (DSL) permit, the addition of the spiral ramp would not impact the timing of submittal of the permit application, but it would result in additional mitigation requirements that could delay the issuance of the DSL permit.
  - **Timeline:** By revising the NEPA process, the anticipated Project schedule delay is estimated between 1 to 2+ years, subject to what the various re-initiations reveal.

- Option 2 assumes that the new ramp connection would be an independently sponsored project with separate NEPA approval. A complete list of anticipated permits is provided in Table 10.
  - **NEPA and Related Approvals:** From a NEPA perspective, this would be an independent action with its own Purpose and Need. Per FHWA regulations, as an independent action, the Eastbank Esplanade connection could be classified as a NEPA Categorical Exclusion (CE) under 23 CFR § 771.117 (c)(3) Construction of bicycle and pedestrian lanes, paths, and facilities.

However, the appropriate level of documentation needed would have to be determined via coordination with FHWA (or other federal lead agency) prior to project inception. While the Eastbank Esplanade connection would be a separate project from the EQRB project, much of the information used in the EQRB environmental impact statement (EIS) documentation could be used for its NEPA documentation, especially regarding existing conditions and affected environment data, thereby minimizing the amount of data collection needed for these NEPA elements. During the NEPA process, the Project would also have to obtain approvals for other federal requirements including compliance with Section 4(f), Endangered Species Act (ESA) and Section 106. With regard to Section 4(f) compliance, the spiral ramp connection would cause closure of the esplanade for an extensive period and would result in increased noise due to the relocation of the esplanade north of the bridge closer to I-5. As the owner of the Eastbank Esplanade, the City of Portland is ultimately responsible for recommending to FHWA if the City's project constitutes a de minimis impact to, or use of, a 4(f) resource. Given that the Project would involve in-water work including shafts and piers to support the spiral ramp connection, demonstration of compliance with ESA would be needed. If FHWA funds are utilized, ESA consultation requirements could likely be satisfied using Oregon's Programmatic Endangered Species Act Consultation on the Federal-Aid Highway Program (FAHP programmatic permit), which covers most of the projects funded by FAHP and administered by the Oregon Department of Transportation (ODOT). Regarding Section 106, the Eastbank Esplanade connection would require coordination with the Oregon State Historic Preservation Office (SHPO) as part of the NEPA process. Background information from the EQRB Section 106 documentation could be used to provide data for the Eastbank Esplanade connection. Although needing verification based on the specifics of the design selected, it is anticipated that the Eastbank Esplanade connection would have no adverse effects on Section 106 resources.

- **Federal Permits:** For compliance with Clean Water Act regulations, a Section 404 Permit and a Section 401 Water Quality Certification will be required. Based on coordination with the USACE, the Eastbank Esplanade Connection may qualify for a Nationwide Permit, which provides coverage for Section 404 and Section 401 (and covers structures regulated under Section 10 of the Rivers and Harbors Act). Nationwide Permits typically cannot be used for projects that cause greater than a certain impact to waters of the United States (e.g., no greater than ½-acre for Nationwide Permit 42, Recreation Facilities). If the Eastbank Esplanade Connection does not qualify for a Nationwide Permit, an individual Section 404 Permit would need to be obtained from USACE and an individual Section 401 Water Quality Certification would need to be obtained from Oregon DEQ.
- **State and Local Permits:** City and state permits and reviews for Option 2 would be the same as Option 1.
- **Timeline:** As an independent project, this scenario would have its own NEPA approval timeline. It would not impact the County's NEPA approval timeline

or process. If a CE is chosen as the appropriate level of NEPA documentation, no public comment is required and NEPA approval could potentially be completed within a year.

- Option 3 assumes that the ramp connection is an independently sponsored project funded with local (non-federal) funds. A complete list of anticipated permits is provided in Table 11.
    - **NEPA and Related Approvals:** Option 3 assumes that the new connection would be a separate, locally funded project with no federal funding. Therefore, there would be no NEPA process related to federal funding. Federal permits would still require ESA and Section 106 documentation and approvals, but these would be under the jurisdiction of the lead federal permitting agency. Table 11 contains a summary of related permits and approvals that are expected under Option 3.

      With regard to ESA, without FHWA funding, the FAHP programmatic permit would not be applicable and consultation with NMFS would be required, likely including the need for a Biological Assessment to be written for the spiral ramp connection and a Biological Opinion to be issued by NMFS. From a USFWS perspective, no effects to species regulated by USFWS are anticipated similar to the EQRB project. Regarding Section 106, the Eastbank Esplanade connection would require coordination with the Oregon SHPO.
    - **Federal Permits:** Required federal permits for Option 3 would be the same as Option 2.
    - **State and Local Permits:** City and state permits and reviews for Option 3 would be the same as Option 2.
    - **Timeline:** As an independent project, this scenario would have its own NEPA approval timeline. It would not impact the County's NEPA approval timeline or process. If a CE is chosen as the appropriate level of NEPA documentation, no public comment is required and NEPA approval could potentially be completed within a year.

1 Introduction

1.1 Joint County / City Purpose Statement

As defined by the joint City-County Senior Leadership Group, the Work Plan purpose is:

"For City of Portland and Multnomah County Staff to (1) jointly determine the cost, environmental, and timeline impacts and trade-offs of any or no changes to the connection between the EQRB Replacement and the Eastbank Esplanade; as well as to (2) to jointly determine the cost, environmental, and timeline impacts and trade-offs … in order to better inform decision-makers as they determine the feasibility and political implications for those potential options and select an option to advance."

1.2 Burnside Bridge Site

Built in 1926, the Burnside Bridge is an aging structure requiring increasingly frequent and significant repairs and maintenance. The existing Burnside Bridge carries a total of 35,000 vehicles per day, and crosses the Willamette River, Interstate 5, Union Pacific Railroad, multiple City of Portland (City) streets, parking lots, parks, TriMet MAX lines, and other facilities under Burnside Street. The existing bridge carries three eastbound and two westbound lanes of vehicle traffic as well as bike lanes and sidewalks in each direction. The total bridge length is approximately 2,307 feet and consists of three separate structures:

- West Approach Bridge (Br. No. 00511A) spans 602 feet
- Main River Bridge (Br. No. 00511) spans 856 feet
- East Approach Bridge (Br. No. 00511B) spans 849 feet

The bridge is designated a historically significant structure and is listed on the National Register of Historic Places.

Regarding the existing connection between the Burnside bridge and the Eastbank Esplanade, a City of Portland-owned staircase facility, constructed in 2001, exists that connects the south side of the bridge (by Multnomah County permit) to the Vera Katz Eastbank Esplanade, located about 50 feet below the bridge.

1.3 History of the EQRB Project

In 2015, the *Willamette River Bridges Capital Improvement Plan 2015–2034* (Multnomah County 2015) prioritized creating a Burnside Street river-crossing that can withstand a major earthquake. The adoption of the improvement plan led to the process to identify and screen alternatives which began in 2016 with the EQRB Feasibility Study documented in the *EQRB Feasibility Study Report* (Multnomah County 2018).

The EQRB project team worked with community and agency stakeholders to develop project objectives and a problem statement, build project awareness through early engagement, and analyze more than 100 options for creating an earthquake ready Willamette River crossing. Screening criteria were developed and applied (see

Appendix C of the *EQRB Feasibility Study Report* (Multnomah County 2018) with the Project's Stakeholder Representative Group, and the results were shared with other project committees (the Senior Agency Staff Group and the Policy Group), as well as with the public through online events and in-person open houses. Following public input, the feasibility study was completed in November 2018, and the Multnomah County Board of Commissioners adopted the draft project purpose and need statement and the range of alternatives for further study.

This process led to the recommendation to advance select bridge alternatives for further study in the environmental process. Following the feasibility study, the project team conducted additional analysis and gathered stakeholder input to further evaluate and refine the project alternatives prior to initiating an EIS. To comply with NEPA, an EIS was developed that studied seven alternatives.

Following almost two years of coordination, analysis, and input, in June 2020, the Project's Community Task Force (CTF) recommended that the Draft EIS Long-span Approach Alternative and the No Temporary Bridge Option comprise the Draft EIS Preferred Alternative (see descriptions of this alternative and option in Section 2.2). The CTF's process to reach that recommendation included identifying the community's values, defining evaluation criteria and measures, and reviewing the performance and impacts of the various alternatives and options. It also considered the input from the project team's technical experts, from resource agencies and other participating agencies, and from other stakeholders including the public. In August 2020, the project team solicited input on the CTF's recommendation from multiple stakeholder groups, agencies and the public through online open houses, an online survey and web meetings. This input, which indicated broad support (85 percent) for the Draft EIS Preferred Alternative recommendation, was provided back to the CTF who then reconfirmed their recommendation in September 2020. The voting members of the Project's Policy Group on October 2, 2020, then unanimously endorsed the recommendation. The Multnomah County Board of Commissioners adopted a resolution on October 29, 2020, expressing approval for the recommended Draft EIS Preferred Alternative. Input received during the Draft EIS comment period confirmed that there was considerably more public support for the Draft EIS Long span Alternative than for any of the other Draft EI'S alternatives.

Following the issuance of the Draft EIS, additional cost and funding analysis identified a substantial risk. It was determined that construction costs of any of the build alternatives studied would be too high to reasonably fund. This risk led the County to direct the project team to identify ways to reduce construction costs while still meeting the Project's purpose and need. This additional refined evaluation was conducted and presented in a Supplemental Draft EIS. Initial findings regarding the cost savings, impacts, and tradeoffs of these potential revisions were provided to the public in November and early December 2021. Project committees endorsed the refinements to the Draft EIS Preferred Alternative, and the Multnomah County Board of Commissioners passed a resolution adopting the refinements on March 17, 2022. Elements that were considered as refinement within the Supplemental Draft EIS included:

- A reduction in bridge width (which eliminated one of the existing vehicular lanes and reduced the width of the combined sidewalk / bicycle lane as compared to the Draft EIS cross section).

- The selection of a conventional slab on girder structure type for the West Approach bridge type.
- The selection of a bascule bridge type as the Main River Span movable bridge type.

1.4 Project Purpose and Need

Geologically, Oregon is located in the Cascadia Subduction Zone (CSZ), making it subject to some of the world's most powerful recurring earthquakes. The last major earthquake in Oregon occurred over 300 years ago, in 1700, a timespan that exceeds 75 percent of the intervals between the major earthquakes to hit Oregon over the last 10,000 years. There is a significant risk that the next event will occur relatively soon. The next major earthquake is expected to cause moderate to significant damage to the aging downtown bridges, including the existing Burnside Bridge, rendering them potentially unusable immediately following the earthquake. In their existing condition, all the downtown bridges and/or approaches fail to provide communities and the region with timely and reliable critical emergency response, evacuation, and recovery functions. In response to this risk from a future seismic event, Multnomah County completed its 20-year *Willamette River Bridges Capital Improvement Plan 2015-2034* (Multnomah County 2015); which identified seismic resiliency of the Burnside Bridge as a top priority for Multnomah County in the next 20 years.

Burnside Bridge is designated as the only County-owned Primary Emergency Transportation Route across the Willamette River in downtown Portland in a 1996 report, *Regional Emergency Transportation Routes* (Metro Task Force 1996) to Metro's Regional Emergency Management Group. This group was formed by intergovernmental agreement among the region's cities, counties, Metro, and the Red Cross to improve disaster preparedness, response, recovery, and mitigation plans and programs.

The Burnside Street emergency route is approximately 18.7 miles in length and extends from SW 57th Avenue in Washington County to US Highway 26 in Gresham, crossing the Willamette River via the Burnside Bridge.

Other agency plans have also identified Burnside Street as an important lifeline route. For example, the City's *Citywide Evacuation Plan* (BEM 2017) addresses evacuation needs for general disasters. The Plan identifies Burnside Street as a secondary east-west evacuation route and an emergency transportation route.

The primary purpose of the Project is to create a seismically resilient Burnside Street lifeline crossing of the Willamette River that would remain fully operational and accessible for vehicles and other modes of transportation immediately following a major CSZ earthquake. A seismically resilient Burnside Bridge would support the region's ability to provide rapid and reliable emergency response, rescue, and evacuation after a major earthquake, as well as enable post-earthquake economic recovery. In addition to ensuring that the crossing is seismically resilient, the purpose is also to provide a long-term, low-maintenance safe crossing for all users.

1.5 City of Portland Policy

The 2009 *Climate Action Plan* (BPS and Multnomah County 2009) included a goal for 80 percent reduction of local carbon emissions by 2050. It had a bicycle mode split goal of 25 percent and introduced a green transportation hierarchy. The 2010 *Portland Bicycle Plan for 2030* (PBOT 2010) included policy recommendations to make bicycling more attractive than driving, create conditions are "safe and comfortable", and to adopt the green transportation hierarchy.

Portland is to prioritize "modes for people movement by making transportation system decisions" to favor walking, bicycling and transit, in that order (Comprehensive Plan Policy 9.6). We do this in part by "[encouraging] walking as the most attractive mode" (Policy 9.17) by "[improving] the quality of the pedestrian environment" (Policy 9.18) and by "[improving] pedestrian safety, accessibility, and convenience for people of all ages and abilities" (Policy 9.19). For bicycling we strive to "create conditions that make bicycling more attractive than driving" (Policy 9.20), by "[creating] a bicycle transportation system that is safe, comfortable, and accessible to people of all ages and abilities" (Policy 9.21). These efforts are in service to our overall mode split goals that aim to reduce driving to no more than 30% of all trips by 2035 (Policy 9.49.f).

The Burnside Bridge carries Portland's highest classifications for bicycling (Major City Bikeway) and walking (Major City Walkway). According to Portland's *2035 Transportation System Plan (TSP)* (City of Portland 2020) Major City Bikeways "should be designed to accommodate large volumes of bicyclists, [and] to maximize their comfort…." We are directed by the TSP to "build the highest quality bikeway facilities." "Where conditions warrant and where practical, Major City Bikeways should have separated facilities for bicycles and pedestrians." According to *PedPDX: Portland's Citywide Pedestrian Plan* (PBOT 2019), Major City Walkways "are intended to provide safe, convenient, and attractive pedestrian access…. [with] wide sidewalk on both sides, and a pedestrian realm that can accommodate high volumes of pedestrian activity." According to the *Portland Pedestrian Design Guide* (PBOT 2022), the Burnside Bridge is also classified as a "Civic Main Street" and should be able to accommodate high levels of pedestrian use.

1.5.1 Designing to the City's Modal Hierarchy

The City of Portland's *2035 Comprehensive Plan* (City of Portland 2020) includes Policy 9.6 (Transportation strategy for people movement):

Implement a prioritization of modes for people movement by making transportation system decisions according to the following ordered list:

1. Walking
2. Bicycling
3. Transit
4. Fleets of electric, fully automated, multiple passenger vehicles
5. Other shared vehicles
6. Low or no occupancy vehicles, fossil-fueled non-transit vehicles

When implementing this prioritization, the facility should consider:

- The needs and safety of each group of users are considered, and changes do not make existing conditions worse for the most vulnerable users higher on the ordered list.
- All users' needs are balanced with the intent of optimizing the right of way for multiple modes on the same street.
- When necessary to ensure safety, accommodate some users on parallel streets as part of a multi-street corridor.
- Land use and system plans, network functionality for all modes, other street functions, and complete street policies, are maintained.
- Policy-based rationale is provided if modes lower in the ordered list are prioritized.

1.5.2 Designing for Bicycle and Pedestrian User Comfort

There is a broad range of people that could be potential bicyclists and the intent of the City's bicycling policies are to attract a broader range of bicyclists from the group of people that may be "interested but concerned." Potential bicyclists include children, seniors, people of different genders, abilities, and demographics, people moving goods or people, and less and more confident bicyclists.

The National Association of Transportation Officials (NACTO) *Designing for All Ages & Abilities - Contextual Guidance for High-Comfort Bicycle Facilities* (NACTO 2017) states that "whether or not people will bicycle is heavily influenced by the stresses they encounter on their trip. These stressors impact their actual physical safety and their perceived comfort level."

A bicyclist's comfort depends on their experience and the type of bicycling facility as it relates to vehicular traffic speed and volume, which are two of the biggest causes of bicyclist stress. These factors are inversely related to comfort and safety; even small increases in either factor can quickly increase stress and potentially increase injury risk.

For all cross section options, the pedestrian/bicycling space is physically separated from vehicular traffic by a crashworthy barrier, which greatly enhances the comfort of these facilities. Pedestrian and bicyclist comfort will also be influenced by these modes' interaction with one another and other environmental factors such as the proximity of vertical features and surface conditions.

2 Bridge and Ramp Definitions and Options

2.1 Facility Classifications and Designations

The *2035 Transportation System Plan* (City of Portland 2020), developed as part of the City of Portland's Comprehensive Plan Policy 9.3, establishes design and planning policies that influence the development of the Burnside bridge cross section. In fact, as specified by Comprehensive Plan Policy 9.3, the TSP is to be maintained and implemented as "the decision-making tool for transportation related projects, policies, programs, and street design."

Within the TSP, there are two noteworthy classifications:

1. **Street design classifications:** Maintain and implement street design classifications consistent with land use plans, environmental context, urban design pattern areas, and the Neighborhood Corridor and Civic Corridor Urban Design Framework designations. (Comprehensive Plan Policy 9.1).
2. **Street policy classifications:** Maintain and implement street policy classifications for pedestrian, bicycle, transit, freight, emergency vehicle, and automotive movement, while considering access for all modes, connectivity, adjacent planned land uses, and state and regional requirements. (Comprehensive Plan Policy 9.2).

The use of the street classifications is to plan, develop, implement, and manage the transportation system in accordance with street design and policy classifications outlined in the Transportation System Plan. (Comprehensive Plan Policy 9.4). Furthermore, classification descriptions are used to describe how streets should function for each mode of travel, not necessarily how they are functioning at present. (Comprehensive Plan Policy 9.4.a)

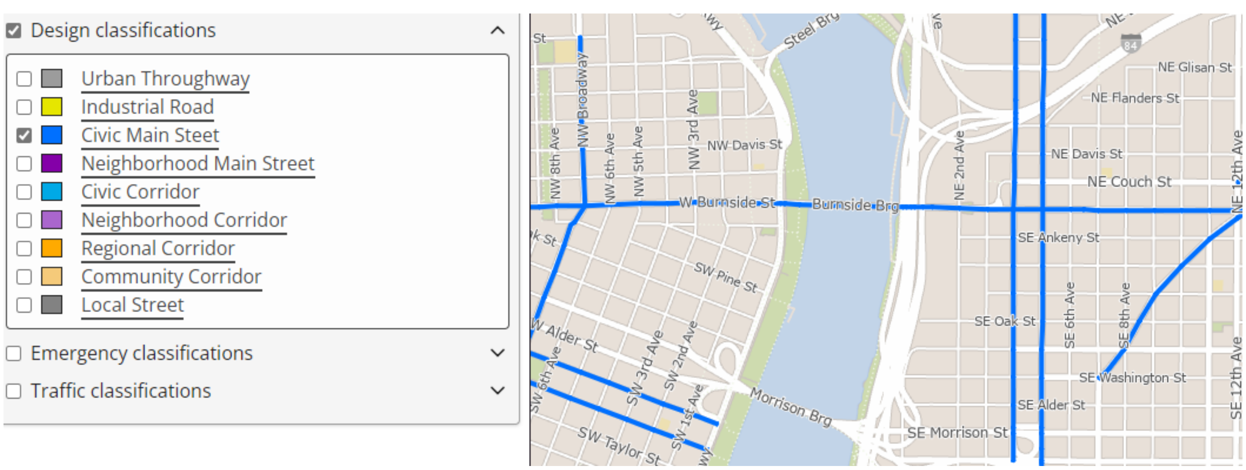
For the Eastbank Esplanade Ramp connection concept, the classifications germane to the discussion include:

- General Design Classification
- Bicycle Classification
- Pedestrian Classification (including users walking and rolling)

2.1.1 General Design Classification

The Burnside Bridge is within a designated Civic Main Street Design classification. Per the TSP, Civic Main Streets serve people throughout the City and are designed to emphasize multimodal access to major activity centers.

Figure 2. Transportation System Plan (City of Portland GIS) – Civic Main Street Design Classification



Within this classification, the following considerations apply:

Land Use: Civic Main Streets are segments of Civic Corridors located within the Central City, Regional Centers, Town Centers, Neighborhood Centers, and other areas of intensive commercial activity. Development consists of a mix of uses that are oriented to the street.

Lanes: Civic Main Streets typically include two to four vehicle lanes, with additional turning lanes as needed. Lanes may be dedicated as transit-only or business-access-transit lanes if needed to improve transit speed and reliability.

Width: Civic Main Streets generally feature a wider right-of-way than Neighborhood Main Streets and are more often able to provide the desired space for each mode and function.

Function: Civic Main Streets should emphasize pedestrian access to adjacent land uses while also accommodating access and mobility for other modes.

Curb zone: The curb zone along Civic Main Streets should emphasize access and place-making functions (such as parking, loading, transit stops, street trees, curb extensions, and street seats) to support adjacent land use and improve the pedestrian realm. The curb zone may be used for mobility functions if space is needed to provide bicycle facilities or provide turn lanes near intersections.

Separation: Civic Main Streets have frequent street connections and support multimodal access to destinations. Sidewalks should be provided, and pedestrian and bicycle crossings should be signalized or improved with median refuge islands or curb extensions as needed to provide safety and comfort. Bicycle facilities should be separated from motor vehicle traffic.

Design Elements: Civic Main Street design should typically include the following: wide sidewalks with a through pedestrian zone, a furnishing zone, and a frontage zone; closely spaced pedestrian crossings; separated bicycle facilities; wayfinding; transit priority treatments as needed; vehicle lanes; low vehicle speeds; medians and/or turn lanes as needed; and limited driveway access.

Design Treatment: During improvement projects, the preservation of existing vegetation, topography, vistas and viewpoints, driver perception, street lighting, and sight distance requirements should be considered.

Utilities: Consider undergrounding or reducing the visual impact of overhead utilities along Civic Main Streets.

2.1.2 Bicycle Classification

The western portion of the Burnside Bridge is within a designated Bicycle District. Per the TSP, Bicycle Districts are areas with a dense concentration of commercial, cultural, institutional and/or recreational destinations where the City intends to make bicycle travel more attractive than driving. Within this district, the following considerations apply:

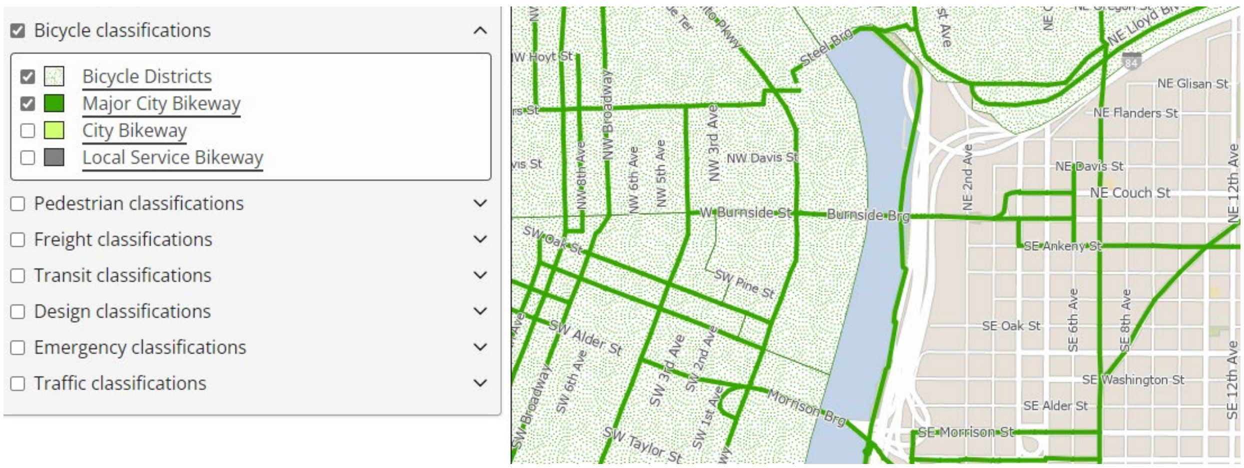
Land Use: High density and mixed-use neighborhoods should be targeted as bicycle districts. Auto-oriented development should be discouraged in Bicycle Districts.

Characteristics: The size and configuration of a Bicycle District should be consistent with the scale of bicycling trips. A Bicycle District includes the streets along its boundaries, except where the abutting street is classified as a Regional Trafficway.

Improvements: All streets within a Bicycle District are important in serving bicycle trips. Appropriate bicycle facilities should be determined for each street based on the desired bicycling conditions and operations. Use the bikeway design and engineering guidelines to design streets within Bicycle Districts.

The Burnside Bridge and the Eastbank Esplanade are each designated with the Major City Bikeway classification. Per the TSP, Major City Bikeways form the backbone of the city's bikeway network and are intended to serve high volumes of bicycle traffic and provide direct, seamless, efficient travel across and between transportation districts.

Figure 3. Transportation System Plan (City of Portland GIS) – Major City Bikeway



Within the Major City Bikeway classification, the following considerations apply:

Land Use: Major City Bikeways should support 2040 land use types.

Improvements: Major City Bikeways should be designed to accommodate large volumes of bicyclists, to maximize their comfort and to minimize delays by emphasizing the movement of bicycles. Build the highest quality bikeway facilities. Motor vehicle lanes and on-street parking may be removed on Major City Bikeways to provide needed width for separated-in-roadway facilities where compatible with adjacent land uses and only after performing careful analysis to determine potential impacts to the essential movement of all modes. Where improvements to the bicycling environment are needed but the ability to reallocate road space is limited, consider alternative approaches that include property acquisition, or dedication, parallel routes and/or less desirable facilities. On Major City Bikeways developed as shared roadways, use all appropriate tools to achieve recommended performance guidelines. Where conditions warrant and where practical, Major City Bikeways should have separated facilities for bicycles and pedestrians.

2.1.3 Pedestrian Classification

The entirety of the Burnside Bridge is within a designated Pedestrian District. Per the TSP, Pedestrian Districts are intended to give priority to pedestrian (including all users walking or rolling) access in areas where high levels of pedestrian activity exist or are planned, including the Central City, Gateway Regional Center, town centers, neighborhood centers, and transit station areas. Within this district, the following considerations apply:

Land Use: Zoning should allow a transit-supportive density of residential and commercial uses that support lively and intensive pedestrian activity. Auto-oriented development should be discouraged in Pedestrian Districts. Institutional campuses that generate high levels of pedestrian activity may be included in Pedestrian Districts. Exceptions to the density and zoning criteria may be appropriate in some designated historic districts with a strong pedestrian orientation.

Streets within a District: Make walking the mode of choice for all trips within a Pedestrian District. All streets within a Pedestrian District are important in serving pedestrian trips and should have sidewalks on both sides or meet alternative design criteria.

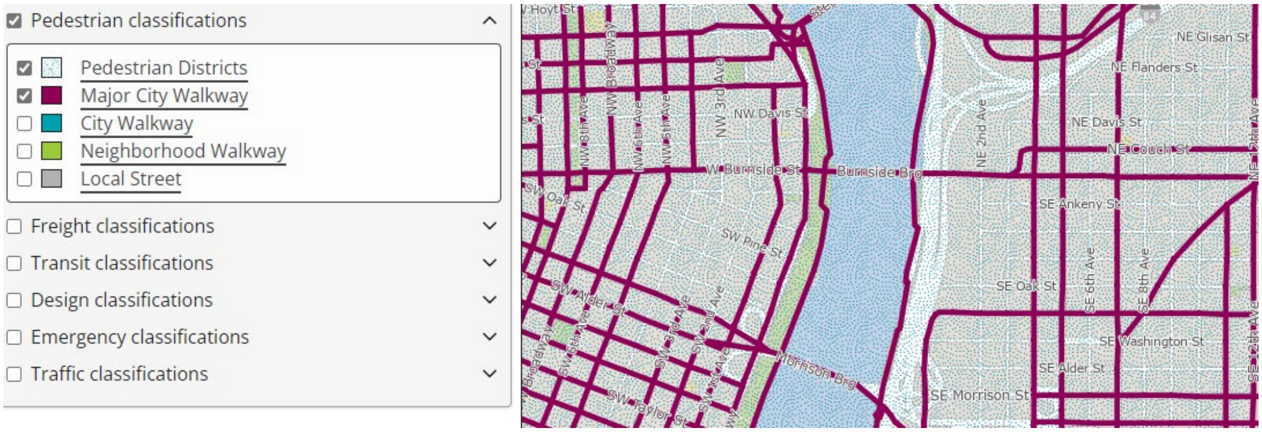
Characteristics: The size and configuration of a Pedestrian District should be consistent with the scale of walking trips. A Pedestrian District includes both sides of the streets along its boundaries, except where the abutting street is classified as a Regional Trafficway. In these instances, the land up to the Regional Trafficway is considered part of the Pedestrian District, but the Regional Trafficway itself is not.

Access to Transit: A Pedestrian District should have, or be planned to have, frequent transit service and convenient access to transit stops.

Improvements: Pedestrian Districts should be designed to provide a safe and comfortable walking (or rolling) environment for high volumes of pedestrians, with a highly connected and built-out pedestrian network with relatively low levels of delay at signals and other crossings. Major City Walkways and City Walkways within Pedestrian Districts should have closely spaced marked crossings.

The Burnside Bridge and the Eastbank Esplanade are each designated with the Major City Walkway classification. Per the TSP, Major City Walkways are intended to provide safe, convenient, and attractive pedestrian access along major streets and trails with a high level of pedestrian activity supported by current and planned land uses. These include Civic and Neighborhood Corridors, Civic and Neighborhood Main Streets, frequent transit lines, high-demand off-street trails, and streets in areas with a high density of pedestrian-oriented uses.

Figure 4. Transportation System Plan (City of Portland GIS) – Major City Walkway



Within the Major City Walkway classification, the following considerations apply:

Land Use: Major City Walkways generally serve areas with the highest density of mixed-use zoning, major commercial areas, and major destinations. Where auto-oriented land uses are allowed on Major City Walkways, site development standards should address the needs of pedestrians for access.

Improvements: Consider special design treatments for Major City Walkways that are also designated as Civic or Neighborhood Main Streets. Major City Walkways should have regularly spaced marked crossings (with closer spacing in Pedestrian Districts), wide sidewalks on both sides, and a pedestrian realm that can accommodate high volumes of pedestrian activity.

2.2 Burnside Bridge

The proposed Burnside Bridge consists of three bridge components: the West Approach, the Main River Span, and the East Approach. At this time, the East Approach bridge type has not been selected and could be either a tied arch (Figure 5) or a cable-stayed (Figure 6) type. Both bridge type options are being carried forward into the Final Design phase so that the bridge type decision can be informed by more detailed cost information and estimates developed by the selected CM/GC contractor. Regardless of the bridge type selected, the East Approach of the bridge will be designed to not preclude an Eastbank Esplanade ramp connection to the bridge when / if it is advanced in the future.

Figure 5. Preferred Alternative with Bascule Movable Span (Tied Arch East Approach)

Figure 6. Preferred Alternative with Bascule Movable Span (Cable Stayed East Approach)

2.2.1 West Approach

The proposed Burnside Bridge includes a girder bridge type for the West Approach, which would be about the same width as the existing bridge. It avoids an adverse effect on the Skidmore/Old Town Historic District National Historic Landmark (NHL). The proposed Burnside Bridge would require two sets of larger bridge columns in the park (versus four with the existing bridge). They are located to provide the necessary horizontal offsets from Naito Parkway and the Willamette Greenway Trail that each traverse under the bridge.

2.2.2 Movable Span

The proposed Burnside Bridge has a bascule bridge as its movable span. The Movable Span will satisfy the required USCG horizontal and vertical navigational clearances for the main span; the requirements include enabling 100 percent of vessel traffic to safely transit under the bridge. The minimum clearances that will allow all vessel traffic to safely transit the bridge are as follows:

- Minimum Vertical Clearance (movable span in the raised position): Elevation 167.0 (NAVD88 datum). This would provide approximately 147 feet of vertical clearance above the ordinary high water mark surface elevation of 20.1 (NAVD88).

- Minimum Vertical Clearance (movable span in the closed position): Elevation 69.0 (NAVD88 datum). This would provide approximately 49 feet of vertical clearance above the ordinary high water mark surface elevation of 20.1 (NAVD88).
- Minimum Horizontal Clearance (permanent condition): 205 feet wide
- Minimum Horizontal Clearance (temporary construction condition): 165 feet wide

The Movable Span will be supported by "delta piers," or trapezoid-shaped piers sized to accommodate a bascule counterweight within the interior void of the pier. The piers will also be equipped with starlings, which are in-water structures that divide and deflect river water and floating debris on the upstream (south) side of the bridge. While these are currently anticipated to be formed starlings, they may alternatively be a smaller structure of equivalent function, such as a dolphin.

2.2.3 East Approach

The proposed Burnside Bridge identified a long-span bridge type for the East Approach but left open the decision for a cable stayed or tied arch bridge type option.

For the tied arch option, the Long-span Alternative includes a span length that minimizes the risks and reduce costs associated with placing a pier and foundation in the geologic hazard zone that extends from the river to about E 2nd Avenue. The tied arch option places the eastern pier of the tied arch span farther east, thereby increasing the length of the tied arch span but reducing the length and depth of the subsequent girder span to the east.

For the cable-stayed option, the tower is placed as reasonably close to the Union Pacific Railroad (UPRR) tracks as permissible, with the assumption that geotechnical ground improvements are necessary to mitigate the seismic geologic hazards. This results in differing cable-stayed span lengths. Based on the current tower location, UPRR pier protection is not required.

2.3 Eastbank Esplanade Ramp Connection

Since the 2018 publication of the project's Feasibility Phase, the City and County have been discussing the potential of a ramp connection between the Eastbank Esplanade and the Burnside Bridge. Early discussions led to the convening of an Active Transportation subgroup that explored a variety of ramp alignments and locations, as well as the potential installation of elevators. Following this work, the City and County agreed that the City would develop a preferred ramp alternative for further consideration.

In late Summer 2023, the City generated a spiral ramp connection concept to provide a potential Americans with Disabilities Act (ADA)-accessible connection between the Eastbank Esplanade and the new bridge. The spiral ramp would replace the existing stairs currently connecting the Burnside Bridge to the esplanade with a ramp structure that would extend from a new connection on the esplanade on the north side of the bridge up to the bridge with connections to the bridge on the south and north sides via spiral ramps. The spiral ramp would require multiple new in-water support structures and would require modifications to the existing Eastbank Esplanade including permanently moving a floating section of the esplanade eastward toward I-5 to accommodate the in-water and above water ramp structure (See Figure 7 through Figure 9). For more information about the concept, see the *Burnside Bridge Connector: Structural Concept Design Report* (KPFF 2023) in Appendix A).

Figure 7. Existing Project without Spral Ramp (View looking South)

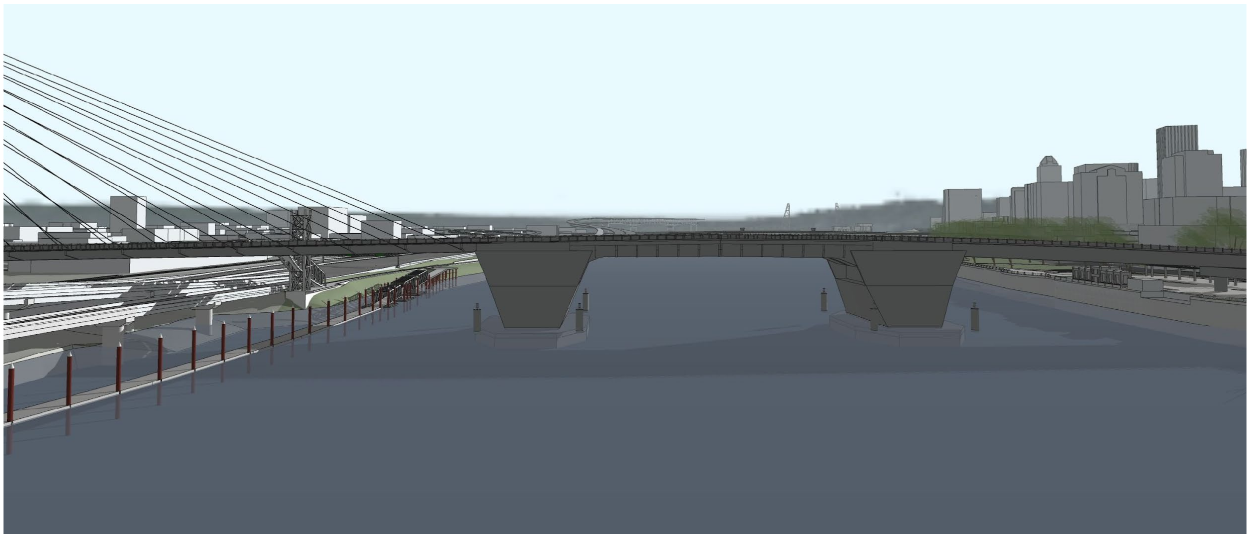


Figure 8. City's Spiral Ramp Connection Concept (View looking South)

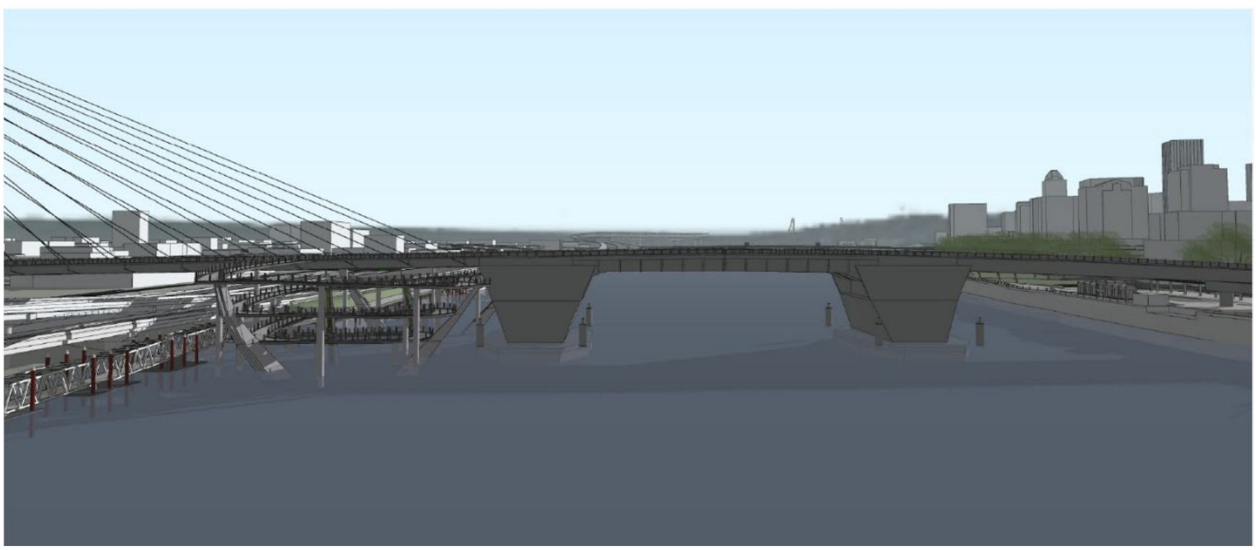
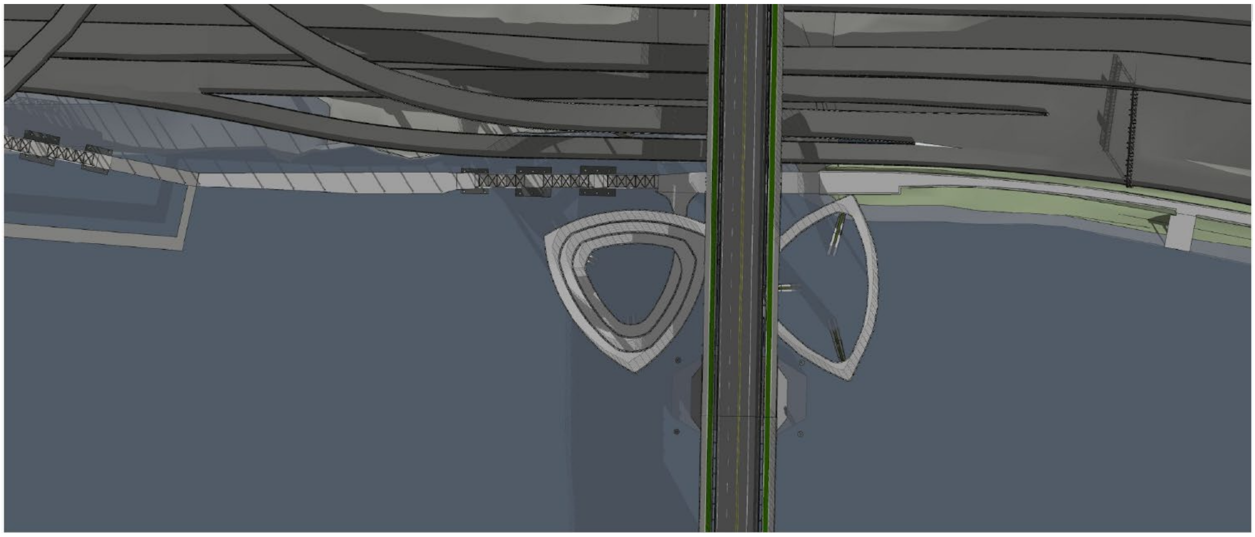


Figure 9. City's Spiral Ramp Connection Concept (Aerial View)



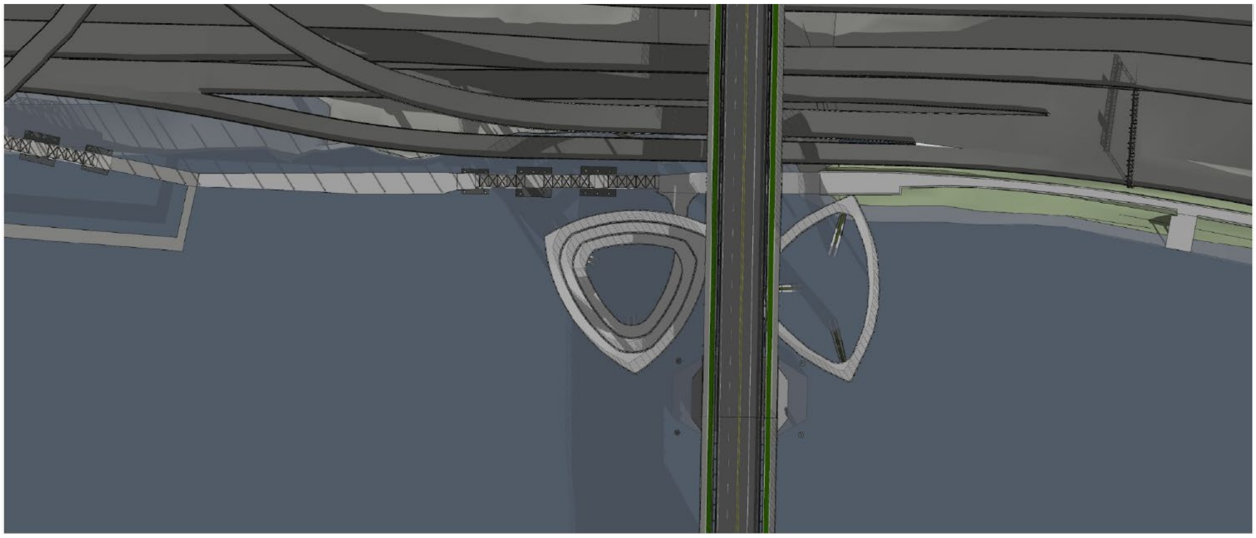
2.3.1 Ramp Connection Tie-in Options

As presently planned, the Burnside Bridge would provide approximately 78 feet of usable width for vehicle lanes, bicycle lanes, and pedestrians, which is comparable to the existing bridge. For the connection of the Eastbank Esplanade ramp to the bridge, there are two primary options, depending on whether there are ramp facilities on both the north and south side of the bridge (defined as Option 1, see Figure 10 and Figure 11 below), or whether the ramp structure is only on the north side of the bridge (defined as Option 2, see Figure 12 and Figure 13).

Option 1: Bicycle and Pedestrian Space on Both Sides of the Bridge

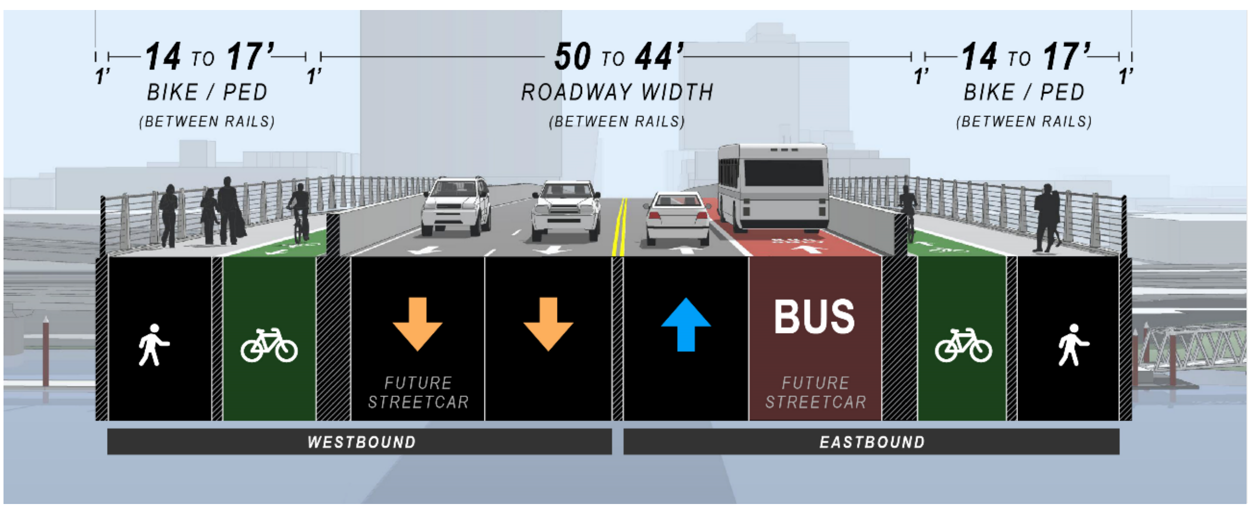
Ramp Configuration: A spiraling ramp at approximately 4 percent grade that is located on both the north and south sides of the Burnside Bridge. The north spiral consists of three loops while the south ramp only consists of only a single loop. Connecting the two spirals is a ramp segment that runs below the bridge. The base of the ramp connects to a relocated floating esplanade that runs parallel to the freeway bridges and connects to the at-grade esplanade at the base of the existing stairway.

Figure 10. Ramp Configuration (North and South Sides)



Roadway Cross Section: A single interior roadway space, ranging from 44 to 50 feet. The Preferred Alternative would accommodate four vehicle lanes. The City of Portland, on July 20, 2022, declared its preferred lane configuration as two westbound lanes (general-purpose) and two eastbound lanes (one general-purpose and one bus-only lane). Two exterior combined bicycle/pedestrian spaces, each ranging from 14 to 17 feet. This space would consist of a single level (i.e., no curb separating the bicycle and sidewalk portions) and be separated by a buffer.

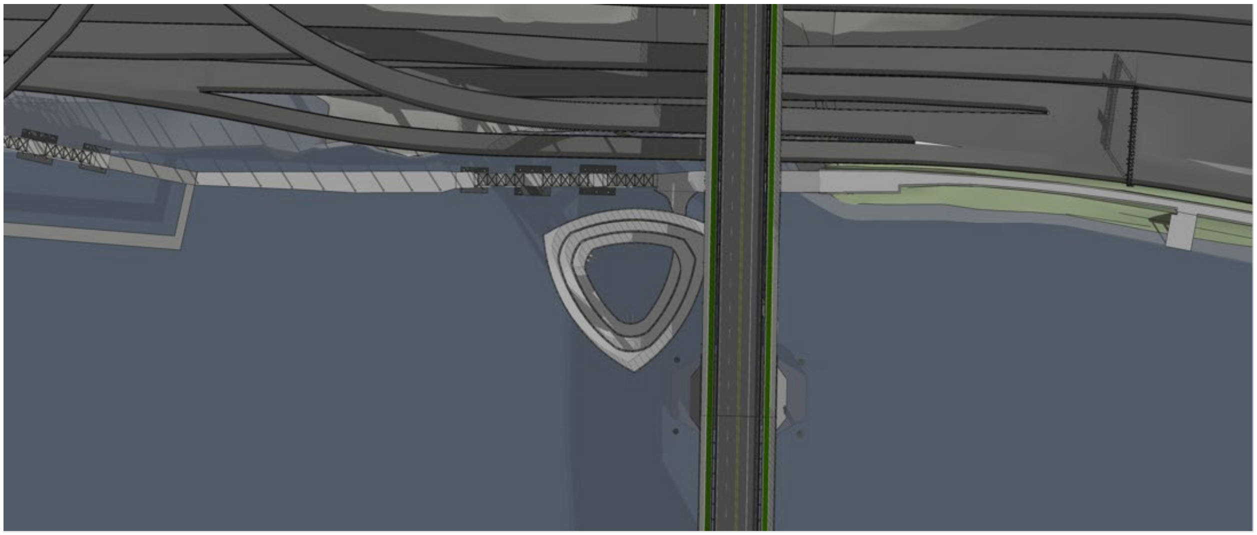
Figure 11. EQRB Bridge Cross Section for Ramp on North and South Sides (West Approach Shown; Others Similar)



Option 2: Ramp Only on the North Side of the Bridge

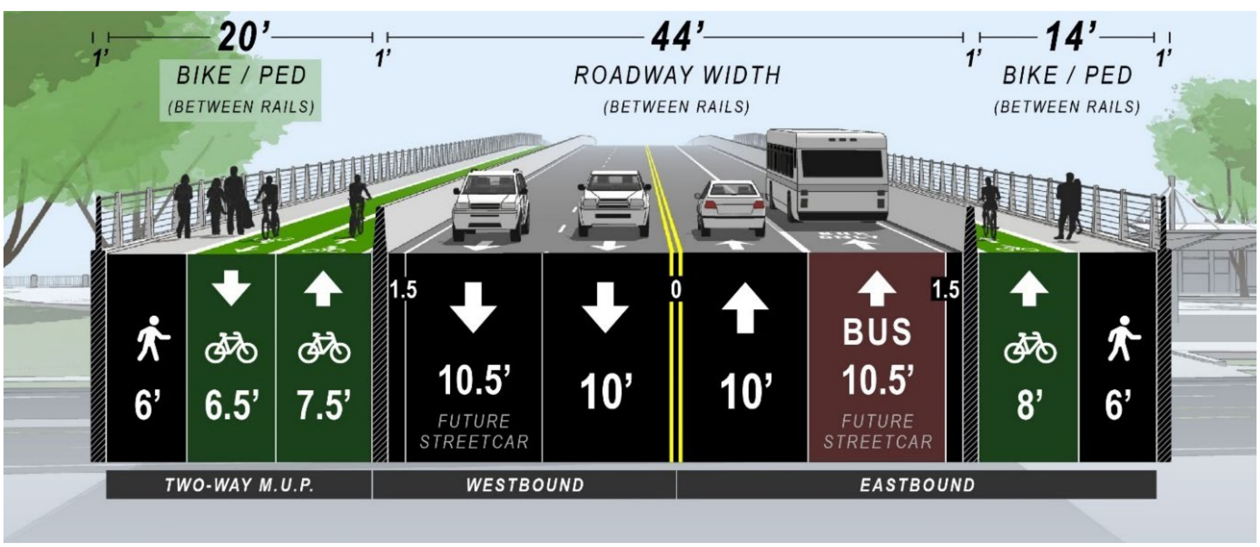
Ramp Configuration: A spiraling ramp at approximately 4 percent grade that is located on only the north sides of the Burnside Bridge. The lone north spiral consists of three loops and connects into a two-way bicycle facility on the north side of the Burnside Bridge. The base of the ramp connects to a relocated floating esplanade that runs parallel to the freeway bridges and connects to the at-grade esplanade at the base of the existing stairway.

Figure 12. Ramp Configuration (North Side Only)



Roadway Cross Section: A single interior roadway space, ranging from 44 to 50 feet. The Preferred Alternative would accommodate four vehicle lanes. The City of Portland, on July 20, 2022, declared its preferred lane configuration as two westbound lanes (general-purpose) and two eastbound lanes (one general-purpose and one bus-only lane). Two exterior combined bicycle/pedestrian spaces, the south side being 14 feet and the north side being 20 feet to accommodate two-way bicycling feet. This space would consist of a single level (i.e., no curb separating the bicycle and sidewalk portions) and be separated by a buffer.

Figure 13. EQRB Bridge Cross Section for Ramp on North Side Only (West Approach Shown; Others Similar)



3 Project Conceptual Cost Estimates

3.1 Cost Estimating Build Methodology

Each ramp connection option consists of up to three different structures:

- North Ramp
- South Ramp
- Floating Esplanade Relocation and Connection Reconstruction

Quantities were developed per structure to estimate the cost of each, using the *Burnside Bridge Connector: Structural Concept Design Report* (KPFF 2023) in Appendix A Report as the engineering basis of the concept. Then depending on the option, structure costs were compiled to formulate the cost of the option. Except for concept changes that include relocating the floating bridge access to the base of the existing stairway and other adjustments to foundations and column support locations described herein, this report assumed that concept provided in Appendix A was valid. No engineering validation of the concept was performed.

Besides updating the quantities and unit cost, a Burnside Bridge premium was developed to account for costs associated with load sharing between the ramp connection and the EQRB and to seismically isolate the bridges during a seismic event. This premium is only applicable to some of the options studied and will be discussed further in subsequent sections.

3.2 Constructed Cost Elements

The construction costs follow the basis of cost developed for the EQRB project. Costs developed consider the complexity of the structure, construction occurring within an urban environment, accommodation for intermittent pedestrian and recreational vessel traffic throughout the duration of construction.

Unit costs match those used for the EQRB project and are based on four key estimating sources:

- Average historical unit bid prices for similar work elements from relevant ODOT bridge cost data or similar projects constructed in the northwest (for estimated work items for which there is a suitable data source to draw from).
- Average historical unit bid prices for similar work elements from relevant projects constructed outside of the northwest (for unique items such as movable bridge components) for which there are little local/regional cost data to draw from.
- Engineering judgment, when pricing from similar projects or work elements, was not available or incomplete.
- Contractor’s style estimating techniques using a bottom-up (labor, material, equipment, and subcontractor) estimating approach to generate costs.

3.2.1 Unit Cost Methodology

Construction costs are the anticipated work items necessary to construct the project as well as the cost of the contractor's onsite management/supervision. Quantities were developed for items of work and unit costs assigned to yield construction cost. Unit costs are based on 2020 construction dollars and do not include any magnification factors for inflation, planning, engineering, or other future project delivery. These magnification factors are applied separately.

Since the options developed are in the early conceptual stages, only major quantities of work were calculated, relying on the contingency value to capture the cost of other minor quantities of work.

3.2.2 CM/GC Multipliers

One modification factor applied to the estimate includes a CM/GC multiplier previously developed for the EQRB Project. Throughout the cost estimation for the EQRB Project, it was determined that to calibrate the engineer's estimate to the contractor style estimate representing contractor risk, material availability, subconsultant labor market costs and other factors that influence pricing, a 1.5 multiplier on construction costs was required for the "High Cost" scenario. Based on discussions with the City, given that no Cost Risk workshop was conducted for the ramp structure, a 1.3 factor was applied for the "Low Cost" scenario.

Hence, following this same methodology, a CM/GC multipliers has been applied to the various ramp connection option estimates.

3.3 Programmatic Cost Elements

The programmatic costs follow the basis of cost developed for the EQRB project. In addition, costs were developed considering a high and low range of project cost percentages of subtotaled construction costs. Table 2 shows the high and low range percentages used for the estimates.

Table 2. High and Low Ranges Project Costs

Cost Feature / Element	High Range	Low Range
Mobilization[1]	10%	5%
Aesthetics Premium	3%	0%
Contingency	40%	35%
Preliminary Engineering	15%	12%
Construction Engineering	15%	12%
Right of Way[2]	0%	0%
Construction Escalation	3.5% to Year 2031	3.5% to Year 3029
CM/GC Multiplier (Applied to the Constructed Value only)	1.5	1.3

1 Contractor mobilization was assumed to be independent of the EQRB Project. Low range mobilization percentages represent a reduced need for remobilization for the contractor's equipment.

2 ROW acquisition costs for the Ramp Connection project are not anticipated.

3.3.1 Engineering and Project Delivery Costs

Engineering and project delivery costs that include a combination of the following three categories:

- Preliminary Engineering (PE) or Pre-Construction Phase – Costs include the necessary effort to develop preliminary and final design plans, specifications, and estimate for bidding the Project. For bridge feasibility studies, a typical PE factor is commonly applied to the construction cost and ranges from 6 to 25 percent. For this Project, because of its scale and complexity, a value of 15 percent of the construction cost (excluding gross receipts tax) is used. The PE cost is not inflated and does not include any cost for Alternative Project Delivery models (i.e., Owners Representative, CM/GC Pre-construction, Independent Estimator, etc.).
- Construction Engineering & Inspection/Construction Administration (CEI/CA) Phase – Costs include all project costs for overseeing the construction phase including construction administration, engineering support, responding to contractor inquiries, construction inspection, and coordinating with the public. CEI/CA costs are established as a percentage of construction costs inclusive of utilities, mobilization, temporary traffic control, contingency, and escalation. For this level of design, a typical CEI/CA factor is commonly applied to the construction cost and ranges from 6 to 20 percent. For this Project, because of its scale and complexity, a value of 15 percent of the construction cost (excluding gross receipts tax) is used.
- Agency Administration – Cost represents the cost for the Owner to oversee and administer the Project, inclusive of Inter-governmental Agreement costs by other agencies. This cost is assumed as part of the PE and CE Phase costs.

3.3.2 Inflationary Costs

The future cost inflation factor used is based on a Washington Department of Transportation (WSDOT)-projected inflation factor from *Connecting Washington Bid Environment* presented to the Joint Transportation Committee on July 20, 2017 (WSDOT 2017) and compared with recent ODOT escalation forecasts. Based on these sources, a 3.5 percent per year inflationary rate is used to escalate construction costs (including the CE cost) from 2020 dollars to the mid-point of construction.

Two scenarios were developed for the midpoint of construction and were assumed to be at the end of 2029 and 2031. It was assumed that construction of the ramp connection would start after the completion of the EQRB Project, using the same contractor, and not during the bridge construction.

No reductions to escalation for Early Work Packages has been accounted for as part of the estimate as these have not yet been determined.

3.4 Anticipated Total Project Cost

A summary of the total estimated Project costs for the four ramp connection options studied are listed in Table 3. High and low range programmatic costs were developed which have a range of project costs as shown in Table 2. Additionally, inflation has been accounted for two construction midpoint years, 2029 and 2031.

Table 3. Anticipated Total Project Cost – Summary of Options

M (millions)

	HIGH RANGE			LOW RANGE		
Option	**2023 $**	**2029 $**	**2031 $**	**2023 $**	**2029 $**	**2031 $**
Option 1a	$116.7M	$141.1M	$150.5M	$88.9M	$107.8M	$115.0M
Option 1b	$111.6M	$134.9M	$143.8M	$85.7M	$103.9M	$110.9M
Option 2a	$97.1M	$117.4M	$125.1M	$75.5M	$91.5M	$97.6M
Option 2b	$91.3M	$110.4M	$117.7M	$71.3M	$86.5M	$92.2M

3.4.1 Anticipated Total Project Cost - Option 1a

The estimate for this option includes costs associated with the north and south pedestrian ramps. For this option, the ramps are completely independent of the Burnside Bridge and do not load share nor require any special joint connections. Therefore, there is not a premium associated with this option. Also included is the cost associated with rerouting the floating esplanade and reconnecting to the Eastbank Esplanade.

North and South Ramp Connection

The structure comprises of spiral ramps on both the north and south sides of the Burnside Bridge. It also includes the cost of the ramp underneath the Burnside Bridge that connects the north and south structures. This portion of the ramp underneath the main bridge is assumed to be self-supported by the ramps themselves and does not connect or load share to the main bridge.

The conceptual foundations estimated for the north ramp consist of a perched footing cap founded on driven steel pipe pile. The footing cap supports the diagonal steel box columns and a portion of the vertical pipe columns supporting the superstructure. For column supports that do not overlap or coincide with the perched footing cap, it is assumed will be supported on individual drilled shafts, with specific quantities as follows:

- (3) 48-inch Diagonal Steel Box Columns
- (19) 48-inch dia. Steel Pipe Columns
- (14) 72-inch dia. Drilled Shafts
- 102-foot x 89-foot x 10-foot Perched Footing Cap
- (12) 48-inch dia. Driven Steel Pipe Pile

The conceptual foundations estimated for the south ramp consist of a perched footing cap founded on drilled shafts. The footing cap supports the diagonal steel box columns. For column supports that do not overlap or coincide with the perched footing cap, it is assumed will be supported on individual drilled shafts, with specific quantities as follows:

- (3) 48-inch Diagonal Steel Box Columns
- (5) 48-inch dia. Steel Pipe Columns
- (5) 72-inch dia. Drilled Shafts
- 56-foot x 56-foot x 10-foot Perched Footing Cap
- (3) 96-inch dia. Drilled Shafts

Eastbank Esplanade Connection

The location of the new ramp connection will require a relocation of the floating portion of the Eastbank Esplanade. The location of the new ramps would be in conflict with the existing mooring piles of the esplanade and new ramp columns, additionally would have vertical clearance underneath the new ramp superstructure during periods of high and low water conditions. Therefore, the estimated work consists of relocation of the existing floating structure to the east of the new ramp connection. Additionally, a new fixed bridge connecting the east embankment to the floating truss portion of the esplanade would be required. Lastly, the original fixed portion of esplanade would be removed.

Burnside Bridge Premium

Not applicable for this option.

Table 4. Anticipated Total Project Cost Breakdown and Summary – Option 1a

Note: High Range costs given. For low range costs, see Appendices.

	North Ramp	South Ramp	Esplanade Connection	Burnside Bridge Premium
Construction Costs Subtotal	$27.8 M	$10.2 M	$2.6 M	NA
Subtotal w/CMGC Multiplier	$47.1 M	$17.3 M	$4.3 M	NA
Subtotal w/Project Costs (No Escalation)	$80.0 M	$29.4 M	$7.3 M	NA

Anticipated Cost Summary – Option 1a

	Subtotal
Ramp Only	$116.7M
Burnside Bridge Only	$0
Ramp + Bridge (2023$)	$116.7M
Ramp + Bridge (2029$)	$141.1M
Ramp + Bridge (2031$)	$150.5M

3.4.2 Anticipated Total Project Cost - Option 1b

The estimate for this option includes costs associated with the North and South pedestrian ramps. For this option, the ramps are dependent on load sharing with Burnside Bridge and would likely require a seismic isolation joint to accommodate out of phase movements between the ramp connection and Burnside Bridge. Therefore, there is a premium associated with this option. Also included is the cost associated with rerouting the floating Esplanade and reconnecting to the Eastbank.

North and South Ramp Connection

The structure comprises of the spiral ramps on both the north and south sides of the Burnside Bridge. It also includes the cost of the ramp underneath the Burnside Bridge that connects the north and south structures. This portion of the ramp underneath the main bridge is assumed to be supported by Burnside Bridge span, therefore requiring fewer column supports to support this portion of the ramp connection.

The conceptual foundations estimated for the north ramp are similar to Option 1a above, except for one less column support. Since the ramp connection will shed load to the Burnside Bridge, less supports are needed. Specific quantities are as follows:

- (3) 48-inch Diagonal Steel Box Columns
- (18) 48-inch dia. Steel Pipe Columns

- (13) 72-inch dia. Drilled Shafts
- 102-foot x 89-foot x 10-foot Perched Footing Cap
- (12) 48-inch dia. Driven Steel Pipe Pile

The conceptual foundations estimated for the south ramp are similar to Option 1a above, except for one less column support. Since the ramp connection will shed load to the Burnside Bridge, less supports are needed. Specific quantities are as follows:

- (3) 48-inch Diagonal Steel Box Columns
- (4) 48-inch dia. Steel Pipe Columns
- (4) 72-inch dia. Drilled Shafts
- 56-foot x 56-foot x 10-foot Perched Footing Cap
- (3) 96-inch dia. Drilled Shafts

Eastbank Esplanade Connection

Work and estimate for the Eastbank Esplanade Connection is the same as Option 1a above.

Burnside Bridge Premium

As previously mentioned, the portion of ramp extending underneath the Burnside Bridge is assumed to be suspended off the bridge span above with the Burnside Bridge carrying this extra load. This results in additional accommodation in the design for the EQRB Project. In addition to the extra load sharing, in order to maintain functionality post seismic event, special seismic joints should be taken into consideration between the portions of the self-supported ramp connection and the portion supported by the Burnside Bridge. These additional design features were captured in a premium and added to the option's cost.

Table 5. Anticipated Total Project Cost Breakdown and Summary– Option 1b

Note: High Range costs given. For low range costs, see Appendices.

	North Ramp	South Ramp	Esplanade Connection	Burnside Bridge Premium
Construction Costs Subtotal	$25.3 M	$9.2 M	$2.6 M	$1.7 M
Subtotal w/CMGC Multiplier	$42.9 M	$15.7 M	$4.3 M	$2.8 M
Subtotal w/Project Costs (No Escalation)	$72.84 M	$26.6 M	$7.3 M	$4.8 M

Anticipated Cost Summary – Option 1b

	Subtotal
Ramp Only	$106.8 M
Burnside Bridge Only	$4.8 M
Ramp + Bridge (2023$)	$111.6 M
Ramp + Bridge (2029$)	$134.9 M
Ramp + Bridge (2031$)	$143.8 M

3.4.3 Anticipated Total Project Cost - Option 2a

The estimate for this option includes costs associated with the North pedestrian ramp and does not include a south side ramp. For this option, the ramp is completely independent of the Burnside Bridge and does not load share nor require any special joint connections. Also included is the cost associated with rerouting the floating Esplanade and reconnecting to the Eastbank.

North Ramp Connection

The structure comprises of the spiral ramp on the north side of Burnside Bridge, only. The conceptual foundations estimated for the north ramp are similar to Option 1a.

Eastbank Esplanade Connection

Work and estimate for the Eastbank Esplanade Connection is the same as Option 1a above.

Burnside Bridge Premium

Although there is no load sharing between the ramp connection and Burnside Bridge, the absence of the south ramp connection spiral would require an asymmetrical cross section of Burnside to accommodate bi-directional multi-modal traffic along the north side of the bridge. This asymmetry would create asymmetric or eccentric loading for the long span structure of Burnside Bridge which would require additional design considerations to accommodate. These additional design features were captured in a premium and added to the option’s cost.

Table 6. Anticipated Total Project Cost Breakdown and Summary– Option 2a

Note: High Range costs given. For low range costs, see Appendices.

	North Ramp	South Ramp	Esplanade Connection	Burnside Bridge Premium
Construction Costs Subtotal	$27.8 M	NA	$2.6 M	$3.5 M
Subtotal w/CMGC Multiplier	$47.1 M	NA	$4.3 M	$5.8 M
Subtotal w/Project Costs (No Escalation)	$80.0 M	NA	$7.3 M	$9.8 M

Anticipated Cost Summary – Option 2a

	Subtotal
Ramp Only	$87.3 M
Burnside Bridge Only	$9.8 M
Ramp + Bridge (2023$)	$97.1 M
Ramp + Bridge (2029$)	$117.4 M
Ramp + Bridge (2031$)	$125.1 M

3.4.4 Anticipated Total Project Cost - Option 2b

The estimate for this option includes costs associated with the North pedestrian ramp and does not include a south side ramp. For this option, the ramp is dependent on load sharing with Burnside Bridge and would likely require a seismic isolation joint to accommodate out of phase movements between the ramp connection and Burnside Bridge. Therefore, there is a premium associated with this option. Also included is the cost associated with rerouting the floating Esplanade and reconnecting to the Eastbank.

North Ramp Connection

The structure comprises of the spiral ramp on the north side of Burnside Bridge, only. The conceptual foundations estimated for the north ramp are similar to Option 1b.

Eastbank Esplanade Connection

Work and estimate for the Eastbank Esplanade Connection is the same as Option 1a above.

Burnside Bridge Premium

It is anticipated that with this option, a portion of the connecter would share load with the Burnside Bridge at the connection point. This results in additional accommodation in the design for the EQRB Project. In addition to the extra load sharing, in order to maintain functionality post seismic event, special seismic joints should be taken into consideration between the portions of the self-supported ramp connection and the portion supported by the Burnside Bridge.

Additionally, the absence of the south ramp connection would require an asymmetrical cross section of Burnside to accommodate bi-directional multi-modal traffic along the north side of the bridge. This asymmetry would create asymmetric or eccentric loading for the long span structure of Burnside Bridge which would require additional design considerations to accommodate.

These additional design features were captured in a premium and added to the option's cost.

Table 7. Anticipated Total Project Cost Breakdown and Summary– Option 2b

Note: High Range costs given. For low range costs, see Appendices.

	North Ramp	South Ramp	Esplanade Connection	Burnside Bridge Premium
Construction Costs Subtotal	$25.3 M	NA	$2.6 M	$4.0 M
Subtotal w/CMGC Multiplier	$42.9 M	NA	$4.3 M	$6.6 M
Subtotal w/Project Costs (No Escalation)	$72.8 M	NA	$7.3 M	$11.1 M

Anticipated Cost Summary – Option 2b

	Subtotal
Ramp Only	$80.2 M
Burnside Bridge Only	$11.1 M
Ramp + Bridge (2023$)	$91.3 M
Ramp + Bridge (2029$)	$110.4 M
Ramp + Bridge (2031$)	$117.7 M

3.5 Value Engineering Opportunities

The Eastbank Esplanade ramp connection options are in early stages of planning and conceptual design. Additional concept feasibility is recommended to explore further value engineering opportunities, but the following represent topics that could be refined to reduce the overall project cost:

- Further refine design assumptions and quantities through additional analysis. This includes:
  - Consider adjusting the ramp shape and layout from a basket to one that can utilize common support elements and foundations.

  - Consider increasing the profile grade to 5 percent in order to reduce the ramp length.
  - Assess the potential for smaller in-water foundations (whether spread footings or drilled shafts).
- Conduct Cost Risk / Value Engineering workshop(s) to identify key cost risks and establish cost reducing mitigation strategies that could potentially lower the 1.3 to 1.5 CMGC factor.

4 NEPA and Environmental Considerations

This section provides an overview of the Eastbank Esplanade connection configurations that have been analyzed in the EQRB Project's NEPA process, as well as the types and status of permits anticipated to be needed for the EQRB project.

It then details the level of NEPA analysis anticipated for an Eastbank Esplanade ramp connection project under three different options, as well as the corresponding environmental approvals, and a summary of federal, state, and local environmental permits that may be needed. This information was developed, in part, based on prior coordination with FHWA.

4.1 Eastbank Esplanade Connections Analyzed in the EQRB NEPA Process

The NEPA Draft EIS and Supplemental Draft EIS written for the Earthquake Ready Burnside Bridge Project have analyzed several options for an ADA-accessible connection. Below is a summary of the various options that have been analyzed. These are further detailed in the *EQRB Revised Active Transportation Access Options Memorandum* (Multnomah County 2022).

At the time of this memorandum, Multnomah County is nearing the end of the NEPA process for the EQRB Project. A Final EIS and a ROD for the Project is anticipated to be published in December 2023 and identifies, as its Selected Alternative, the replacement of the existing bridge with a seismically-resilient one in approximately the same location.

There is agreement between the City and County that there will be no ramp constructed from the bridge to the Eastbank Esplanade as part of the EQRB Project. Further, a decision about whether to maintain or remove the existing stairway is not known at this time but will be made early in the Final Design phase and is subject to applicable laws, regulations and standards, including the Americans with Disability Act.

4.1.1 Draft EIS

The EQRB Draft EIS considered a range of potential connections from the Burnside Bridge to the Eastbank Esplanade. These include:

- Stairway and an elevator on both sides of the bridge
- Stairway and an elevator on the bridge's south side only, with a signalized mid-block pedestrian and bicycle crossing on the bridge deck

- Ramps on both sides of the bridge and a stairway on the south side
- Ramp and stairway on the south side only, with a signalized mid-block pedestrian and bicycle crossing on the bridge deck

4.1.2 Supplemental Draft EIS

For the EQRB Supplemental Draft EIS, additional analysis and refinements to the type of connection from the Burnside Bridge to the Eastbank Esplanade were performed. These include:

- Further evaluation of a refined elevator/stairway option
- Removed signalized mid-block crossing
- Additional analysis for reconnection of existing stairs or no connection to the Eastbank Esplanade. Added discussion that pedestrian/bike/ADA connection to the Eastbank Esplanade could be done by the City as an independent project

4.1.3 Final EIS

As discussed above, the EQRB Final EIS Preferred Alternative identifies protecting in-place the existing staircase for later reconnection to the new Burnside Bridge. There is agreement between the City and County that there will be no ramp constructed from the bridge to the Eastbank Esplanade as part of the EQRB Project. Further, a decision about whether to maintain or remove the existing stairway is not known at this time but will be made early in the Final Design phase and is subject to applicable laws, regulations and standards, including the Americans with Disability Act.

4.2 EQRB Approval and Permit Status

As a federally funded project, the EQRB Project is required to obtain approvals showing compliance with federal regulations and laws including Section 7 of the ESA, Section 106 of the National Historic Preservation Act (Section 106) and Section 4(f) of the Department of Transportation Act (Section 4(f)). The Project obtained a Biological Opinion from NMFS in July 2021. Final versions of the Section 106 Programmatic Agreement and Section 4(f) analysis will accompany the Final EIS.

The EQRB Project has a variety of permits needed from federal, state, and local agencies. A list of permits and application status are shown in Table 8 below. Note for the permit applications submitted prior to Final Design, the EQRB Project is utilizing an assumed design that includes reconnection of the existing stairs at the Eastbank Esplanade. There is agreement between the City and County that there will be no ramp constructed from the bridge to the Eastbank Esplanade as part of the EQRB Project. Further, a decision about whether to maintain or remove the existing stairway is not known at this time but will be made early in the Final Design phase and is subject to applicable laws, regulations and standards, including the Americans with Disability Act.

Table 8. EQRB Project Required Permits and Timeframes

Permit	Permitting Agency	Anticipated Timeframe and Status
CWA 404 permit	US Army Corps of Engineers (USACE)	Spring 2024 - In progress
Section 9 Bridge Permit	US Coast Guard (USCG)	Summer 2024 - In progress
Section 408 Navigation Permit	USACE	Spring 2024 - In progress
CWA 401 Water Quality Certification	Oregon Department of Environmental Quality	Winter 2021 - Completed
Oregon Removal-Fill Permit	Oregon Department of State Lands	During Final Design
Floodplain Development Permit	City of Portland	During Final Design
Type II River Review	City of Portland	During Final Design
Non-Park Use Permit	City of Portland	During Final Design
Noise Ordinance Variance	City of Portland	During Final Design
Type II or III Conditional Use Review	City of Portland	During Final Design
Type IV Demolition Review/Demolition Permit	City of Portland	During Final Design
Type III Historic Resource Review	City of Portland	During Final Design
Type II Adjustment or Type II Design Modification	City of Portland	During Final Design

4.3 Potential NEPA options for the City Eastbank Esplanade Ramp Connection

For the purposes of the NEPA discussion, it is generally assumed that federal funding utilizing DOT monies, likely administered by FHWA as the lead federal agency, would be used to fund the new Eastbank Esplanade connection. The following discussion identifies where processes that are related specifically to DOT funding may not be applicable if funding sources from a non-DOT funded agency are utilized.

On August 15, 2023, County staff, the County's consulting team, and City personnel met to discuss options for the Eastbank Esplanade spiral ramp connection concept and potential NEPA processes, permitting pathways, and related timelines that might be utilized to provide for construction of the ramp connection.

Two options were considered that assume incorporating federal funds, thus creating a federal NEPA nexus. A third options was explored that consisted of locally-funds only, thus avoiding the federal NEPA nexus.

- Option 1 assumes that the new ramp connection is incorporated into County EQRB NEPA documents.

- Option 2 assumes that the new ramp connection would be an independently sponsored project with separate NEPA approval.
- Option 3 assumes that the ramp connection is an independently sponsored project funded with local (non-federal) funds.

The sections that follow serve as a summary of implementation options that were considered when including the City's preferred spiral ramp connection.

4.3.1 Implementation Option 1: Spiral Ramp Connection Incorporated into County EQRB NEPA Documentation Post-Record of Decision

NEPA and Related Approvals

In this scenario, the new connection would be incorporated into the County's EQRB NEPA documentation (under the existing project Purpose and Need) after the ROD is issued and prior to the construction phase commencing. The incorporation of the new connection's design and analysis of its related impacts would likely require additional supplemental NEPA documentation as determined by a FHWA NEPA re-evaluation. The re-evaluation and any required supplemental NEPA analysis would require additional technical analysis and reports for the ramp connection, creation, and issuance of supplemental NEPA documents, potential additional public comment periods and issuance of an amended ROD. The supplemental NEPA process would also likely require re-initiation of consultation with the USFWS and NMFS for potential impacts to threatened and endangered fish species due to the ramp in-water structures. Extensive re-initiation of the Section 106 process is unlikely given that the existing ramp and the Eastbank Esplanade are not historic resources.

The most likely extensive coordination would involve resolving impacts to the Eastbank Esplanade as a Section 4(f) resource. The selection of reconnecting the existing stairs to the new Burnside Bridge under the Selected Alternative of the current draft ROD represents the environmentally preferable alternative, which is required to be identified under 40 CFR 1505.2(b). This is primarily due to a shorter duration of time and impact to the Eastbank Esplanade associated with reconnection of the existing stairs when compared to the other connection options analyzed in the Draft EIS, Supplemental Draft EIS, and draft Final EIS. The spiral ramp connection would have a greater duration of closure and physical impact to the Eastbank Esplanade than the current Selected Alternative. In addition, the spiral ramp connection would have increased noise impacts from I-5 due to permanent relocation of the floating section of the esplanade immediately north of the Burnside Bridge closer to the freeway to accommodate the spiral ramp placement. Based on these additional impacts, it would therefore not be the environmentally preferable alternative in an amended ROD regarding Section 4(f) resource impacts. A single interior roadway space, ranging from 44 to 50 feet. The Preferred Alternative would accommodate four vehicle lanes. The City of Portland, on July 20, 2022, declared its preferred lane configuration as two westbound lanes (general-purpose) and two eastbound lanes (one general-purpose and one bus-only lane). Two exterior combined bicycle / pedestrian spaces, each ranging from 14 to 17 feet. This space would consist of a single level (i.e., no curb separating the bicycle and sidewalk portions) and be separated by a buffer.

Federal Permits

With the need for a supplemental NEPA approval to the EQRB project post-ROD, it is likely that the completion of the final design phase would be delayed until NEPA approval is complete. Moreover, coordination would be needed with federal and state permitting agencies including USACE, USCG, and DEQ for revisions to any permit applications pending or permits issued. The USACE would need to determine if the additional in-water structure fits within the scope and scale of impacts related to the existing project. If not, USACE would likely need to reinitiate the public comment process prior to issuing a decision. Similarly for the Section 401 Water Quality Certification, if revisions to the USACE Section 404 permit exceed impacts assumed in the initial public notice, DEQ would need to review the project again and re-issue the 401 Certification. Regarding the USCG Bridge Permit, USCG would require modification of the existing bridge permit application.

State and Local Permits

The delay of final design would also impact the timeline for obtaining remaining state or local permit approvals especially those from the City of Portland, which are procured during the final design phase (Table 8). Regarding the City's floodplain development code (Title 33) and related permitting, the additional in-water ramp structure would likely result in a rise in base flood elevation in the Willamette River. This would require additional hydraulic modeling and mitigation to eliminate the rise or to refine design to minimize rise. In addition, future City code changes related to cut/fill requirements in the floodplain would need to be considered and accommodated. With respect to the City's land use and zoning permits, the in-water structure would occupy a larger area of the river column and riverbed than the currently Selected Alternative with greater impacts to shallow-water and riverine habitat along the east side of the Willamette River. The additional ramp structure both in-water and adjacent to the Willamette River exacerbate the challenge of finding additional types and areas of mitigation that could offset project impacts. Finally, with regard to the DSL permit, the addition of the spiral ramp would not impact the timing of submittal of the permit application, but it would result in additional mitigation requirements that could delay the issuance of the DSL permit.

Anticipated Permit List

Table 9 below contains a summary of the needed NEPA documentation and timeline impacts anticipated for Option 1.

Table 9. Option 1 Anticipated Approvals and Permits

Permit/Document	Update Required?	Relative Impact to Project Timeline	Notes
Final EIS/ROD	Yes	Moderate to significant based on re-evaluation needs	Re-evaluation by FHWA to determine if supplemental NEPA documentation needed.
Section 4(f)	Yes	Moderate to significant	4(f) coordination needed due to increased duration of EE closure for ramp and increased noise impacts for relocation closer to freeway
NMFS Biological Opinion	Yes	Moderate	Re-initiation of consultation with NMFS due to additional impacts of ramp in-water structure
Section 106	Not likely	Minor to none	New ramp not likely to have additional Section 106 impacts
DEQ CWA 401 WQ Certification	Likely	Moderate	If revisions to the USACE Section 404 permit exceed impacts assumed by the initial public notice, DEQ would review the project again and issue a revised 401 certification
USACE Permit (Section 404 and 408)	Yes	Moderate	USACE would need to determine if the additional structure fits within the scope and scale of the existing project and the impacts resulting from the existing project. If determine it would not, USACE would likely need to re-initiate the public process prior to issuing a decision.
USCG Permit	Yes	Moderate	Would require modification of existing USCG permit application
City Floodplain Development Permit	No	Moderate	The project would likely result in a rise requiring mitigation to eliminate the rise or an adjustment. Also, need to consider future City code for cut/fill requirements.
City Title 24/ Land Use and Zoning Permits	No	Moderate	The challenges with finding mitigation acceptable under the existing code would be exacerbated by the addition of the Spiral Ramp Connection.
DSL	No	Minor to none	No impact to the timing of the submittal. Additional impacts would result in additional mitigation requirements.

4.3.2 Implementation Option 2: Spiral Ramp Connection as a Separate, Federally Funded Project

NEPA and Related Approvals

Option 2 assumes that the new connection would be a separate, federally funded project. From a NEPA perspective, this would be an independent action with its own Purpose and Need. Per FHWA regulations, as an independent action, the Eastbank Esplanade connection could be classified as a NEPA CE under 23 CFR § 771.117 (c)(3) Construction of bicycle and pedestrian lanes, paths, and facilities. However, the appropriate level of documentation needed would have to be determined via coordination with FHWA (or other federal lead agency) prior to project inception. While the Eastbank Esplanade connection would be a separate project from the EQRB Project, much of the information used in the EQRB EIS documentation could be used for its NEPA documentation, especially regarding existing conditions and affected environment data, thereby minimizing the amount of data collection needed for these NEPA elements.

During the NEPA process, the Project would also have to obtain approvals for other federal requirements including compliance with Section 4(f), ESA, and Section 106. With regard to Section 4(f) compliance, the spiral ramp connection would cause closure of the esplanade for an extensive period and would result in increased noise due to the relocation of the esplanade north of the bridge closer to I-5. As the owner of the Eastbank Esplanade, the City of Portland is ultimately responsible for recommending to FHWA if the City's project constitutes a de minimis impact to, or use of, a 4(f) resource. Based on the impact decision, the project sponsor would need to provide analysis and documentation for either a de minimis impact or 4(f) use as specified by FHWA guidance. This could potentially include the use of a Nationwide Section 4(f) Programmatic Evaluation such as the Independent Walkway and Bikeways Construction Projects programmatic. Note that if DOT funds are not used to for the Eastbank Esplanade connection, Section 4(f) is not applicable.

Given that the Project would involve in-water work including shafts and piers to support the spiral ramp connection, demonstration of compliance with ESA would be needed. If FHWA funds are utilized, ESA consultation requirements could likely be satisfied using Oregon's Programmatic Endangered Species Act Consultation on the Federal-Aid Highway Program (FAHP programmatic permit), which covers most of the projects funded by FAHP and administered by ODOT. Background information from the EQRB Biological Assessment and Biological Opinion could be used to provide data for the FAHP programmatic permit documentation. Note that if FHWA funding is not utilized, the use of the FAHP programmatic permit would not be applicable and consultation with NMFS would be required, likely including the need for a Biological Assessment to be written for the Eastbank Esplanade Connection and a Biological Opinion to be issued by NMFS. From a USFWS perspective, if the FAHP programmatic permit cannot be utilized, no effects to species regulated by USFWS are anticipated similar to the EQRB project.

Regarding Section 106, the Eastbank Esplanade connection would require coordination with the Oregon SHPO as part of the NEPA process. Background information from the EQRB Section 106 documentation could be used to provide data for the Eastbank Esplanade connection. Although needing verification based on the specifics of the design selected, it is anticipated that the Eastbank Esplanade connection would have no adverse effects on Section 106 resources.

As an independent project, this scenario would have its own NEPA approval timeline. It would not impact the County's NEPA approval timeline or process. If a CE is chosen as the appropriate level of NEPA documentation, no public comment is required and NEPA approval could potentially be completed within a year. Regarding permitting and delivery of a new connection post-NEPA approval, the project sponsor could either perform that independently or via inclusion of those processes into the County's permitting and delivery.

Federal Permits

For compliance with Clean Water Act regulations, a Section 404 Permit and a Section 401 Water Quality Certification will be required. Based on coordination with the USACE, the Eastbank Esplanade Connection may qualify for a Nationwide Permit, which provides coverage for Section 404 and Section 401 (and covers structures regulated under Section 10 of the Rivers and Harbors Act). Nationwide Permits typically cannot be used for projects that cause greater than a certain impact to waters of the United States (e.g., no greater than ½-acre for Nationwide Permit 42, Recreation Facilities). If the Eastbank Esplanade Connection does not qualify for a Nationwide Permit, an individual Section 404 Permit would need to be obtained from USACE and an individual Section 401 Water Quality Certification would need to be obtained from Oregon DEQ. The project sponsor could utilize much of the data from the EQRB Section 404 and 401 applications to provide existing conditions and affected environment information for this process. Applications for these permits are made using the Joint Permit Application (JPA) form.

The spiral ramp connection would require submittal of documentation to the USACE to determine if a Section 408 permit is required. If the project may result in sediment migration that could impact the channel, then a 408 permit would be required.

With regard to USCG permitting, based on coordination and input from USCG staff, the spiral ramp connection would require a new USCG bridge permit application. The proposed configuration of the spiral ramp connection could be an impediment to river travel along the east side of the bridge and could require extensive design coordination with the USCG including issuance of an additional river user survey and the need for a new Navigation Impact Report.

State and Local Permits

City and state permits and reviews for Option 2 would be the same as Option 1.

Anticipated Permit List

Table 10 below contains a summary of the needed NEPA documentation and timeline impacts anticipated for Option 2.

Table 10. Option 2 Anticipated Approvals and Permits

Permit/Document	Documentation Type	Notes
NEPA	Likely CE	Could be classified as a NEPA Categorical Exclusion (CE) under 23 CFR § 771.117 (c)(3) Construction of bicycle and pedestrian lanes, paths, and facilities. Would need confirmation from FHWA.
Section 4(f)	*De minimis* or Full Section 4(f) analysis	4(f) coordination needed due to increased duration of EE closure for ramp and increased noise impacts for relocation closer to freeway
Endangered Species Act	Likely FAHP programmatic	ESA consultation requirements could likely be satisfied using Oregon's Programmatic ESA Consultation on the Federal-Aid Highway Program (FAHP programmatic permit)
Section 106	Section 106 Report	Would need to coordinate with Oregon SHPO but unlikely to cause an adverse effect under Section 106.
DEQ CWA 401 WQ Certification	JPA	Likely occur under a Nationwide Permit
USACE Permit (Section 404)	JPA	Likely occur under a Nationwide Permit
USACE Permit (Section 408)	Design documentation	Would require coordination with USACE. If permit is required, design review by USACE to include specific analyses such as hydraulic modeling, real estate documentation, geotechnical analysis.
USCG Permit	Bridge permit application	Would require modification of USCG bridge permit application or new application. Proposed ramp configuration under east bridge approach could be an impediment to river traffic so could require extensive design modification/coordination with USCG including issuance of an additional river user survey.
City Floodplain Development Permit	City permit application	Would likely result in a rise requiring mitigation to eliminate the rise or an adjustment. Also, need to consider future City code for cut/fill requirements.
City Title 33/ Land Use and Zoning Permits	City permit application	New permit required existing code would be exacerbated by the addition of the Spiral Ramp Connection.
DSL	JPA	No impact to the timing of the submittal. Additional impacts would result in additional mitigation requirements.

4.3.3 Implementation Option 3: Spiral Ramp Connection as a Separate, Locally (Non-Federally) Funded Project

NEPA and Related Approvals

Option 3 assumes that the new connection would be a separate, locally funded project with no federal funding. Therefore, there would be no NEPA process related to federal funding. Federal permits would still require ESA and Section 106 documentation and approvals, but these would be under the jurisdiction of the lead federal permitting agency. Table 11 contains a summary of related permits and approvals that are expected under Option 3.

With regard to ESA, without FHWA funding, the FAHP programmatic permit would not be applicable and consultation with NMFS would be required, likely including the need for a Biological Assessment to be written for the spiral ramp connection and a Biological Opinion to be issued by NMFS. From a US Fish and Wildlife Service (USFWS) perspective, no effects to species regulated by USFWS are anticipated similar to the EQRB project.

Regarding Section 106, the Eastbank Esplanade connection would require coordination with the Oregon State Historic Preservation Office (SHPO). Background information from the EQRB Section 106 documentation could be used to provide data for the spiral ramp connection. Although needing verification based on the specifics of the design selected, it is anticipated that the connection would have no adverse effects on Section 106 resources.

Federal Permits

Required federal permits for Option 3 would be the same as Option 2.

State and Local Permits

City and state permits and reviews for Option 3 would be the same as Option 2.

Anticipated Permit List

Table 11 below contains a summary of the needed NEPA documentation and timeline impacts anticipated for Option 2.

Table 11. Option 3 Anticipated Approvals and Permits

Permit/Document	Approval or Permit Required?	Documentation Type	Notes
NEPA	No	N/A	No NEPA process related to federal funding
Section 4(f)	No	N/A	No federal DOT funding
Endangered Species Act	Yes	TBD but likely Biological Assessment	Could not use FAHP process to satisfy ESA. Would need to consult with federal lead agency and NMFS to determine path to ESA coverage from NMFS. May be able to use SLOPES.
Section 106	Same as Option 2	Same as Option 2	Same as Option 2
DEQ CWA 401 WQ Certification	Same as Option 2	Same as Option 2	Same as Option 2
USACE Permit (Section 404 and 408)	Same as Option 2	Same as Option 2	Same as Option 2
USCG Permit	Same as Option 2	Same as Option 2	Same as Option 2
City Floodplain Development Permit	Same as Option 2	Same as Option 2	Same as Option 2
City Title 33/ Land Use and Zoning Permits	Same as Option 2	Same as Option 2	Same as Option 2
DSL	Same as Option 2	Same as Option 2	Same as Option 2

5 Active Transportation Design and Connectivity

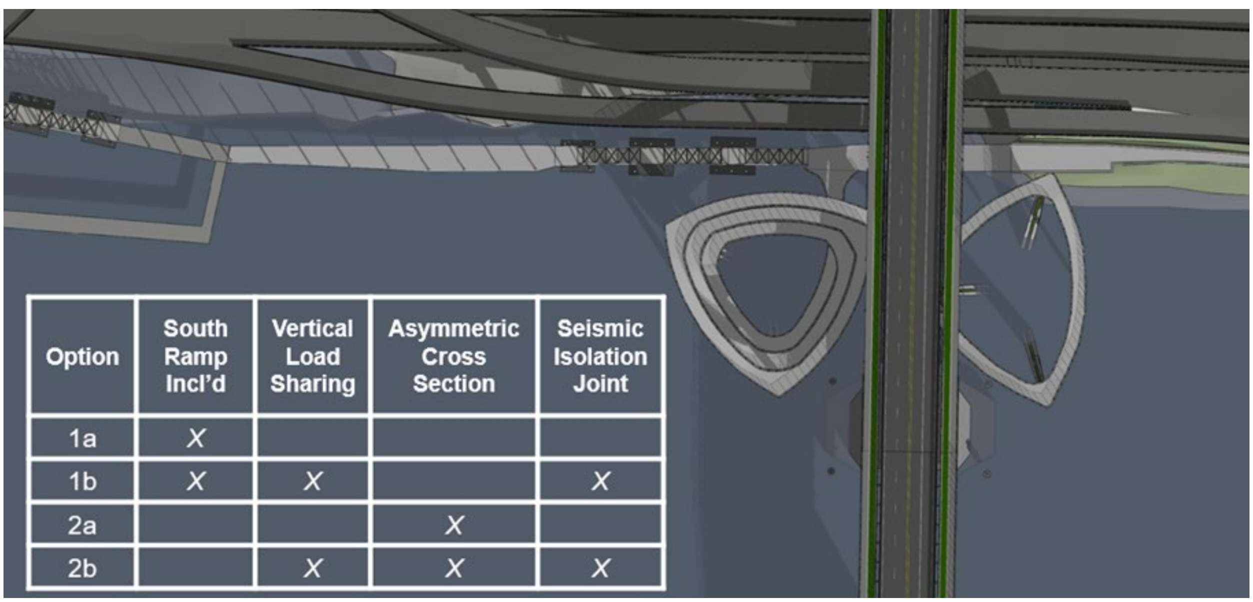
The City-County Joint Technical Team considered the advantages, disadvantages, impacts, and tradeoffs of various cross section options for the bridge deck. The bridge is constrained in its overall width and these options vary the amount of space provided for traffic, transit, large vehicle, and other roadway needs compared to the amount of space provided for active transportation.

The cross section options are also influenced by potential ramp connections to the Eastbank Esplanade. The ramp connection option has an impact on the design of the bikeway on the bridge deck and its connectivity back into the bikeway network on either side of the bridge. The ramp connection option has some impact on the design of pedestrian facilities and network connectivity. Bidirectional pedestrian movement can mostly be accommodated by sidewalks, although narrower sidewalks could result in people stepping into the bicycling space to pass other pedestrians and increase the potential for ped-bike conflicts.

There are two primary connection options to the Eastbank Esplanade, as described below:

- Provide connections to both the northside and southside of the bridge, as shown in Options 1a and 1b in Figure 14. With this option, active transportation users going to or coming from the Eastbank Esplanade can choose which side of the bridge to walk or ride on. Most people will choose to walk or ride on the side that keeps them in the same direction as traffic. For example, bicyclists headed west will come up the ramp and connect to the north side of the bridge and bicyclists headed east will come up the ramp and connect to the south side of the bridge. This allows the bikeways on the bridge deck to be designed as unidirectional. This is the case for Bridge Cross section Options 1, 2, and 3.
- Provide a connection to just the north side of the bridge, as shown in Options 2a and 2b in Figure 14. With this option, active transportation users going to or coming from the Eastbank Esplanade will have to use the northside of the bridge. This results in two-way pedestrian movement and two-way bicycling traffic on the northside of the bridge, which impacts the bridge cross section and how this facility connects back into the bicycle network on either end of the bridge. This is the case for Bridge Cross section Option 4.

Figure 14. Eastbank Esplanade Ramp Connection Options



Option	South Ramp Incl'd	Vertical Load Sharing	Asymmetric Cross Section	Seismic Isolation Joint
1a	X			
1b	X	X		X
2a			X	
2b		X	X	X

Table 12 provides the active transportation characteristics for each of the bridge cross section options. Analysis of the bikeway design and connectivity considerations are described for each option in the sections below.

Table 12. Active Transportation Characteristics for the Bridge Cross Section Options

Option	Eastbank Esplanade Connection	Northside AT Space	Northside Bikeway Type	Southside AT Space	Southside Bikeway
1	Connections to both the northside and southside of the bridge	14’	Unidirectional (westbound)	14’	Unidirectional (eastbound)
2	Connections to both the northside and southside of the bridge	17’	Unidirectional (westbound)	17’	Unidirectional (eastbound)
3	Connections to both the northside and southside of the bridge	15.5’	Unidirectional (westbound)	15.5’	Unidirectional (eastbound)
4	Connection to the northside of the bridge only	20’	Bidirectional (eastbound and westbound)	14’	Unidirectional (eastbound)

5.1 Basis for Active Transportation Design

The following information provides a basis for design for the active transportation space.

5.1.1 Expected User Volumes

Expected bicycling volumes were calculated using two methods. The lower end of expected bicycling volumes was calculated in the NEPA documentation, which estimated 2019 and 2040 bike volumes on all the downtown bridges based on previous counts and growth patterns. Bicycling volumes for the Burnside Bridge were calculated as 1,750 bicyclists per day for base conditions in 2019 and 2,950 bicyclists per day for 2040 future year conditions.

Approximately 10 percent of daily trips occur in the peak hour, although this can vary from 7 percent to 15 percent depending on the type of location. Daily volumes were multiplied by 10 percent to get peak hour volumes, and then multiplied by a 70 percent to 30 percent directional split to identify volumes in the peak direction. This resulted in a 2040 directional peak hour volume of approximately 205 bicyclists per hour in the peak direction.

The upper end of expected bicycling volumes was calculated from the region’s modal aspirations. Bicycle mode split in Portland’s Inner East Side would need to hit 34 percent for Portland to achieve the overall bicycle mode split of 25 percent identified in the 2009 *Climate Action Plan* (BPA and Multnomah County 2009). The bicycle (plus walking and transit) mode splits needed by City section are described in “Table Array 4: Scenario Analysis Results” of the 2013 “White Paper on OHAS and the Path Ahead”.

A simple way to identify the outcomes toward which the City is aiming, planning, and designing is to assume that 34 percent of current automobile trips on the Burnside Bridge are converted to bicycling trips. Peak hour volumes were considered given they are the volumes used to inform facility width. Pre-pandemic and pre-construction peak hour automobile volumes were collected on W Burnside Street, east of 2nd Avenue and are shown in Table 13. This results in expected volumes of approximately 450 westbound peak hour bicyclists and 650 eastbound peak hour bicyclists.

Table 13. Peak Hour Automobile and Target Bicycle Volumes on the Burnside Bridge (Sorted from Most to Least)

table units: vehicles per hour

AM Peak Volumes (Autos Westbound)	Count Date	PM Peak Volumes (Autos Eastbound)	Count Date
1472	November 2015	2105	June 2012
1426	June 2012	1953	February 2011
1286	February 2011	1932	November 2015
1279	August 2016	1783	August 2016
1067	September 2018	1542	May 2022
1306	= Average Auto Count	1863	= Average Auto Count
444	= AM Bicycle Peak Volume (i.e., Ave count x 34%) in bicyclists per hour	633	= PM Bicycle Peak Volume (i.e., Ave count x 34%) in bicyclists per hour
287	= AM Bicycle Peak Volume (i.e., Ave count x 22%) in bicyclists per hour	410	= PM Bicycle Peak Volume (i.e., Ave count x 22%) in bicyclists per hour

Source: City of Portland (PBOT), August 8, 2023.
https://pdx.maps.arcgis.com/apps/webappviewer/index.html?id=7ce8d1f5053141f1bc0f5bd7905351e6.

Expected pedestrian volumes were calculated using the same methods. The lower end was calculated in the NEPA documentation, which estimated 2019 and 2040 pedestrian volumes on all the downtown bridges based on previous counts and growth patterns. Pedestrian volumes for the Burnside Bridge were calculated as 1,400 pedestrians per day for base conditions in 2019 and 2,750 pedestrians per day for 2040 future year conditions. Daily volumes were multiplied by 10 percent to get peak hour volumes, and then multiplied by a 70 percent/30 percent directional split to get volumes in the peak direction. This resulted in a 2040 directional peak hour volume of approximately 195 pedestrians per hour in the peak direction.

The upper end of expected pedestrian volumes was calculated from the region's modal aspirations. Pedestrian mode split in Portland's Inner East Side would need to hit 22 percent for Portland to achieve the overall walk mode split of 20 percent identified in the 2009 *Climate Action Plan* (BPS and Multnomah County 2009). In other words, 22 percent of current automobile trips on the Burnside Bridge would need to be converted to walking trips. Using the pre-pandemic and pre-construction peak hour automobile volumes on the Burnside, shown in Table 13, this results in expected volumes of approximately 290 westbound peak hour pedestrians and 410 eastbound peak hour pedestrians.

5.1.2 Street Classification

The Burnside Bridge has the following designations in the City of Portland's Transportation System Plan (TSP):

- Street Type: Civic Main Street. Although the bridge does connect two segments of Civic Main Street on either side, the bridge itself does not have all the characteristics of this type of street (i.e., with "areas of intensive commercial activity; development consisting of a mix of uses that are oriented to the street"). The bridge is more like a Civic Corridor in that it, runs "along major transit corridors and between Civic Main Street segments."
- Pedestrian Designation: Major City Walkway
- Bicycling Designation: Major City Bikeway

5.1.3 Active Transportation Cross Section Elements

Design guidance is provided in several City of Portland policies that inform the recommended dimensions for different active transportation cross section elements on the bridge including:

- Pedestrian space: The recommended minimum sidewalk dimensions are included in the *Portland Pedestrian Design Guide* (PBOT 2022) and are shown on Figure 15. Based on these, an 8-foot pedestrian through zone (walkway) is the recommended minimum width for a Civic Main Street. A 6-foot pedestrian through zone allows two people to walk side by side or to pass one another. Widths of 7-feet to 8-feet are sufficient for up to three people to walk together or for pedestrians to pass others on the sidewalk. Narrower sidewalks may require people to step into the bicycling space to pass other people walking.
- Bicycling space: The recommended bicycling zone widths are included in the *Portland Protected Bicycle Lane Design Guide* (PBOT 2021) and depend on directionality and expected bicycling volumes. These are shown on Figure 15. For unidirectional bike lanes with expected volumes between 150-750 bicyclists per hour in the peak hour, a minimum bicycling zone width of 6-foot 6-inches and a preferred width of 8 feet are recommended. For bidirectional bike lanes with expected volumes between 150-350 bicyclists per hour in the peak hour, a minimum bicycling zone width of 11 feet and a preferred width of 12 feet are recommended. For volumes over 350 bicyclists per hour, a minimum bicycling zone width of 14 feet and a preferred width of 16 feet are recommended.
- Shy distance: Bicyclists tend to ride some distance from vertical features such as the bridge railings that will be on either side of the active transportation space. Based on industry guidance and field testing conducted by PBOT on the Tilikum Bridge, this shy distance is at least 1 foot to 2 feet from the face of the railing to where the edge of the bike lane should be striped. Accounting for the shy distance, the remaining width is the functional width of the bike lane.

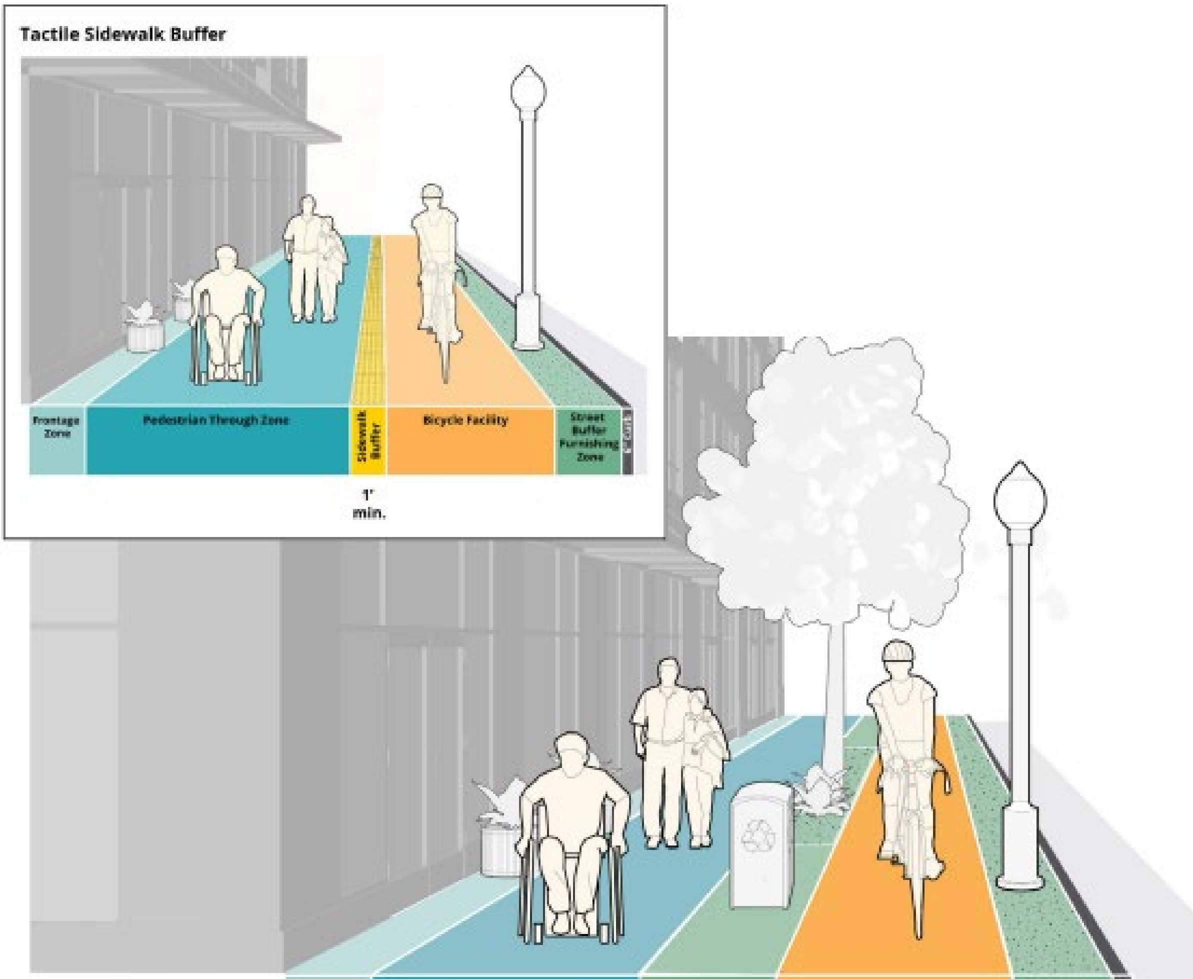
- Sidewalk buffer: PedPDX provides design guidance for when pedestrian and bicycling space are provided at the same grade, as shown on Figure 16. A sidewalk buffer of 1 foot to 4 feet is required to separate these users. Wider sidewalk buffers provide space for street furniture such as light poles, benches, and other features that can provide more physical separation between users. Narrower buffers with less vertical features will allow users to move into the other space when needed. The Burnside Bridge midspan will include a minimum 1-foot tactile sidewalk buffer. Experience on other bridges, such as the Tilikum Bridge have observed bicyclists passing one another by crossing into the pedestrian space, and vice versa. This is also likely to be more prevalent for options where narrower pedestrian through zone and bike lane dimensions are provided.

Based on the above guidance, the City's minimum unidirectional bicycle/pedestrian space width is 17.5 feet (8-foot ped + 1-foot buffer + 6.5-foot bike + 2-foot shy) and their preferred width is 19 feet (8-foot ped + 1-foot buffer + 8-foot bike + 2-foot shy). The City, however, has stated that they are willing to accept 17 feet, but they would anticipate bicycle and pedestrian conflicts with any space less than 17 feet.

Based on the above guidance, the City's minimum bidirectional bicycle/pedestrian space width is 27 feet (8-foot ped + 1-foot buffer + 14-foot bike + 2-foot shy) and their preferred width is 29 feet (8-foot ped + 1-foot buffer + 16-foot bike + 2-foot shy). The City, however, has stated that they are willing to accept 20 feet, but they would anticipate bicycle and pedestrian conflicts.

The City has further stated that the more this space is reduced, the further that it deviates from its Policy objectives. The dimensions provided above are clear widths between bridge rails, with no reduction for bridge appurtenances.

Figure 15: PedPDX Recommended Sidewalk Dimensions



Street Design Classification	Frontage Zone	Pedestrian Through Zone	Sidewalk Buffer Furnishing Zone	Bicycle Facility	Street Buffer Furnishing Zone *exclusive of curb width*
Civic Main Street	2.5'	8'	1' minimum, at least 4' ideal width	See Portland Protected Bicycle Lane Planning and Design Guide	3' minimum, at least 4' ideal width
Neighborhood Main Street	2.5'	8'			
Civic Corridor	1.5'	6'			
Neighborhood Corridor	1.5'	6'			
Community Corridor	1.5'	6'			
Regional Corridor	0.5'	6'			
Industrial Road	0.5'	6'			
Local Street	N/A	N/A	N/A	N/A	N/A

6" Curb

Figure 16: Portland Protected Bicycle Lane Design Guide Recommended Bike Lane Dimensions

Peak Hour Directional Bicyclist Volume	Bike Lane Width (ft.)	
	Preferable	Minimum*
<150	6.5	5
150-750	8	6.5
>750	10	8

* Constrained width may be as low as 4 feet for short distances.

Figure 3. Portland's recommended widths for directional bikeways

Peak Hour Bidirectional Bicyclist Volume	Bike Lane Width (ft.)	
	Preferable	Minimum*
<150	11	10
150-350	12	11
>350	16	14

* Constrained width may be as low as 8 feet for short distances.

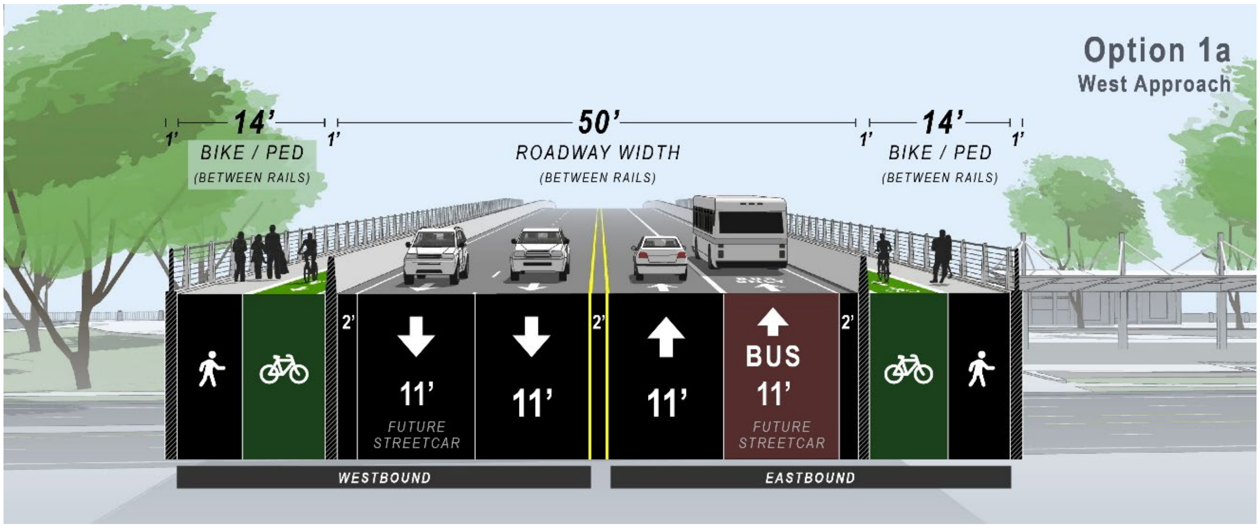
Figure 4. Portland's recommended widths for bidirectional bikeways

5.2 Bridge Cross Section Options

5.2.1 Bridge Cross Section Option 1

Bridge Cross Section Option 1 is shown on Figure 17 and is one of the cross section options if the Eastbank Esplanade ramp structure was connected to both sides of the bridge. Under this option, the northside and southside of the bridge would be designed for unidirectional active transportation movement within a 14-foot space between railings.

Figure 17: Bridge Cross Section Option 1A: One-Way Bikeways Both Sides within a 14-foot Active Transportation Space



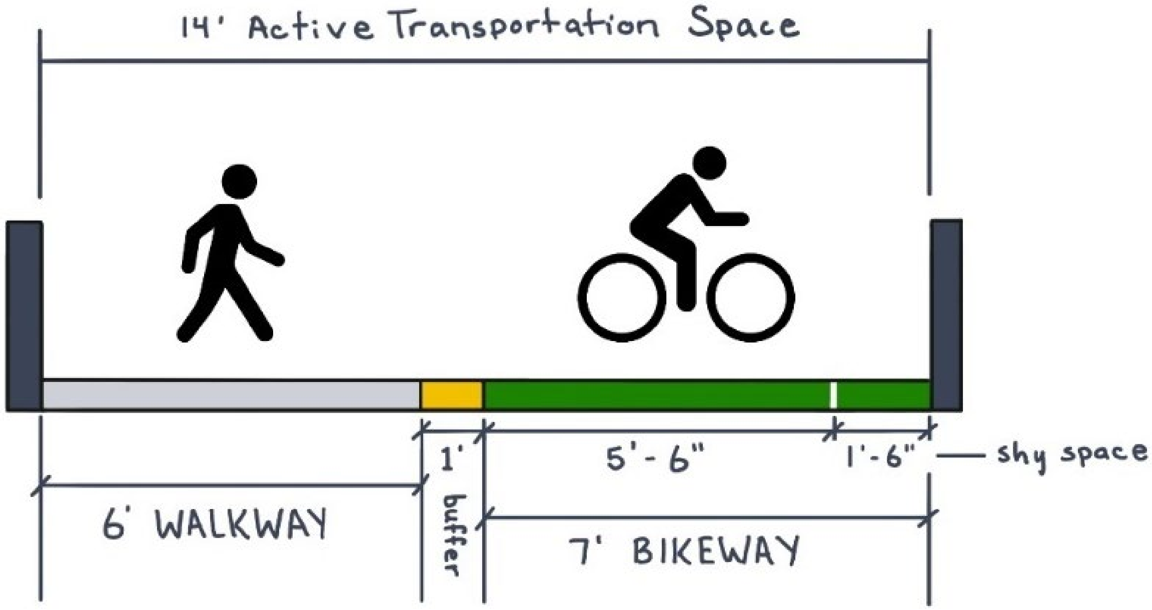
Cross Section Considerations

This option includes a 14-foot wide active transportation space on both sides of the bridge. This is the narrowest active transportation space provided for any of the bridge cross section options and allows more space to accommodate traffic, transit, large vehicle, and other roadway needs.

A possible breakdown of the active transportation space between bicyclists and pedestrians is shown in Figure 18 and shows:

- A 6-foot pedestrian through zone (walkway) for pedestrians. This is less than the required width for a Civic Main Street but meets the requirements for a Civic Corridor. Providing a narrower pedestrian space could result in more people stepping into the bike space to pass other pedestrians, increasing the potential for ped-bike conflicts.
- A 7-foot unidirectional bikeway. Accounting for a one foot six inches shy distance, this results in an effective bike lane width of five foot six inches, which is below PBOT's recommended minimum width of six foot six inches and could result in more people encroaching into the pedestrian space to pass other bicyclists, increasing the potential for ped-bike conflicts.
- A 1-foot tactile sidewalk buffer. This is the minimum separation recommended in PedPDX and allows bicyclists and pedestrians to cross into the other space if needed.

Figure 18: Possible Breakdown of Active Transportation Space for the 14-foot Active Transportation Space Option



Eastside Network Connectivity

The bicycle/pedestrian space needs to be connected into the pedestrian and bicycling networks on the eastside of the bridge. Pedestrians will use crossings at the MLK Boulevard and Couch Street intersections to connect to the existing pedestrian network. The proposed design will provide eastbound bicyclists with a bike signal to cross MLK Boulevard and connect with bike facilities on E Burnside Street. Westbound bicyclists will come from the Couch Street bike lanes or Couch Court and travel through the Couch Street curves to connect to the bridge.

Plan and cross section views of what the eastbound connection could look like at the E Burnside Street and MLK. Boulevard intersection is shown on Figure 19. The eastern bridge head is constrained to its existing width through the Couch Street Curves, but it widens from the midspan on the approach to MLK Boulevard to accommodate space for additional general purpose traffic lanes. The Final Design phase will also refine the allocation of space behind the curb. PBOT's preferred design includes, as a minimum, a 4 feet furnishing zone, a 6-feet 6-inch wide (or more) sidewalk level bike lane, a 1-foot tactile sidewalk buffer, an 8-feet pedestrian through zone, and a frontage zone to provide a buffer to buildings that front the bridge.

Westside Network Connectivity

The bicycle/pedestrian space needs to be connected into the pedestrian and bicycling networks on the westside of the bridge. Pedestrians will use crossings provided on all legs of the signalized intersection at 2nd Avenue intersection to connect to the existing pedestrian network. This will include upgrading curb ramps and providing an accessible pathway to the Skidmore Fountain MAX station using the sidewalks on NW 2nd Avenue and NW Couch Street. The proposed design will provide westbound bicyclists with a bike signal to cross NW 2nd Avenue and connect with bike facilities on 2nd and 3rd Avenues. Eastbound bicyclists will move with the eastbound through movement to connect from existing bike facilities on Burnside Street and 2nd Avenue.

Plan and cross section views of what the eastbound connection could look like at the E Burnside & Martin Luther King Jr. Boulevard intersection is shown on Figure 20. The west bridgehead widens from the midspan and to accommodate space for additional transit and general-purpose traffic lanes. The Final Design phase will also refine the allocation of space behind the curb. PBOT's preferred design includes, as a minimum, a 4-feet furnishing zone, a 6-feet-6-inch-wide sidewalk level bike lane, a 1-foot tactile sidewalk buffer, and an 8-feet pedestrian through zone. Space is also recommended in front of buildings connecting to the bridge to provide a buffer between buildings such as the Portland Rescue Mission and the transportation functions of the sidewalk.

Figure 19: Eastbound Approach to MLK at the East End of Bridge with Furniture Zone

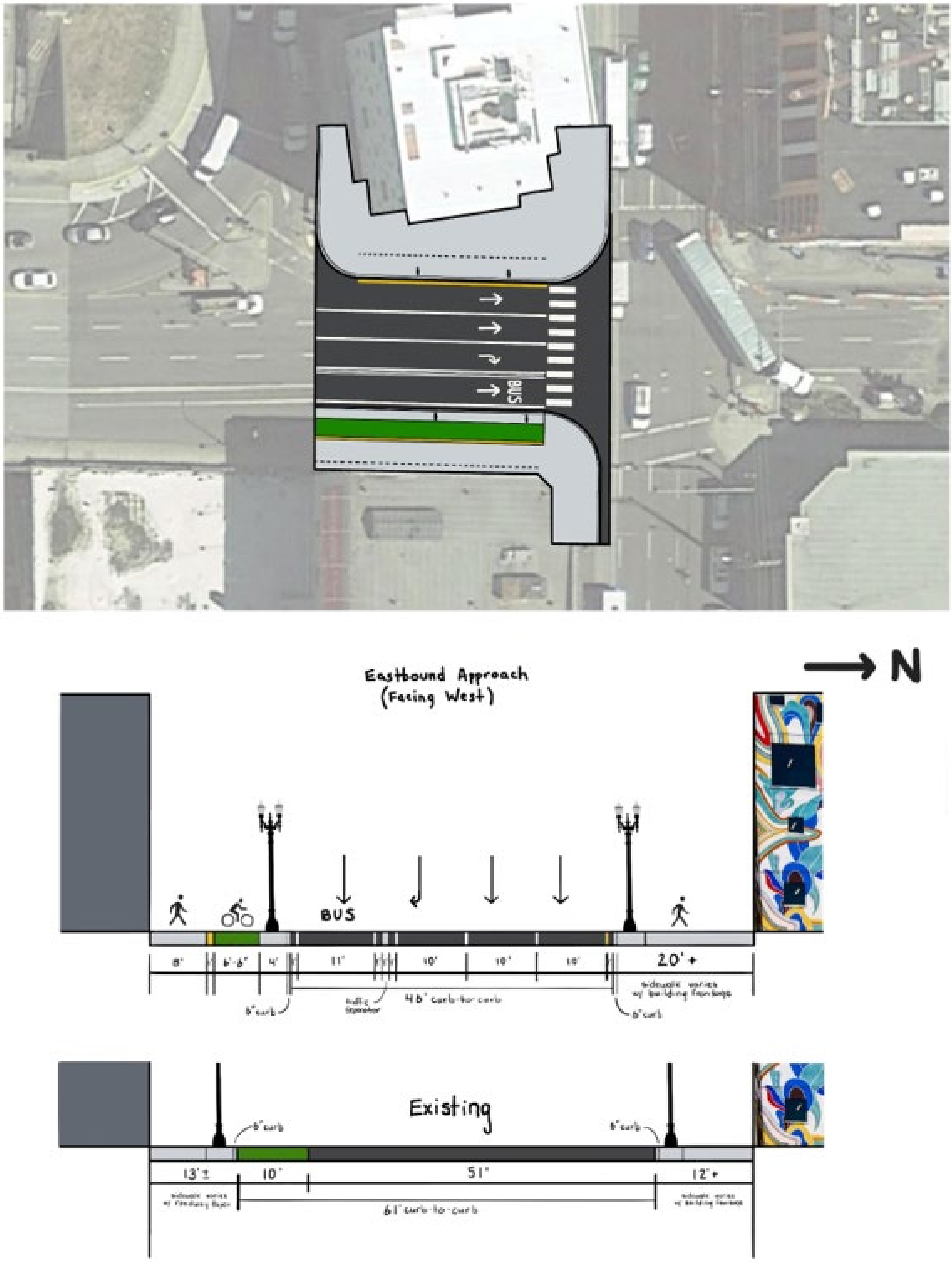
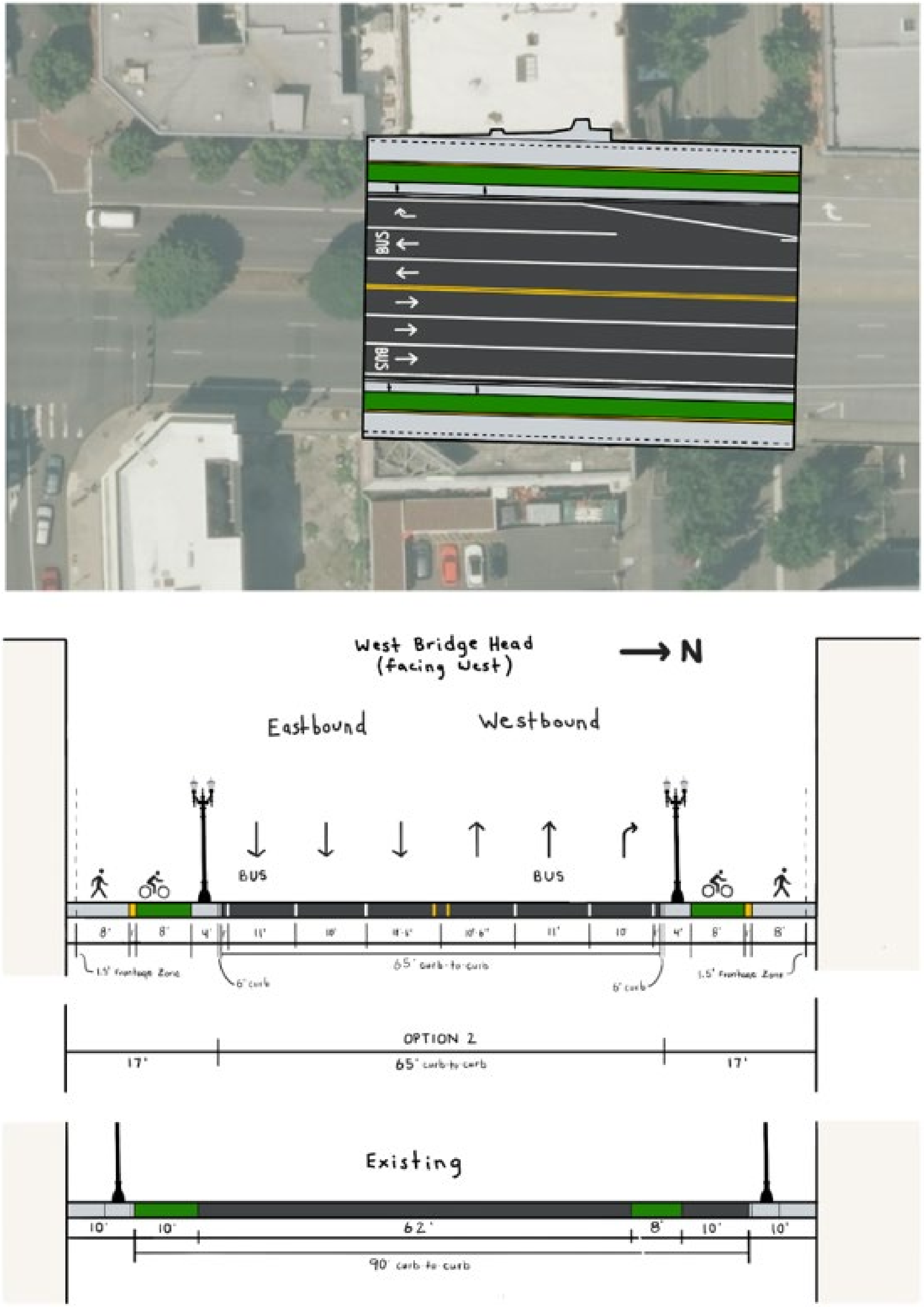


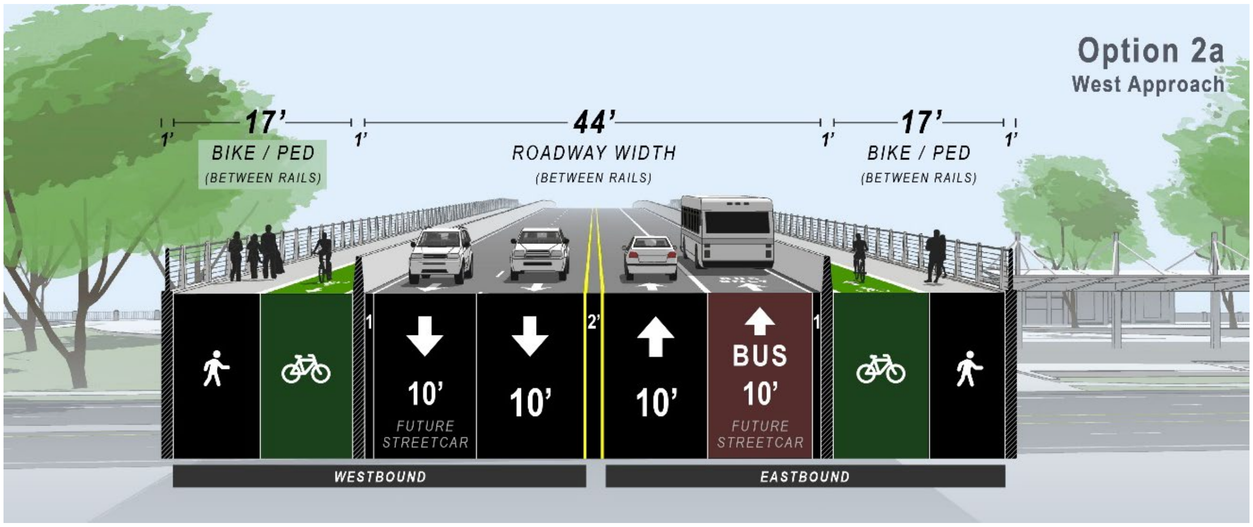
Figure 20: Westbound Approach to 2nd Avenue at the West End of Bridge with Furniture Zone (Note: assumes Option 3 Roadway Cross Section)



5.2.2 Bridge Cross Section Option 2

Bridge Cross Section Option 2 is shown on Figure 21 and is one of the cross section options if the Eastbank Esplanade ramp structure was connected to both sides of the bridge. Under this option, the northside and southside of the bridge would be designed for unidirectional active transportation movement within a 17-foot space between railings.

Figure 21: Bridge Cross Section Option 2A: One-Way Bikeways Both Sides within a 17-foot Active Transportation Space

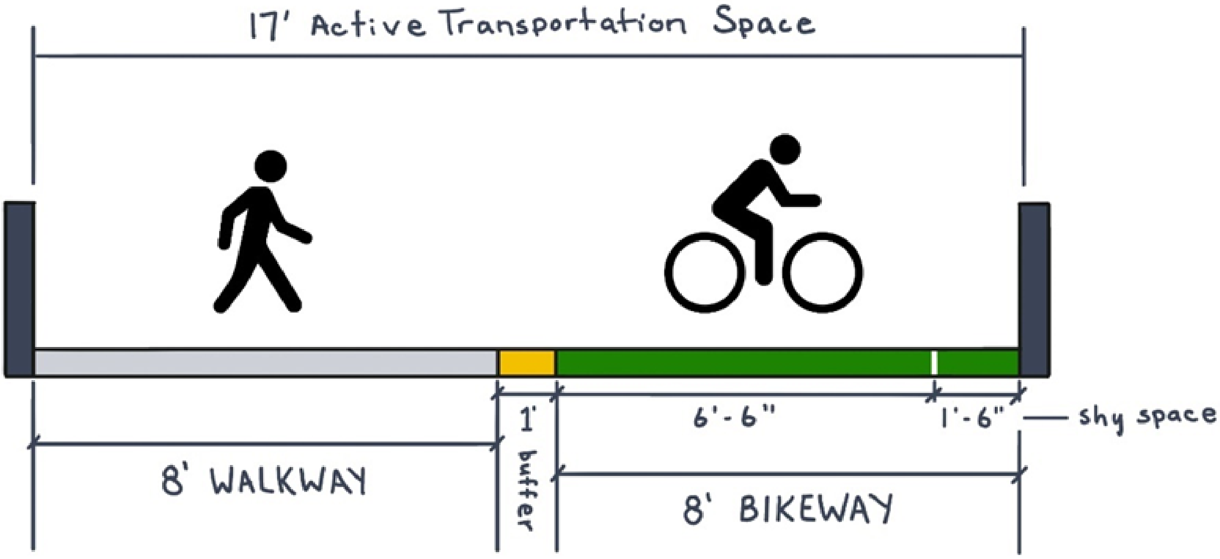


Cross Section Considerations

This option includes a 17-foot wide active transportation space on both sides of the bridge. This is the widest active transportation space provided for any of the bridge cross section options. A possible breakdown of the active transportation space between bicyclists and pedestrians is shown on Figure 22 and shows:

- An 8-foot pedestrian through zone (walkway) for pedestrians. This is the required width for a Civic Main Street. Providing this wider pedestrian space could result in fewer people stepping into the bike space to pass other pedestrians, reducing the potential for ped-bike conflicts.
- An 8-foot unidirectional bikeway. Accounting for a one-foot six-inch shy distance, this results in an effective bike lane width of six feet six inches, which is PBOT’s recommended minimum width. Providing a wider bike lane could result in fewer people encroaching into the pedestrian space to pass other bicyclists, reducing the potential for ped-bike conflicts.
- A 1-foot tactile sidewalk buffer. This is the minimum separation recommended in PedPDX and allows bicyclists and pedestrians to cross into the other space if needed.

Figure 22: Possible Breakdown of Active Transportation Space for the 17-foot Active Transportation Space Option



Eastside Network Connectivity

The unidirectional bikeways need to be connected back to the network on the eastside of the bridge. See Section 5.2.1.

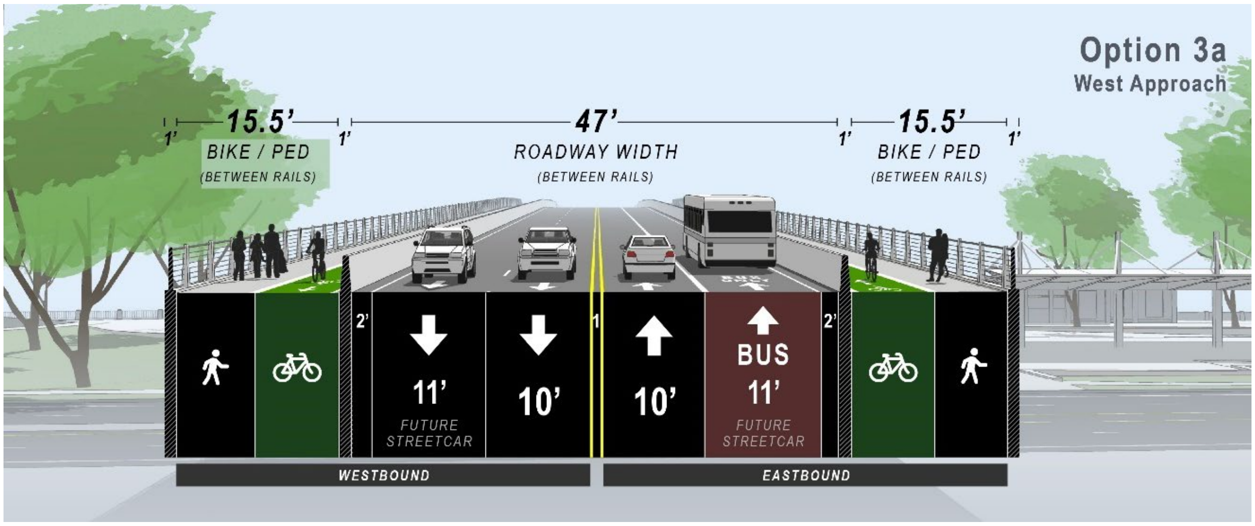
Westside Network Connectivity

The unidirectional bikeways need to be connected back to the network on the westside of the bridge. See Section 5.2.1.

5.2.3 Bridge Cross Section Option 3

Bridge Cross Section Option 3 is shown on Figure 23 and is one of the cross section options if the Eastbank Esplanade ramp structure was connected to both sides of the bridge. Under this option, the northside and southside of the bridge would be designed for unidirectional active transportation movement within a 15.5-foot space between railings.

Figure 23: Bridge Cross Section Option 3A: One-Way Bikeways Both Sides within a 15.5-foot Active Transportation Space

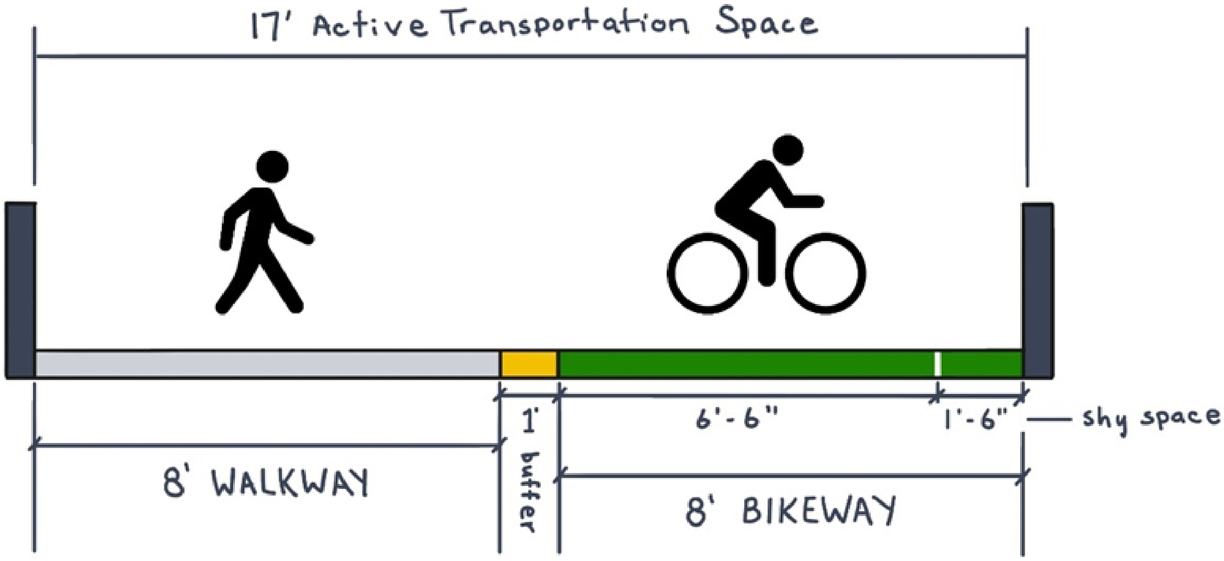


Cross Section Considerations

This option includes a 17-foot wide active transportation space on both sides of the bridge. This is the widest active transportation space provided for any of the bridge cross section options. A possible breakdown of the active transportation space between bicyclists and pedestrians is shown on Figure 24 and shows:

- An 8-foot pedestrian through zone (walkway) for pedestrians. This is the required width for a Civic Main Street. Providing this wider pedestrian space could result in fewer people stepping into the bike space to pass other pedestrians, reducing the potential for ped-bike conflicts.
- An 8-foot unidirectional bikeway. Accounting for a one-foot six-inch shy distance, this results in an effective bike lane width of six feet six inches, which is PBOT's recommended minimum width. Providing a wider bike lane could result in fewer people encroaching into the pedestrian space to pass other bicyclists, reducing the potential for ped-bike conflicts.
- A 1-foot tactile sidewalk buffer. This is the minimum separation recommended in PedPDX and allows bicyclists and pedestrians to cross into the other space if needed.

Figure 24: Possible Breakdown of Active Transportation Space for the 17-foot Active Transportation Space Option



Eastside Network Connectivity

The unidirectional bikeways need to be connected back to the network on the eastside of the bridge. See Section 5.2.1.

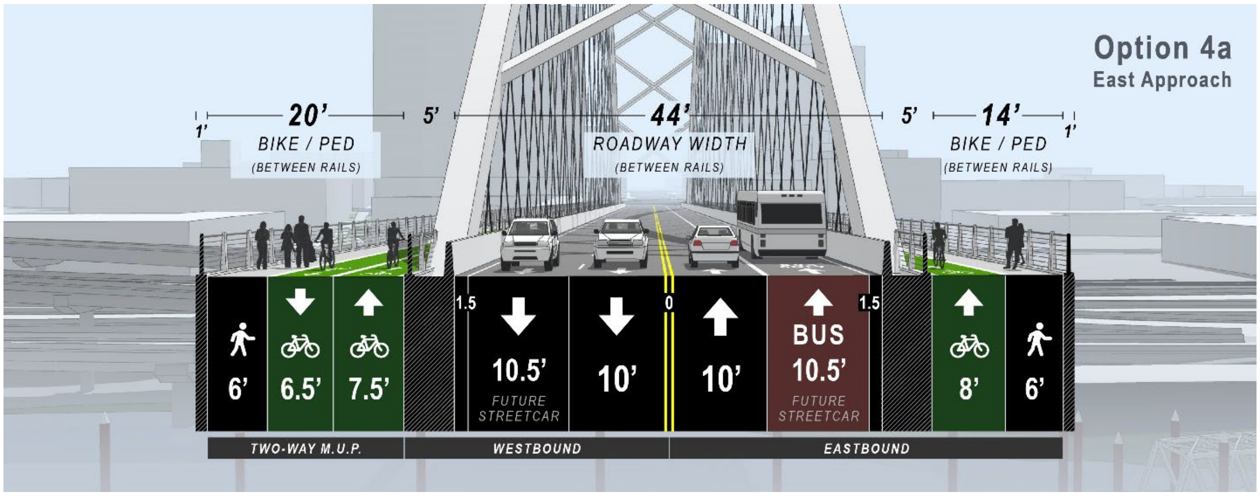
Westside Network Connectivity

The unidirectional bikeways need to be connected back to the network on the westside of the bridge. See Section 5.2.1

5.2.4 Bridge Cross Section Option 4

Bridge Cross Section Option 4 is shown on Figure 25 and would be required if the Eastbank Esplanade ramp structure was connected to only the northside of the bridge. This would necessitate two-way movement of active transportation users on the northside of the bridge within a 20-foot space between the railings. The southside of the bridge would still be designed for unidirectional active transportation movement within a 14-foot space between railings.

Figure 25: Bridge Cross Section Option 4A: Two-Way Bikeway on Northside



Cross Section Considerations

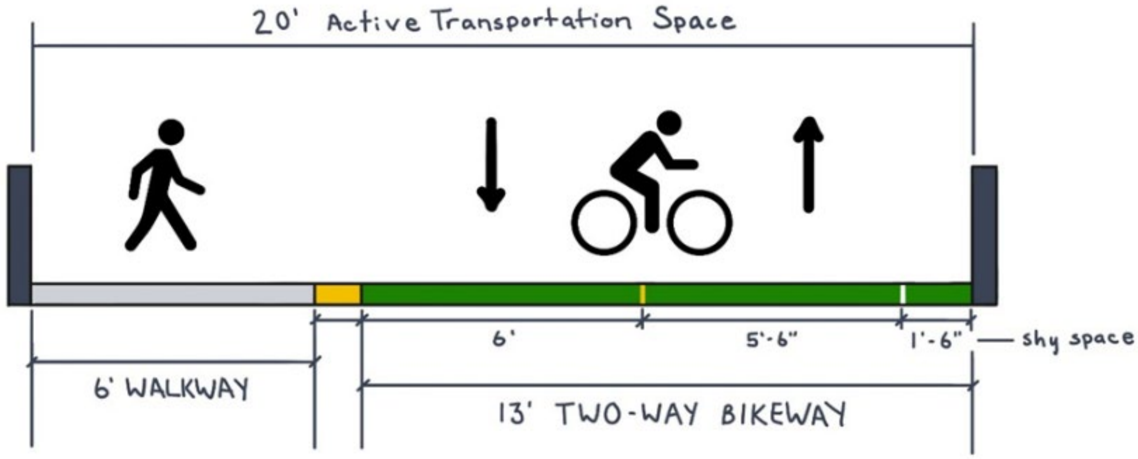
This option includes a 14-foot wide active transportation space on the southside of the bridge to accommodate pedestrians and eastbound bicyclists, and a 20-foot wide active transportation space on the northside of the bridge to accommodate pedestrians and bi-directional bicyclists. This option results in an asymmetrical bridge cross section as well as less flexibility for additional space to be provided to traffic, transit, and other roadway needs because all available space needs to be designated to the accommodation of bi-directional bicyclists.

For the 20-foot wide bidirectional active transportation space on the north side of the bridge, a possible breakdown of the active transportation space between bicyclists and pedestrians is shown on Figure 26 and shows:

- A 6-foot pedestrian through zone (walkway) for pedestrians. This is less than the required width for a Civic Main Street but meets the requirements for a Civic Corridor. Providing a narrower pedestrian space could result in more people stepping into the bike space to pass other pedestrians, increasing the potential for ped-bike conflicts. This potential is further increased with two-way movement of bicyclists and pedestrians.
- A 13-foot bidirectional bikeway. Accounting for a one-foot six-inch shy distance, this results in an effective bike lane width of 11 feet 6 inches, which is above the minimum 11-foot width recommended for peak hour volumes between 150-350 bicyclists per hour, but less than the minimum 14-foot width recommended for peak hour volumes over 350 bicyclists per hour. Providing a narrower bike lane could result in more people encroaching into the pedestrian space to pass other bicyclists, increasing the potential for ped-bike conflicts. This potential is further increased with two-way movement of bicyclists and pedestrians.
- A 1-foot tactile sidewalk buffer. This is the minimum separation recommended in PedPDX and allows bicyclists and pedestrians to cross into the other space if needed.

For consideration of the 14-foot active transportation space on the southside of the bridge, see Section 5.2.1.

Figure 26: Possible Breakdown of Active Transportation Space for the 20-foot Active Transportation Space Option



Eastside Network Connectivity

The pedestrian / bicycling space needs to be connected into the pedestrian and bicycling networks on the eastside of the bridge. Pedestrians will use crossings at the MLK Boulevard and Couch Street intersections to connect to the existing pedestrian network. The proposed design will provide eastbound bicyclists on the south side of the bridge with a bike signal to cross MLK Boulevard and connect with bike facilities on E Burnside Street.

The two-way bikeway needs to be connected back to the network on the eastside of the bridge as far east as the 7th Avenue bikeway. Several options were considered including:

A. **Continue the Bikeway on Couch Street:** This option would carry the two-way bikeway through the Couch Street curves and along the northside of NE Couch Street to NE 7th Avenue.

B. **Cross Eastbound Bicyclists with Dual Facilities on Burnside:** This option would cross eastbound bicyclists at the Couch Street curves and carry a bike lane on the northside of E Burnside Street to E 7th Avenue. The bike lane on the southside of E Burnside Street would remain.

C. **Cross Eastbound Bicyclists with a Two-Stage Crossing at MLK:** This option would cross eastbound bicyclists at the Couch Street curves and carry a bike lane on the northside of E Burnside Street to a two-stage crossing of E Burnside Street and E Martin Luther King Jr. Boulevard to connect with the existing eastbound bike lane on the southside of E Burnside Street.

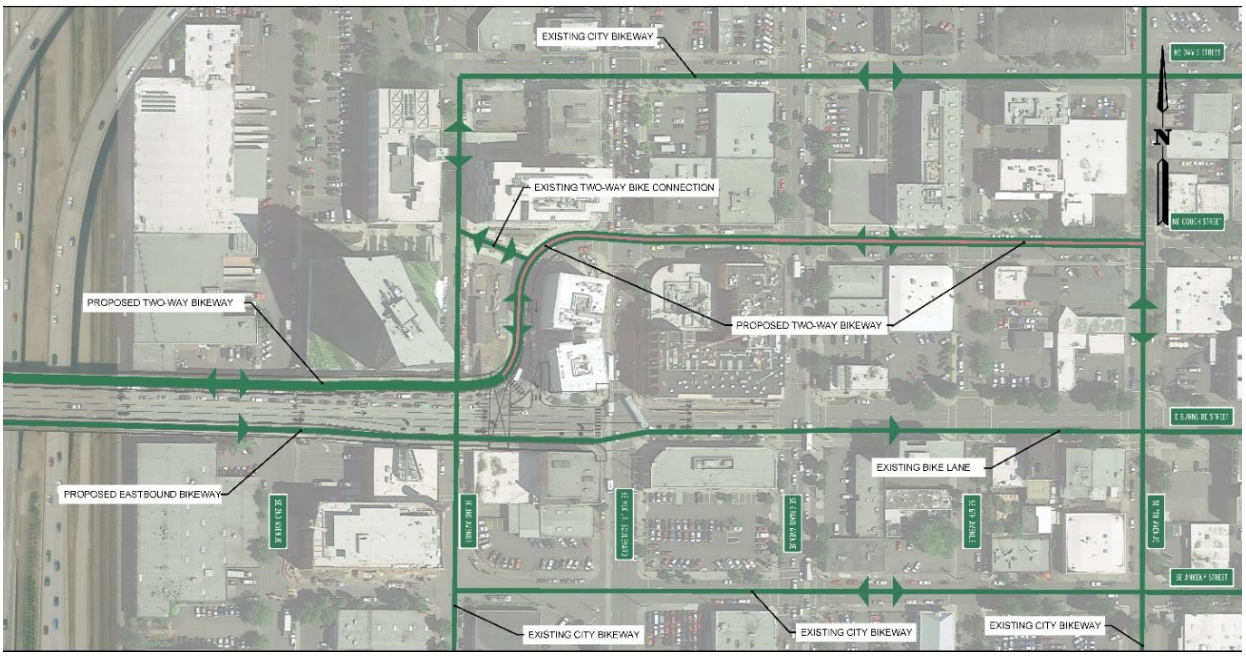
D. **Continue Bikeway to Couch Court and Cross Eastbound Bicyclists with a Two-Stage Crossing at MLK:** This option would carry the two-way bikeway through the

Couch Street curves to Couch Court and formalize the neighborhood greenway route along NE 3rd Avenue and NE Davis Street to connect to NE 7th Avenue. This option also crosses eastbound bicyclists at the Couch Street curves and carries a bike lane on the northside of E Burnside Street to a two-stage crossing of E Burnside Street and E Martin Luther King Jr. Boulevard to connect with the existing eastbound bike lane on the southside of E Burnside Street.

Option A – Continue the Bikeway on Couch Street

Under this option, the two-way bikeway would be carried through the Couch Street curves and along the northside of NE Couch Street to NE 7th Avenue as shown on Figure 27. This option would require redesigning the Couch Street curves as well as NE Couch Street between NE Martin Luther King Jr. Boulevard and NE 7th Avenue.

Figure 27: Two-Way Bikeway Option A: Continue Bikeway on Couch



COUCH STREET CURVES

Existing conditions at the most constrained point of the Couch Street curves are shown on Figure 28. The cross section currently includes two traffic lanes, an intermediate-level unidirectional bikeway (separated from the traffic lane by an angled curb), furnishing zones with street trees, and sidewalks. The outside lane and bikeway are designed to allow buses and other large vehicles to navigate through the curves and this needs to be considered in any redesign of the street. Recent development has occurred on both sides of the street that defines the property line at the edge of the right-of-way. There may be some opportunity to redesign the planters and stairways on the west side of the street, but this is likely to be at considerable cost and disruption to building residents.

The project team reviewed options to redesign the curves to include a two-way bikeway on the north/west side of the curves. The following design assumptions were made:

- Maintain the eastside curb location and preserve the existing sidewalk and street trees.
- Maintain a 6-foot sidewalk on the westside of the curves.
- Maintain two traffic lanes with the outside lanes wide enough to accommodate bus and truck movements.

Figure 28: Existing Conditions at the Couch Street "S" Curve

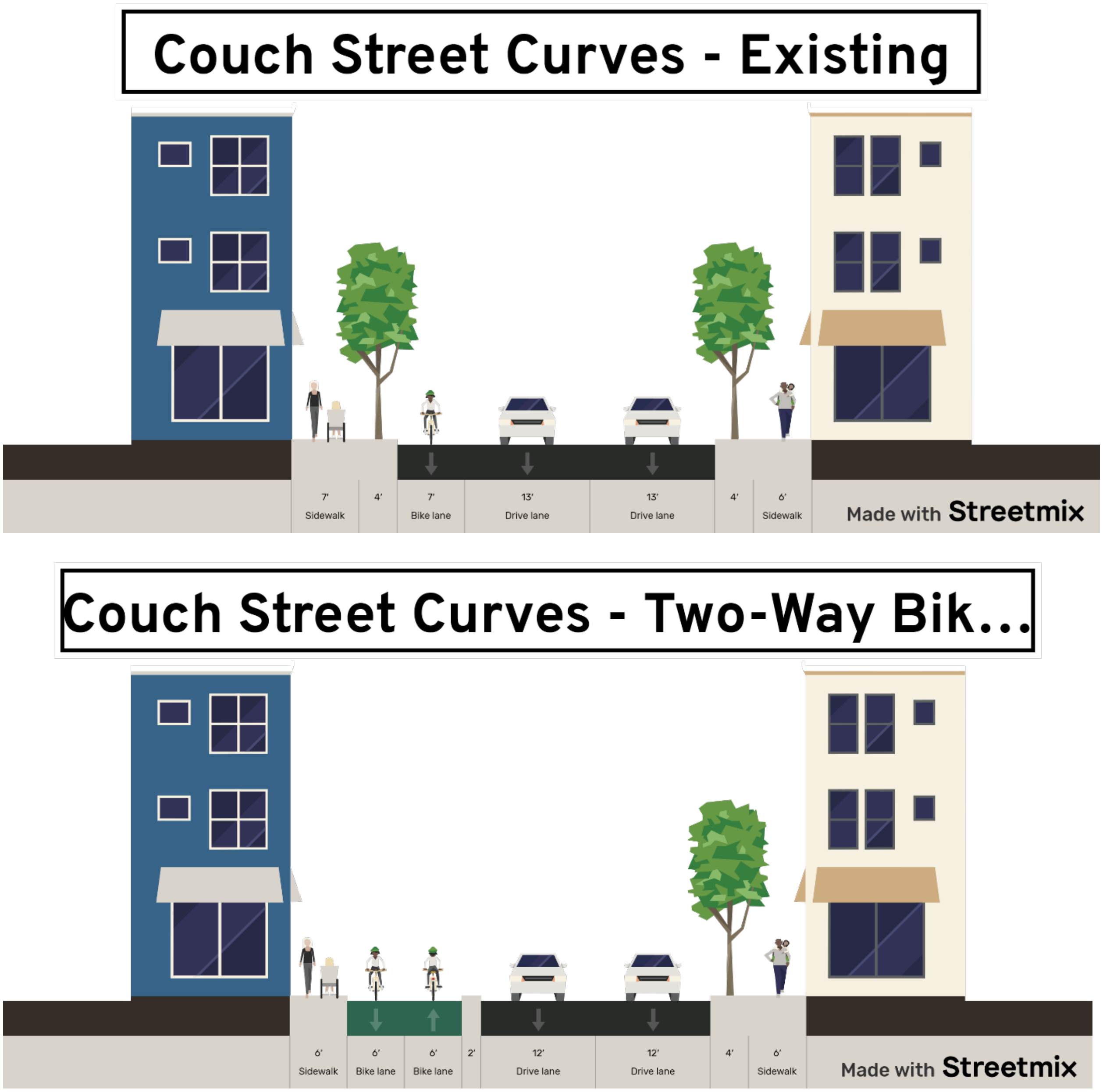
To provide a two-way bikeway on the north/west side of the curves requires:

- Reducing the travel lanes from 13 feet to 12 feet.
- Redesigning the westside of the street to include a 6-foot sidewalk next to a 12-foot two-way, intermediate-level bikeway that is separated from traffic by a 2-foot median.
    - Exploring options for reducing the cross section by one feet six inches for a short (~80 feet) segment of the tangent between the two curves.

A comparison of the existing and potential cross sections is included in Figure 29 below. The challenges with this design are:

- If a full height vertical curb is used, bicyclists are expected to pedal away from the vertical edge and a shy distance of one feet is needed, which would reduce the effective width of the bikeway to 10 feet. If designed as a sidewalk-level or an intermediate-level bikeway with a sloped curb away from the bikeway, no shy distance is needed.
- A 12-foot bikeway meets the preferred width for the low-end of expected two-way bicycling volumes but is less than the preferred width for the high-end of expected two-way bicycling volumes and introduces conflicts between eastbound and westbound bicyclists.
- More detailed design is required to understand whether a 12-foot outside travel lane next to a vertical curb is consistent with bus and large vehicle tracking needs through the curves and future streetcar compatibility.

Figure 29: Couch Street Curves Cross Section Just North of E Burnside Street



COUCH STREET BETWEEN MLK BOULEVARD AND 7TH AVENUE

Existing conditions at the most constrained point on Couch Street, just east of NE Martin Luther King Jr. Boulevard are shown on Figure 30. The cross section includes two traffic lanes, a bike lane, curbside lanes on each side of the street that include on-street parking, curb extensions, and bus stops, street trees in the sidewalk furnishing zone, and sidewalks.

NE Couch Street would need to be redesigned between NE Martin Luther King Jr. Boulevard and NE 7th Avenue to include a two-way bikeway on the northside of the street. The following design assumptions were made:

- Maintain the southside sidewalk and street trees.

- Repurpose the curbside lane on the southside of the street.
- Maintain two traffic lanes.

Figure 30: Existing Conditions on NE Couch Street, just East of NE MLK Boulevard

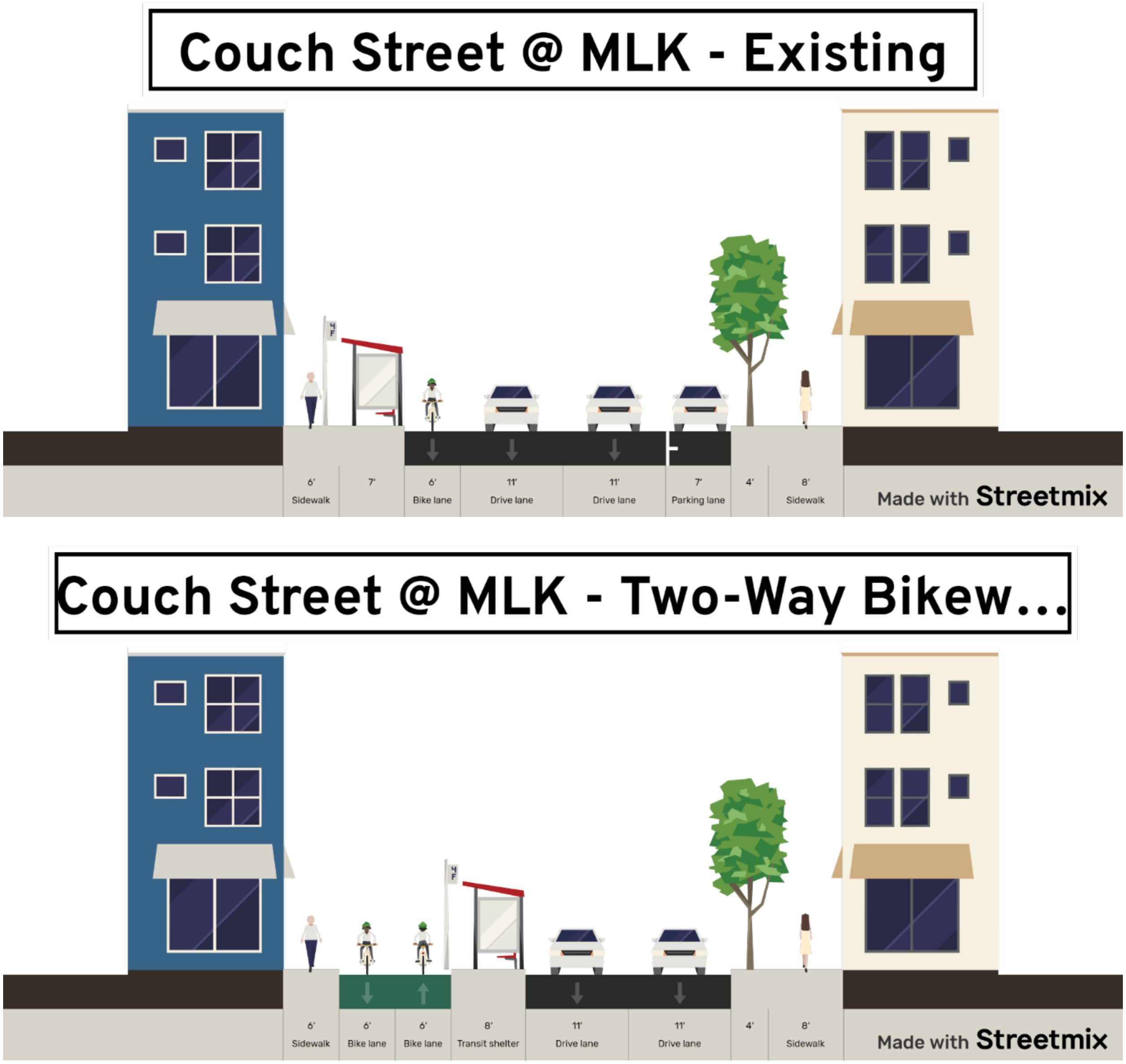
To provide a two-way bikeway on the northside of the street requires:

- Shifting the traffic lanes south to be up against the curb on the southside of the street.
- Redesigning the northside of the street to include a 6-foot sidewalk next to a 12-foot two-way, intermediate-level bikeway, and increasing the width of the bus island to 8 feet.

A comparison of the existing and the possible cross sections is included in Figure 31 below. The challenges with this design are:

- The travel lanes shift south, which introduces off-tracking through the NE Martin Luther King Jr. intersection.
- If designed as an intermediate-level bikeway with a sloped curb away from the bikeway, bicyclists are not expected to pedal away from the vertical curb edge. If a full height vertical curb is used, a shy distance of 1 foot is needed, which would reduce the effective width of the bikeway to 10 feet.
- A 12-foot bikeway meets the preferred width for the low-end of expected two-way bicycling volumes but is less than the preferred width for the high-end of expected two-way bicycling volumes and introduces conflicts between eastbound and westbound bicyclists. In particular, downhill (westbound) bicyclists can travel at much higher speed than uphill (eastbound) bicyclists. In the downhill direction, a bicyclist can get a "green wave," i.e., a progression of green signal displays as they travel along NE Couch Street that allows them to travel at high speeds.
- The two-way bikeway design introduces out-of-direction movements with the one-way flow of traffic and will require signal infrastructure. A two-way bikeway also introduces out-of-direction conflicts between westbound bicyclists and right-turning vehicles at several intersections that would require more detailed design.

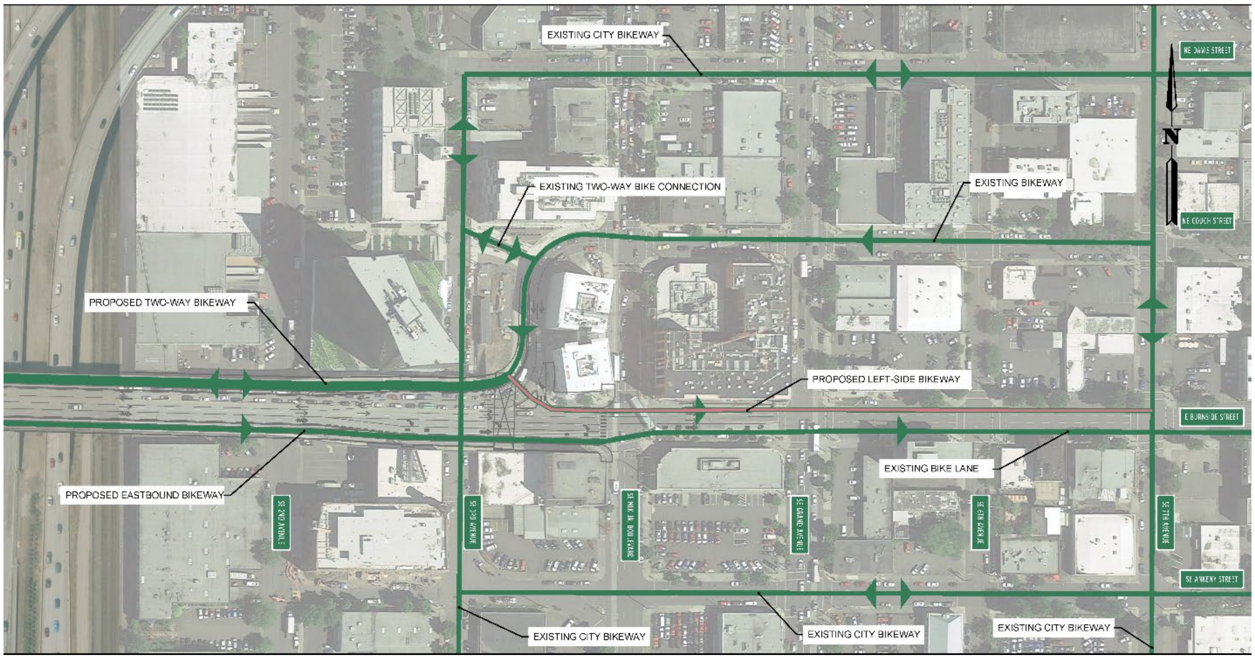
Figure 31: Couch Street "S" Curves Cross Section Just North of E Burnside Street



Option B – Cross Eastbound Bicyclists with Dual Facilities on Burnside

Under this option, eastbound bicyclists using the two-way bikeway would cross the Couch Street curves where it meets E Burnside Street. An eastbound bike lane would be carried along the northside of E Burnside Street to 7th Avenue as shown on Figure 32. The bike lane on the southside of E Burnside Street would remain. This option would require redesigning E Burnside Street between the Couch Street curves and 7th Avenue.

Figure 32: Two-Way Bikeway Option B: Cross Eastbound Bicyclists with Dual Facilities on Burnside



BURNSIDE STREET BETWEEN COUCH STREET AND MLK BOULEVARD

Existing conditions on E Burnside Street, just east of E Martin Luther King Jr. Boulevard are shown on Figure 33. The cross section includes two through lanes, a right-turn lane, a Business Access and Transit (BAT) lane, an on-street bike lane on the right side of the street, a curbside parking lane on the left side of the street, street trees in the sidewalk furnishing zone, and sidewalks.

Figure 33: Existing Conditions on E Burnside Street, Looking East Towards MLK Boulevard

The project team reviewed options to redesign the street to include a left-side bikeway on the northside of the street. The following design assumptions were made:

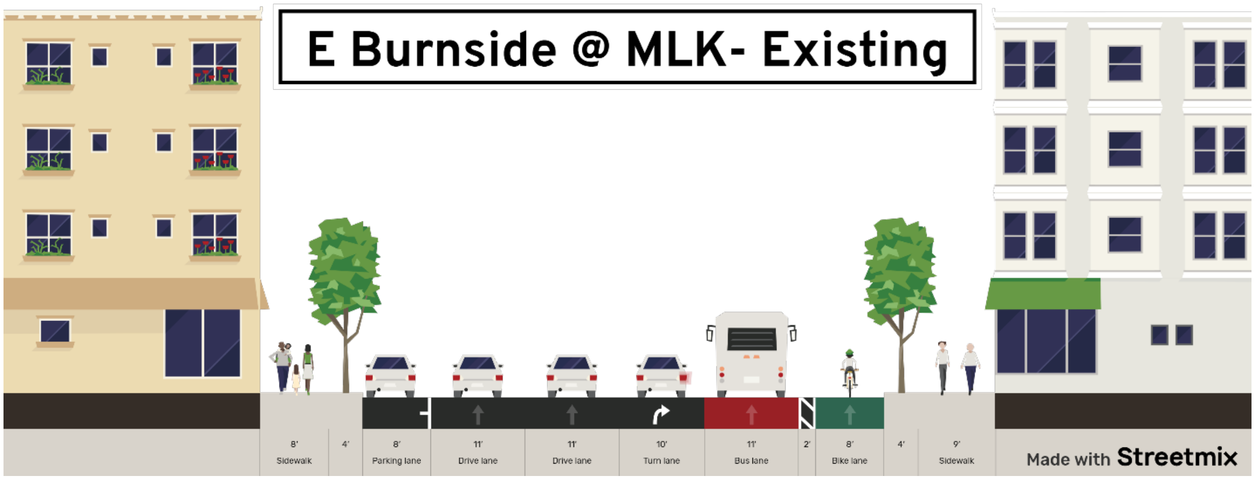
- Maintain and preserve the existing sidewalks and street trees on the north and southsides of the street.
- Maintain two traffic lanes, the right-turn lane, the BAT lane, and the right-side bike lane.

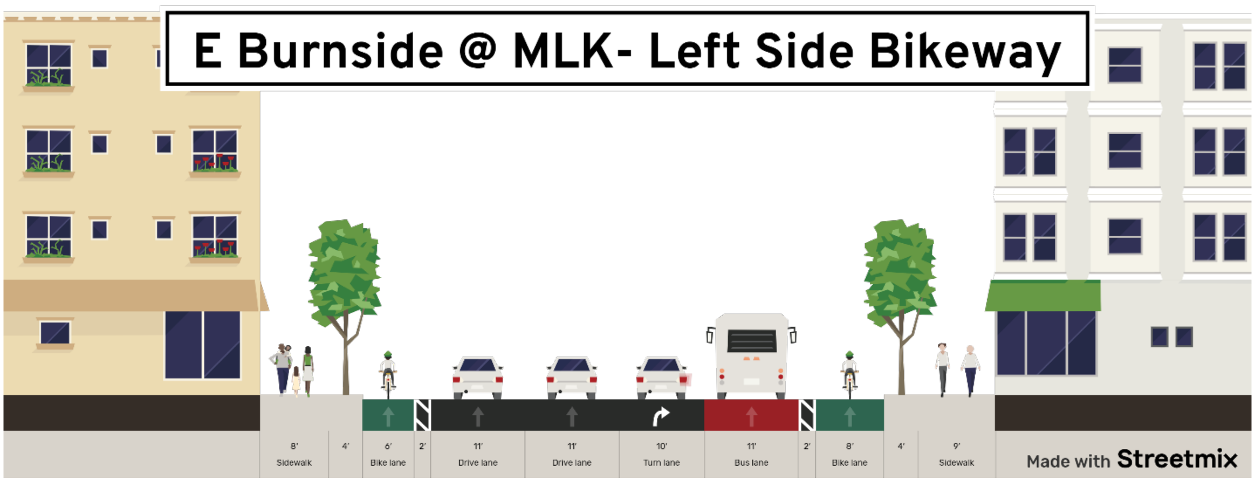
To provide an on-street bike lane on the left side of the street requires reallocating the left-side parking lane.

A comparison of the existing and the possible cross sections are included in Figure 34 below. The challenges with this design are:

- The two-way bikeway would need to be designed with queuing space for eastbound bicyclists to wait for the signal to cross the Couch Street curves at the signalized intersection with E Burnside Street. In addition, the left-turn slip lane from the Couch Street curves onto E Burnside Street would need to be signalized.
- More detailed design is required to transition the left-side bike lane back to the right-side of the street at Martin Luther King Jr. Boulevard.

Figure 34: E Burnside Street Cross Section Just West of MLK Boulevard





BURNSIDE STREET BETWEEN MLK BOULEVARD AND 7TH AVENUE

Existing conditions on E Burnside Street, just east of E Martin Luther King Jr. Boulevard are shown on Figure 35. The cross section includes two through lanes, a left-turn lane, a BAT lane, an on-street bike lane on the right side of the street, a curbside lane on the left side of the street for parking and green street treatments, street trees in the sidewalk furnishing zone, and sidewalks.

The project team reviewed options to redesign the street to include a left-side bikeway on the northside of the street. The following design assumptions were made:

- Maintain the southside curb location and preserve the existing sidewalk and street trees.
- Maintain two traffic lanes, the left-turn lane, the BAT lane, and the right-side bike lane.

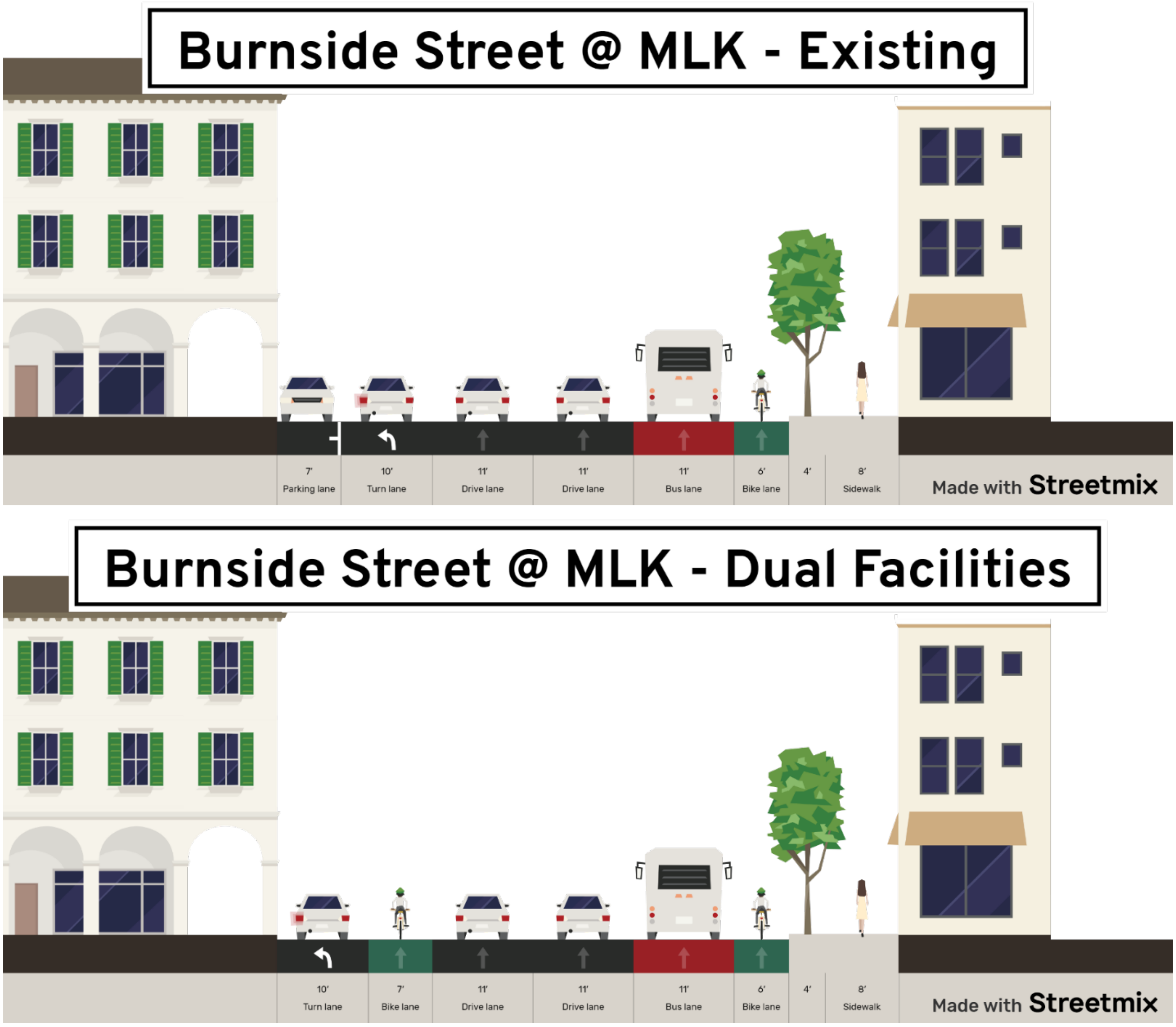
To provide an on-street bike lane on the left side of the street requires reallocating the curbside lane that currently provides parking and green street treatments.

Figure 35: Existing Conditions on E Burnside Street, Looking East from MLK Boulevard

A comparison of the existing and the possible cross sections are included in Figure 36 below. The challenges with this design are:

- The two-way bikeway would need to be designed with queuing space for eastbound bicyclists to wait for the signal to cross the Couch Street curves at the signalized intersection with E Burnside Street. In addition, the left-turn slip lane from the Couch Street curves onto E Burnside Street would need to be signalized.
- The left-side bike lane on E Burnside Street introduces a conflict with left-turning traffic at certain intersections, in particular, the heavy left-turn volume from E Burnside Street to NE Grand Avenue would require a bike signal to separate it from the left-turn movement.
- More detailed design is required to transition the left-side bike lane back to the right-side of the street at E 7th Avenue.

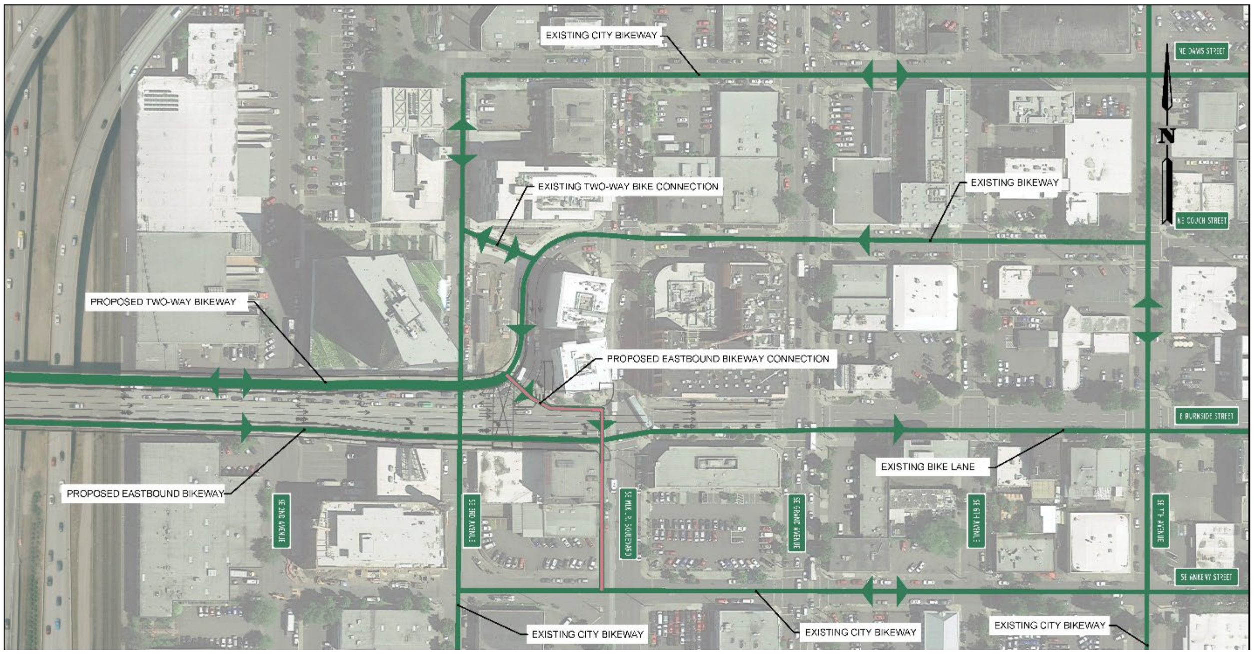
Figure 36: E Burnside Street Cross Section Just East of MLK Boulevard



Option C – Cross Eastbound Bicyclists with a Two-Stage Crossing at MLK

Under this option, eastbound bicyclists using the two-way bikeway would cross the Couch Street curves where it meets E Burnside Street. An eastbound bike lane would be carried along the northside of E Burnside Street to E Martin Luther King Jr. Boulevard. Bicyclists would cross to the right-side bike lane on E Burnside Street with a two-stage crossing of the E Martin Luther King Jr. Boulevard intersection as shown on Figure 37. This option would require redesigning E Burnside Street between the Couch Street curves and Martin Luther King Jr. Boulevard.

Figure 37: Two-Way Bikeway Option C: Cross Eastbound Bicyclists with a Two-Stage Crossing at MLK Boulevard



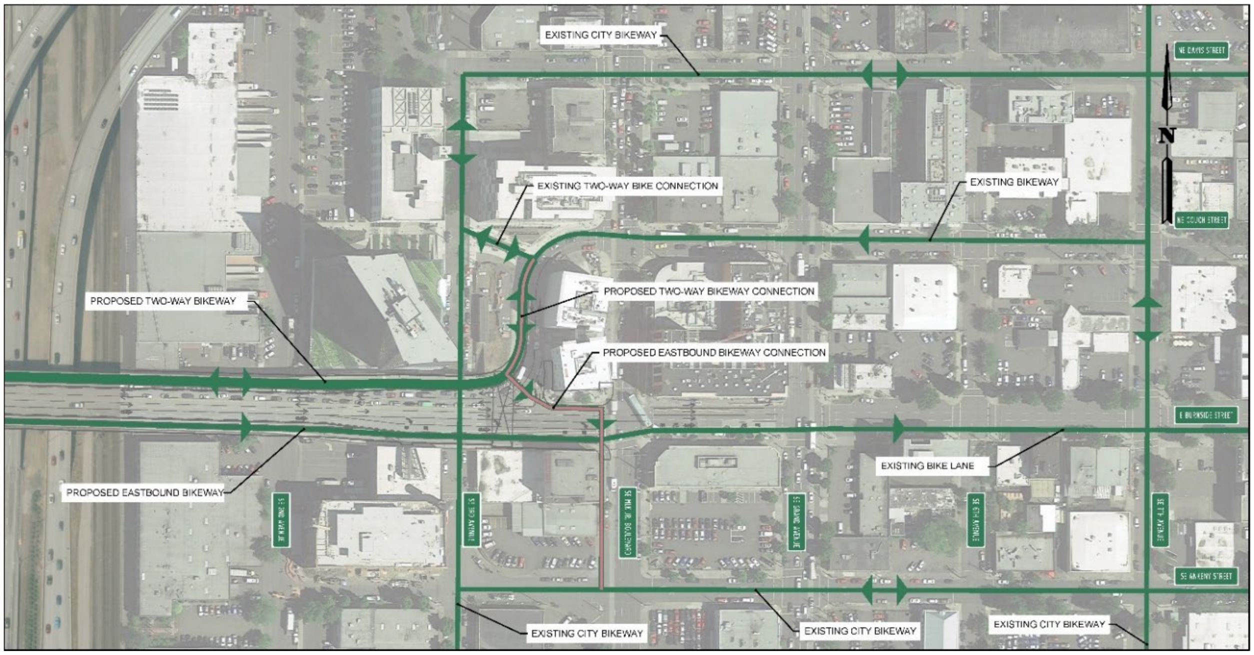
BURNSIDE STREET BETWEEN COUCH STREET AND MLK BOULEVARD

For the left-side bikeway on E Burnside Street through to the Martin Luther King Jr. Boulevard intersection, see the Option B section above.

Option D – Continue Bikeway to Couch Court and Cross Eastbound Bicyclists with a Two-Stage Crossing at MLK Boulevard

Under this option, the two-way bikeway would be carried through the Couch Street curves to Couch Court and formalize the neighborhood greenway route along NE 3rd Avenue and NE Davis Street to connect to NE 7th Avenue. Eastbound bicyclists that want to continue east would cross the Couch Street curves where it meets E Burnside Street. An eastbound bike lane would be carried along the northside of E Burnside Street to E Martin Luther King Jr. Boulevard. Bicyclists would cross to the right-side bike lane on E Burnside Street with a two-stage crossing of the E Martin Luther King Jr. Boulevard intersection as shown on Figure 38. This option would require redesigning the Couch Street curves and E Burnside Street between the Couch Street curves and Martin Luther King Jr. Boulevard.

Figure 38. Two-Way Bikeway Option D: Continue Bikeway to Couch Court to connect to 3rd Avenue and Cross Eastbound Bicyclists with a Two-Stage Crossing at MLK



BURNSIDE STREET BETWEEN COUCH STREET AND MLK BOULEVARD

For the two-way bikeway through the Couch Street curves to Couch Court, see the section above.

For the left-side bikeway on E Burnside Street through to the Martin Luther King Jr. Boulevard intersection, see the section above.

The challenges with this design are:

- If designed as an intermediate-level bikeway with a sloped curb away from the bikeway, bicyclists are not expected to pedal away from the vertical curb edge. If a full height vertical curb is used, a shy distance of 1 foot is needed, which would reduce the effective width of the bikeway to 10 feet.
- A 12-foot bikeway meets the preferred width for the low-end of expected two-way bicycling volumes but is less than the preferred width for the high-end of expected two-way bicycling volumes and introduces conflicts between eastbound and westbound bicyclists.
- More detailed design is required to understand whether 12-foot travel lanes and, whether the outside lane next to a vertical curb is consistent with bus and large vehicle tracking needs through the curves and future streetcar compatibility.
- The two-way bikeway would need to be designed with queuing space for eastbound bicyclists to wait for the signal to cross the Couch Street curves at the signalized intersection with E Burnside Street. In addition, the left-turn slip lane from the Couch Street curves onto E Burnside Street would need to be signalized.
- More detailed design is required to transition the left-side bike lane back to the right-side of the street at Martin Luther King Jr. Boulevard.

Two-Way Bikeway Eastside Connection Option Summary

The benefits and challenges of the four connection options are reviewed in Table 14 below.

Table 14: Summary of Two-Way Bikeway Eastside Connection Options

Option	Benefits	Challenges
A – Continue Bikeway on Couch	Provides continuous bikeway in both directions to/from 7th Avenue. Connects to Couch Court and 3rd Avenue, allowing access to the Davis Street and Ankeny Street neighborhood greenways.	Constrained space results in minimum-standard bikeway. Impacts on sidewalk space and street trees. Requires signal infrastructure on Couch Street for opposite direction bikeway. Impacts to on-street parking on Couch Street. Potential impacts with off-tracking through the Grand Avenue intersection. Potential impacts to bus, large vehicle, and future streetcar tracking through the Couch Street curves.
B – Cross Eastbound Bicyclists with Dual Facilities on Burnside	Provides a direct bikeway connection along Burnside Street and manages the transition to a right-side bike lane at 7th Avenue.	Does not provide two-way connection to Couch Court and 3rd Avenue. Requires queuing space on bridge for eastbound bicyclists to wait for crossing signal at Couch Street curves. Requires signalization of left-turn lane from Couch Street onto Burnside. Impacts to on-street parking on Burnside Street. Impacts to green stormwater infrastructure on Burnside Street. Requires bike signal at Grand Avenue to manage conflicts between left-turning vehicles and bicyclists.
C – Cross Eastbound Bicyclists with Two-Stage Crossing at MLK	Provides earliest transition for eastbound bicyclists back to unidirectional, right-side bike facilities.	Does not provide two-way connection to Couch Court and 3rd Avenue. Requires queuing space on bridge for eastbound bicyclists to wait for crossing signal at Couch Street curves. Requires signalization of left-turn lane from Couch Street onto Burnside. Some impact to on-street parking (3 spaces).
D – Continue Bikeway to Couch Court and Cross Eastbound Bicyclists with Two-Stage Crossing at MLK	Connects more directly to existing right-side bikeway on E Burnside Street. Connects to Couch Court and 3rd Avenue, allowing access to Davis Street and Ankeny Street neighborhood greenways.	Constrained space in the Couch Street curves results in minimum-standard bikeway. Impacts on sidewalk space and street trees. Potential impacts to bus, large vehicle, and future streetcar tracking through the Couch Street curves. Requires queuing space on bridge for eastbound bicyclists to wait for crossing signal at Couch Street curves. Requires signalization of left-turn lane from Couch Street onto Burnside. Some impact to on-street parking (3 spaces).

Westside Network Connectivity

The two-way bikeway needs to be connected back to the network on the westside of the bridge. This transition will occur through redesign of the W Burnside Street and 2nd Avenue intersection to include turn and/or bike boxes and enhanced wayfinding.

Options for this transition are:

A. Provide bike crossing markings on the west and north legs of the intersection along with appropriate design of intersection corners (Figure 39).

B. Provide bike crossing markings on the south and east legs of the intersection along with appropriate design of intersection corners (Figure 40).

Figure 39. Two-Way Bikeway West Side: Utilize West and North legs to Connect Eastbound Bicyclists to North-Side Two-Way Bikeway

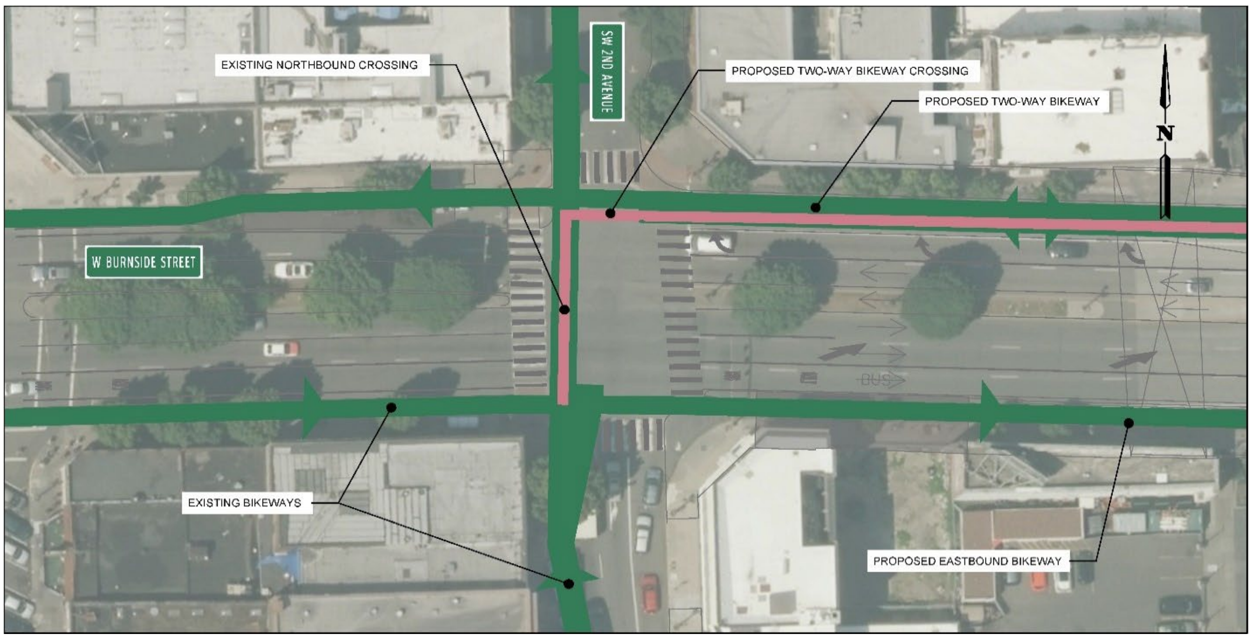
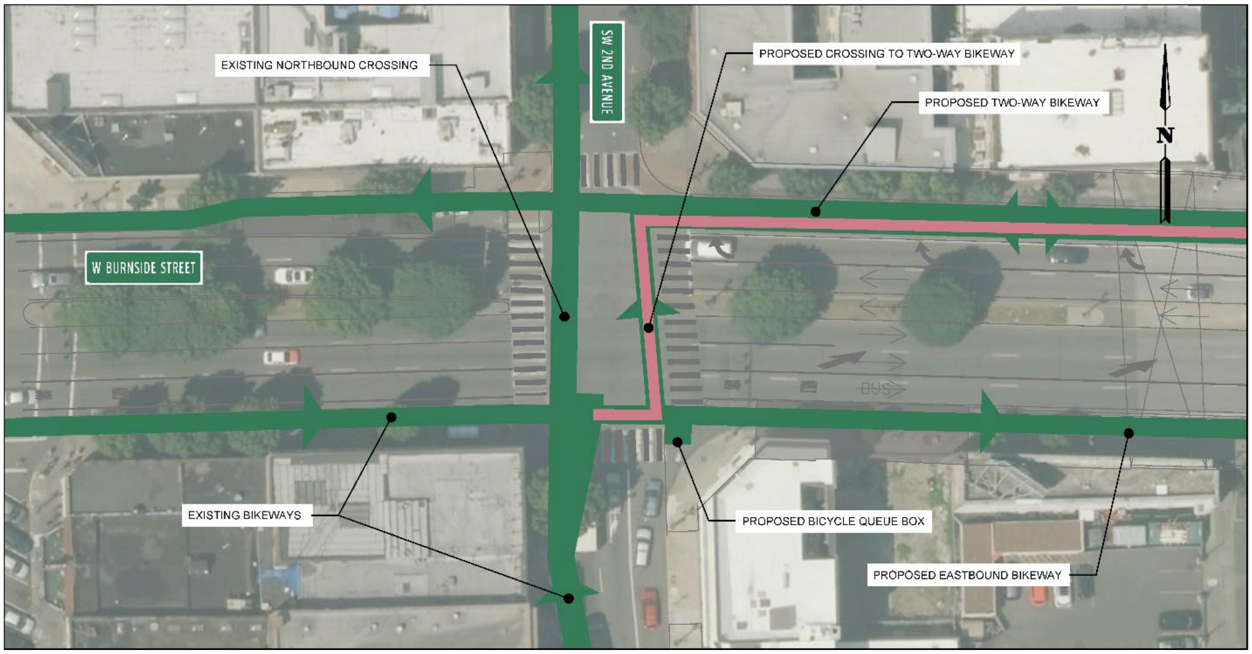


Figure 40. Two-Way Bikeway West Side: Utilize South and East legs to Connect Eastbound Bicyclists to North-Side Two-Way Bikeway



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Appendix A. KPFF Report

Burnside Bridge Connector

Structural Concept Design Report

KPFF Project No. 10022100869

August 19, 2022

Submitted To:

Sharon Daleo, PE
Major Projects and Partnerships
Portland Bureau of Transportation

Submitted By:

KPFF Consulting Engineers
Contributors: Architectural Applications and GRI

Table of Contents

Introduction and Project Background

The proposed Burnside Bridge Connector (connector) will provide a pedestrian connection from the proposed replacement Burnside Bridge to the existing Eastbank Esplanade on the east side of the Willamette River in Downtown Portland.

The Burnside Bridge currently has a pedestrian connection to the Eastbank Esplanade (esplanade) via a steel framed stair connecting to the south side of the bridge on the east bank of the Willamette River. The Burnside Bridge is expected to sustain major damage during a large seismic event and Multnomah County is in the early stages of designing a replacement bridge capable of withstanding a code level seismic event. The replacement bridge is expected to begin construction in 2025 with completion expected in 2029.

The "Earthquake Ready Burnside Bridge" (EQRB) is expected to be constructed along the current alignment of the existing bridge with the roadway located at approximately the same elevation as the current roadway.

The Eastbank Esplanade was constructed in the late 1990's and includes a floating walkway under the existing bridge, connected to a steel pile supported walkway with aluminum gangways to the south that connect to an on-grade trail along the riverbank.

Construction of the new bridge will require removal of the existing pedestrian connector from the south side of the bridge to the esplanade, as well as partial removal of the esplanade in the vicinity of the bridge. The Portland Bureau of Transportation (PBOT) has retained KPFF to develop concept level designs for new connectors between both sides of the EQRB and the esplanade.

At this time, the final structure type for the EQRB is still to be determined. We understand from discussions with the PBOT and Multnomah County, that the bridge span over the esplanade will be either a cable stay structure or an arch. We understand that the bridge sidewalks will be located on the outside of the main cable or arch structure, therefore connection of the new connector to the bridge will not be impacted by the bridge structure type.

PBOT has expressed a strong preference to develop a connector design that provides access from both the north and south sides of the EQRB to avoid a crosswalk on the bridge roadway. PBOT has also indicated that the new connector structure should provide views of downtown Portland to the south and along the Willamette River to the north. The structure will also be highly visible from downtown Portland on the west side of the Willamette River, requiring consideration of the aesthetic impact.

The new connector is to be structurally isolated from the EQRB with its gravity and lateral force resisting systems being independent of the EQRB.

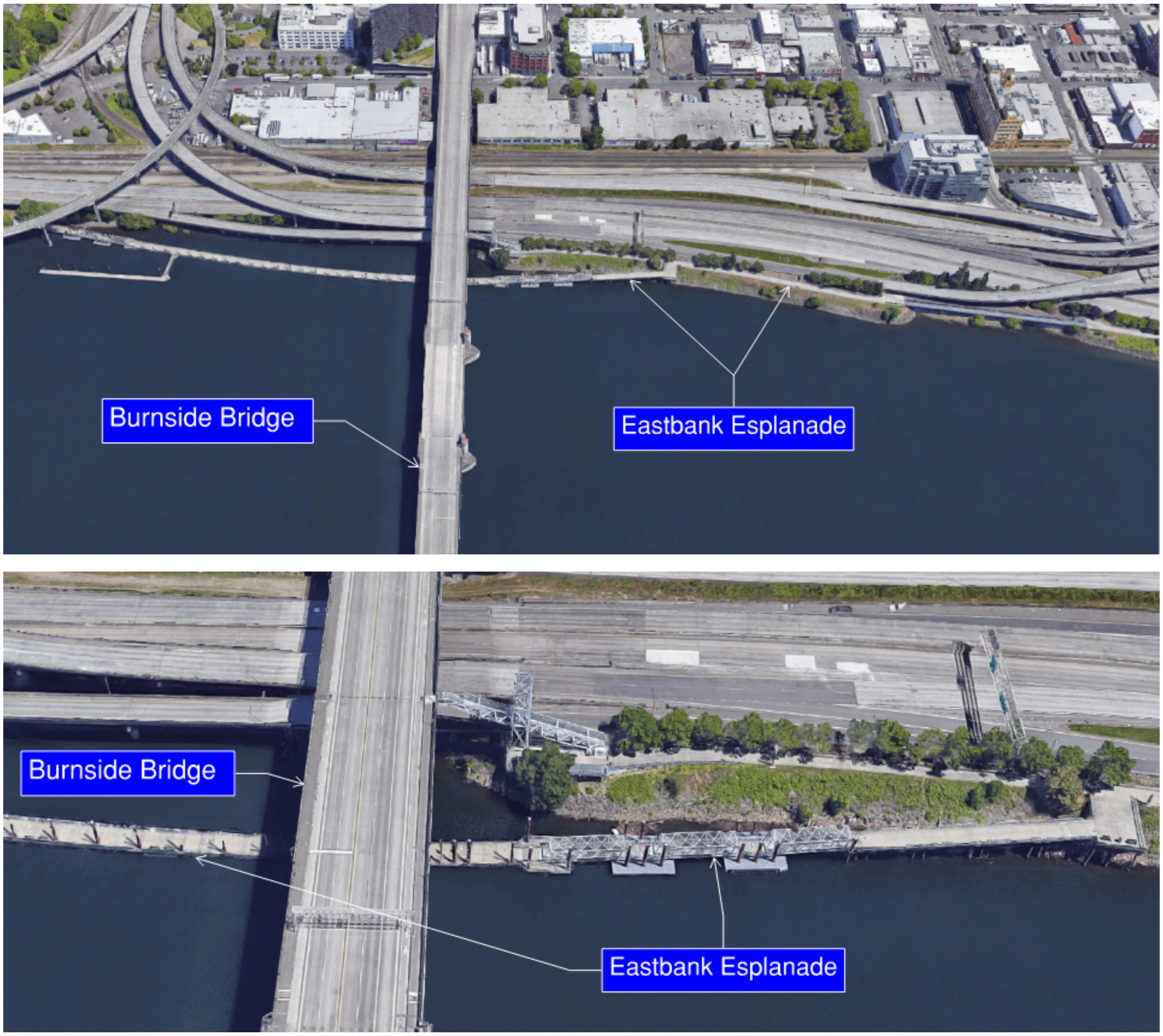


Figure 1: Existing Bridge, Esplanade and Connector View Facing East

Design Criteria and Project Constraints

The following design criteria have been used to develop the concept design:

- LRFD Guide Specifications for the Design of Pedestrian Bridges
- AASHTO LRFD Bridge Design Specifications, 9th Edition
- Seismic Design to AASHTO "Life Safety" Criteria for 1,000-year return period earthquake. Connector concepts will be seismically separated from Burnside Bridge and will avoid damaging the bridge during a seismic event.
- AASHTO - Guide for the Development of Bicycle Facilities
- Oregon Bicycle and Pedestrian Design Guide
- American with Disabilities Act ("ADA") Standards

The structure is to be designed for pedestrian traffic only and is not expected to support vehicular traffic.

The following constraints are also applicable to the concept design:

- The new connector should connect to the existing esplanade alignment as close as reasonably possible to the north and south of the bridge to minimize reconstruction and realignment of the esplanade.
- The EQRB will be on the same alignment and approximately at the same elevation as the existing bridge. The bridge will be approximately 80 feet wide, and the superstructure will be approximately 8 feet deep below the roadway elevation.
- The connector will need to achieve approximately 50 feet of elevation difference from the EQRB roadway to the existing fixed end of the esplanade at the south of the bridge. The elevation change will need to meet the requirements of the Americans with Disabilities Act (ADA). The structure will be designed with a maximum assumed longitudinal slope of 4.5% to allow for tolerances below the ADA maximum slope of 5%.
- The connector deck is assumed to be 12 feet wide for the purpose of this study. The final width will need to be sufficient for two-way bicycle and pedestrian travel, including turning radii for commonly used bicycles.
- The alignment should consider design approaches to restrict bicycle and skateboard speeds and should avoid providing significant areas of shelter.
- The alignment will cross under the EQRB and should provide a minimum of 10 feet overhead clearance to the underside of the bridge. Greater clearance is preferred to provide a more open feel for users of the connector.
- Geographic constraints include the navigable channel of the Willamette River to the west and the Interstate 5 off ramps to the east. The traffic noise on the ramps is considerable, therefore sound attenuation should be included in the design.
- Major geotechnical challenges exist due to liquifiable soils, particularly under the area to the south of the existing bridge.

Geotechnical Conditions

GRI conducted a preliminary geotechnical review of existing subsurface information and design recommendations previously completed for the EQRB project (Shannon & Wilson, 2022).

Subsurface materials and conditions at the site were evaluated based on available information from previous explorations in the vicinity of the Burnside Bridge and GRI's experience and understanding of subsurface conditions at the project site and sites nearby. Published geologic mapping indicates the site is mantled with a variable thickness of artificial fill underlain by recent alluvium consisting of silt and sand, which was deposited by the Willamette River. Review of subsurface information for the site obtained by GRI and others for previous projects in the area indicates the alluvial sands and silts are underlain by gravels consisting of both alluvial gravels and the Troutdale Formation.

Based on GRI's review of the explorations within the vicinity of the proposed structures, the sand soils at the site below the groundwater are highly susceptible to seismically induced liquefaction and will experience post shaking reconsolidation settlement. The near surface fill soils and silts will likely experience limited cyclic degradation and will largely act as a non-liquefied crust overlying the liquefiable materials.

As noted above, the site is underlain by soils susceptible to liquefaction from a code-based seismic event. In riverfront areas, liquefaction can also cause large lateral spreading deformations of the riverbank, which may extend hundreds of feet into the upland areas. GRI's experience with similar projects along the Willamette River and review of recently completed numerical modeling for the EQRB project indicate lateral deformations on the order of 8 feet will likely occur on the eastern bank of the Willamette River near the Burnside bridge following the 1,000 year and median level Mw 9 events.

The magnitude and extent of this liquefaction induced soil movement, and the subsequent lateral loading applied to foundations, varies from the south to north side of the bridge, with the north side of the bridge applying significantly less lateral loading on the foundations.

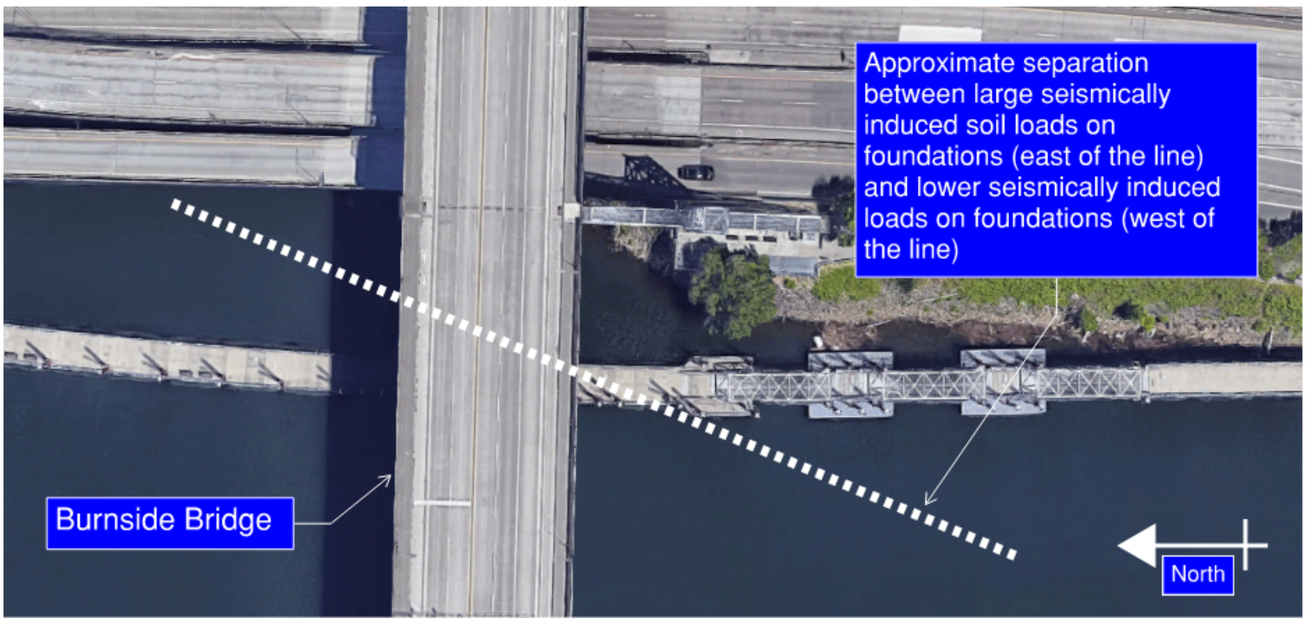


Figure 2: Plan at Existing Bridge Showing Approximate Location of Liquifiable Soils

Alternatives Studied and Preferred Alternate

This structure presents a unique set of challenges due to difficult soil conditions, connections to the existing esplanade, physical constraints at the site and the context of the EQRB. This alternatives analysis considers the major elements of the design separately to address these challenges, instead of a more traditional evaluation of complete designs side by side.

We have considered alternatives for the following items separately and have combined into one preferred alternate:

- Alignment
- Foundations
- Superstructure
- Context with EQRB

While cost and constructability and often significant drivers of design selection, we believe that the items noted above present more significant challenges that must be addressed before determining cost and constructability.

Alignment Concepts

Alignment Concept 1

This concept provides a direct path from the bridge along the riverbank to connect the bridge to the esplanade. It also demonstrates the scale of the length of connector pathway required to meet ADA limits on deck slope. Two options for this direct approach are shown in Figure 3 below.

Advantages

- Most direct travel route
- Avoids crossover points

Disadvantages

- Long footprint along the riverbank
- Fewer opportunities to manage bicycle and skateboard speeds

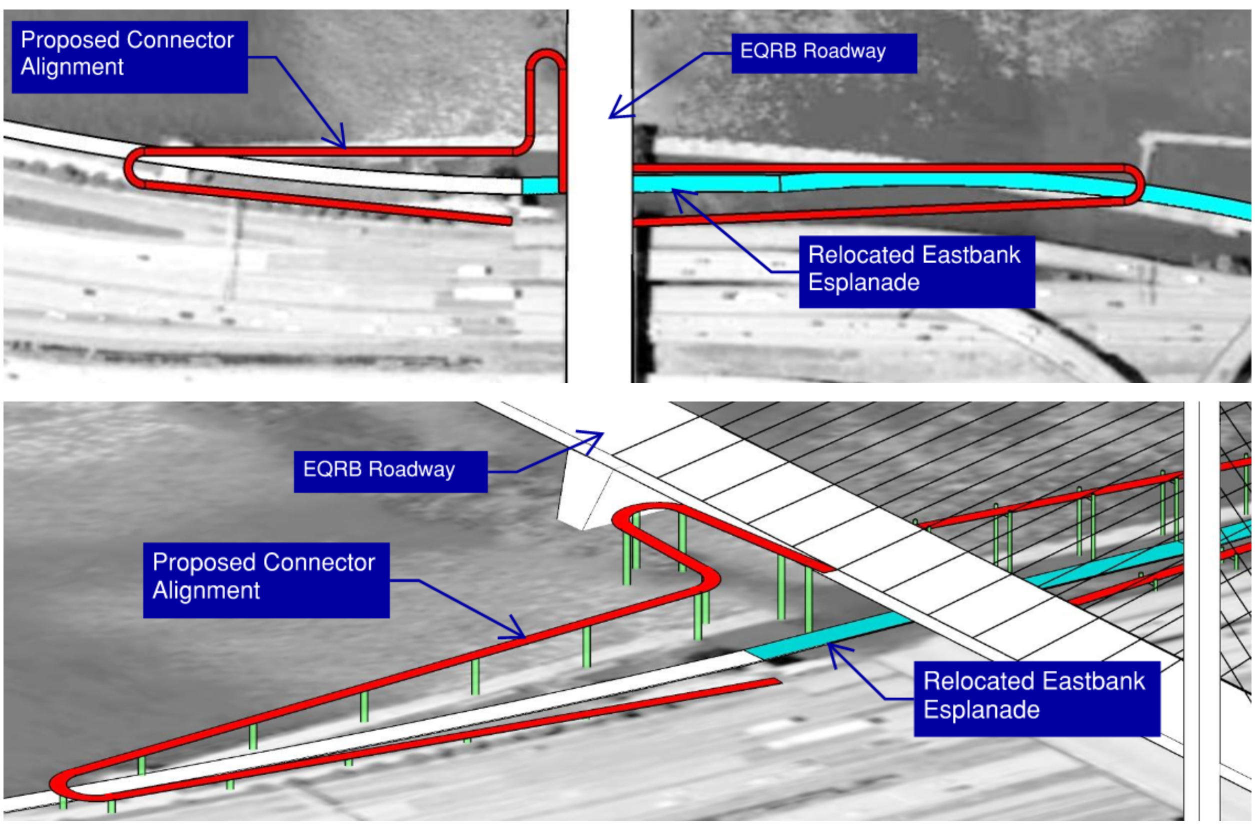


Figure 3: Alignment Concept 1

Alignment Concept 2

This approach meanders to gain travel distance within a more compact footprint while providing a more enjoyable experience. It also provides opportunities to slow bicycles and skateboards through the use of curves and out-of-path travel features. Two options for this approach are shown in Figure 4 below.

Advantages

- Mimics experience of the existing esplanade walking between pile supported structures
- Reduced footprint
- Reduces bicycle and skateboard speeds

Disadvantages

- Less efficient use of structure
- May be challenging to manage bicycle and skateboard speeds

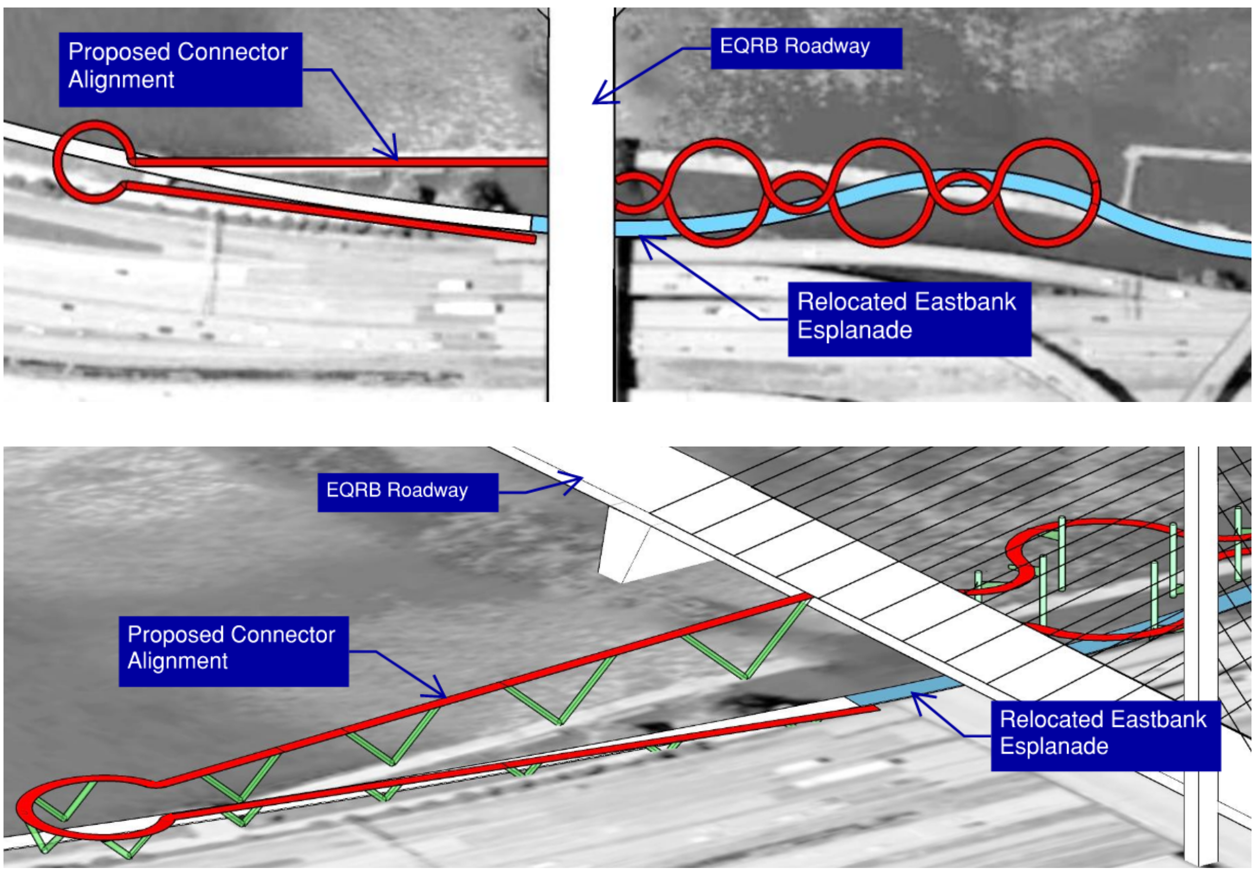


Figure 4: Alignment Concept 2

Alignment Concept 3

This approach provides a compact footprint with tightly radiused alignments to limit bicycle and skateboard speeds and reduce foundation footprint. Widened sections would also be included for resting/refuge. Two options for this approach are shown in Figure 5.

Advantages

- Fewer columns and foundations
- Compact footprint reduces location of foundations in challenging soil conditions.
- Tighter corners will help manage bicycle and skateboard speeds

Disadvantages

- Tighter alignment and less experience of walking along the river

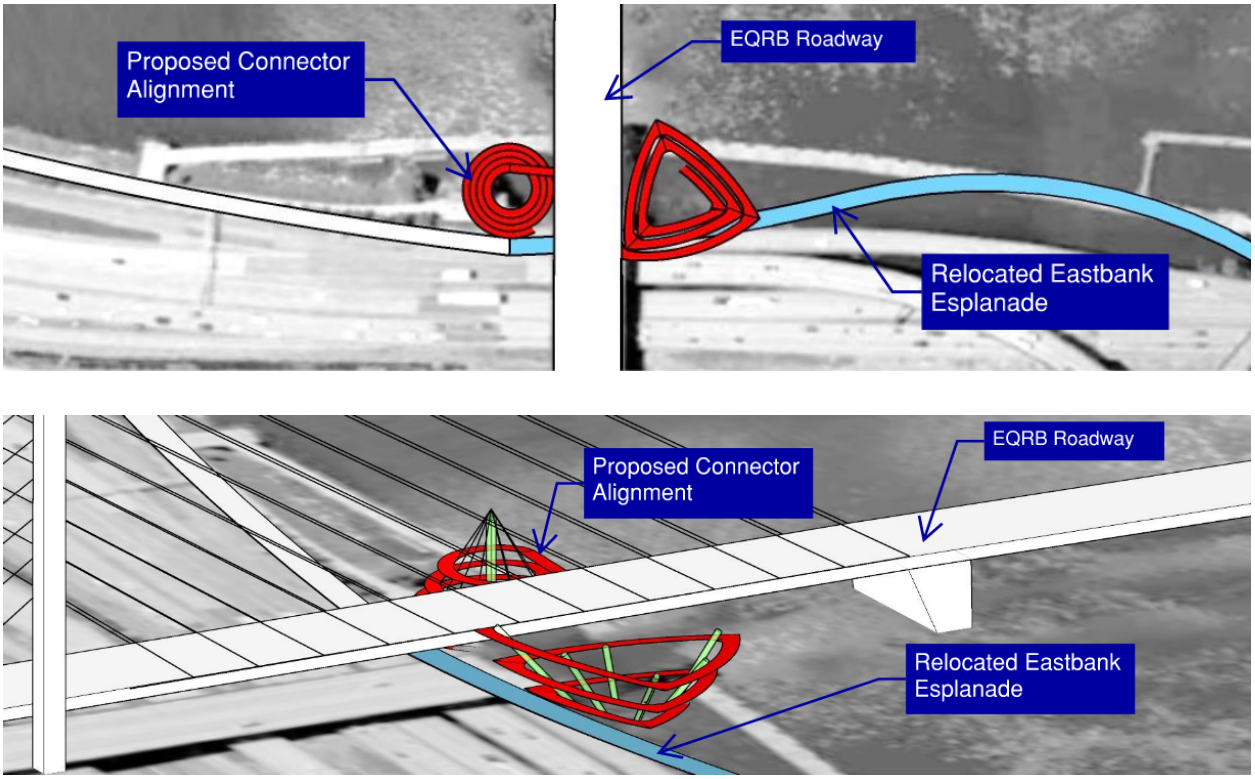


Figure 5: Alignment Concept 3

Alignment Concept 4

This concept incorporates an asymmetric structure that provides access from both the north and south sides of the bridge walkways and merges them under the bridge to touch down at the esplanade on a single walkway.

Advantages

- Balances reduced footprint while maintaining longer walkways along river
- One structure merges near bridge
- Asymmetric design does not complete visually with the EQRB

Disadvantages

- Requires users to cross under bridge on walkway

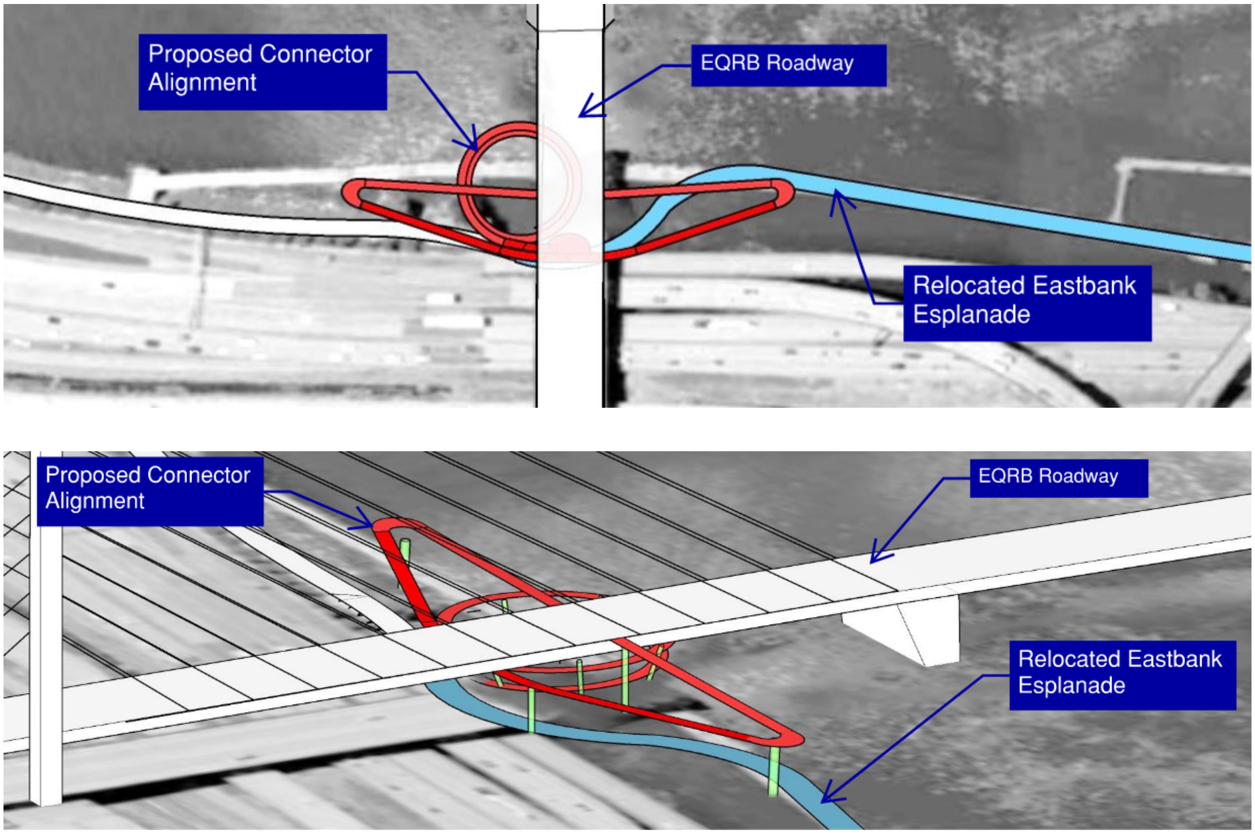


Figure 6: Alignment Concept 4

Foundation Options

South of EQRB

The underlying soils on the south side of the bridge are expected to experience liquefaction in a large seismic event, causing several feet of lateral movement of the underlying soils towards the river. This liquefaction will impose significant lateral loads against the foundations as the soil pushes towards the river. The effect of this liquefaction is greatest on the riverbank south of the bridge and reduces substantially to the west of the existing esplanade alignment.

Steel pipe piles are often used to support structures on deep foundations, However, the magnitude of lateral forces applied to the foundation by the soils make the use of this foundation type impractical.

Large diameter concrete shafts can provide the strength and stiffness to resist the lateral forces from the liquifiable soils generated during a code level seismic event, and we anticipate 10 foot diameter shafts to be adequate to support the new connector structure south of EQRB.

Ground improvement (by jet grouting for example) could provide a soil buttress east of the structure to resist the soil loads and allow more conventional foundation systems such as steel pipe piles or smaller diameter concrete shafts. However, the constraints of the river to the west and the freeways to the east place significant restrictions on where the ground improvement could be installed from, dramatically increasing the cost. It is anticipated that ground improvement on the south side of the bridge could exceed $20 million, making this option impractical from a cost perspective.

North of EQRB
The underlying soils on the north side of the bridge are expected to experience liquefaction to a significantly smaller extent to that described above for the south side of the bridge.

These reduced lateral forces from liquefaction permit the use of 48-inch diameter steel pipe piles on the north side of EQRB.

Concrete drilled shafts may also be used in this location.

Superstructure Options

Concrete Framing
Concrete framing, while typically more durable than steel framing, presents numerous challenges at this location:

- The seismic mass of a concrete structure is significantly higher than other structure types, increasing the demand on foundations and the resulting cost of the foundations.
- A concrete structure would be deeper than a steel structure, requiring the alignment of the walkway to be elongated to avoid reduced clearance where the structure crosses over itself.
- Forming and pouring concrete over the river will require significant containment to protect the river.

Steel Framing
- Steel framing can be constructed from shop fabricated elements, reducing working time in the river and adjacent to the freeway's ramps.
- Shallower steel structure will reduce clearance conflicts and visual impacts of structure.

Aesthetic Considerations

The EQRB is expected to be either a cable stayed bridge or arch, with a height of more than 100 feet above the roadway. This presents a significant visual element immediately adjacent to the new connector.

Due to the scale of the bridge compared to the connector, we have evaluated designs that appear as independent structures from the bridge and do not compete with it from an aesthetic perspective.

We also evaluated making the connections to the north and south sides of the bridge symmetrical. However, this appears to "frame" the new bridge aesthetically, providing less visual separation from the bridge itself. After discussions with PBOT, we agreed to develop concepts based on an asymmetrical layout, with the connector on the north side of the bridge having a significantly different aesthetic to that on the south.

Recommended Design

We recommend utilizing a compact structure similar to alignment Concept 4 to minimize the cost of foundations in the most challenging soils while providing connectivity to both sides of the bridge.

To provide aesthetic asymmetry, a compact section is proposed on the north side of the bridge, with a single ramp on the south side.

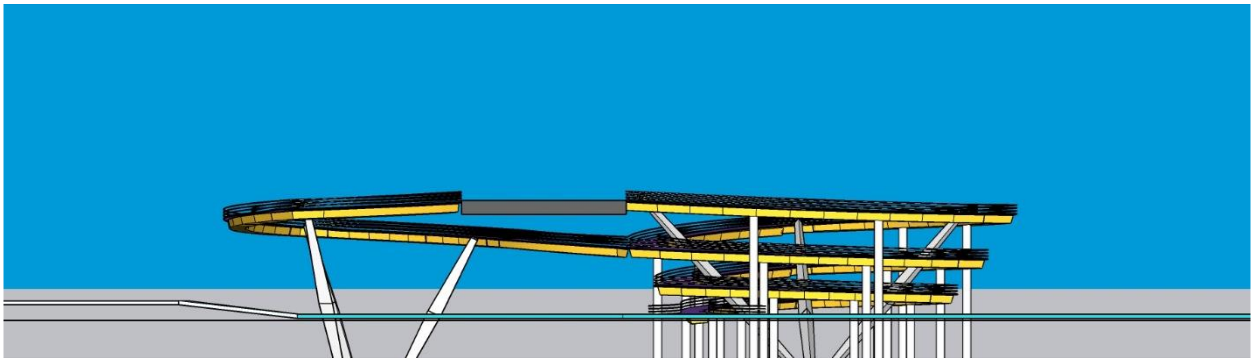


Figure 7: Overall Elevation

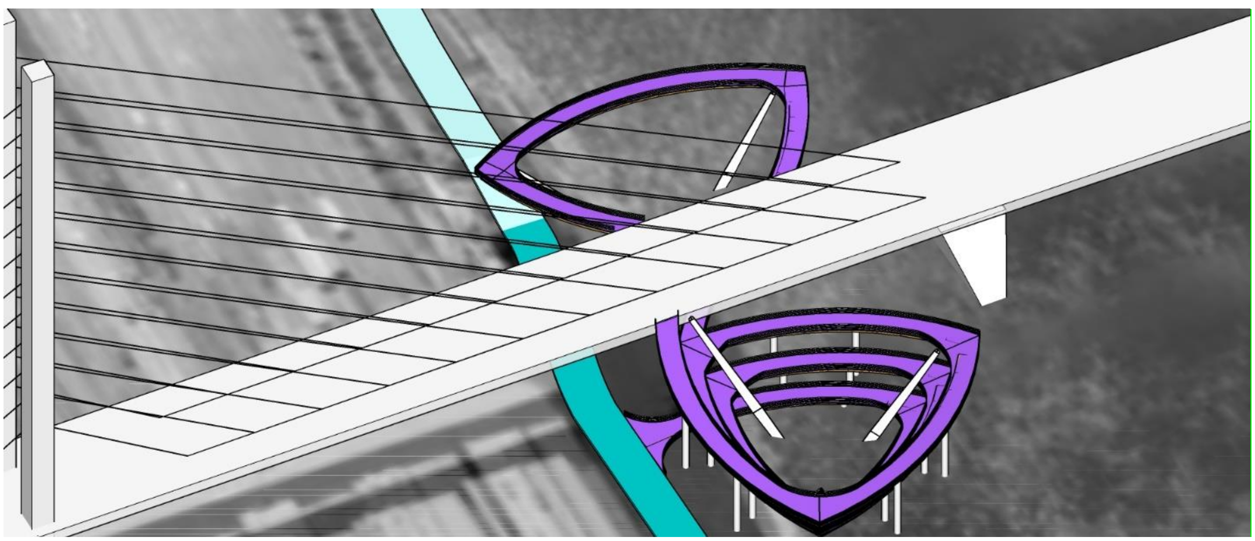


Figure 8: North Perspective

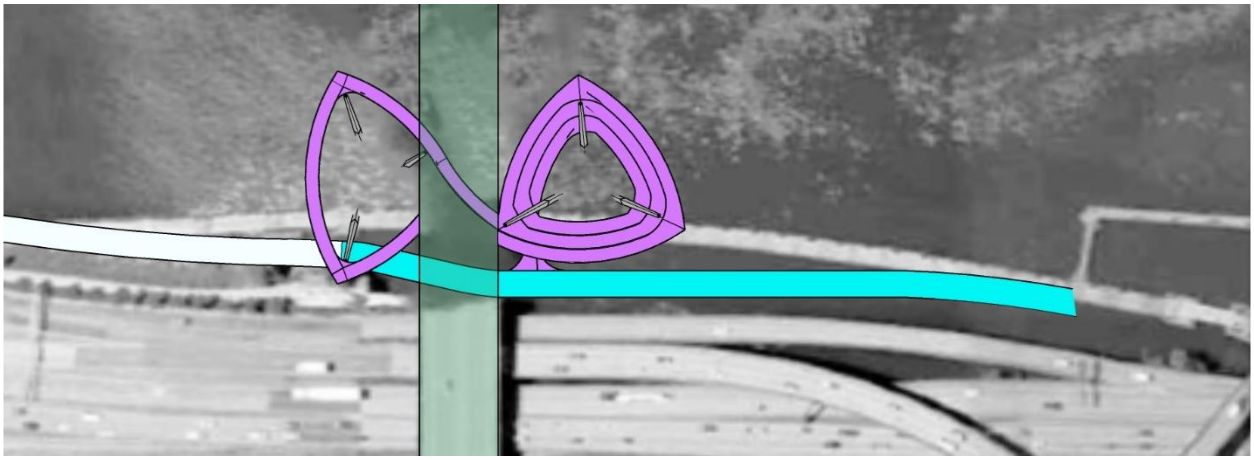


Figure 9: Plan

Future Design Development

The images shown above represent unique alignments developed to accommodate the design criteria and site constraints described in this report. However, the alignment and basic form of this design could be modified without substantially impacting cost and constructability if the general alignments and locations are maintained.

Esplanade Realignment

A section of the floating portion of the esplanade will be removed to accommodate construction of the EQRB. It is assumed that the existing gangways and floats that connect to the pile supported section of the esplanade on the south of the bridge will be salvaged and relocated after construction of the EQRB.

This concept design assumes a fixed, pile supported section of esplanade will be constructed on a similar alignment to the existing floating esplanade on the south of the bridge and under the bridge, supported on the connector foundations where available. The relocated floats and gangways will be relocated to the north of the EQRB, to connect the new pile supported section of esplanade to the existing floating esplanade north of the EQRB in the same way as they currently do on the south side of the bridge.

Civil Design, Stormwater, and Permitting Considerations

The radii on the proposed alignment can be developed to control reduce bicycle speeds. Close attention will need to be paid during design to implement additional features to help control bicycle speeds through the project area.

Based on the assumption that the proposed walkway will include concrete decking we anticipate that the project will be responsible for providing water quality treatment for the new structure. This could be accommodated with implementation of a vegetated planter or planters that would likely be sized at approximately 2% of the contributing impervious area. If vegetated treatment is not feasible due to limited upland areas and proximity to the river, storm water treatment might include treatment through a manufactured filter system. A case could also be made for a Special Circumstance since pollutant loads are low for the bike and pedestrian use of the pathway.

Environmental permitting is expected to be a considerable task for this project, due to its footprint within the Willamette River. Consideration should be given to combining the permitting of the connector with the permitting for the EQRB, which is expected to include a significant portion of the footprint of the connector.

Concept Engineering Analysis and Structural Member Sizes

Structural Framing Overview Basket Structure

A 3D SAP2000 structural model was created for preliminary gravity and lateral analysis. The superstructure consists of a curved walkway, approximately 1300 feet in length, and 70 feet tall from top of pile cap to top of framing. The framing is supported by concrete pile cap on concrete drilled shafts. The drilled shafts are fixed into the Troutdale formation for lateral and vertical resistance.

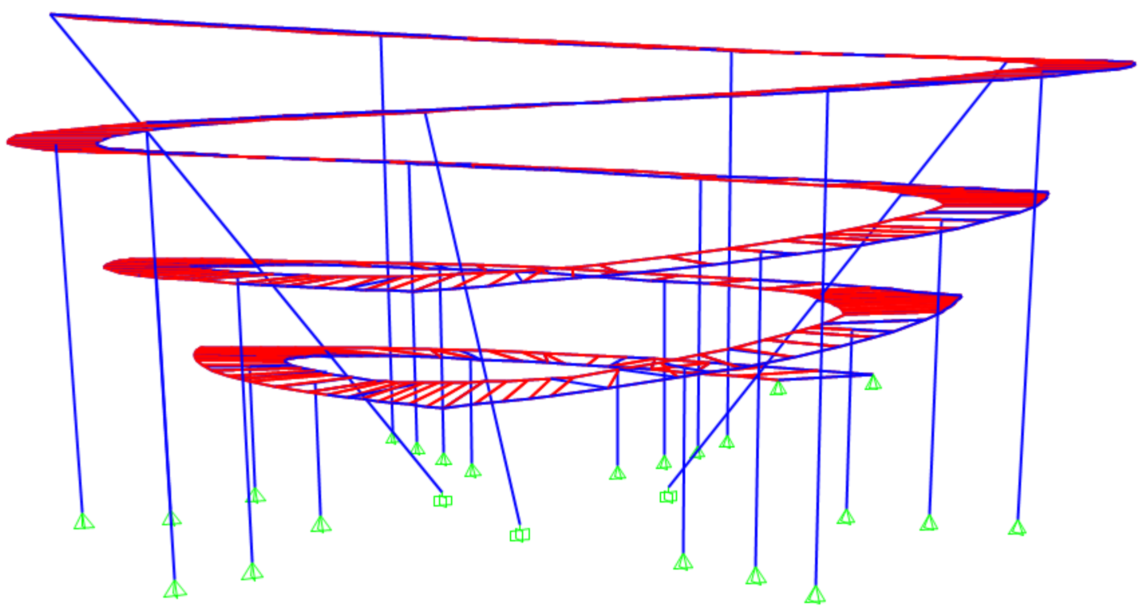


Figure 10: Rendering of 3D SAP2000 analysis model

The walkway is supported by (18) – 48" diameter steel pipe columns, and (3) – 48" square steel box columns flared outward at approximately 40 degrees from vertical. The steel box columns are the primary lateral system, and the pipe columns are the primary gravity system. The walkway consists of a 6" slab, approximately 15 feet wide, framed on the exterior side of the steel columns with a pair of W40x215 girders and W40x149 infill tie beams to prevent the deck from rolling. The maximum beam span is approximately 80 feet.

Design Loads
Design Dead Load: Self weight of beams, columns, 7" concrete deck.

Design Live Load: 90psf un-reduced

Seismic Design: Site Class E, Sds = 0.92, R = 3. Response spectra analysis utilizing ODOT response spectra, 1000-year earthquake life safety.

Soil Lateral Loads: 530pcf non liquefied soil 0-5 feet below mudline. 16pcf min to 32pcf max for liquefied soil, 5 feet to 60 feet below mudline.

Dynamic Analysis of Structure
A dynamic modal analysis was performed on the structure to determine the fundamental modes of vibration. The first fundamental periods of the structure for lateral loads are approximately 1.1 sec (0.9Hz) for each direction, and approximately 0.4sec (2.5Hz) for vertical loads.

AASHTO recommends providing vertical modes above 3Hz and lateral modes above 1.3Hz in order to prevent harmonic resonance with pedestrian footfall traffic. The frequency of the structure is close to the recommended design values, and in final design the frequency will be modified as needed using tuned mass dampers or increased stiffness.

Soil Forces on Foundations
Due to the basket structures proximity to the east bank, and the likelihood of a liquefaction and a slope failure, significant soil forces occur on the drilled shafts. To capture the effects of the soil on the drilled shafts, passive soil pressures were applied to the sides of the shafts. The soil lateral forces were combined with the earthquake effects to determine the total lateral demands on the shafts. The results showed that approximately 10-foot diameter shafts had adequate capacity to resist the combined lateral forces.

Cost Estimates

Concept level cost estimates have been developed for the recommended design. We have broken the estimate into three sections:

- North Side of bridge
- South Side of bridge
- Relocated Esplanade

The estimated costs for each section are:

- North Side of Bridge $ 41,600,000
- South Side of Bridge $ 21,000,000
- Relocated Esplanade $ 7,200,000

Detailed costs estimates are contained in Appendix D. Costs are based on 2022 dollars and have not been increased for escalation. The costs noted above include a 40% contingency and a 30% increase for PE/CE.

Significant risks to the estimated costs include escalation in construction costs due to inflation, significant variation in geotechnical conditions from those assumed for this study, as well as changes to the alignment, location, or elevation of the EQRB.

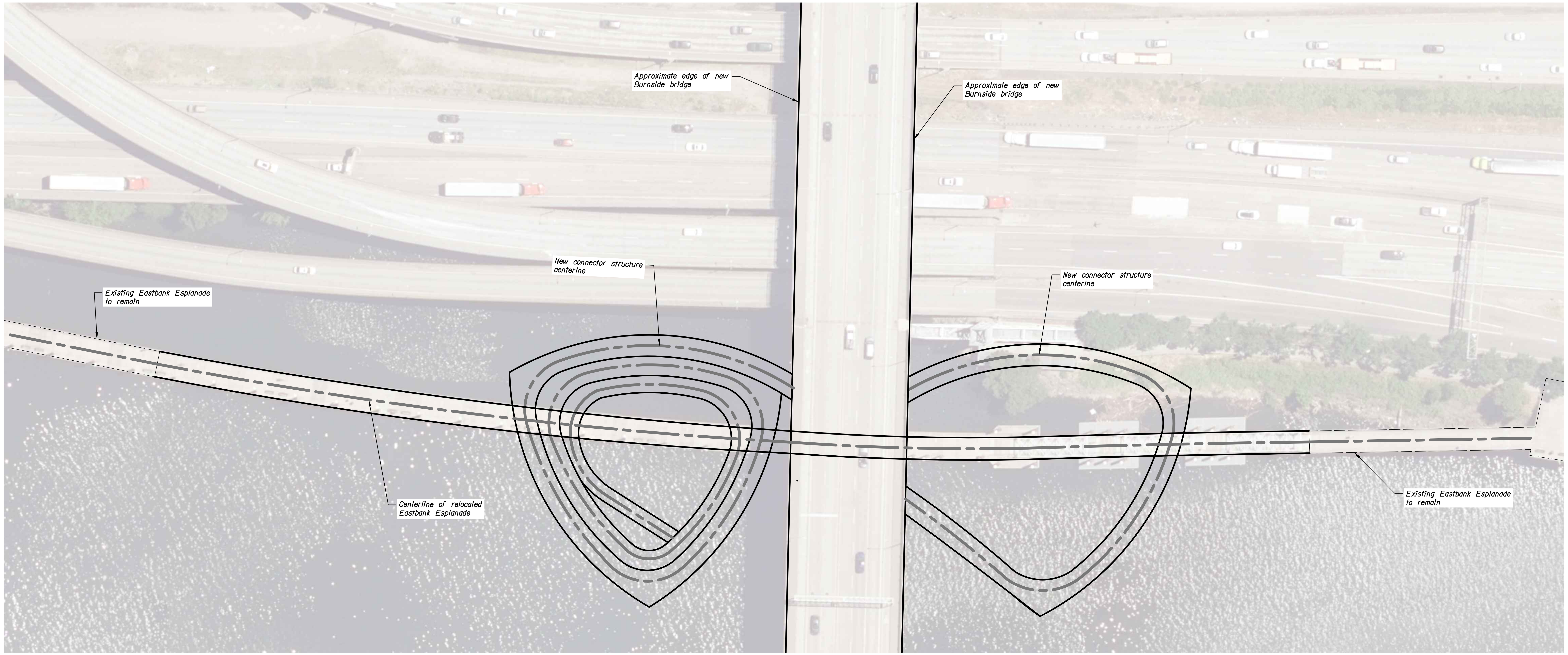
The proposed connector will require lengthy environmental permitting, and significant delays resulting from this process could add to the effects of escalating construction costs.

Conclusion and Next Steps

The intended purpose of this alternatives analysis is to develop a concept level design, alignment, and cost estimate for the new connector. The proposed concept design described above is intended to address the project goals and constraints while providing flexibility in the design to allow further development as the project progresses.

This design and the associated cost estimates have been developed to a concept design level of completion. This information will allow PBOT and the KPFF team to complete a concept design report for use by PBOT in advancing the project and for PBOT coordination with the EQRB design team. Further refinement and adjustment of the approaches presented in this alternatives analysis is expected as the project moves forward into detailed design.

Appendix A. Conceptual Structural Plans



CONNECTOR-OVERALL PLAN

NORTH

SCALE

30 0 15 30 60

1 INCH = 30 FEET

kpff

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Portland, OR 97204
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F: 503.227.7980
www.kpff.com

NO.	DATE	DESCRIPTION	APPD.

REVISION

DESIGNED BY	DATE APPROVED
SF	Aug 2022
CAD BY SV	Aug 2022
CHECKED BY CT	Aug 2022

APPROVALS:

DIVISION ENGINEER REG. PROF. ENGR. NO. 55504PE

CITY ENGINEER REG. PROF. ENGR. NO. 51538PE

CITY OF PORTLAND OFFICE OF TRANSPORTATION

SAM ADAMS COMMISSIONER
STEVE TOWNSEN, P.E. CITY ENGINEER

CITY OF PORTLAND, OREGON 1851

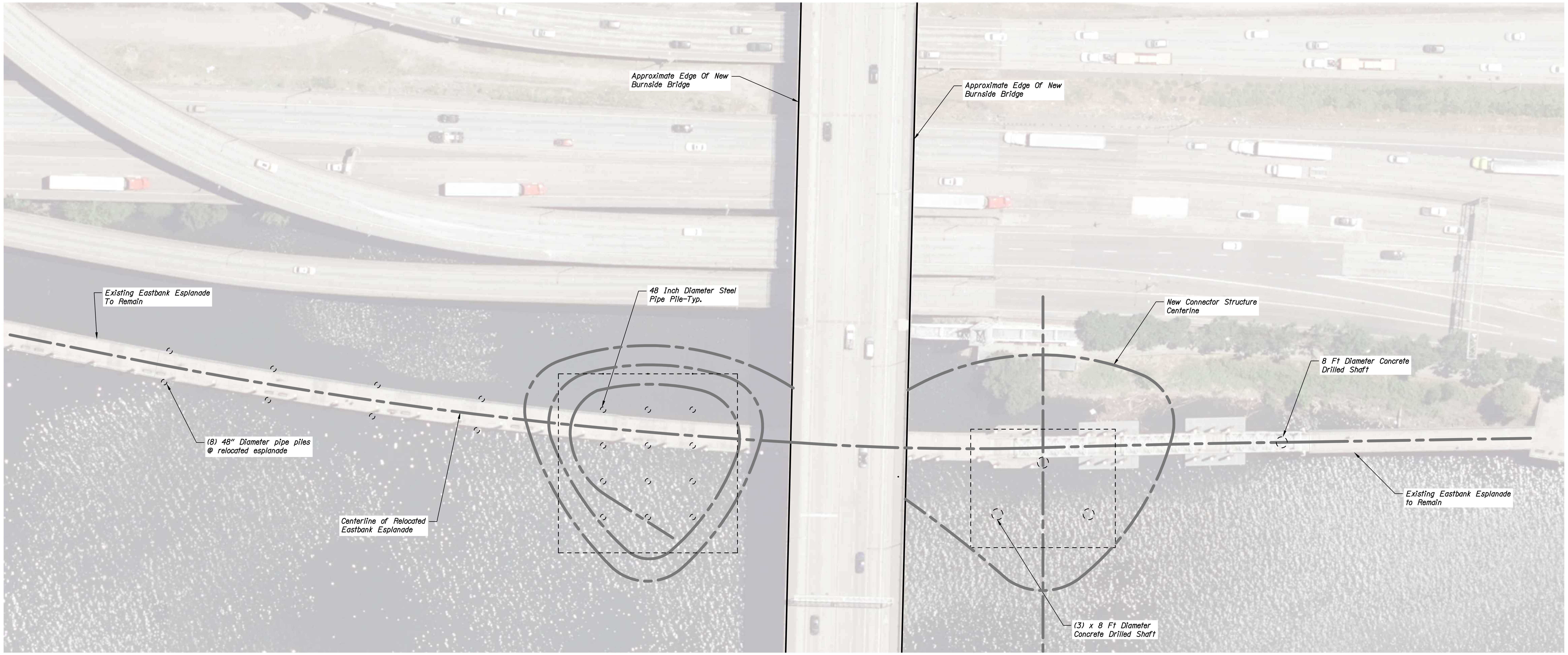
BURNSIDE BRIDGE CONNECTOR
MULTNOMAH COUNTY
CONNECTOR-
OVERALL PLAN

1/4 SECTION 2527

PROJECT NO. 37585

SHEET NO. BC-01

Plot Date: $DATE$ $TIME$ Filename: $FILE$



CONNECTOR-FOUNDATION PLAN

NORTH

SCALE

40 0 20 40 80

1 INCH = 40 FEET

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NO.	DATE	DESCRIPTION	APPD.
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SF	Aug 2022
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CT	Aug 2022

APPROVALS:

DIVISION ENGINEER — REG. PROF. ENGR. NO. 55504PE

CITY ENGINEER — REG. PROF. ENGR. NO. 51538PE

CITY OF PORTLAND OFFICE OF TRANSPORTATION

SAM ADAMS — COMMISSIONER
STEVE TOWNSEN, P.E. — CITY ENGINEER

CITY OF PORTLAND, OREGON 1851

BURNSIDE BRIDGE CONNECTOR
MULTNOMAH COUNTY
CONNECTOR-FOUNDATION PLAN

1/4 SECTION: 2527

PROJECT NO.: 37585

SHEET NO.: BC-02

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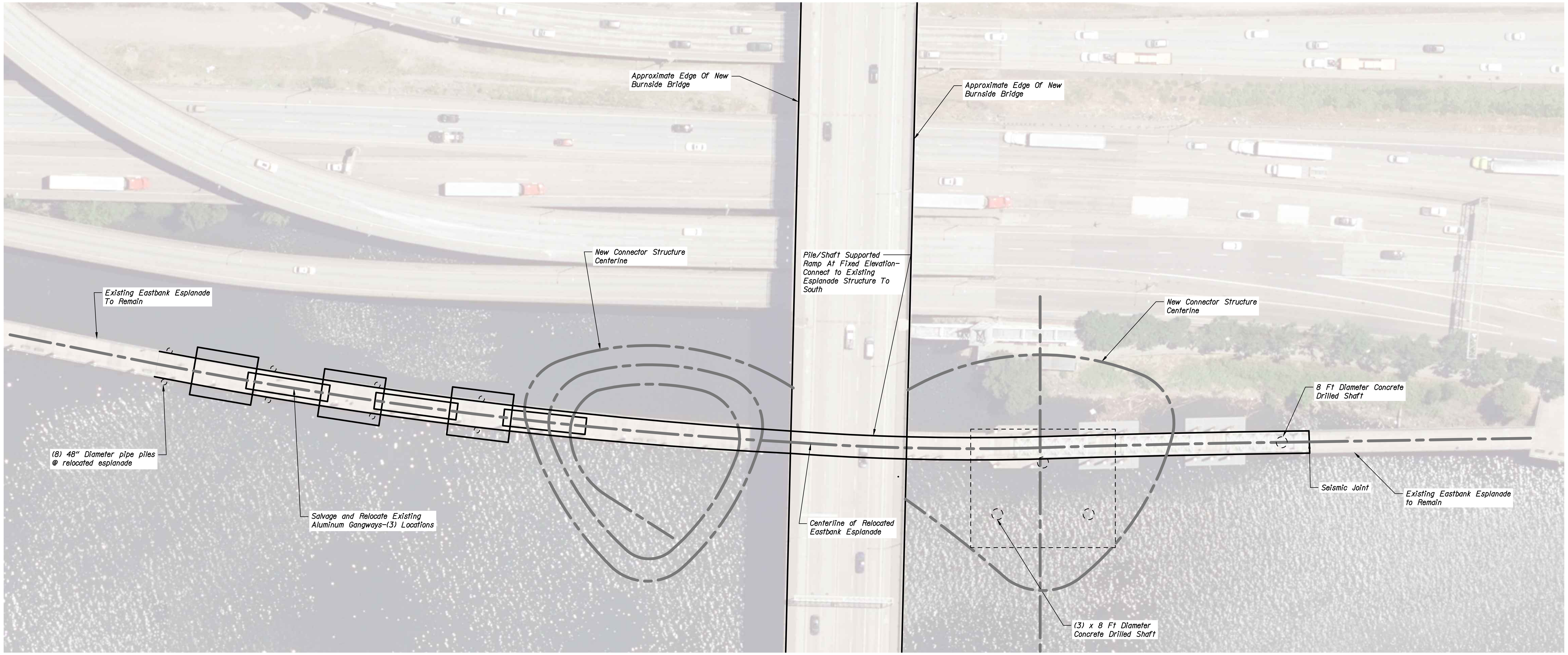

RELOCATED ESPLANADE PLAN

NORTH

SCALE

40 0 20 40 80

1 INCH = 40 FEET

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$FILE$ Filename:

$TIME$

$DATE$ Plot Date:

NO.	DATE	DESCRIPTION	APPD.
		REVISION	

DESIGNED BY	DATE APPROVED
SF	Aug 2022
CAD BY	
SV	Aug 2022
CHECKED BY	
CT	Aug 2022

APPROVALS:

DIVISION ENGINEER — REG. PROF. ENGR. NO. 55504PE

CITY ENGINEER — REG. PROF. ENGR. NO. 51538PE

CITY OF PORTLAND OFFICE OF TRANSPORTATION

SAM ADAMS — COMMISSIONER
STEVE TOWNSEN, P.E. — CITY ENGINEER

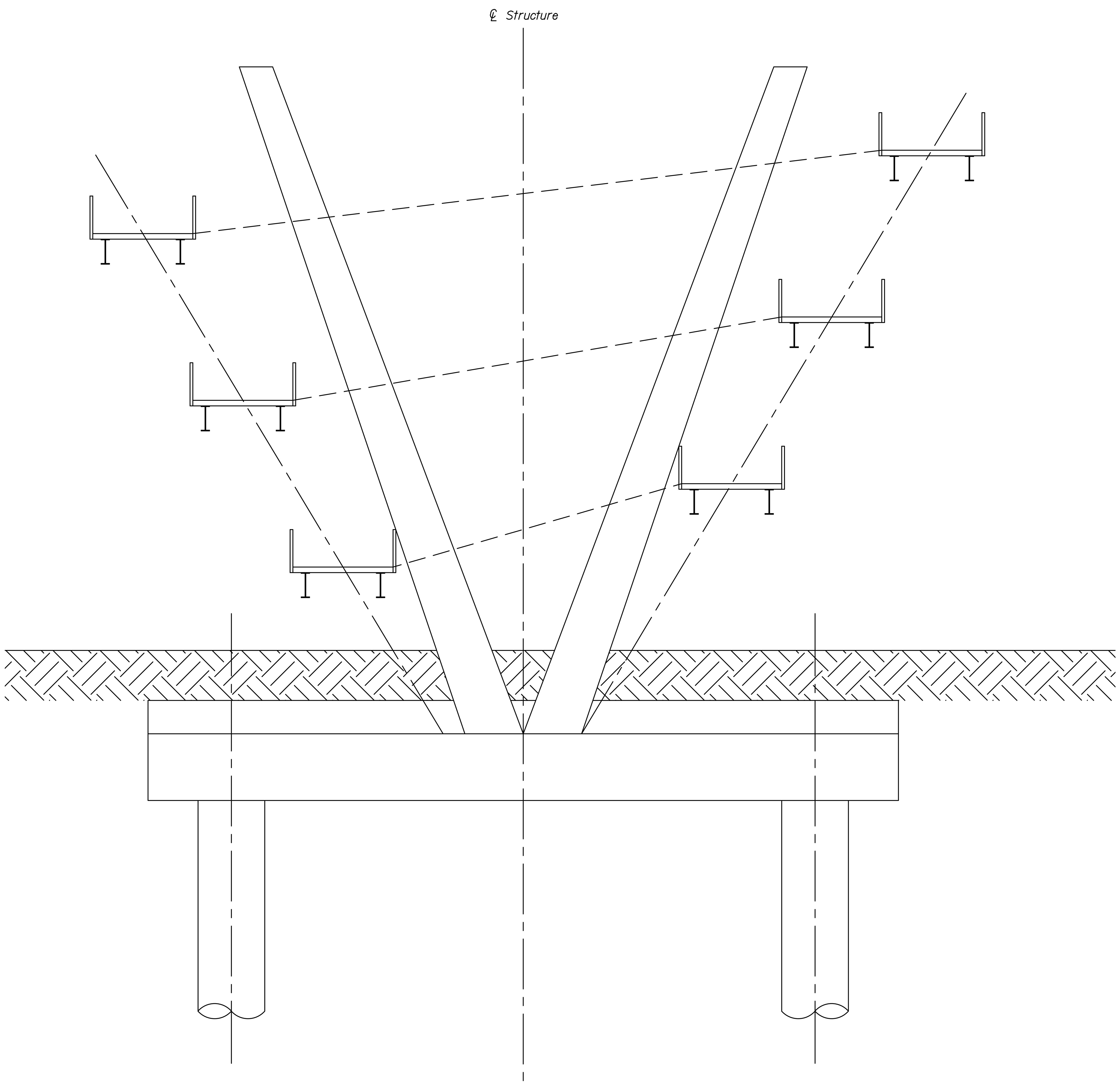
CITY OF PORTLAND, OREGON 1851

BURNSIDE BRIDGE CONNECTOR
MULTNOMAH COUNTY
RELOCATED ESPLANADE PLAN

1/4 SECTION: 2527

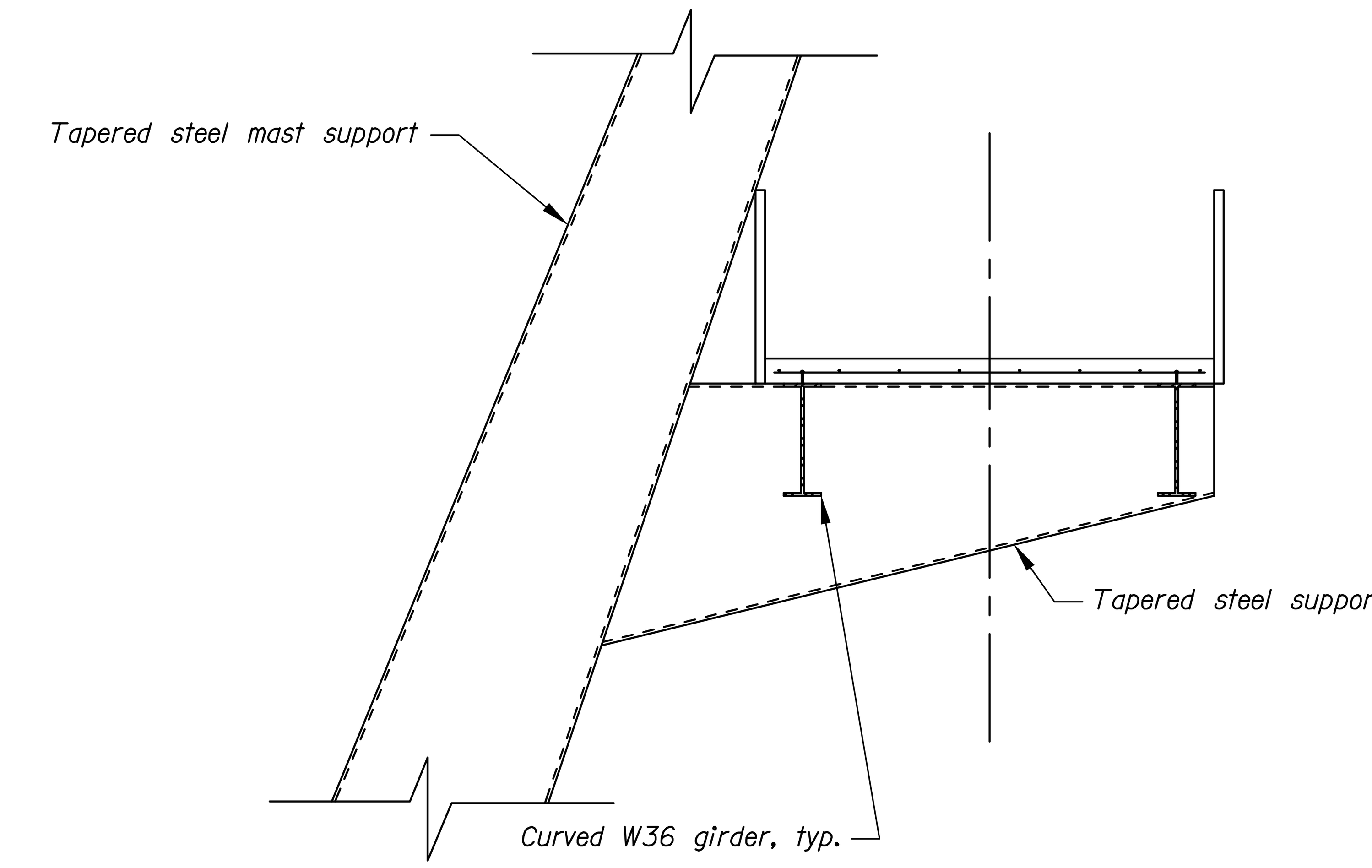
PROJECT NO.: 37585

SHEET NO.: BC-03



SECTION AT "BASKET"

Scale: 1/8"=1'-0"



SECTION AT "BASKET" DECK

Scale: 1/4"=1'-0"

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NO.	DATE	DESCRIPTION	APPD.
		REVISION	

DESIGNED BY	SF	DATE APPROVED Aug 2022
CAD BY	SV	Aug 2022
CHECKED BY	CT	Aug 2022

APPROVALS:

DIVISION ENGINEER REG. PROF. ENGR. NO. 55504PE

CITY ENGINEER REG. PROF. ENGR. NO. 51538PE

CITY OF PORTLAND OFFICE OF TRANSPORTATION

SAM ADAMS COMMISSIONER
STEVE TOWNSEN, P.E. CITY ENGINEER

CITY OF PORTLAND, OREGON 1851

BURNSIDE BRIDGE CONNECTOR
MULTNOMAH COUNTY

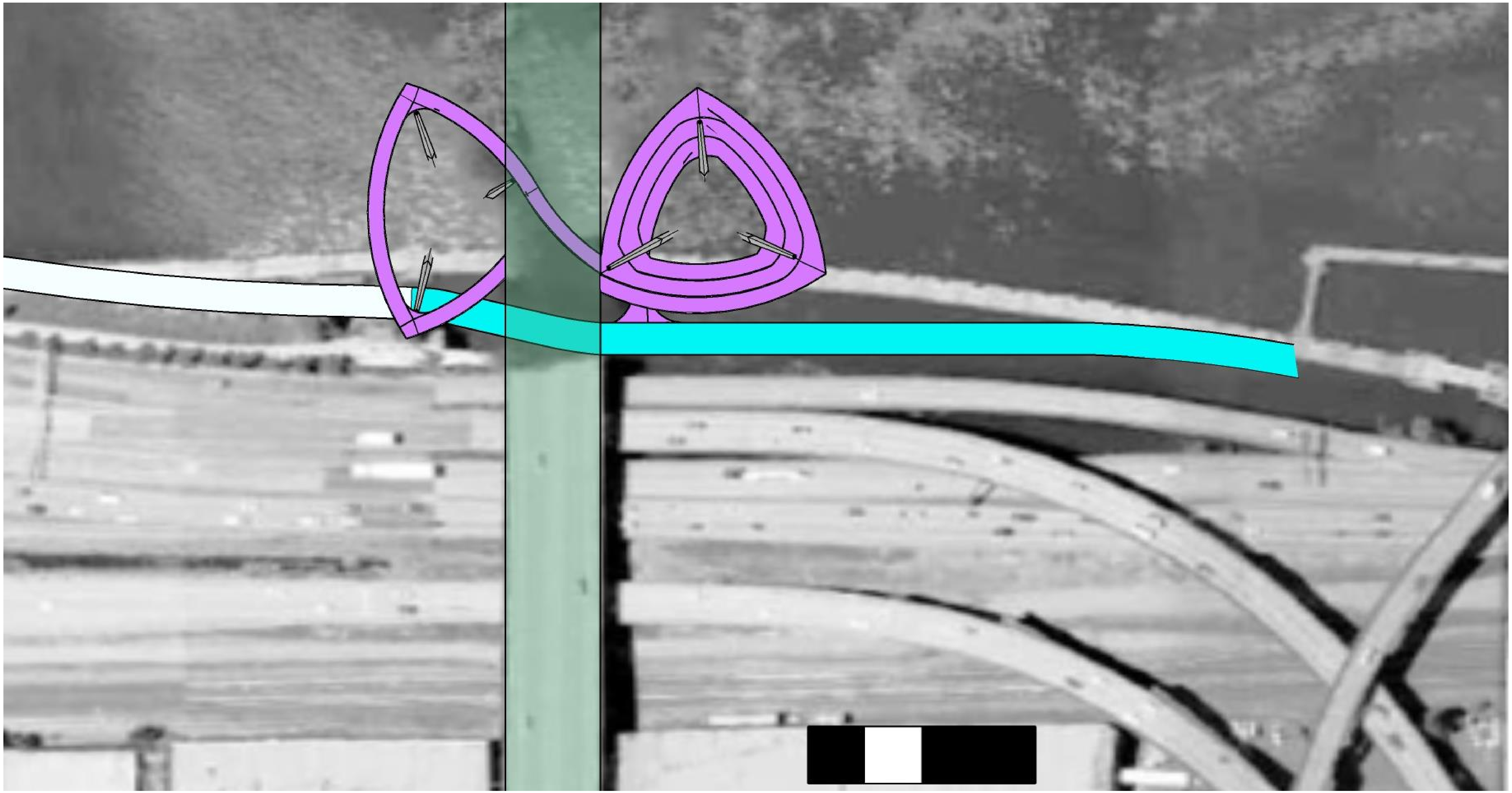
SECTIONS

1/4 SECTION 2527
PROJECT NO. 37585
SHEET NO. BC-04

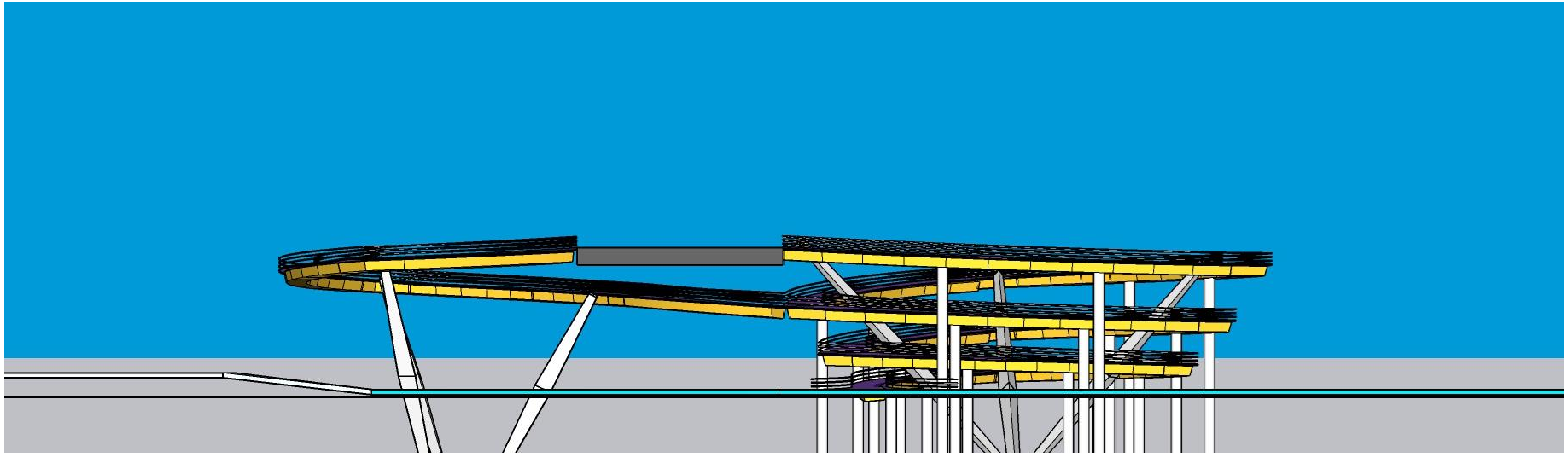
$FILE$ Filename:
$TIME$
$DATE$ Plot Date:

Appendix B. Concept Renderings

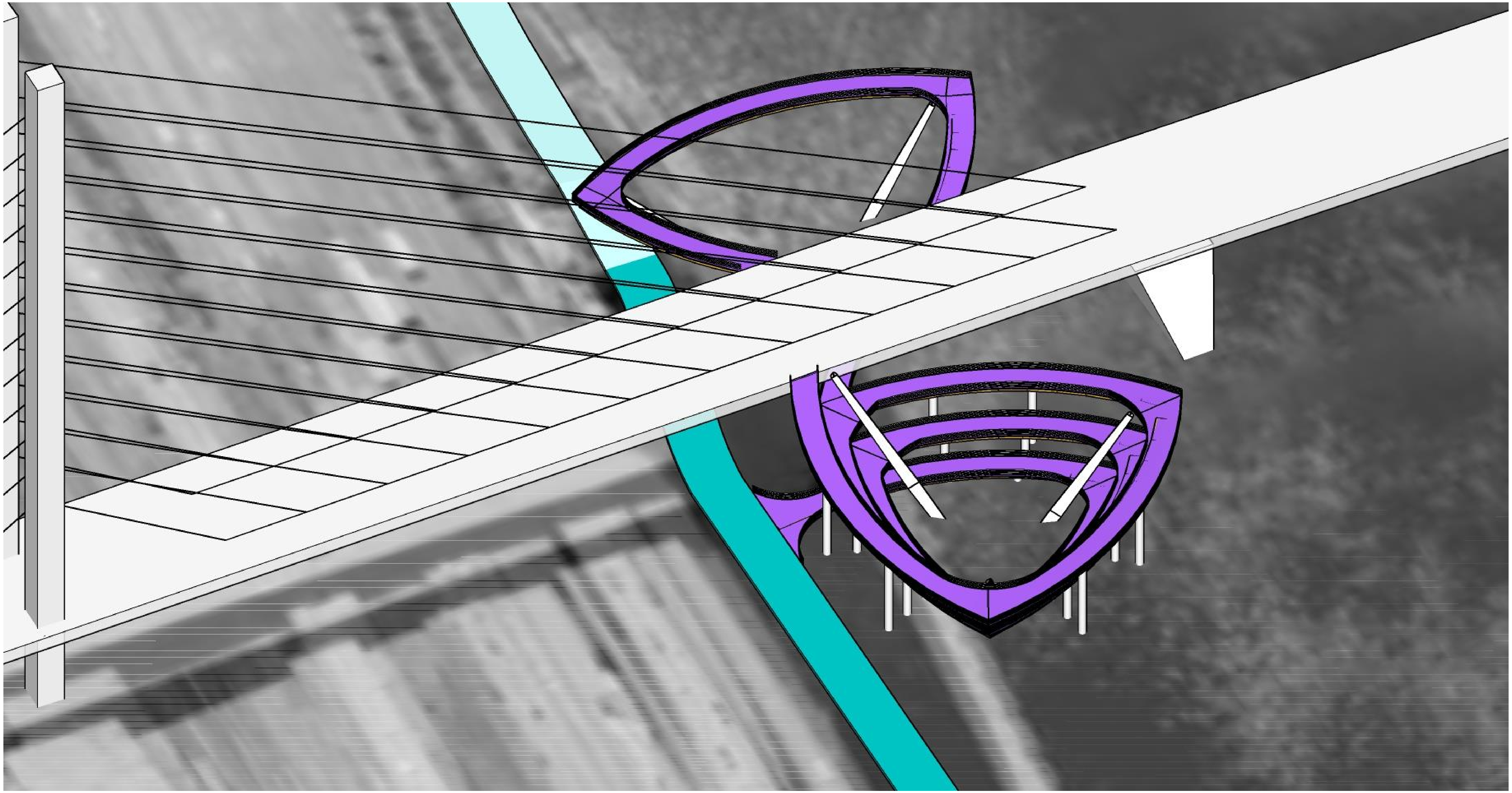
Overall Plan



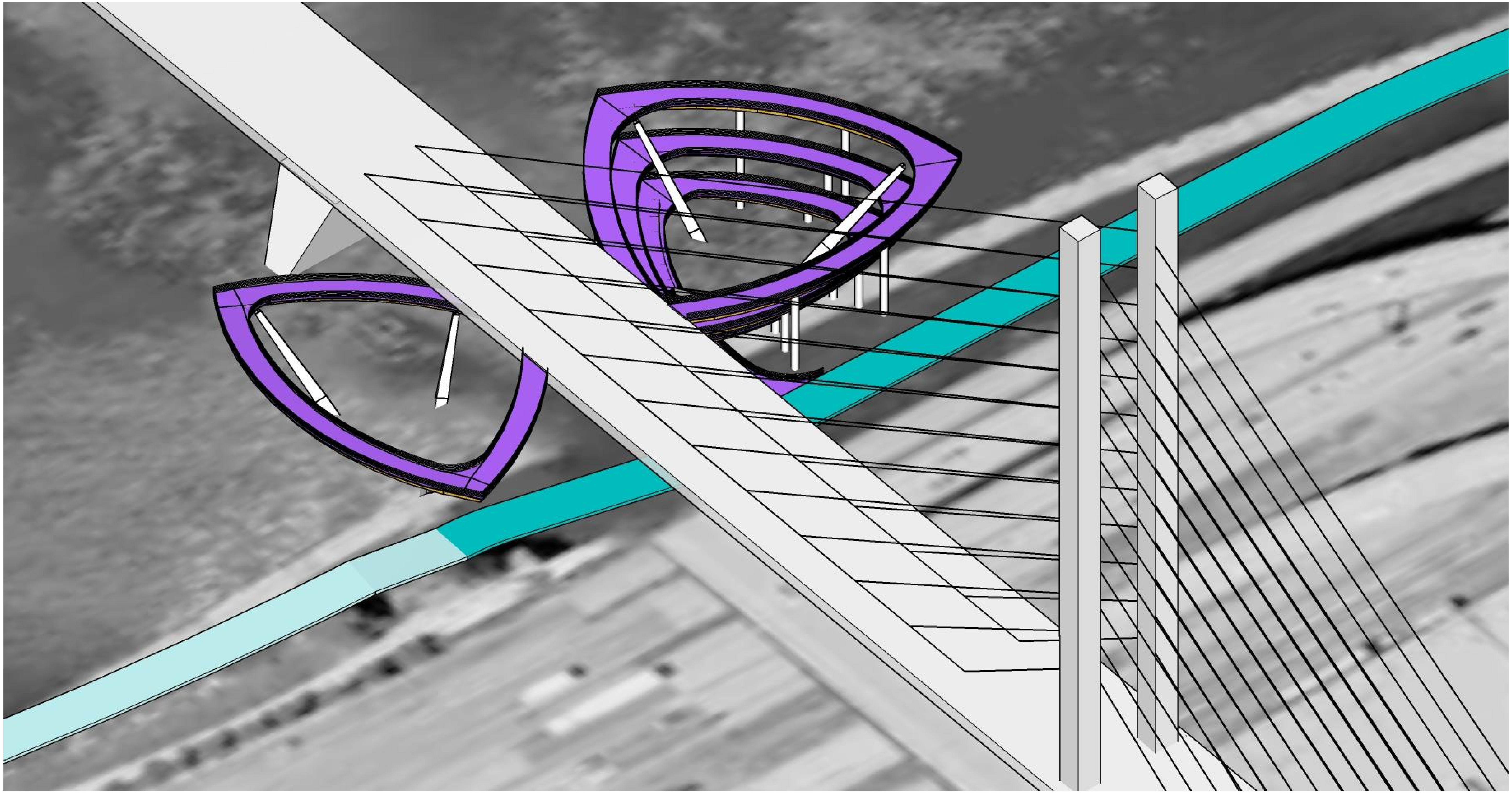
Overall Elevation



North Perspective



South Perspective



Appendix C. Detailed Concept Level Costs

Location:	**Burnside Bridge Connector**	Date	8/19/2022
Prepared for:	PBOT	Prepared by:	KPFF

CONSTRUCTION COST ESTIMATE - NORTH STRUCTURE
CONCEPT DESIGN

SPEC PART#	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM COST
210	MOBILIZATION	1	LS	10%	$2,222,625
BRIDGES					$ 22,226,250
510	FURNISH DRILLING EQUIPMENT	1	LS	$ 1,000,000	$ 1,000,000
515	PIPE PILE 48 INCH DIAMETER	12	EA	$ 220,000	$ 2,640,000
515	PILE CAP CONCRETE	3,000	CY	$ 1,000	$ 3,000,000
515	PILE CAP REINF.	100,000	LBS	$ 2	$ 175,000
515	COFFERDAM 100ft x 100ft	1	LS	$ 1,600,000	$ 1,600,000
520	DECK SLAB REINFORCEMENT	115,000	LB	$ 2	$ 201,250
525	SUPERSTRUCTURE CONCRETE CLASS 4000	450	CY	$ 1,000	$ 450,000
530	STRUCTURAL STEEL	1,700,000	LBS	$ 6	$ 10,200,000
535	STEEL ERECTION	1	LS	$ 2,000,000	$ 2,000,000
535	GUARDRAIL	3,200	LF	$ 300	$ 960,000
	CONSTRUCTION SUBTOTAL				**$24,448,875**
	CONTINGENCY	1	LS	40%	$ 9,779,550
	PRELIMINARY AND CONSTRUCTION ENGINEERING	1	LS	30%	$ 7,334,663
	TOTAL ESTIMATED CONSTRUCTION COSTS (ROUNDED)				**$41,600,000**

Location:	**Burnside Bridge Connector**	Date	8/19/2022
Prepared for:	PBOT	Prepared by:	KPFF

CONSTRUCTION COST ESTIMATE - SOUTH STRUCTURE
CONCEPT DESIGN

SPEC PART#	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM COST
210	MOBILIZATION	1	LS	10%	$1,125,500
BRIDGES					$ 11,255,000
510	FURNISH DRILLED SHAFT EQUIPMENT	1	LS	$ 1,500,000	$ 1,500,000
515	DRILLED SHAFT, FURNISH AND INSTALL - 8 FT DIAMETER	3	EA	$ 1,000,000	$ 3,000,000
515	COFFERDAM 100 FT X 100 FT	1	LS	$ 1,600,000	$ 1,600,000
520	PILE CAP CONCRETE	900	CY	$ 1,000	$ 900,000
520	PILE CAP REINF.	300,000	LBS	$ 2	$ 525,000
520	DECK SLAB REINFORCEMENT	40,000	LB	$ 2	$ 70,000
525	SUPERSTRUCTURE CONCRETE CLASS 4000	150	CY	$ 1,000	$ 150,000
530	STRUCTURAL STEEL GIRDERS	275,000	LBS	$ 6	$ 1,650,000
530	GUARDRAIL	1,200	LF	$ 300	$ 360,000
530	STEEL ERECTION	1	LS	$ 1,500,000	$ 1,500,000
	CONSTRUCTION SUBTOTAL				**$12,380,500**
	CONTINGENCY	1	LS	40%	$ 4,952,200
	PRELIMINARY AND CONSTRUCTION ENGINEERING	1	LS	30%	$ 3,714,150
	TOTAL ESTIMATED CONSTRUCTION COSTS (ROUNDED)				**$21,000,000**

Location: **Burnside Bridge Connector** Date 8/19/2022
Prepared for: PBOT Prepared by: KPFF

CONSTRUCTION COST ESTIMATE - ESPLANADE FLOATING SECTION
CONCEPT DESIGN

SPEC PART#	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM COST
210	MOBILIZATION	1	LS	10%	$383,350
BRIDGES					$ 3,833,500
515	PIPE PILE DRIVING	8	EA	$ 40,000	$ 320,000
515	FURNISH PIPE PILE, 48" DIA.	1,360	LF	$ 1,100	$ 1,496,000
515	REINFORCED PILE TIPS	8	EA	$ 2,000	$ 16,000
515	PILE SPLICES	16	EA	$ 1,500	$ 24,000
515	DRILLED SHAFT, FURNISH AND INSTALL, 10ft DIAMETER	1	EA	$ 1,000,000	$ 1,000,000
520	DECK SLAB REINFORCEMENT	10,000	LB	$ 2	$ 17,500
525	SUPERSTRUCTURE CONCRETE CLASS 4000	100	CY	$ 1,000	$ 100,000
530	STRUCTURAL STEEL GIRDERS	80,000	LBS	$ 4	$ 320,000
530	GUARDRAIL	800	LF	$ 300	$ 240,000
	RELOCATE EXISTING FLOATING DOCK	1	LS	$ 300,000	$ 300,000
	CONSTRUCTION SUBTOTAL				**$4,216,850**
	CONTINGENCY	1	LS	40%	$ 1,686,740
	PRELIMINARY AND CONSTRUCTION ENGINEERING	1	LS	30%	$ 1,265,055
	TOTAL ESTIMATED CONSTRUCTION COSTS (ROUNDED)				**$7,200,000**

Appendix D. GRI Geotech Memo

GRI
16520 SW Upper Boones Ferry Road, Suite 100
Tigard, OR 97224
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www.gri.com

MEMORANDUM

To: Stuart Finney, PE, SE
KPFF Consulting Engineers
111 SW Fifth Avenue, Suite 2600
Portland, OR 97204

Date: August 15, 2022

GRI Project No.: 6646-A

From: Jason D. Bock, PE

Re: Preliminary Geotechnical Consultation
Burnside Connector
Portland, Oregon

At your request, GRI is providing preliminary geotechnical consultation during concept development for the Burnside Connector project in Portland, Oregon. Our work included review of existing subsurface information and design recommendations completed for the ongoing Earthquake Ready Burnside (EQRB) Bridge Replacement project (Shannon & Wilson, 2022) and preliminary evaluation of foundation support options and seismic hazards, with mitigation as needed, for the new structure.

Based on information provided by you, we understand the Portland Bureau of Transportation (PBOT) is considering constructing a new pedestrian bridge connecting the east bank esplanade with the proposed new Burnside Bridge. Current concepts call for the construction of new structures located both north and south of the Burnside Bridge. The structure north of the Burnside Bridge will be a meandering bridge located near the existing floating esplanade and known as the Ribbon Structure. Another structure is proposed south of the Burnside Bridge in line with the existing floating esplanade and is known as the Basket. The third and last structure is the Human Access Project (HAP) and is a new elevated ADA walkway located on the bank of the Willamette River south of the Burnside Bridge. Given the location of the proposed structures, we anticipate all will need to be founded on deep foundations.

SUBSURFACE CONDITIONS

Subsurface materials and conditions at the site were evaluated based on explorations in the vicinity of the Burnside Bridge and GRI's experience and understanding of subsurface conditions at the project site and sites nearby. Published geologic mapping indicates the site is mantled with a variable thickness of artificial fill underlain by recent alluvium consisting of silt and sand, which was deposited by the Willamette River (Madin, 2004). Review of subsurface information for the site obtained by GRI and others for previous projects in the area indicates the alluvial sands and silts are underlain by gravels consisting of both alluvial gravels and the Troutdale Formation.

Due to the close proximity of the Willamette River, we anticipate the groundwater level at the site will rise and fall in response to fluctuations in the river level and rainfall. In general, we anticipate water to be at about elevation 10 feet to 15 feet (NAVD 88). In addition, perched groundwater conditions may occur in the silt soils and fill that mantle the site during periods of heavy or prolonged precipitation.

PRELIMINARY GEOTECHNICAL CONSIDERATIONS

The following preliminary geotechnical considerations are provided to assist the design team with initial project planning.

Liquefaction

Liquefaction is a process by which loose, saturated granular materials, such as clean sand and, to a somewhat lesser degree, non-plastic and low-plasticity silts, temporarily lose stiffness and strength during and immediately after a seismic event. This degradation in soil properties may be substantial and abrupt, particularly in loose sands. Liquefaction occurs as seismic shear stresses propagate through saturated soil and distort the soil structure, causing loosely packed groups of particles to contract or collapse. If drainage is impeded and cannot occur quickly, the collapsing soil structure causes the pore water pressure to increase between the soil grains. If the pore water pressure becomes sufficiently large, the intergranular stresses become small, and the granular layer temporarily behaves as a viscous liquid rather than a solid. After liquefaction is triggered, there is an increased risk of settlement, loss of bearing capacity, lateral spreading, and/or slope instability, particularly along waterfront areas. Liquefaction-induced settlement occurs as the elevated pore water pressures dissipate and the soil consolidates after the earthquake.

Based on our review of the explorations within the vicinity of the proposed structures, the sand soils at the site below the groundwater are highly susceptible to liquefaction and will experience post-shaking reconsolidation settlement. The near-surface fill soils and silts will likely experience limited cyclic degradation and will largely act as a non-liquefied crust overlying the liquefiable materials.

Lateral Spreading

As noted above, the site is underlain by soils susceptible to liquefaction from a code-based seismic event. In riverfront areas, liquefaction can also cause large lateral spreading deformations of the riverbank, which may extend hundreds of feet into the upland areas. Our experience with similar projects along the Willamette River and review of recently completed numerical modeling for the EQRB project indicate lateral deformations on the order of 8 feet will likely occur on the eastern bank of the Willamette River near the burnside bridge following the 1,000-year and median level Mw 9 events.

We understand current plans call for construction of the new Ribbon and Basket structures within the river near the alignment of the existing esplanade. Based on review of available subsurface information and modeling by others, we anticipate both locations are within a zone of lateral spreading. The HAP project currently includes a long, elevated walkway along the bank of the Willamette River. Preliminary modeling completed for the EQRB project indicates significant lateral displacements along the alignment and large lateral forces as a result of a relatively thick non-liquefied crust that wants to move laterally over the underlying liquefiable soils. For comparison purposes, liquefiable soils typically exert lateral forces on the order of 1/10th that of a non-liquefied crust. Preliminary review of deep foundations for the HAP project indicates ground improvement will be required to reduce deformation and lateral loading on the proposed foundations.

Preliminary Deep Foundation Design Considerations

The following sections provide a profile of estimated capacity and lateral soil loading for conceptual level evaluation of the proposed deep foundations. It should be noted, provided lateral pressures have been increased to account for soil/pile arching effects where appropriate.

Ribbon Structure:

Driven Pipe Pile Nominal Unit Skin Capacity

- 0 feet to 50 feet – 0 ksf
- 50 feet to 80 feet – 2 ksf
- 80+ feet – 5 ksf

Estimated Lateral Loading

- 0 feet to 25 feet – 35 pcf

Estimated Passive Pressures

- 535 pcf (pounds per cubic foot) – Alluvial Gravels
- 875 pcf – Troutdale Gravels

Basket Structure:

Drilled Shaft Nominal Unit Skin Capacity

- 0 feet to 60 feet – 0 ksf
- 60 feet to 90 feet – 10 ksf
- 90+ feet – 14 ksf

Estimated Lateral Loading

- 0 feet to 5 feet – 530 pcf (non-liquefied crust)
- 5 feet to 60 feet – 35 pcf

Estimated Passive Pressures

- 535 pcf – Alluvial Gravels
- 875 pcf – Troutdale Gravels

HAP Structure:

Drilled Shaft Nominal Unit Skin Capacity

- 0 feet to 120 feet – 0 ksf
- 120 feet to 155 feet – 10 ksf
- 155+ feet – 14 ksf

Estimated Lateral Loading

- 0 feet to 10 feet – 1,300 pcf (non-liquefied crust)
- 10 feet to 25 feet – 1,100 pcf (non-liquefied crust)
- 25 feet to 50 feet – 535 pcf (non-liquefied crust)
- 50 feet to 90 feet – 35 pcf
- 90 feet to 100 feet – 525 pcf (non-liquefied soil)
- 100 feet to 120 feet 35 pcf

Estimated Passive Pressures

- 535 pcf – Alluvial Gravels
- 875 pcf – Troutdale Gravels

Preliminary Ground Improvement Design Considerations

Based on the estimated high loads associated with the non-liquefied crust at the proposed HAP structure, the project should consider the use of ground improvement. For preliminary purposes, we have reviewed various ground improvement approaches. Based on the limited access to the site as well as the soil conditions encountered, we recommend the use of jet grout. For a conceptual level basis, we recommend the ground improvement extend through the liquefiable soils and tipped into the medium-dense alluvial gravels at depth. Ground improvement should be constructed utilizing overlapping columns to form perimeter and interior walls at an average replacement ratio of approximately 30%. Due to the depth of the liquefiable soils, we recommend the ground improvement extend approximately 100 feet perpendicular to the river. Preliminary cost estimates based on these preliminary recommendations and our understanding that the HAP will extend approximately 1,200 feet to the south of the Burnside Bridge are on the order of $120 million to $130 million.

While costs associated with the ground improvement are high, several main things are driving the cost up. These items include the use of jet grout itself, proximity to the river, and access for the entire lateral width. As noted above, we will need to construct a ground improvement buttress approximately 100 feet wide. In comparison, jet grout can be installed at an angle, realistically only up to about 15°, given the depth required for this project. This will likely mean the project will require temporary lane closures on I-5/offramps to be able to build the jet grout block. The other main component is the control of spoils and the relative proximity to the river. For jet grout, we often see spoils essentially equal to the neat volume of treated soil and it will have a relatively low viscosity. Careful management and removal of these will be critical and drives up cost.

LIMITATIONS

This memorandum has been prepared for use by the project team and should not be relied upon by any other entity without the written permission of an authorized representative. The scope is limited to the specific project and location described within this memorandum and our description of the project represents our understanding of the significant aspects of the project relevant to the design and construction of the Burnside Connector at the time of this memorandum. In the event any changes in the design and location of the improvements as outlined in this memorandum are planned, we should be given the opportunity to review the changes and modify or reaffirm the conclusions and recommendations of this memorandum in writing.

The conclusions and recommendations submitted in this memorandum are based on the data obtained from previous field investigations and our understanding of the subsurface conditions. It is acknowledged that variations in soil conditions may exist at the project location. It should be understood our recommendations are for conceptual planning only and additional explorations and analysis will be required.

Please contact the undersigned if you have any questions regarding this memorandum.

Submitted for GRI,

Renews 12-2023

Jason D. Bock, PE
Principal

GRI 6646-A PRELIMINARY GEOTECHNICAL CONSULTATION MEMORANDUM

REFERENCES

Madin, I. p., 2004, Preliminary digital geologic compilation map of the greater Portland urban area, Oregon: Oregon Department of Geology and Mineral Industries, Open- File Report O-04-02, scale 1:24,000

Shannon and Wilson, 2022, "Draft, Revised Geotechnical Report, Earthquake Ready Burnside Bridge, Portland, Oregon" Shannon and Wilson No. 102636-009

Appendix E.
River Access Concept Design Memo

Burnside Bridge Connector

River Access Concept Design Narrative

KPFF Project No. 10022100869

August 19, 2022

Submitted To:

Sharon Daleo, PE
Major Projects and Partnerships
Portland Bureau of Transportation

Submitted By:

KPFF Consulting Engineers
Contributors: Architectural Applications and GRI

Introduction and Project Background

The Human Access Project (HAP) is a volunteer advocacy group focused on providing pedestrian access to the river. The HAP has developed a concept plan to provide access from the proposed replacement Burnside Bridge to the Eastbank Esplanade (the esplanade) on the east bank of the Willamette River (river) in downtown Portland. The plan includes a ramp and stairs (the connector) from the bridge in addition to site improvements on the bank of the river.

The Burnside Bridge currently has a pedestrian connection to the Eastbank Esplanade via a steel framed stair connecting to the south side of the bridge on the east bank of the Willamette River. The Burnside Bridge is expected to sustain major damage during a large seismic event and Multnomah County is in the early stages of designing a replacement bridge capable of withstanding a code level seismic event. The replacement bridge is expected to begin construction in 2025 with completion expected in 2029.

The ”Earthquake Ready Burnside Bridge“ (EQRB) is expected to be constructed along the current alignment of the existing bridge with the roadway located at approximately the same elevation as the current roadway.

The Eastbank Esplanade was constructed in the late 1990’s and consists of a floating walkway under the existing bridge, connected to a steel pile supported walkway with aluminum gangways to the south that connect to an on-grade trail along the riverbank.

This narrative addresses the site improvements between the existing Esplanade and the river, to provide pedestrian access from the esplanade to the river. The connection of the esplanade to the EQRB is addressed in a separate report.

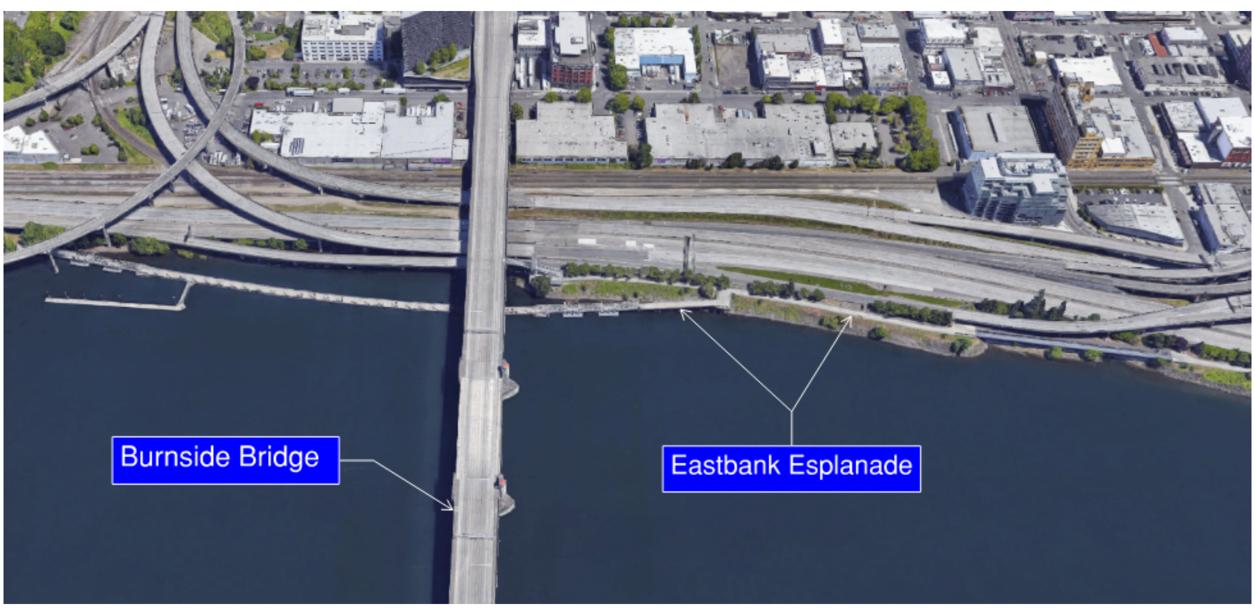


Figure 1: Existing Burnside Bridge and Eastbank Esplanade

Figure 2: Human Access Project – Burnside Connector Concept

Concept River Access

The river access concept evaluated in this report is based on the river access proposed in the HAP. The general alignment is shown below in Figure 3:

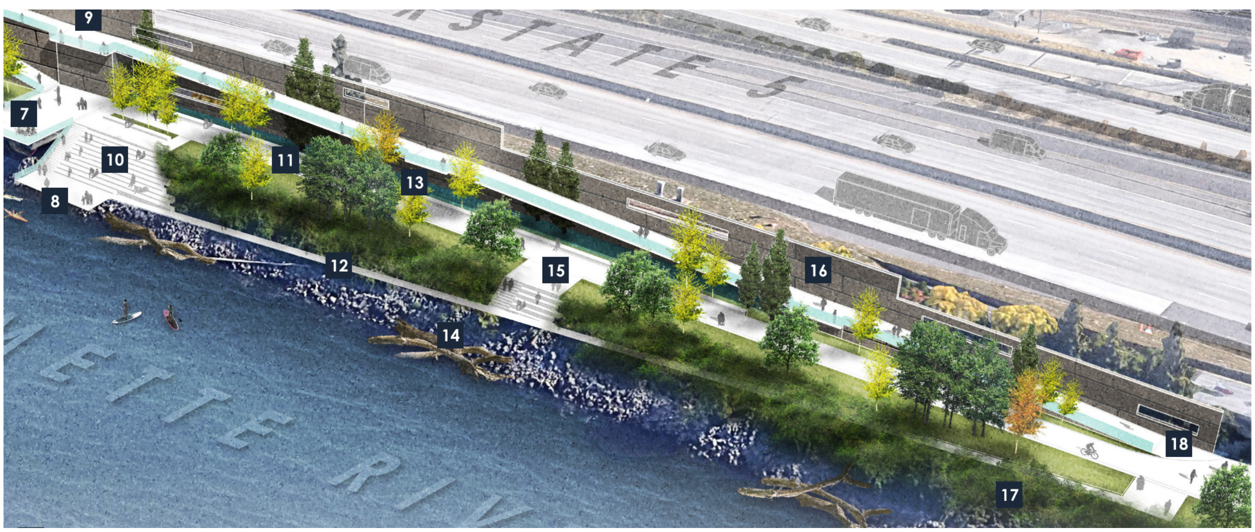


Figure 3: Human Access Project – On Grade River Access

Project Constraints

The following constraints are applicable to the concept design:

- Geographic constraints include the navigable channel of the Willamette River to the west and the Interstate 5 off ramps to the east.
- Major geotechnical challenges exist due to liquifiable soils along the entire river access alignment.
- Permitting challenges associated with work on the river bank, including the need to balance cuts and fills required to form the ramps and access stairs.

Geotechnical Conditions

GRI conducted a preliminary geotechnical review of existing subsurface information and design recommendations previously completed for the EQRB project (Shannon & Wilson, 2022).

The site is underlain by soils susceptible to liquefaction from a code-based seismic event. In riverfront areas, liquefaction can also cause large lateral spreading deformations of the riverbank, which may extend hundreds of feet into the upland areas. GRI's experience with similar projects along the Willamette River and review of recently completed numerical modeling for the EQRB project indicate lateral deformations on the order of 8 feet will likely occur on the eastern bank of the Willamette River near the Burnside bridge following the 1,000 year and median level Mw 9 events.

Similar seismic conditions existed at the location of an Mw 9 seismic event in Japan in 2011. A photograph of a block/wedge ground failure from that event is included in Figure 4 below.

Figure 4: Seismic Induced Ground Failure in Mw 9 Earthquake, Japan, 2011

The subgrade conditions along the east bank of the Willamette River in the vicinity of this project have the potential to respond to a large seismic event in a similar way to that shown in Figure 4.

Based on the estimated lateral loads associated with the non-liquefied soil crust at this location, elevated structures would require costly ground improvement to provide structures and foundations capable of remaining stable under seismic conditions. Ground improvement in the area of the river access could cost in the order of $50 million. This ground improvement could also be partially utilized for construction of the elevated connectors to the EQRB, so costs could be shared between multiple projects.

If the river access is limited to on grade structures – ramps and sidewalks – seismic considerations are limited to accommodating the potential seismic movement like that shown above in Figure 4.

Civil and Permitting

Grading

It is not clear, based on the HAP rendering, if the intent is to fill into the river to gain adequate space for the proposed stair and ramp structures but it does appear likely that the proposed improvements would require some level of fill below ordinary high water(OHW). Design efforts will need to focus on minimizing the amount of fill below OHW to improve the potential for acquisition of needed permits.

This would likely include the incorporation of walls on the riverbank to allow grade transitions for the proposed ramp and stairs. It may also mean reviewing the proposed ramp to water level to evaluate the difference in impacts are between using a consistent 4.5% design slope from top to bottom or utilizing a ramp system with sections of 7.5% design slopes with intermittent landings. The ramp system may provide more flexibility in minimizing in-water impacts but the decision with regard to accessibility will require detailed evaluation.

Floodplain Impacts

Portland City Code 24.50.060 requires balanced cut and fill in all Flood Management Areas of the City. This requirement may be difficult to meet if the proposed improvements require fill within the Willamette River floodway and floodplain. In addition, the project will need to demonstrate no increase in the base flood elevation, or the project will need to undergo extensive FEMA permitting.

Riverbank Work

Any work on the riverbank will need to be designed to address the significant potential for scour caused by the river. While the incorporation of riprap has historically been the preferred solution for addressing this concern, it has fallen out of favor with the agencies responsible for permitting projects of this type. It is likely that any bank stabilization work will need to incorporate a hybrid system that includes large woody debris and vegetated treatments where practicable.

As noted above, it is likely that retaining walls will be necessary to accommodate the proposed stairs and ramp structure while minimizing fill within the floodway and floodplain. Selection of a wall type for work on the riverbank will need to take into consideration:

1. Constructability: The implementation of cast-in-place concrete walls may pose challenges associated with water levels during construction.
2. Acceptability to permitting agencies: While gabion walls may likely be a good technical solution, they may see opposition from the permitting agencies to their use below OHW.

One potential solution would be to implement a system similar to that used by Portland Parks and Recreation in the development of the South Waterfront Greenway which included a series of precast concrete vault structures installed as retaining walls to create terraces and to provide additional planting space.

Stormwater Management

The HAP rendering does appear to provide adequate space for storm water treatment for impervious areas above the top of bank. We would assume that the treatment facilities would include the use of vegetated planters and filter strips to meet treatment requirements.

Inundation of Structures

One other design consideration for the proposed improvements that needs some thought is that the HAP rendering appears to show pedestrian railings extending down the riverbank into areas that are likely to be inundated during high water events. These facilities will need to be designed to either stand up to potential debris impacts during these high water events or they will need to be designed to be removable to avoid debris impacts.

Environmental Permitting

Based on a preliminary review of the HAP rendering, environmental permitting requirements may include, but are not necessarily limited to:

- NEPA, if the project will have federal funding. The project is likely to be classified as a Categorical Exclusion. Section 6(f) (Land and Water Conservation Fund) will need to be addressed, if applicable. In addition, if the project will have Department of Transportation funding, then Section 4(f) will need to be addressed, if applicable.
- Federal environmental permitting:
  - Section 10 of the Rivers and Harbors Act
  - Section 404 of the Clean Water Act
  - Section 106 of the National Historic Preservation Act (cultural resources)
  - Compliance with the Endangered Species Act (ESA)
- State environmental permitting:
  - Oregon Department of Environmental Quality (DEQ) Section 401 Water Quality Certification
  - Oregon Department of State Lands (DSL) Removal-Fill Permit
- Local permitting:

- City of Portland Land Use permitting
- City of Portland compliance with Chapter 24.50 Flood Hazard Areas

Concept Design

The concept design shown in the attached concept plans and estimate is based on a system of on-grade concrete ramps and stairs, with pedestrian guardrails. The grade of the walkways and stairs is achieved with cast-in-place concrete retaining walls, integrated into the walkways.

This approach avoids to use of costly ground improvement to support elevated structures.

Cost Estimates

A concept level cost estimate has been developed for the design described above.

The concept level cost estimate for the on-grade access to the river is $8,700,000.

A detailed cost estimate is attached. Costs are based on 2022 dollars and have not been increased for escalation. The Cost estimates include a 40% contingency, due to the concept level nature of the design and a 30% increase for PE/CE.

The cost estimate does not include landscape improvements or bank improvements/stabilization for grading of the river bank beyond that required for the walkway and stairs. The cost estimate does not include connection to the EQRB. This cost is addressed in a separate report.

Significant risks to the estimated costs include escalation in construction costs due to inflation, significant variation in geotechnical conditions from those used for this study, and changes in alignment and structural support to address scour potential.

The proposed access will require lengthy environmental permitting due to its close proximity to the river. Significant delays resulting from this process could add to the effects of escalating construction costs.

Conclusion and Next Steps

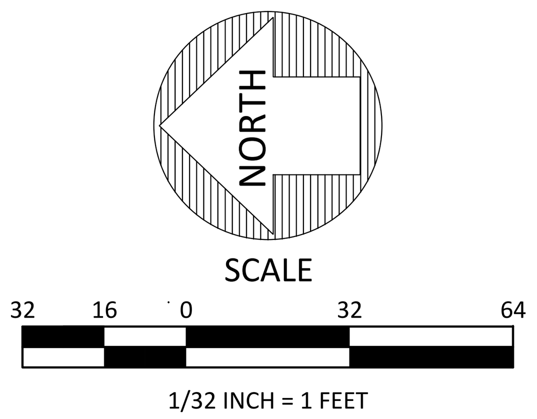
The intended purpose of this study is to develop a concept design and cost estimate for new access to the river. The proposed design described above is intended to address the project goals and constraints.

This design and the associated cost estimates have been developed to a concept design level of completion. Further refinement and adjustment of the concept presented in this report is expected if the project moves forward into detailed design.

Concept Level Plans

RIVER ACCESS PLAN

Scale: 1/32"=1'-0"



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$FILE$

Filename:

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Plot Date:

NO.	DATE	DESCRIPTION	APPD.
		REVISION	

DESIGNED BY	DATE APPROVED
SF	June 2022
CAD BY	
SV	June 2022
CHECKED BY	
CT	June 2022

APPROVALS:

DIVISION ENGINEER REG. PROF. ENGR. NO. 55504PE

CITY ENGINEER REG. PROF. ENGR. NO. 51538PE

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SAM ADAMS COMMISSIONER

STEVE TOWNSEN, P.E. CITY ENGINEER

CITY OF PORTLAND, OREGON 1851

BURNSIDE BRIDGE CONNECTOR
MULTNOMAH COUNTY

RIVER ACCESS PLAN

1/4 SECTION	2527
PROJECT NO.	37585
SHEET NO.	HAP-05

Concept Level Costs

Location:	**Burnside Bridge Connector**	Date	7/1/2022
Prepared for:	PBOT	Prepared by:	KPFF

CONSTRUCTION COST ESTIMATE - RIVER ACCESS
CONCEPT DESIGN

SPEC PART#	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM COST
210	MOBILIZATION	1	LS	10%	$466,000
BRIDGES					$ 4,660,000
515	CONCRETE WALKWAY AND RETAINING WALLS	1,000	LF	$ 4,000	$ 4,000,000
515	CONCRETE PLATFORM	400	SF	$ 300	$ 120,000
515	CONCRETE STAIRS	1,200	SF	$ 200	$ 240,000
535	GUARDRAIL	1,000	LF	$ 300	$ 300,000
	CONSTRUCTION SUBTOTAL				**$5,126,000**
	CONTINGENCY	1	LS	40%	$ 2,050,400
	PRELIMINARY AND CONSTRUCTION ENGINEERING	1	LS	30%	$ 1,537,800
	TOTAL ESTIMATED CONSTRUCTION COSTS (ROUNDED)				**$8,700,000**

Appendix F.

Human Access Project Concept Design Memo

Human Access Project

Structural Concept Design Report

KPFF Project No. 10022100869

August 19, 2022

Submitted To:

Sharon Daleo, PE
Major Projects and Partnerships
Portland Bureau of Transportation

Submitted By:

KPFF Consulting Engineers
Contributors: Architectural Applications and GRI

Introduction and Project Background

The Human Access Project (HAP) is a volunteer advocacy group focused on providing pedestrian access to the river. The HAP has developed a concept plan to provide access from the proposed replacement Burnside Bridge to the Eastbank Esplanade (the esplanade) on the east bank of the Willamette River in downtown Portland. The plan includes a ramp and stairs (the connector) from the bridge in addition to site improvements on the bank of the river.

The Burnside Bridge currently has a pedestrian connection to the Eastbank Esplanade via a steel framed stair connecting to the south side of the bridge on the east bank of the Willamette River. The Burnside Bridge is expected to sustain major damage during a large seismic event and Multnomah County is in the early stages of designing a replacement bridge capable of withstanding a code level seismic event. The replacement bridge is expected to begin construction in 2025 with completion expected in 2029.

The ”Earthquake Ready Burnside Bridge“ (EQRB) is expected to be constructed along the current alignment of the existing bridge with the roadway located at approximately the same elevation as the current roadway.

The Eastbank Esplanade was constructed in the late 1990’s and consists of a floating walkway under the existing bridge, connected to a steel pile supported walkway with aluminum gangways to the south that connect to an on-grade trail along the riverbank.

Construction of the new bridge will require removal of the existing pedestrian connector to the esplanade. The Portland Bureau of Transportation (PBOT) has retained KPFF to develop a concept level design and cost estimate for the HAP connector from the EQRB to the existing esplanade.

At this time, the final structure type for the EQRB is still to be determined. We understand from discussions with the PBOT and Multnomah County, the bridge span over the esplanade will be either a cable stay structure or an arch. We understand that the bridge sidewalks will be located on the outside of the main cable or arch structure, so connection of the new connector to the bridge will not be impacted by the bridge structure.

The new connector is to be structurally isolated from the EQRB with its gravity and lateral force resisting systems being independent of the EQRB.

This study is limited to evaluating the HAP proposed ramp and stair connector structure from the EQRB to the esplanade and does not include the site improvements at the end of the ramp. This study evaluates the HAP design without significant modification, to maintain a design reasonably consistent with the HAP proposal.

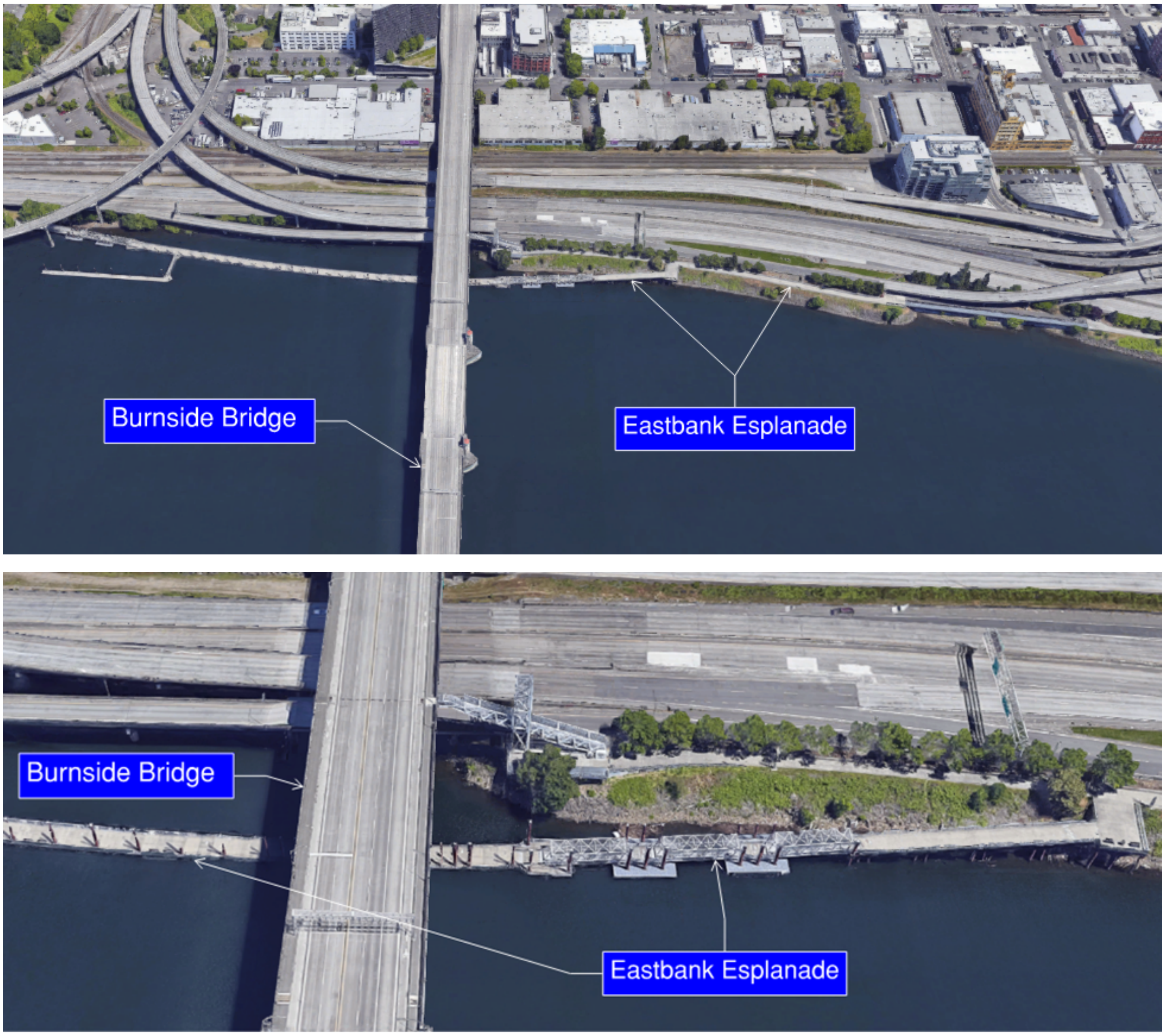

Figure 1: Existing Burnside Bridge and Eastbank Esplanade

Figure 2: Human Access Project – Burnside Connector Concept

Design Criteria and Project Constraints

The following design criteria have been used to develop the concept design:

- LRFD Guide Specifications for the Design of Pedestrian Bridges
- AASHTO LRFD Bridge Design Specifications, 9th Edition
- Seismic Design to AASHTO "Life Safety" Criteria for 1,000-year return period earthquake. Connector concepts will be seismically separated from Burnside Bridge and will avoid damaging the bridge during a seismic event.
- AASHTO - Guide for the Development of Bicycle Facilities
- Oregon Bicycle and Pedestrian Design Guide
- American with Disabilities Act ("ADA") Standards

The structure is to be designed for pedestrian traffic only and is not expected to support vehicular traffic.

The following constraints are also applicable to the concept design:

- The connector ramp will need to achieve approximately 45 feet of elevation difference from the EQRB roadway to the existing on grade section of the esplanade to the south of the bridge. The elevation change will need to meet the requirements of the Americans with Disabilities Act (ADA). The structure will be designed with a maximum assumed longitudinal slope of 4.5% to allow for tolerances below the ADA maximum slope of 5%.
- The connector deck will be 12 feet wide.
- Geographic constraints include the navigable channel of the Willamette River to the west and the Interstate 5 off ramps to the east. The traffic noise on the ramps is considerable, so sound attenuation should be included in the design.

- Major geotechnical challenges exist due to liquifiable soils, particularly under the area to the south of the existing bridge.

Geotechnical Conditions

GRI conducted a preliminary geotechnical review of existing subsurface information and design recommendations previously completed for the EQRB project (Shannon & Wilson, 2022).

Subsurface materials and conditions at the site were evaluated based on available information from previous explorations in the vicinity of the Burnside Bridge and GRI's experience and understanding of subsurface conditions at the project site and sites nearby. Published geologic mapping indicates the site is mantled with a variable thickness of artificial fill underlain by recent alluvium consisting of silt and sand, which was deposited by the Willamette River. Review of subsurface information for the site obtained by GRI and others for previous projects in the area indicates the alluvial sands and silts are underlain by gravels consisting of both alluvial gravels and the Troutdale Formation.

Based on GRI's review of the explorations within the vicinity of the proposed structures, the sand soils at the site below the groundwater are highly susceptible to seismically induced liquefaction and will experience post shaking reconsolidation settlement. The near surface fill soils and silts will likely experience limited cyclic degradation and will largely act as a non-liquefied crust overlying the liquefiable materials.

As noted above, the site is underlain by soils susceptible to liquefaction from a code-based seismic event. In riverfront areas, liquefaction can also cause large lateral spreading deformations of the riverbank, which may extend hundreds of feet into the upland areas. GRI's experience with similar projects along the Willamette River and review of recently completed numerical modeling for the EQRB project indicate lateral deformations on the order of 8 feet will likely occur on the eastern bank of the Willamette River near the Burnside bridge following the 1,000 year and median level Mw 9 events.

Based on the estimated high loads associated with the non-liquefied crust at the proposed HAP structure, this concept design considers the use of ground improvement. Based on the limited access to the site as well as the soil conditions encountered, we have assumed the use of jet grout. Due to the depth of the liquefiable soils, we the ground improvement will likely need to extend approximately 100 feet perpendicular from the river.

Preliminary cost estimates for ground improvement are on the order of $100 million.

While costs associated with the ground improvement are high, there are several main things driving cost up. These items include the use of jet grout itself, proximity to the river, and access for the entire lateral width. As noted above, we will need to construct a ground improvement buttress that is approximately 100 feet wide. While jet grout can be installed at an angle, realistically it can only be installed up to about 15 degrees given the depth required for this project. This will likely mean the project will require temporary lane closures on I-5/offramps to be able to build the jet grout block. The other main component is control of spoils and the relative proximity to the river. For jet grout we often see spoils essentially equal to the neat volume of treated soil and it will have a relatively low viscosity. Careful management and removal of these will be critical and significantly increases cost.

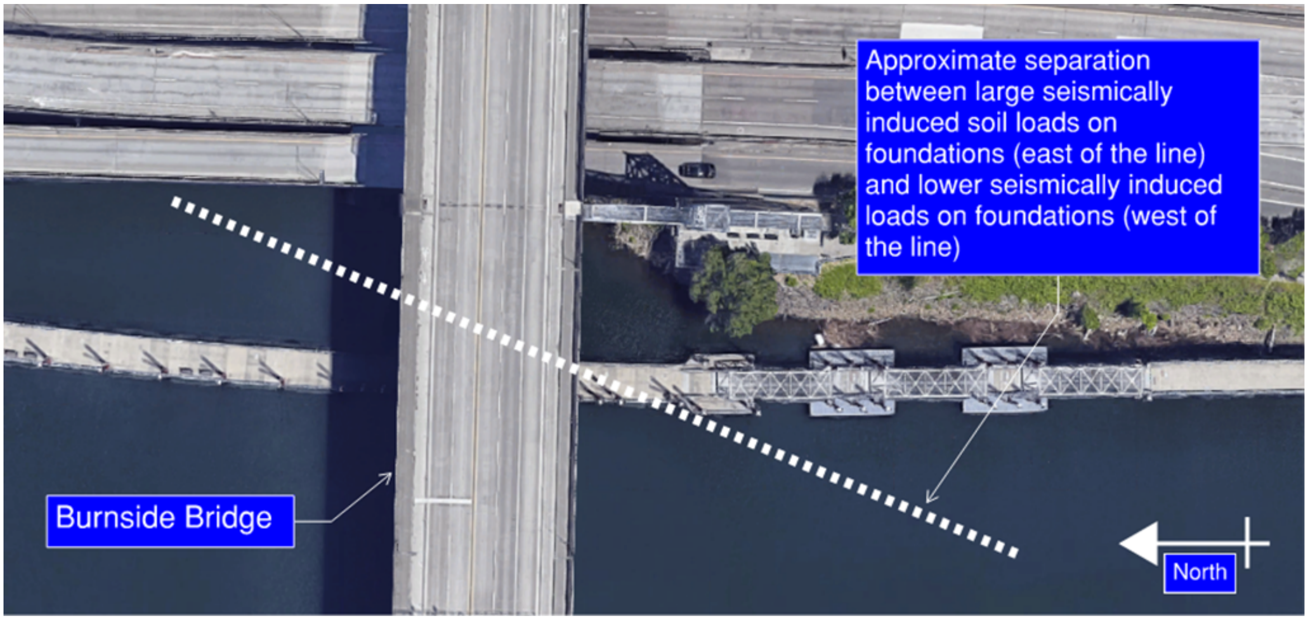

Figure 3: Summary of Geotechnical Challenges

Foundation Options

South of EQRB

The underlying soils on the south side of the Burnside Bridge are expected to experience liquefaction in a large seismic event, causing several feet of lateral movement of the underlying soils towards the river. This liquefaction will impose significant lateral loads against the foundations of the connector as the soil pushes towards the river. This liquefaction risk is estimated to extend from the Burnside Bridge along the full length of the proposed connector. The effects of this liquefaction reduce for structures in the river as well as to the north of the existing bridge.

Steel pipe piles are often used to support structures on deep foundations, However, the magnitude of lateral forces applied to the foundation by the soils make the use of this foundation type impractical from and engineering perspective.

The EQRB is expected to utilize a long span over these poor soils, minimizing the impacts of this liquefaction and allowing it to be founded on 12 ft diameter concrete drilled shafts further west in the Willamette River. Large diameter concrete shafts often provide the strength and stiffness to resist the lateral forces from liquifiable soils, however the depth and magnitude of anticipated lateral soil loading at this location makes the use of drilled shafts impractical.

Ground improvement (by jet grouting for example) appears to be the only viable solution capable of providing stable subsurface conditions in the event of a large earthquake. This stability is critical to the development of a structure that meets code required “life safety” performance under a code level seismic event. Without ground improvement, it is likely that the connector would sustain significant damage in a large earthquake, presenting a significant life safety hazard to users of the connector, as well as those west of the connector on the riverbank and the freeway ramps to the east.

Ground improvement would provide a soil buttress under the connector to resist the lateral soil loads and allow more conventional foundation systems such as steel pipe piles or smaller diameter concrete shafts. However, the constraints of the river to the west and the freeways to the east place significant restrictions on where the ground improvement could be installed from, dramatically increasing the cost. It is anticipated that ground improvement along the alignment of the connector could cost approximately $100 million.

Superstructure Options

Concrete Framing

Concrete framing, while typically more durable than steel framing, presents numerous challenges at this location:

- The connector will be approximately 50 feet high near the EQRB, resulting in a significant seismic mass. Also, the seismic mass of a concrete structure is significantly higher that other structure types, increasing the demand on foundations and the resulting cost of the foundations.
- Forming and pouring concrete to the anticipated height of the connector would require substantial bracing of the formwork and partially completed structure during construction. This bracing cannot extend into the adjacent freeway ramps, so costly bracing would be required near or in the river.
- Placing concrete near the river over the river will require significant containment to protect the river.
- An advantage of a concrete framed structure as conceived is the acoustic attenuation of freeway and vehicular noise on pedestrians using the connector.

Steel Framing

- Steel framing can be constructed from shop fabricated elements, reducing working time adjacent to the freeway's ramps.
- Steel framing can be clad with lightweight materials, minimizing seismic mass.

Recommended Design

We recommend the following structural design:

Foundations

Micropiles can be installed through the improved subsurface. Installation of micropiles can be achieved with significantly smaller equipment than that required for steel pipe pile installation or drilled shafts. This will allow installation using equipment on the esplanade, eliminating the cost of work from a barge in the river and eliminating the challenges of driving pipe piles or drilling large diameter shafts next to the freeway ramps.

The micropiles would support cast-in-place concrete pile caps spaced along the connector.

Superstructure

A structural steel frame will support the elevated walkway. The stair and ramp provide the structure with sufficient width (transverse to the walkway) to install braced frames within the void under the walkway. These frames will provide lateral resistance to the wind and seismic loading applied to the solid connector structure.

The walkway deck will be a cast-in-place concrete deck, supported on the steel frame. A soundwall to attenuate freeway traffic noise will extend above the deck level, between it and the freeway ramps to the east.

Cost Estimates

A concept level cost estimate has been developed for the recommended design.

The concept level cost estimate for the connector is $140,000,000. As described above, approximately $100,000,000 of this cost is associated with the anticipated ground improvement.

Detailed costs estimates are contained in Appendix D. Costs are based on 2022 dollars and have not been increased for escalation. The Cost estimates include a 40% contingency, due to the concept level nature of the design and a 30% increase for PE/CE. The PE/CE increase is not applied to ground improvement, due to the outsized contribution of this item to the overall costs and the limited engineering associated with it.

Significant risks to the estimated costs include escalation in construction costs due to inflation, significant variation in geotechnical conditions from those used for this study as well as changes to the alignment, location, or elevation of the EQRB.

The proposed connector will require lengthy environmental permitting, and significant delays resulting from this process could add to the effects of escalating construction costs.

Conclusion and Next Steps

The intended purpose of this study is to develop a concept design and cost estimate for the new connector. The proposed design described above is intended to address the project goals and constraints.

This design and the associated cost estimates have been developed to a concept design level of completion. Further refinement and adjustment of the concept presented in this report is expected if the project moves forward into detailed design.

Due to the impact of geotechnical ground improvement costs on the overall cost estimate, we recommend that a detailed geotechnical study be performed along the entire connector alignment to more accurately define the scope of required ground improvement before developing the structural design any further.

Conceptual Structural Plans

HAP GROUND IMPROVEMENT PLAN

Scale: 1/32"=1'-0"

NORTH

SCALE

32 16 0 32 64

1/32 INCH = 1 FEET

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		REVISION	

DESIGNED BY	DATE APPROVED
SF	June 2022
CAD BY SV	June 2022
CHECKED BY CT	June 2022

APPROVALS:

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CITY ENGINEER REG. PROF. ENGR. NO. 51538PE

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SAM ADAMS COMMISSIONER
STEVE TOWNSEN, P.E. CITY ENGINEER

CITY OF PORTLAND, OREGON 1851

BURNSIDE BRIDGE CONNECTOR
MULTNOMAH COUNTY
HAP GROUND IMPROVEMENT PLAN

1/4 SECTION 2527

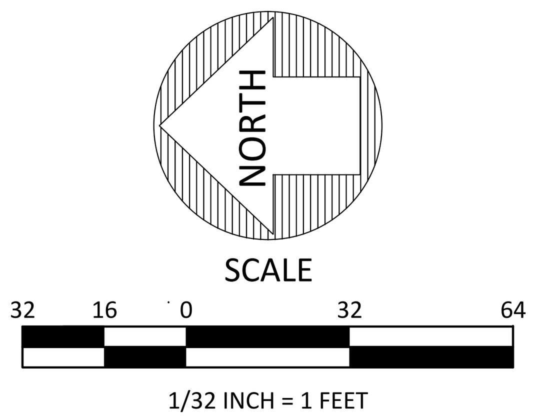
PROJECT NO. 37585

SHEET NO. HAP-01

Plot Date: $DATE$ $TIME$ Filename: $FILE$

HAP FOUNDATION PLAN

Scale: 1/32"=1'-0"



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CITY OF PORTLAND, OREGON 1851

BURNSIDE BRIDGE CONNECTOR
MULTNOMAH COUNTY

HAP FOUNDATION PLAN

1/4 SECTION	2527
PROJECT NO.	37585
SHEET NO.	HAP-02

HAP FRAMING PLAN

Scale: 1/32"=1'-0"

NORTH

SCALE

32 16 0 32 64

1/32 INCH = 1 FEET

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DATE APPROVED

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CITY OF PORTLAND, OREGON 1851

BURNSIDE BRIDGE CONNECTOR
MULTNOMAH COUNTY

HAP FRAMING PLAN

1/4 SECTION	2527
PROJECT NO.	37585
SHEET NO.	HAP-03

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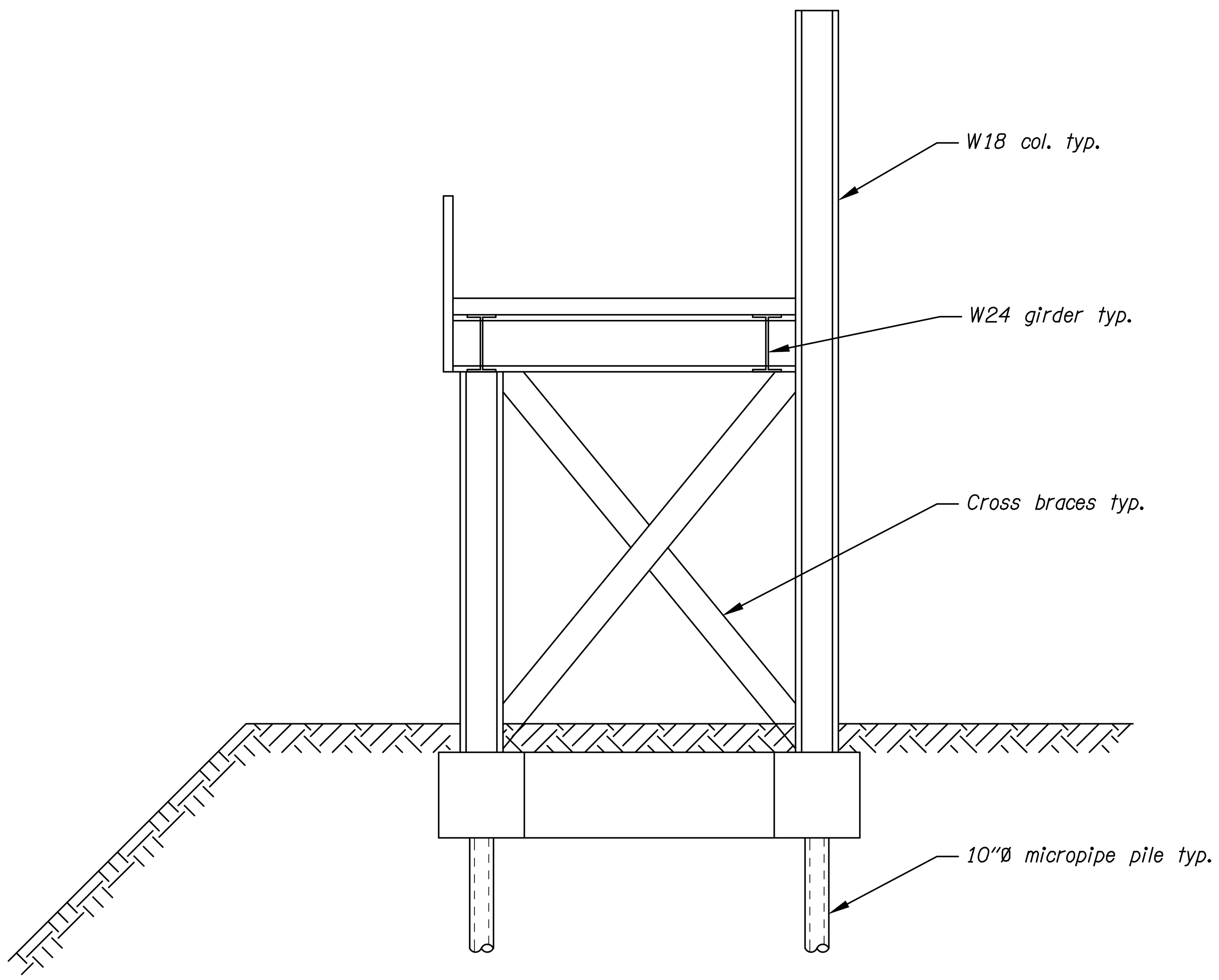
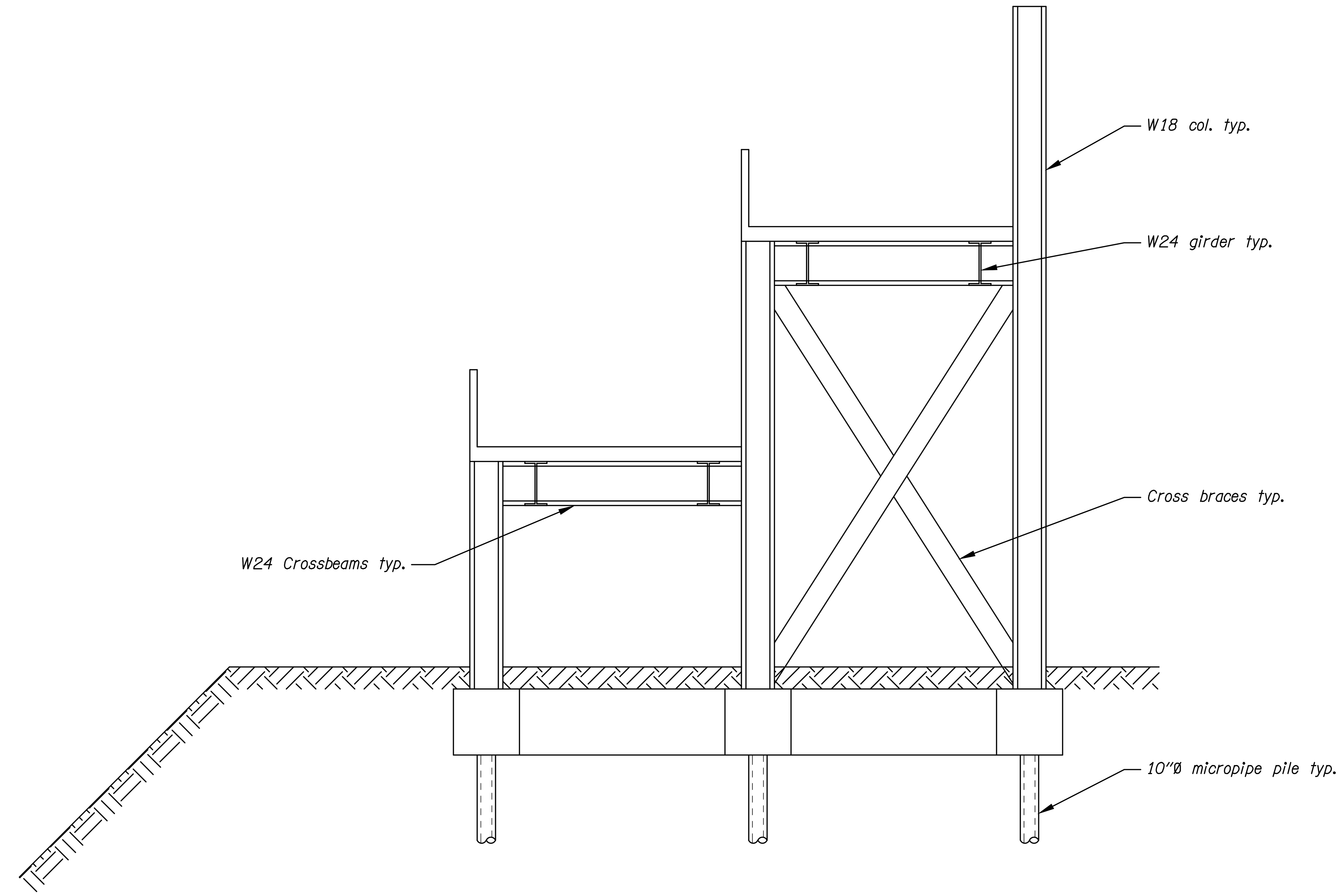
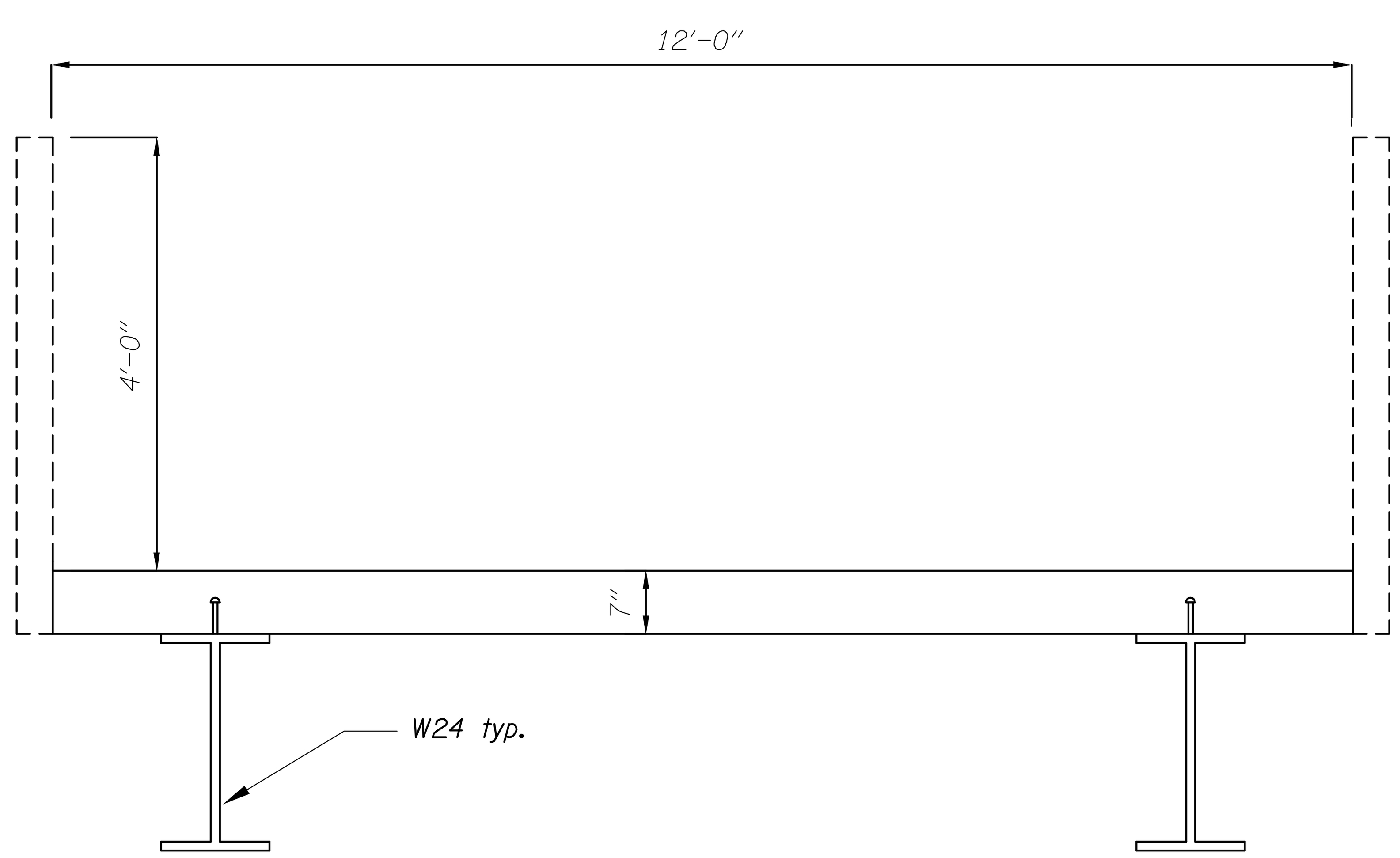


SECTION AT STEEL SUPPORTED WALKWAY
Scale: 1/4"=1'-0"



SECTION AT STAIR
Scale: 1/4"=1'-0"



TYPICAL WALKWAY SECTION
Scale: 3/4"=1'-0"

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BURNSIDE BRIDGE CONNECTOR
MULTNOMAH COUNTY

HAP SECTIONS AND DETAILS

1/4 SECTION 2527
PROJECT NO. 37585
SHEET NO. HAP-04

Plot Date: $DATE$ $TIME$ Filename: $FILE$

Concept Renderings

LEGEND

1 BRIDGE RAMP CONNECTION
2 NEW BURNSIDE BRIDGE
3 EXISTING ESPLANADE RAMP
4 ADA ACCESSIBLE RAMP
5 STORMWATER TREATMENT AREA
6 STAIRS TO ESPLANADE
7 EXISTING ESPLANADE OVERLOOK
8 WATER LEVEL PEDESTRIAN ACCESS
9 RAMP OVERLOOK
10 TERRACED SEATING STEPS
11 EXISTING ESPLANADE
12 ADA RAMP TO WATER LEVEL
13 STORMWATER TREATMENT AREA
14 WOODY DEBRIS FOR HABITAT
15 STAIRS TO RAMP
16 SOUND/VISUAL BARRIER WALL ALONG FREEWAY
17 ENHANCED RIPARIAN PLANTING
18 RAMP CONNECTION TO EXISTING ESPLANADE

BURNSIDE BRIDGE PEDESTRIAN ACCESS RAMP CONCEPT

OVERVIEW BIRDSEYE
LOOKING NORTHEAST

GREENWORKS | HUMAN ACCESS PROJECT

Detailed Concept Level Costs

Location: **Burnside Bridge Connector**
Prepared for: PBOT

Date 6/17/2022
Prepared by: KPFF

CONSTRUCTION COST ESTIMATE - HAP
CONCEPT DESIGN

SPEC PART#	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM COST
210	MOBILIZATION	1	LS	10%	$8,970,625
BRIDGES					$ 89,706,250
510	FURNISH MICROPILE EQUIPMENT	1	LS	$ 150,000	$ 150,000
515	MICROPILES, FURNISH AND INSTALL	42	EA	$ 30,000	$ 1,260,000
515	PILE CAP CONCRETE	150	CY	$ 1,000	$ 150,000
515	PILE CAP REINF.	25,000	LBS	$ 2	$ 43,750
515	SOIL MITIGATION	1	LS	$ 80,000,000	$ 80,000,000
520	DECK SLAB REINFORCEMENT	30,000	LB	$ 2	$ 52,500
525	SUPERSTRUCTURE CONCRETE CLASS 4000	300	CY	$ 1,000	$ 300,000
530	STRUCTURAL STEEL	150,000	LBS	$ 4	$ 600,000
535	STEEL ERECTION	1	LS	$ 500,000	$ 500,000
535	GUARDRAIL	2,500	LF	$ 300	$ 750,000
535	EXTERIOR CLADDING / SOUND ATTENUATION	60,000	SF	$ 75	$ 4,500,000
	CONSTRUCTION SUBTOTAL				**$98,676,875**
	CONTINGENCY	1	LS	40%	$ 39,470,750
	PRELIMINARY AND CONSTRUCTION ENGINEERING (EXCLUDES GROUND IMPROVEMENT)	1	LS		$ 2,000,000
	TOTAL ESTIMATED CONSTRUCTION COSTS (ROUNDED)				**$140,100,000**

Appendix G. Environmental Memo

Parametrix
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES
700 NE MULTNOMAH, SUITE 1000 | PORTLAND, OR 97232 | P 503.233.2400, 360.694.5020

TECHNICAL MEMORANDUM

DATE: August 19, 2022
TO: Sharon Daleo, Portland Bureau of Transportation
FROM: Shane Phelps, Parametrix, Inc.
SUBJECT: Eastbank Esplanade Connection – Potential NEPA Process and Environmental Permitting
CC: Megan Neill, PE, Multnomah County; Steve Drahota, PE, HDR

At the time of writing of this memorandum, Multnomah County is nearing the end of the NEPA process for the Earthquake Ready Burnside Bridge (EQRB) Project. A Final Environmental Impact Statement (FEIS) for the Project is anticipated to be published in December 2022 and identifies, as its Preferred Alternative, the replacement of the existing bridge with a seismically resilient one in approximately the same location. The Preferred Alternative would maintain the existing City of Portland–owned staircase that currently connects the south side of the bridge (by Multnomah County permit) to the Vera Katz Eastbank Esplanade located about 50 feet below the bridge. The staircase would be protected in place during both the demolition of the existing bridge and the reconstruction of the new bridge. Access to the existing stairs would be provided once the Project's construction phase is completed.

It is anticipated that the City will fund the design and construction of a new, independent Eastbank Esplanade connection to replace the existing staircase as a separate project with its own permits. The purpose of this memorandum is to provide a discussion of potential NEPA and environmental permitting processes that may be needed for the City to construct an ADA-accessible connection between the Eastbank Esplanade and the new bridge. As context, this memorandum includes an overview of the connection configurations that have been analyzed in the EQRB Project's NEPA process, and the types and status of permits anticipated to be needed for the EQRB project. The memorandum then details the level of NEPA analysis anticipated for the City's Eastbank Esplanade connection project, as well as corollary environmental approvals, and a summary of federal, state, and local environmental permits that may be needed. This information was developed, in part, based on a conversation with FHWA.

EASTBANK ESPLANADE CONNECTIONS ANALYZED IN THE EQRB NEPA PROCESS

The NEPA Draft Environmental Impact Statement (DEIS) and Supplemental DEIS written for the Burnside Bridge have analyzed several options for an ADA accessible connection. Below is a summary of the various options that have been analyzed. These are further detailed in the Revised Active Transportation Access Options Memo (see https://www.multco.us/earthquake-ready-burnside-bridge/supplemental-draft-environmental-impact-statement).

DEIS

The EQRB DEIS considered a range of potential connections from the Burnside Bridge to the Eastbank Esplanade. These include:

- Stairway and an elevator on both sides of the bridge

- Stairway and an elevator on the bridge's south side only, with a signalized mid-block pedestrian and bicycle crossing on the bridge deck
- Ramps on both sides of the bridge and a stairway on the south side
- Ramp and stairway on the south side only, with a signalized mid-block pedestrian and bicycle crossing on the bridge deck

SDEIS

For the EQRB SDEIS, additional analysis and refinements to the type of connection from the Burnside Bridge to the Eastbank Esplanade were performed. These include:

- Further evaluation of a refined elevator/stairway option
- Removed signalized mid-block crossing
- Additional analysis for reconnection of existing stairs or no connection to the Eastbank Esplanade. Added discussion that pedestrian/bike/ADA connection to the Eastbank Esplanade could be done by the City as an independent project

FEIS

As discussed above, the EQRB FEIS Preferred Alternative identifies protecting in-place the existing staircase for later reconnection to the new Burnside Bridge.

EQRB APPROVAL AND PERMIT STATUS

As a federally funded project, the EQRB Project is required to obtain approvals showing compliance with federal regulations and laws including Section 7 of the Endangered Species Act (ESA), Section 106 of the National Historic Preservation Act (Section 106) and Section 4(f) of the Department of Transportation Act (Section 4(f)). The project obtained a Biological Opinion from National Marine Fisheries Service (NMFS) in July 2021. Final versions of the Section 106 Programmatic Agreement and Section 4(f) analysis will accompany the Final EIS.

The EQRB Project has a variety of permits needed from federal, state, and local agencies. A list of permits and application status are shown below. Note for the permit applications, the EQRB Project is utilizing a design that includes reconnection of the existing stairs at the Eastbank Esplanade.

Table 1. EQRB Project Required Permits and Timeframes

Permit	Permitting Agency	Anticipated Timeframe and Status
CWA 404 permit	US Army Corps of Engineers (USACE)	Winter 2023 - In progress
Section 9 Bridge Permit	US Coast Guard (USCG)	Spring/ Summer 2023 - In progress
Section 408 Navigation Permit	USACE	Winter 2023 - In progress
CWA 401 Water Quality Certification	Oregon Department of Environmental Quality	Winter 2021 - Completed
Oregon Removal-Fill Permit	Oregon Department of State Lands	During Final Design
Floodplain Development Permit	City of Portland	During Final Design
Type III Greenway Goal Exception	City of Portland	During Final Design
Type IIx River Review	City of Portland	During Final Design
Non-Park Use Permit	City of Portland	During Final Design
Noise Ordinance Variance	City of Portland	During Final Design
Type II or III Conditional Use Review	City of Portland	During Final Design
Type IV Demolition Review/Demolition Permit	City of Portland	During Final Design
Type III Historic Resource Review	City of Portland	During Final Design
Type II Adjustment or Type II Design Modification	City of Portland	During Final Design

ANTICIPATED NEPA PROCESS FOR THE CITY EASTBANK ESPLANADE CONNECTION

For the purposes of the NEPA process discussion, it is generally assumed that the City would obtain federal funding utilizing DOT monies, likely administered by the Federal Highway Administration (FHWA) as the lead federal agency. As needed, it has been identified in this discussion where processes that are related specifically to DOT funding may not be applicable if funding sources from a non-DOT funded agency (e.g., National Parks Service or similar) are utilized.

Per FHWA regulations, the Eastbank Esplanade connection could be classified as a NEPA Categorical Exclusion under 23 CFR § 771.117 (c)(3) Construction of bicycle and pedestrian lanes, paths, and facilities. However, the appropriate level of documentation needed would have to be determined via coordination with FHWA (or other federal lead agency) prior to project inception. While the Eastbank Esplanade connection is a separate project from the EQRB project, much of the information used in the EQRB EIS documentation could be used by the City for its NEPA documentation, especially regarding existing conditions and affected environment data, thereby minimizing the amount of data collection needed for these NEPA elements.

During the NEPA process, the Project would also have to obtain approvals for other federal requirements including compliance with ESA, Section 106, and Section 4(f). Given that the Project would involve in-water work including shafts and piers to support the Eastbank Esplanade connection, demonstration of compliance with ESA would be needed. If FHWA funds are utilized, ESA consultation requirements could be satisfied using Oregon's Programmatic Endangered Species Act Consultation on the Federal-Aid Highway Program (FAHP programmatic permit), which covers most of the projects funded by FAHP and administered by ODOT. Background information from the EQRB Biological Assessment and Biological Opinion could be used to provide data for the FAHP programmatic permit documentation. Note that if FHWA funding is not utilized, the use of the FAHP programmatic permit would not be applicable and consultation with NMFS would be required, likely including the need for a Biological Assessment to be written for the Eastbank Esplanade Connection and a Biological Opinion to be issued by NMFS. From a US Fish and Wildlife Service (USFWS) perspective, if the FAHP programmatic permit can't be utilized, no effects to species regulated by USFWS are anticipated similar to the EQRB project.

Regarding Section 106, the Eastbank Esplanade connection would require coordination with the Oregon State Historic Preservation Office (SHPO) as part of the NEPA process. Background information from the EQRB Section 106 documentation could be used to provide data for the Eastbank Esplanade connection. Although needing verification based on the specifics of the design selected, it is anticipated that the Eastbank Esplanade connection would have no adverse effects on Section 106 resources.

The Project would also have to provide documentation for Section 4(f) compliance. Depending upon the connection design chosen, the Eastbank Esplanade, a Section 4(f) property, could be closed for an extensive period. As the owner of the Eastbank Esplanade, the City of Portland is ultimately responsible for recommending to FHWA if the City's project constitutes a *de minimis* impact to, or use of, a 4(f) resource. Based on the impact decision, the City would need to provide analysis and documentation for either a *de minimis* impact or 4(f) use as specified by FHWA guidance. This could potentially include the use of a Nationwide Section 4(f) Programmatic Evaluation such as the Independent Walkway and Bikeways Construction Projects programmatic. Note that if DOT funds are not used to for the Eastbank Esplanade connection, Section 4(f) is not applicable.

ANTICIPATED PERMITTING PROCESS FOR THE CITY EASTBANK ESPLANADE CONNECTION

Several permits will be required for construction of the new Eastbank Esplanade connection. Below is a discussion of permits likely needed, and they are summarized in Table 2.

Nationwide Permit

For compliance with Clean Water Act regulations, a Section 404 Permit and a Section 401 Water Quality Certification will be required. Based on coordination with the US Army Corps of Engineers (USACE), the Eastbank Esplanade Connection may qualify for a Nationwide Permit, which provides coverage for Section 404 and Section 401 (and covers structures regulated under Section 10 of the Rivers and Harbors Act). Nationwide Permits typically cannot be used for projects that cause greater than a certain impact to waters of the United States (e.g., no greater than ½-acre for Nationwide Permit 42, Recreation Facilities). If the Eastbank Esplanade Connection does not qualify for a Nationwide Permit, an individual Section 404 Permit would need to be obtained from

USACE and an individual Section 401 Water Quality Certification would need to be obtained from Oregon Department of Environmental Quality (DEQ).

The City could utilize much of the data from the EQRB Section 404 and 401 applications to provide existing conditions and affected environment information for this process. Applications for these permits are made using the Joint Permit Application (JPA) form.

Section 408 (Not Likely Needed)

The EQRB project requires a Section 408 permit from the USACE for work within the federal navigation channel. It is not anticipated that the Eastbank Esplanade Connection would require a Section 408 permit, but the City should coordinate with USACE to determine that it is not required

Oregon Removal-Fill Permit

The Eastbank Esplanade Connection would also require a removal-fill permit from Oregon Department of State Lands (DSL). DSL has several thresholds for different permit or authorization types. The City would need to coordinate with DSL to determine the type of permit needed. Permit applications are typically made using a JPA for either individual or general permits but a General Authorization Notification form is used for general authorizations. The City could utilize much of the data from the EQRB DSL application to provide existing conditions and affected environment information for this process.

City of Portland Permits

The City of Portland will require several permits and reviews for the Eastbank Esplanade Connection. Anticipated permits and reviews are shown in Table 2 below, but coordination with City staff should be conducted to verify this list and to determine the types of documentation needed for these permits. Note that some permits will require special analysis and documentation such as a No-Rise Analysis for the Floodplain Development Permit.

Table 2. Anticipated Permits for Eastbank Esplanade Connection

Permit	Nexus	Permitting Agency
Nationwide Permit (Section 404, Section 401, Section 10)	Fill below ordinary high-water mark (OHWM) of Willamette River	USACE, Oregon Department of Environmental Quality
Section 408 Navigation Permit (Not Likely Needed)	Impacts to federal navigation channel of Willamette River	USACE
Oregon Removal-Fill Permit	Fill/removal below OHWM of Willamette River	Oregon DSL
Floodplain Development Permit	New fill/construction within floodplain/floodway	City of Portland
Type III Greenway Goal Exception	Location of development that is not river-dependent	City of Portland
Type IIx River Review	Development or regulated activity in the River Environmental overlay zone that is not exempt from zone overlay regulations	City of Portland
Non-Park Use Permit	Construction work or staging on Portland Parks and Recreation property	City of Portland
Type II or III Conditional Use Review	Ground disturbing structure replacement	City of Portland

Appendix B. Cost Estimate Backup

EQRB ESTIMATING METHODOLOGY										
	2023 $ (No Escalation)			Escalation to 2029 (Mid-Point of Const)			Escalation to 2031 (Mid-Point of Const)			
Ramp Option	High Range	Low Range	Ramp $/SF	High Range	Low Range	Ramp $/SF	High Range	Low Range	Ramp $/SF	Bridge $/SF
Option 1a	$ 116,735,000	$ 88,947,000	$ 3,344	$ 141,136,000	$ 107,799,000	$ 4,048	$ 150,455,000	$ 114,999,000	$ 4,316	$ 4,211
Option 1b	$ 111,576,000	$ 85,729,000	$ 3,061	$ 134,898,000	$ 103,899,000	$ 3,705	$ 143,805,000	$ 110,839,000	$ 3,950	$ 4,239
Option 2a	$ 97,093,000	$ 75,517,000	$ 2,506	$ 117,388,000	$ 91,522,000	$ 3,033	$ 125,139,000	$ 97,636,000	$ 3,234	$ 4,268
Option 2b	$ 91,295,000	$ 71,339,000	$ 2,302	$ 110,378,000	$ 86,460,000	$ 2,786	$ 117,666,000	$ 92,235,000	$ 2,971	$ 4,275

EQRB ESTIMATING METHODOLOGY							
	2023 $ (No Escalation)		Escalation to 2029 (Mid-Point of Const)		Escalation to 2031 (Mid-Point of Const)		
Ramp Option	Average	Ramp $/SF	Average	Ramp $/SF	Average	Ramp $/SF	Bridge $/SF
Option 1a	$ 102,841,000	$ 3,344	$ 124,467,500	$ 4,048	$ 132,727,000	$ 4,316	$ 4,211
Option 1b	$ 98,652,500	$ 3,061	$ 119,398,500	$ 3,705	$ 127,322,000	$ 3,950	$ 4,211
Option 2a	$ 86,305,000	$ 2,506	$ 104,455,000	$ 3,033	$ 111,387,500	$ 3,234	$ 4,211
Option 2b	$ 81,317,000	$ 2,302	$ 98,419,000	$ 2,786	$ 104,950,500	$ 2,971	$ 4,211

EQRB ESTIMATING METHODOLOGY (HIGH RANGE)

OPTION 1a

		NORTH RAMP	SOUTH RAMP	ESPLANADE CONNECTION	BURNSIDE BRIDGE PREMIUM
CONSTRUCTION SUBTOTAL					
Subtotal		$ 27,763,620	$ 10,209,422	$ 2,608,059	$ -
TOTAL CONSTRUCTION COSTS					
Contractor Mobilization	10%	$ 2,776,362	$ 1,020,942	$ 260,806	$ -
Aesthetics Premium	3%	$ 832,909	$ 306,283	$ -	$ -
Subtotal		$ 31,372,891	$ 11,536,647	$ 2,868,865	$ -
Subtotal W/ CMGC Multiplier		$ 47,059,336	$ 17,304,970	$ 4,303,297	$ -
TOTAL PROJECT COSTS					
Contingency	40%	$ 18,823,734	$ 6,921,988	$ 1,721,319	$ -
Preliminary Engineering (PE)	15%	$ 7,058,900	$ 2,595,746	$ 645,495	$ -
Construction Engineering	15%	$ 7,058,900	$ 2,595,746	$ 645,495	$ -
ROW	0%	$ -	$ -	$ -	$ -
Subtotal		$ 80,000,871	$ 29,418,449	$ 7,315,605	$ -
NO ESCALATION					
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2023$)		$ 116,735,000			
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2023$)		$ -			
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2023$)		$ 116,735,000			
ESCALATION (Construction Year Midpoint 2029)					
Construction Escalation	3.5%	$ 16,722,335	$ 6,149,248	$ 1,529,158	$ -
ROW Escalation	5%	$ -	$ -	$ -	$ -
Subtotal		$ 96,723,206	$ 35,567,697	$ 8,844,764	$ -
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2029$)		$ 141,136,000			
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2029$)		$ -			
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2029$)		$ 141,136,000			
ESCALATION (Construction Year Midpoint 2031)					
Construction Escalation	3.5%	$ 23,108,675	$ 8,497,675	$ 2,113,151	$ -
ROW Escalation	5%	$ -	$ -	$ -	$ -
Subtotal		$ 103,109,547	$ 37,916,124	$ 9,428,757	$ -
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2031$)		$ 150,455,000			
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2031$)		$ -			
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2031$)		$ 150,455,000			

OPTION 1b

		NORTH RAMP	SOUTH RAMP	ESPLANADE CONNECTION	BURNSIDE BRIDGE PREMIUM
CONSTRUCTION SUBTOTAL					
Subtotal		$ 25,278,590	$ 9,242,187	$ 2,608,059	$ 1,707,054
TOTAL CONSTRUCTION COSTS					
Contractor Mobilization	10%	$ 2,527,859	$ 924,219	$ 260,806	$ 170,705
Aesthetics Premium	3%	$ 758,358	$ 277,266	$ -	$ -
Subtotal		$ 28,564,807	$ 10,443,671	$ 2,868,865	$ 1,877,759
Subtotal W/ CMGC Multiplier		$ 42,847,210	$ 15,665,507	$ 4,303,297	$ 2,816,638
TOTAL PROJECT COSTS					
Contingency	40%	$ 17,138,884	$ 6,266,203	$ 1,721,319	$ 1,126,655
Preliminary Engineering (PE)	15%	$ 6,427,082	$ 2,349,826	$ 645,495	$ 422,496
Construction Engineering	15%	$ 6,427,082	$ 2,349,826	$ 645,495	$ 422,496
ROW	0%	$ -	$ -	$ -	$ -
Subtotal		$ 72,840,257	$ 26,631,362	$ 7,315,605	$ 4,788,285
NO ESCALATION					
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2023$)		$ 106,788,000			
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2023$)		$ 4,788,285			
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2023$)		$ 111,576,000			
ESCALATION (Construction Year Midpoint 2029)					
Construction Escalation	3.5%	$ 15,225,574	$ 5,566,671	$ 1,529,158	$ 1,000,880
ROW Escalation	5%	$ -	$ -	$ -	$ -
Subtotal		$ 88,065,831	$ 32,198,033	$ 8,844,764	$ 5,789,166
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2029$)		$ 129,109,000			
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2029$)		$ 5,789,166			
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2029$)		$ 134,898,000			
ESCALATION (Construction Year Midpoint 2031)					
Construction Escalation	3.5%	$ 21,040,294	$ 7,692,610	$ 2,113,151	$ 1,383,122
ROW Escalation	5%	$ -	$ -	$ -	$ -
Subtotal		$ 93,880,551	$ 34,323,972	$ 9,428,757	$ 6,171,407
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2031$)		$ 137,634,000			
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2031$)		$ 6,171,407			
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2031$)		$ 143,805,000			

OPTION 2a

		NORTH RAMP	ESPLANADE CONNECTION	BURNSIDE BRIDGE PREMIUM
CONSTRUCTION SUBTOTAL				
Subtotal		$ 27,763,620	$ 2,608,059	$ 3,485,309
TOTAL CONSTRUCTION COSTS				
Contractor Mobilization	10%	$ 2,776,362	$ 260,806	$ 348,531
Aesthetics Premium	3%	$ 832,909	$ -	$ -
Subtotal		$ 31,372,891	$ 2,868,865	$ 3,833,839
Subtotal W/ CMGC Multiplier		$ 47,059,336	$ 4,303,297	$ 5,750,759
TOTAL PROJECT COSTS				
Contingency	40%	$ 18,823,734	$ 1,721,319	$ 2,300,304
Preliminary Engineering (PE)	15%	$ 7,058,900	$ 645,495	$ 862,614
Construction Engineering	15%	$ 7,058,900	$ 645,495	$ 862,614
ROW	0%	$ -	$ -	$ -
Subtotal		$ 80,000,871	$ 7,315,605	$ 9,776,290
NO ESCALATION				
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2023$)		$ 87,317,000		
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2023$)		$ 9,776,290		
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2023$)		$ 97,093,000		
ESCALATION (Construction Year Midpoint 2029)				
Construction Escalation	3.5%	$ 16,722,335	$ 1,529,158	$ 2,043,508
ROW Escalation	5%	$ -	$ -	$ -
Subtotal		$ 96,723,206	$ 8,844,764	$ 11,819,798
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2029$)		$ 105,568,000		
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2029$)		$ 11,819,798		
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2029$)		$ 117,388,000		
ESCALATION (Construction Year Midpoint 2031)				
Construction Escalation	3.5%	$ 23,108,675	$ 2,113,151	$ 2,823,933
ROW Escalation	5%	$ -	$ -	$ -
Subtotal		$ 103,109,547	$ 9,428,757	$ 12,600,224
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2031$)		$ 112,539,000		
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2031$)		$ 12,600,224		
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2031$)		$ 125,139,000		

OPTION 2b

		NORTH RAMP	ESPLANADE CONNECTION	BURNSIDE BRIDGE PREMIUM
CONSTRUCTION SUBTOTAL				
Subtotal		$ 25,278,590	$ 2,608,059	$ 3,970,993
TOTAL CONSTRUCTION COSTS				
Contractor Mobilization	10%	$ 2,527,859	$ 260,806	$ 397,099
Aesthetics Premium	3%	$ 758,358	$ -	$ -
Subtotal		$ 28,564,807	$ 2,868,865	$ 4,368,092
Subtotal W/ CMGC Multiplier		$ 42,847,210	$ 4,303,297	$ 6,552,139
TOTAL PROJECT COSTS				
Contingency	40%	$ 17,138,884	$ 1,721,319	$ 2,620,855
Preliminary Engineering (PE)	15%	$ 6,427,082	$ 645,495	$ 982,821
Construction Engineering	15%	$ 6,427,082	$ 645,495	$ 982,821
ROW	0%	$ -	$ -	$ -
Subtotal		$ 72,840,257	$ 7,315,605	$ 11,138,635
NO ESCALATION				
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2023$)		$ 80,156,000		
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2023$)		$ 11,138,635		
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2023$)		$ 91,295,000		
ESCALATION (Construction Year Midpoint 2029)				
Construction Escalation	3.5%	$ 15,225,574	$ 1,529,158	$ 2,328,275
ROW Escalation	5%	$ -	$ -	$ -
Subtotal		$ 88,065,831	$ 8,844,764	$ 13,466,910
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2029$)		$ 96,911,000		
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2029$)		$ 13,466,910		
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2029$)		$ 110,378,000		
ESCALATION (Construction Year Midpoint 2031)				
Construction Escalation	3.5%	$ 21,040,294	$ 2,113,151	$ 3,217,454
ROW Escalation	5%	$ -	$ -	$ -
Subtotal		$ 93,880,551	$ 9,428,757	$ 14,356,089
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2031$)		$ 103,310,000		
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2031$)		$ 14,356,089		
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2031$)		$ 117,666,000		

Construction Escalation only applied to CE, Contingency, Total Construction Costs
ROW Escalation only applied to ROW Project Costs
CMGC Multiplier applied to Total Construction costs to represent "All In" construction costs

EQRB ESTIMATING METHODOLOGY (LOW RANGE)

OPTION 1a

		NORTH RAMP	SOUTH RAMP	ESPLANADE CONNECTION	BURNSIDE BRIDGE PREMIUM
CONSTRUCTION SUBTOTAL					
Subtotal		$ 27,763,620	$ 10,209,422	$ 2,608,059	$ -
TOTAL CONSTRUCTION COSTS					
Contractor Mobilization	5%	$ 1,388,181	$ 510,471	$ 130,403	$ -
Aesthetics Premium	0%	$ -	$ -	$ -	$ -
Subtotal		$ 29,151,801	$ 10,719,893	$ 2,738,462	$ -
Subtotal W/ CMGC Multiplier		$ 37,897,341	$ 13,935,861	$ 4,107,693	$ -
TOTAL PROJECT COSTS					
Contingency	35%	$ 13,264,069	$ 4,877,551	$ 1,437,693	$ -
Preliminary Engineering (PE)	12%	$ 4,547,681	$ 1,672,303	$ 492,923	$ -
Construction Engineering	12%	$ 4,547,681	$ 1,672,303	$ 492,923	$ -
ROW	0%	$ -	$ -	$ -	$ -
Subtotal		$ 60,256,773	$ 22,158,019	$ 6,531,232	$ -
NO ESCALATION					
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2023$)		$ 88,947,000			
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2023$)		$ -			
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2023$)		$ 88,947,000			
ESCALATION (Construction Year Midpoint 2029)					
Construction Escalation	3.5%	$ 12,771,606	$ 4,696,459	$ 1,384,314	$ -
ROW Escalation	5.0%	$ -	$ -	$ -	$ -
Subtotal		$ 73,028,379	$ 26,854,478	$ 7,915,546	$ -
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2029$)		$ 107,799,000			
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2029$)		$ -			
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2029$)		$ 107,799,000			
ESCALATION (Construction Year Midpoint 2031)					
Construction Escalation	3.5%	$ 17,649,144	$ 6,490,060	$ 1,912,991	$ -
ROW Escalation	5.0%	$ -	$ -	$ -	$ -
Subtotal		$ 77,905,916	$ 28,648,079	$ 8,444,222	$ -
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2031$)		$ 114,999,000			
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2031$)		$ -			
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2031$)		$ 114,999,000			

OPTION 1b

		NORTH RAMP	SOUTH RAMP	ESPLANADE CONNECTION	BURNSIDE BRIDGE PREMIUM
CONSTRUCTION SUBTOTAL					
Subtotal		$ 25,278,590	$ 9,242,187	$ 2,608,059	$ 1,707,054
TOTAL CONSTRUCTION COSTS					
Contractor Mobilization	5%	$ 1,263,930	$ 462,109	$ 130,403	$ 85,353
Aesthetics Premium	0%	$ -	$ -	$ -	$ -
Subtotal		$ 26,542,520	$ 9,704,296	$ 2,738,462	$ 1,792,406
Subtotal W/ CMGC Multiplier		$ 34,505,275	$ 12,615,585	$ 4,107,693	$ 2,688,609
TOTAL PROJECT COSTS					
Contingency	35%	$ 12,076,846	$ 4,415,455	$ 1,437,693	$ 941,013
Preliminary Engineering (PE)	12%	$ 4,140,633	$ 1,513,870	$ 492,923	$ 322,633
Construction Engineering	12%	$ 4,140,633	$ 1,513,870	$ 492,923	$ 322,633
ROW	0%	$ -	$ -	$ -	$ -
Subtotal		$ 54,863,388	$ 20,058,781	$ 6,531,232	$ 4,274,889
NO ESCALATION					
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2023$)		$ 81,454,000			
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2023$)		$ 4,274,889			
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2023$)		$ 85,729,000			
ESCALATION (Construction Year Midpoint 2029)					
Construction Escalation	3.5%	$ 11,628,462	$ 4,251,519	$ 1,384,314	$ 906,076
ROW Escalation	5.0%	$ -	$ -	$ -	$ -
Subtotal		$ 66,491,850	$ 24,310,300	$ 7,915,546	$ 5,180,964
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2029$)		$ 98,718,000			
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2029$)		$ 5,180,964			
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2029$)		$ 103,899,000			
ESCALATION (Construction Year Midpoint 2031)					
Construction Escalation	3.5%	$ 16,069,427	$ 5,875,195	$ 1,912,991	$ 1,252,110
ROW Escalation	5.0%	$ -	$ -	$ -	$ -
Subtotal		$ 70,932,815	$ 25,933,976	$ 8,444,222	$ 5,526,999
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2031$)		$ 105,312,000			
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2031$)		$ 5,526,999			
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2031$)		$ 110,839,000			

OPTION 2a

		NORTH RAMP	ESPLANADE CONNECTION	BURNSIDE BRIDGE PREMIUM
CONSTRUCTION SUBTOTAL				
Subtotal		$ 27,763,620	$ 2,608,059	$ 3,485,309
TOTAL CONSTRUCTION COSTS				
Contractor Mobilization	5%	$ 1,388,181	$ 130,403	$ 174,265
Aesthetics Premium	0%	$ -	$ -	$ -
Subtotal		$ 29,151,801	$ 2,738,462	$ 3,659,574
Subtotal W/ CMGC Multiplier		$ 37,897,341	$ 4,107,693	$ 5,489,361
TOTAL PROJECT COSTS				
Contingency	35%	$ 13,264,069	$ 1,437,693	$ 1,921,276
Preliminary Engineering (PE)	12%	$ 4,547,681	$ 492,923	$ 658,723
Construction Engineering	12%	$ 4,547,681	$ 492,923	$ 658,723
ROW	0%	$ -	$ -	$ -
Subtotal		$ 60,256,773	$ 6,531,232	$ 8,728,084
NO ESCALATION				
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2023$)		$ 66,789,000		
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2023$)		$ 8,728,084		
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2023$)		$ 75,517,000		
ESCALATION (Construction Year Midpoint 2029)				
Construction Escalation	3.5%	$ 12,771,606	$ 1,384,314	$ 1,849,944
ROW Escalation	5.0%	$ -	$ -	$ -
Subtotal		$ 73,028,379	$ 7,915,546	$ 10,578,028
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2029$)		$ 80,944,000		
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2029$)		$ 10,578,028		
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2029$)		$ 91,522,000		
ESCALATION (Construction Year Midpoint 2031)				
Construction Escalation	3.5%	$ 17,649,144	$ 1,912,991	$ 2,556,446
ROW Escalation	5.0%	$ -	$ -	$ -
Subtotal		$ 77,905,916	$ 8,444,222	$ 11,284,530
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2031$)		$ 86,351,000		
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2031$)		$ 11,284,530		
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2031$)		$ 97,636,000		

OPTION 2b

		NORTH RAMP	ESPLANADE CONNECTION	BURNSIDE BRIDGE PREMIUM
CONSTRUCTION SUBTOTAL				
Subtotal		$ 25,278,590	$ 2,608,059	$ 3,970,993
TOTAL CONSTRUCTION COSTS				
Contractor Mobilization	5%	$ 1,263,930	$ 130,403	$ 198,550
Aesthetics Premium	0%	$ -	$ -	$ -
Subtotal		$ 26,542,520	$ 2,738,462	$ 4,169,543
Subtotal W/ CMGC Multiplier		$ 34,505,275	$ 4,107,693	$ 6,254,314
TOTAL PROJECT COSTS				
Contingency	35%	$ 12,076,846	$ 1,437,693	$ 2,189,010
Preliminary Engineering (PE)	12%	$ 4,140,633	$ 492,923	$ 750,518
Construction Engineering	12%	$ 4,140,633	$ 492,923	$ 750,518
ROW	0%	$ -	$ -	$ -
Subtotal		$ 54,863,388	$ 6,531,232	$ 9,944,359
NO ESCALATION				
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2023$)		$ 61,395,000		
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2023$)		$ 9,944,359		
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2023$)		$ 71,339,000		
ESCALATION (Construction Year Midpoint 2029)				
Construction Escalation	3.5%	$ 11,628,462	$ 1,384,314	$ 2,107,737
ROW Escalation	5.0%	$ -	$ -	$ -
Subtotal		$ 66,491,850	$ 7,915,546	$ 12,052,096
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2029$)		$ 74,408,000		
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2029$)		$ 12,052,096		
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2029$)		$ 86,460,000		
ESCALATION (Construction Year Midpoint 2031)				
Construction Escalation	3.5%	$ 16,069,427	$ 1,912,991	$ 2,912,692
ROW Escalation	5.0%	$ -	$ -	$ -
Subtotal		$ 70,932,815	$ 8,444,222	$ 12,857,051
SUBTOTAL RAMP ONLY (PROGRAMMATIC 2031$)		$ 79,378,000		
SUBTOTAL BURNSIDE BRIDGE ONLY (PROGRAMMATIC 2031$)		$ 12,857,051		
TOTAL RAMP + BURNSIDE BRIDGE (PROGRAMMATIC 2031$)		$ 92,235,000		

Construction Escalation only applied to CE, Contingency, Total Construction Costs
ROW Escalation only applied to ROW Project Costs
CMGC Multiplier applied to Total Construction costs to represent "All In" construction costs

HIGH RANGE

EQRB FUNDING METHODOLOGY

Bridge Name: Burnside Bridge Connector - North Structure (Dependent)
Owner: PBOT City Ramp Concept
Concept By: KPFF
Cost Estimating Check By: HDR

BASE CONSTRUCTION COSTS

Substructure Work Item	Unit	Quantity	Unit Cost	Total
PERCHED COFFERDAM	LS	1	$ 1,656,000.00	$ 1,656,000.00
FURNISH DRILLING EQUIPMENT	EA	1	$ 1,400,000.00	$ 1,400,000.00
DRILLED SHAFT EXCAVATION, 72 INCH DIAMETER	FT	1140	$ 1,400.00	$ 1,596,000.00
DRILLED SHAFT CONCRETE	CY	1200	$ 250.00	$ 300,000.00
DRILLED SHAFT REINFORCEMENT, GRADE 60	LB	297100	$ 2.00	$ 594,200.00
CSL TEST ACCESS TUBES	FT	6770	$ 9.00	$ 60,930.00
CSL TEST	EA	14	$ 3,400.00	$ 47,600.00
FURNISH PILE DRIVING EQUIPMENT	LS	1	$ 100,000.00	$ 100,000.00
FURNISH PP 48 PILES	FT	1728	$ 960.00	$ 1,658,880.00
DRIVE PP 48 PILES	EA	12	$ 3,000.00	$ 36,000.00
REINFORCED PILE TIPS	EA	12	$ 190.00	$ 2,280.00
PILE LOAD TEST (DYNAMIC)	EA	4	$ 3,000.00	$ 12,000.00
REINFORCEMENT, GRADE 60	LB	876500	$ 2.00	$ 1,753,000.00
FOUNDATION CONCRETE, CLASS 4000	CY	3370	$ 600.00	$ 2,022,000.00
DECK CONCRETE, CLASS 4000	CY	430	$ 900.00	$ 387,000.00
STRUCTURAL STEEL - SUPERSTRUCTURE	LB	1097200	$ 3.00	$ 3,291,600.00
STRUCTURAL STEEL - COLUMNS	LB	1595100	$ 6.00	$ 9,570,600.00
PEDESTRIAN RAIL	FT	3100	$ 255.00	$ 790,500.00
			CONSTRUCTION SUBTOTAL	**$ 25,278,590.00**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	10%	$ 2,527,859.00
Aesthetics Premium	3%	$ 758,357.70
	SUBTOTAL	$ 28,564,806.70
	CMGC Multiplier	1.50
	SUBTOTAL	**$ 42,847,210.05**

TOTAL PROJECT COSTS

Contingency	40%	$ 17,138,884.02
Preliminary Engineering (PE)	15%	$ 6,427,081.51
Construction Engineering	15%	$ 6,427,081.51
Right-of-Way	0%	$ -
Total Project Cost before Inflation (2023 $)		**$ 72,840,257.09**

ESCALATION

Construction Year Midpoint:	**2029**	% per Yr	No. Years	
Construction Escalation		3.5%	6	23% $ 15,225,574.24
ROW Escalation		5.0%	6	34% $ -
Total Project After Inflation				**$ 88,065,831.33**

ESCALATION

Construction Year Midpoint:	**2031**	% per Yr	No. Years	
Construction Escalation		3.5%	8	32% $ 21,040,294.20
ROW Escalation		5.0%	8	48% $ -
Total Project After Inflation				**$ 93,880,551.28**

Construction Escalation only applied to CE, Contingency, Total Construction Costs
ROW Escalation only applied to ROW Project Costs
CMGC Multiplier applied to Total Construction costs to represent "All In" construction costs

EQRB FUNDING METHODOLOGY

BASE CONSTRUCTION COSTS

Substructure Work Item	Unit	Quantity	Unit Cost	Total
PERCHED COFFERDAM	LS	1	$ 1,656,000.00	$ 1,656,000.00
FURNISH DRILLING EQUIPMENT	EA	1	$ 1,400,000.00	$ 1,400,000.00
DRILLED SHAFT EXCAVATION, 72 INCH DIAMETER	FT	1140	$ 1,400.00	$ 1,596,000.00
DRILLED SHAFT CONCRETE	CY	1200	$ 250.00	$ 300,000.00
DRILLED SHAFT REINFORCEMENT, GRADE 60	LB	297100	$ 2.00	$ 594,200.00
CSL TEST ACCESS TUBES	FT	6770	$ 9.00	$ 60,930.00
CSL TEST	EA	14	$ 3,400.00	$ 47,600.00
FURNISH PILE DRIVING EQUIPMENT	LS	1	$ 100,000.00	$ 100,000.00
FURNISH PP 48 PILES	FT	1728	$ 960.00	$ 1,658,880.00
DRIVE PP 48 PILES	EA	12	$ 3,000.00	$ 36,000.00
REINFORCED PILE TIPS	EA	12	$ 190.00	$ 2,280.00
PILE LOAD TEST (DYNAMIC)	EA	4	$ 3,000.00	$ 12,000.00
REINFORCEMENT, GRADE 60	LB	876500	$ 2.00	$ 1,753,000.00
FOUNDATION CONCRETE, CLASS 4000	CY	3370	$ 600.00	$ 2,022,000.00
DECK CONCRETE, CLASS 4000	CY	430	$ 900.00	$ 387,000.00
STRUCTURAL STEEL - SUPERSTRUCTURE	LB	1097200	$ 3.00	$ 3,291,600.00
STRUCTURAL STEEL - COLUMNS	LB	1595100	$ 6.00	$ 9,570,600.00
PEDESTRIAN RAIL	FT	3100	$ 255.00	$ 790,500.00
			CONSTRUCTION SUBTOTAL	**$ 25,278,590.00**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	11.00%	$ 2,780,644.90
Temporary Protection and Direction of Traffic	1.50%	$ 379,178.85
Erosion Control	1.00%	$ 252,785.90
Pollution Control Plan	0.10%	$ 25,278.59
Clearing and Grubbing	0.00%	$ -
Aesthetics Premium	3.00%	$ 1,339,529.50
	SUBTOTAL	**$ 30,056,007.74**

TOTAL PROJECT COSTS

Contract Contingency	10.00%	$ 3,005,600.77
Construction Contingency	3.50%	$ 1,051,960.27
Project Management	5.00%	$ 1,502,800.39
Design Engineering	25.00%	$ 7,514,001.94
Construction Management	15.00%	$ 4,508,401.16
Project Engineering and Management Overhead	80.00%	$ 10,820,162.79
Right-of-Way	0.00%	$ -
Art	2.00%	$ 601,120.15
Total Project Cost before Inflation (2023 $)		**$ 59,060,055.21**

ESCALATION AND ALLOWANCE FOR DESIGN REFINEMENTS

Construction Year Midpoint:	**2031**	
Escalation	5.10%	$ 23,283,442.39
Allowance for Design Refinement	30.00%	$ 24,522,713.23
Total Project After Inflation (2031 $)		**$ 106,866,210.83**

Construction Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost
Design Refinement Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost

HIGH RANGE

EQRB FUNDING METHODOLOGY

Bridge Name: Burnside Bridge Connector - South Structure (Independent)
Owner: PBOT City Ramp Concept
Concept By: KPFF
Cost Estimating Check By: HDR

BASE CONSTRUCTION COSTS

Work Item	Unit	Quantity	Unit Cost	Total
SHORING & CRIBBING -PERCHED COFFERDAM	LS	1	$ 1,024,000.00	$ 1,024,000.00
FURNISH DRILLING EQUIPMENT	EA	0	$ 1,400,000.00	$ -
DRILLED SHAFT EXCAVATION, 96 INCH DIAMETER	FT	441	$ 2,400.00	$ 1,058,400.00
DRILLED SHAFT EXCAVATION, 72 INCH DIAMETER	FT	586	$ 1,400.00	$ 820,400.00
DRILLED SHAFT CONCRETE	CY	1440	$ 250.00	$ 360,000.00
DRILLED SHAFT REINFORCEMENT, GRADE 60	LB	358800	$ 2.00	$ 717,600.00
CSL TEST ACCESS TUBES	FT	7028	$ 9.00	$ 63,252.00
CSL TEST	EA	8	$ 3,400.00	$ 27,200.00
REINFORCEMENT, GRADE 60	LB	294750	$ 2.00	$ 589,500.00
FOUNDATION CONCRETE, CLASS 4000	CY	1160	$ 600.00	$ 696,000.00
DECK CONCRETE, CLASS 4000	CY	150	$ 900.00	$ 135,000.00
STRUCTURAL STEEL - SUPERSTRUCTURE	LB	327380	$ 3.00	$ 982,140.00
STRUCTURAL STEEL - COLUMNS	LB	579900	$ 6.00	$ 3,479,400.00
PEDESTRIAN RAIL	FT	1006	$ 255.00	$ 256,530.00
			CONSTRUCTION SUBTOTAL	**$ 10,209,422.00**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	10%	$ 1,020,942.20
Aesthetics Premium	3%	$ 306,282.66
	SUBTOTAL	$ 11,536,646.86
	CMGC Multiplier	1.50
	SUBTOTAL	**$ 17,304,970.29**

TOTAL PROJECT COSTS

Contingency	40%	$ 6,921,988.12
Preliminary Engineering (PE)	15%	$ 2,595,745.54
Construction Engineering	15%	$ 2,595,745.54
Right-of-Way	0%	$ -
Total Project Cost before Inflation (2023 $)		**$ 29,418,449.49**

ESCALATION

Construction Year Midpoint: **2029**	% per Yr	No. Years		
Construction Escalation	3.5%	6	23%	$ 6,149,247.75
ROW Escalation	5.0%	6	34%	$ -
Total Project After Inflation				**$ 35,567,697.24**

ESCALATION

Construction Year Midpoint: **2031**	% per Yr	No. Years		
Construction Escalation	3.5%	8	32%	$ 8,497,675.01
ROW Escalation	5.0%	8	48%	$ -
Total Project After Inflation				**$ 37,916,124.50**

Construction Escalation only applied to CE, Contingency, Total Construction Costs
ROW Escalation only applied to ROW Project Costs
CMGC Multiplier applied to Total Construction costs to represent "All In" construction costs

EQRB FUNDING METHODOLOGY

BASE CONSTRUCTION COSTS

Work Item	Unit	Quantity	Unit Cost	Total
SHORING & CRIBBING -PERCHED COFFERDAM	LS	1	$ 1,024,000.00	$ 1,024,000.00
FURNISH DRILLING EQUIPMENT	EA	0	$ 1,400,000.00	$ -
DRILLED SHAFT EXCAVATION, 96 INCH DIAMETER	FT	441	$ 2,400.00	$ 1,058,400.00
DRILLED SHAFT EXCAVATION, 72 INCH DIAMETER	FT	586	$ 1,400.00	$ 820,400.00
DRILLED SHAFT CONCRETE	CY	1440	$ 250.00	$ 360,000.00
DRILLED SHAFT REINFORCEMENT, GRADE 60	LB	358800	$ 2.00	$ 717,600.00
CSL TEST ACCESS TUBES	FT	7028	$ 9.00	$ 63,252.00
CSL TEST	EA	8	$ 3,400.00	$ 27,200.00
REINFORCEMENT, GRADE 60	LB	294750	$ 2.00	$ 589,500.00
FOUNDATION CONCRETE, CLASS 4000	CY	1160	$ 600.00	$ 696,000.00
DECK CONCRETE, CLASS 4000	CY	150	$ 900.00	$ 135,000.00
STRUCTURAL STEEL - SUPERSTRUCTURE	LB	327380	$ 3.00	$ 982,140.00
STRUCTURAL STEEL - COLUMNS	LB	579900	$ 6.00	$ 3,479,400.00
PEDESTRIAN RAIL	FT	1006	$ 255.00	$ 256,530.00
			CONSTRUCTION SUBTOTAL	**$ 10,209,422.00**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	11.00%	$ 1,123,036.42
Temporary Protection and Direction of Traffic	1.50%	$ 153,141.33
Erosion Control	1.00%	$ 102,094.22
Pollution Control Plan	0.10%	$ 10,209.42
Clearing and Grubbing	0.00%	$ -
Aesthetics Premium	3.00%	$ 306,282.66
	SUBTOTAL	**$ 11,904,186.05**

TOTAL PROJECT COSTS

Contract Contingency	10.00%	$ 1,190,418.61
Construction Contingency	3.50%	$ 416,646.51
Project Management	5.00%	$ 595,209.30
Design Engineering	25.00%	$ 2,976,046.51
Construction Management	15.00%	$ 1,785,627.91
Project Engineering and Management Overhead	80.00%	$ 4,285,506.98
Right-of-Way	0.00%	$ -
Art	2.00%	$ 238,083.72
Total Project Cost before Inflation (2023 $)		**$ 23,391,725.59**

ESCALATION AND ALLOWANCE FOR DESIGN REFINEMENTS

Construction Year Midpoint: **2031**		
Escalation	5.10%	$ 9,221,797.94
Allowance for Design Refinement	30.00%	$ 9,712,631.94
Total Project After Inflation (2031 $)		**$ 42,326,155.47**

Construction Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost.
Design Refinement Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost

HIGH RANGE

EQRB FUNDING METHODOLOGY

Bridge Name: Burnside Bridge Connector - North Structure (Independent)
Owner: PBOT City Ramp Concept
Concept By: KPFF
Cost Estimating Check By: HDR

BASE CONSTRUCTION COSTS

Substructure Work Item	Unit	Quantity	Unit Cost	Total
PERCHED COFFERDAM	LS	1	$ 1,656,000.00	$ 1,656,000.00
FURNISH DRILLING EQUIPMENT	EA	1	$ 1,400,000.00	$ 1,400,000.00
DRILLED SHAFT EXCAVATION, 72 INCH DIAMETER	FT	1220	$ 1,400.00	$ 1,708,000.00
DRILLED SHAFT CONCRETE	CY	1280	$ 250.00	$ 320,000.00
DRILLED SHAFT REINFORCEMENT, GRADE 60	LB	317800	$ 2.00	$ 635,600.00
CSL TEST ACCESS TUBES	FT	7240	$ 9.00	$ 65,160.00
CSL TEST	EA	15	$ 3,400.00	$ 51,000.00
FURNISH PILE DRIVING EQUIPMENT	LS	1	$ 100,000.00	$ 100,000.00
FURNISH PP 48 PILES	FT	1728	$ 960.00	$ 1,658,880.00
DRIVE PP 48 PILES	EA	12	$ 3,000.00	$ 36,000.00
REINFORCED PILE TIPS	EA	12	$ 190.00	$ 2,280.00
PILE LOAD TEST (DYNAMIC)	EA	4	$ 3,000.00	$ 12,000.00
REINFORCEMENT, GRADE 60	LB	876500	$ 2.00	$ 1,753,000.00
FOUNDATION CONCRETE, CLASS 4000	CY	3370	$ 600.00	$ 2,022,000.00
DECK CONCRETE, CLASS 4000	CY	430	$ 900.00	$ 387,000.00
STRUCTURAL STEEL - SUPERSTRUCTURE	LB	1097200	$ 3.00	$ 3,291,600.00
STRUCTURAL STEEL - COLUMNS	LB	1979100	$ 6.00	$ 11,874,600.00
PEDESTRIAN RAIL	FT	3100	$ 255.00	$ 790,500.00
			CONSTRUCTION SUBTOTAL	**$ 27,763,620.00**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	10%	$ 2,776,362.00
Aesthetics Premium	3%	$ 832,908.60
	SUBTOTAL	$ 31,372,890.60
	CMGC Multiplier	1.50
	SUBTOTAL	**$ 47,059,335.90**

TOTAL PROJECT COSTS

Contingency	40%	$ 18,823,734.36
Preliminary Engineering (PE)	15%	$ 7,058,900.39
Construction Engineering	15%	$ 7,058,900.39
Right-of-Way	0%	$ -
Total Project Cost before Inflation (2023 $)		**$ 80,000,871.03**

ESCALATION

		% per Yr	No. Years		
Construction Year Midpoint:	2029				
Construction Escalation		3.5%	6	23%	$ 16,722,335.28
ROW Escalation		5.0%	6	34%	$ -
Total Project After Inflation					**$ 96,723,206.31**

ESCALATION

		% per Yr	No. Years		
Construction Year Midpoint:	2031				
Construction Escalation		3.5%	8	32%	$ 23,108,675.47
ROW Escalation		5.0%	8	48%	$ -
Total Project After Inflation					**$ 103,109,546.50**

Construction Escalation only applied to CE, Contingency, Total Construction Costs
ROW Escalation only applied to ROW Project Costs
CMGC Multiplier applied to Total Construction costs to represent "All In" construction costs

EQRB FUNDING METHODOLOGY

BASE CONSTRUCTION COSTS

Substructure Work Item	Unit	Quantity	Unit Cost	Total
PERCHED COFFERDAM	LS	1	$ 1,656,000.00	$ 1,656,000.00
FURNISH DRILLING EQUIPMENT	EA	1	$ 1,400,000.00	$ 1,400,000.00
DRILLED SHAFT EXCAVATION, 72 INCH DIAMETER	FT	1220	$ 1,400.00	$ 1,708,000.00
DRILLED SHAFT CONCRETE	CY	1280	$ 250.00	$ 320,000.00
DRILLED SHAFT REINFORCEMENT, GRADE 60	LB	317800	$ 2.00	$ 635,600.00
CSL TEST ACCESS TUBES	FT	7240	$ 9.00	$ 65,160.00
CSL TEST	EA	15	$ 3,400.00	$ 51,000.00
FURNISH PILE DRIVING EQUIPMENT	LS	1	$ 100,000.00	$ 100,000.00
FURNISH PP 48 PILES	FT	1728	$ 960.00	$ 1,658,880.00
DRIVE PP 48 PILES	EA	12	$ 3,000.00	$ 36,000.00
REINFORCED PILE TIPS	EA	12	$ 190.00	$ 2,280.00
PILE LOAD TEST (DYNAMIC)	EA	4	$ 3,000.00	$ 12,000.00
REINFORCEMENT, GRADE 60	LB	876500	$ 2.00	$ 1,753,000.00
FOUNDATION CONCRETE, CLASS 4000	CY	3370	$ 600.00	$ 2,022,000.00
DECK CONCRETE, CLASS 4000	CY	430	$ 900.00	$ 387,000.00
STRUCTURAL STEEL - SUPERSTRUCTURE	LB	1097200	$ 3.00	$ 3,291,600.00
STRUCTURAL STEEL - COLUMNS	LB	1979100	$ 6.00	$ 11,874,600.00
PEDESTRIAN RAIL	FT	3100	$ 255.00	$ 790,500.00
			CONSTRUCTION SUBTOTAL	**$ 27,763,620.00**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	11.00%	$ 3,053,998.20
Temporary Protection and Direction of Traffic	1.50%	$ 416,454.30
Erosion Control	1.00%	$ 277,636.20
Pollution Control Plan	0.10%	$ 27,763.62
Clearing and Grubbing	0.00%	$ -
Aesthetics Premium	3.00%	$ 1,339,529.50
	SUBTOTAL	**$ 32,879,001.82**

TOTAL PROJECT COSTS

Contract Contingency	10.00%	$ 3,287,900.18
Construction Contingency	3.50%	$ 1,150,765.06
Project Management	5.00%	$ 1,643,950.09
Design Engineering	25.00%	$ 8,219,750.46
Construction Management	15.00%	$ 4,931,850.27
Project Engineering and Management Overhead	80.00%	$ 11,836,440.66
Right-of-Way	0.00%	$ -
Art	2.00%	$ 657,580.04
Total Project Cost before Inflation (2023 $)		**$ 64,607,238.58**

ESCALATION AND ALLOWANCE FOR DESIGN REFINEMENTS

Construction Year Midpoint:	2031		
Escalation		5.10%	$ 25,470,326.98
Allowance for Design Refinement		30.00%	$ 26,825,995.65
Total Project After Inflation (2031 $)			**$ 116,903,561.21**

Construction Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost
Design Refinement Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost

HIGH RANGE

EQRB FUNDING METHODOLOGY

Bridge Name: Burnside Bridge Connector - South Structure (Dependent)
Owner: PBOT City Ramp Concept
Concept By: KPFF
Cost Estimating Check By: HDR

BASE CONSTRUCTION COSTS

Work Item	Unit	Quantity	Unit Cost	Total
SHORING & CRIBBING -PERCHED COFFERDAM	LS	1	$ 1,024,000.00	$ 1,024,000.00
FURNISH DRILLING EQUIPMENT	EA	0	$ 1,400,000.00	$ -
DRILLED SHAFT EXCAVATION, 96 INCH DIAMETER	FT	441	$ 2,400.00	$ 1,058,400.00
DRILLED SHAFT EXCAVATION, 72 INCH DIAMETER	FT	483	$ 1,400.00	$ 676,200.00
DRILLED SHAFT CONCRETE	CY	1330	$ 250.00	$ 332,500.00
DRILLED SHAFT REINFORCEMENT, GRADE 60	LB	331800	$ 2.00	$ 663,600.00
CSL TEST ACCESS TUBES	FT	6413	$ 9.00	$ 57,717.00
CSL TEST	EA	7	$ 3,400.00	$ 23,800.00
REINFORCEMENT, GRADE 60	LB	294750	$ 2.00	$ 589,500.00
FOUNDATION CONCRETE, CLASS 4000	CY	1160	$ 600.00	$ 696,000.00
DECK CONCRETE, CLASS 4000	CY	150	$ 900.00	$ 135,000.00
STRUCTURAL STEEL - SUPERSTRUCTURE	LB	327380	$ 3.00	$ 982,140.00
STRUCTURAL STEEL - COLUMNS	LB	457800	$ 6.00	$ 2,746,800.00
PEDESTRIAN RAIL	FT	1006	$ 255.00	$ 256,530.00
			CONSTRUCTION SUBTOTAL	**$ 9,242,187.00**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	10%	$ 924,218.70
Aesthetics Premium	3%	$ 277,265.61
	SUBTOTAL	$ 10,443,671.31
	CMGC Multiplier	1.50
	SUBTOTAL	**$ 15,665,506.97**

TOTAL PROJECT COSTS

Contingency	40%	$ 6,266,202.79
Preliminary Engineering (PE)	15%	$ 2,349,826.04
Construction Engineering	15%	$ 2,349,826.04
Right-of-Way	0%	$ -
Total Project Cost before Inflation (2023 $)		**$ 26,631,361.84**

ESCALATION

		% per Yr	No. Years		
Construction Year Midpoint:	**2029**				
Construction Escalation		3.5%	6	23%	$ 5,566,671.41
ROW Escalation		5.0%	6	34%	$ -
Total Project After Inflation					**$ 32,198,033.25**

ESCALATION

		% per Yr	No. Years		
Construction Year Midpoint:	**2031**				
Construction Escalation		3.5%	8	32%	$ 7,692,609.97
ROW Escalation		5.0%	8	48%	$ -
Total Project After Inflation					**$ 34,323,971.81**

Construction Escalation only applied to CE, Contingency, Total Construction Costs
ROW Escalation only applied to ROW Project Costs
CMGC Multiplier applied to Total Construction costs to represent "All In" construction costs

EQRB FUNDING METHODOLOGY

BASE CONSTRUCTION COSTS

Work Item	Unit	Quantity	Unit Cost	Total
SHORING & CRIBBING -PERCHED COFFERDAM	LS	1	$ 1,024,000.00	$ 1,024,000.00
FURNISH DRILLING EQUIPMENT	EA	0	$ 1,400,000.00	$ -
DRILLED SHAFT EXCAVATION, 96 INCH DIAMETER	FT	441	$ 2,400.00	$ 1,058,400.00
DRILLED SHAFT EXCAVATION, 72 INCH DIAMETER	FT	483	$ 1,400.00	$ 676,200.00
DRILLED SHAFT CONCRETE	CY	1330	$ 250.00	$ 332,500.00
DRILLED SHAFT REINFORCEMENT, GRADE 60	LB	331800	$ 2.00	$ 663,600.00
CSL TEST ACCESS TUBES	FT	6413	$ 9.00	$ 57,717.00
CSL TEST	EA	7	$ 3,400.00	$ 23,800.00
REINFORCEMENT, GRADE 60	LB	294750	$ 2.00	$ 589,500.00
FOUNDATION CONCRETE, CLASS 4000	CY	1160	$ 600.00	$ 696,000.00
DECK CONCRETE, CLASS 4000	CY	150	$ 900.00	$ 135,000.00
STRUCTURAL STEEL - SUPERSTRUCTURE	LB	327380	$ 3.00	$ 982,140.00
STRUCTURAL STEEL - COLUMNS	LB	457800	$ 6.00	$ 2,746,800.00
PEDESTRIAN RAIL	FT	1006	$ 255.00	$ 256,530.00
			CONSTRUCTION SUBTOTAL	**$ 9,242,187.00**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	11.00%	$ 1,016,640.57
Temporary Protection and Direction of Traffic	1.50%	$ 138,632.81
Erosion Control	1.00%	$ 92,421.87
Pollution Control Plan	0.10%	$ 9,242.19
Clearing and Grubbing	0.00%	$ -
Aesthetics Premium	3.00%	$ 277,265.61
	SUBTOTAL	**$ 10,776,390.04**

TOTAL PROJECT COSTS

Contract Contingency	10.00%	$ 1,077,639.00
Construction Contingency	3.50%	$ 377,173.65
Project Management	5.00%	$ 538,819.50
Design Engineering	25.00%	$ 2,694,097.51
Construction Management	15.00%	$ 1,616,458.51
Project Engineering and Management Overhead	80.00%	$ 3,879,500.42
Right-of-Way	0.00%	$ -
Art	2.00%	$ 215,527.80
Total Project Cost before Inflation (2023 $)		**$ 21,175,606.43**

ESCALATION AND ALLOWANCE FOR DESIGN REFINEMENTS

Construction Year Midpoint:	**2031**		
Escalation		5.10%	$ 8,348,129.89
Allowance for Design Refinement		30.00%	$ 8,792,462.56
Total Project After Inflation (2031 $)			**$ 38,316,198.88**

Construction Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost.
Design Refinement Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost

HIGH RANGE

EQRB FUNDING METHODOLOGY

Bridge Name: Burnside Bridge Connector - Esplanade Connection
Owner: PBOT City Ramp Concept
Concept By: KPFF
Cost Estimating Check By: HDR

BASE CONSTRUCTION COSTS

Work Item	Unit	Quantity	Unit Cost	Total
BRIDGE REMOVAL	LS	1	$ 108,000.00	$ 108,000.00
BRIDGE RELOCATE	LS	1	$ 459,000.00	$ 459,000.00
FURNISH DRILLING EQUIPMENT	EA	0	$ 1,400,000.00	$ -
DRILLED SHAFT EXCAVATION, 72 INCH DIAMETER	FT	360	$ 1,400.00	$ 504,000.00
DRILLED SHAFT CONCRETE	CY	380	$ 250.00	$ 95,000.00
DRILLED SHAFT REINFORCEMENT, GRADE 60	LB	95000	$ 2.00	$ 190,000.00
CSL TEST ACCESS TUBES	FT	2151	$ 9.00	$ 19,359.00
CSL TEST	EA	3	$ 3,400.00	$ 10,200.00
REINFORCEMENT, GRADE 60	LB	15750	$ 2.00	$ 31,500.00
DECK CONCRETE, CLASS 4000	CY	70	$ 900.00	$ 63,000.00
STRUCTURAL STEEL - SUPERSTRUCTURE	LB	147700	$ 3.00	$ 443,100.00
STRUCTURAL STEEL - COLUMNS	LB	92900	$ 6.00	$ 557,400.00
PEDESTRIAN RAIL	FT	500	$ 255.00	$ 127,500.00
			CONSTRUCTION SUBTOTAL	**$ 2,608,059.00**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	10%	$ 260,805.90
Aesthetics Premium	0%	$ -
	SUBTOTAL	$ 2,868,864.90
	CMGC Multiplier	1.50
	SUBTOTAL	**$ 4,303,297.35**

TOTAL PROJECT COSTS

Contingency	40%	$ 1,721,318.94
Preliminary Engineering (PE)	15%	$ 645,494.60
Construction Engineering	15%	$ 645,494.60
Right-of-Way	0%	$ -
Total Project Cost before Inflation (2023 $)		**$ 7,315,605.50**

ESCALATION

Construction Year Midpoint: **2029**	% per Yr	No. Years		
Construction Escalation	3.5%	6	23%	$ 1,529,158.45
ROW Escalation	5.0%	6	34%	$ -
Total Project After Inflation				**$ 8,844,763.94**

ESCALATION

Construction Year Midpoint: **2031**	% per Yr	No. Years		
Construction Escalation	3.5%	8	32%	$ 2,113,151.41
ROW Escalation	5.0%	8	48%	$ -
Total Project After Inflation				**$ 9,428,756.90**

Construction Escalation only applied to CE, Contingency, Total Construction Costs
ROW Escalation only applied to ROW Project Costs
CMGC Multiplier applied to Total Construction costs to represent "All In" construction costs

EQRB FUNDING METHODOLOGY

BASE CONSTRUCTION COSTS

Work Item	Unit	Quantity	Unit Cost	Total
BRIDGE REMOVAL	LS	1	$ 108,000.00	$ 108,000.00
BRIDGE RELOCATE	LS	1	$ 459,000.00	$ 459,000.00
FURNISH DRILLING EQUIPMENT	EA	0	$ 1,400,000.00	$ -
DRILLED SHAFT EXCAVATION, 72 INCH DIAMETER	FT	360	$ 1,400.00	$ 504,000.00
DRILLED SHAFT CONCRETE	CY	380	$ 250.00	$ 95,000.00
DRILLED SHAFT REINFORCEMENT, GRADE 60	LB	95000	$ 2.00	$ 190,000.00
CSL TEST ACCESS TUBES	FT	2151	$ 9.00	$ 19,359.00
CSL TEST	EA	3	$ 3,400.00	$ 10,200.00
REINFORCEMENT, GRADE 60	LB	15750	$ 2.00	$ 31,500.00
DECK CONCRETE, CLASS 4000	CY	70	$ 900.00	$ 63,000.00
STRUCTURAL STEEL - SUPERSTRUCTURE	LB	147700	$ 3.00	$ 443,100.00
STRUCTURAL STEEL - COLUMNS	LB	92900	$ 6.00	$ 557,400.00
PEDESTRIAN RAIL	FT	500	$ 255.00	$ 127,500.00
			CONSTRUCTION SUBTOTAL	**$ 2,608,059.00**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	11.00%	$ 286,886.49
Temporary Protection and Direction of Traffic	1.50%	$ 39,120.89
Erosion Control	1.00%	$ 26,080.59
Pollution Control Plan	0.10%	$ 2,608.06
Clearing and Grubbing	0.00%	$ -
Aesthetics Premium	0.00%	$ -
	SUBTOTAL	**$ 2,962,755.02**

TOTAL PROJECT COSTS

Contract Contingency	10.00%	$ 296,275.50
Construction Contingency	3.50%	$ 103,696.43
Project Management	5.00%	$ 148,137.75
Design Engineering	25.00%	$ 740,688.76
Construction Management	15.00%	$ 444,413.25
Project Engineering and Management Overhead	80.00%	$ 1,066,591.81
Right-of-Way	2.00%	$ 59,255.10
Art	2.00%	$ 59,255.10
Total Project Cost before Inflation (2023 $)		**$ 5,881,068.72**

ESCALATION AND ALLOWANCE FOR DESIGN REFINEMENTS

Construction Year Midpoint: **2031**		
Escalation	5.10%	$ 2,295,152.99
Allowance for Design Refinement	30.00%	$ 2,417,313.45
Total Project After Inflation (2031 $)		**$ 10,593,535.16**

Construction Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost.
Design Refinement Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost.

HIGH RANGE

EQRB FUNDING METHODOLOGY

Bridge Name: Burnside Bridge Connector - Burnside Bridge Premium Opt 1b
Owner: PBOT City Ramp Concept
Concept By: KPFF
Cost Estimating Check By: HDR

BASE CONSTRUCTION COSTS

Work Item	Unit	Quantity	Unit Cost	Total
VERTICAL LOAD PREMIUM	LS	1	$ 471,369.00	$ 471,369.00
ASYMMETRICAL MUP PREMIUM	LS	0	$ 3,485,308.54	$ -
LATERAL STABILITY PREMIUM	LS	1	$ 235,684.51	$ 235,684.51
Joint Premium	EA	4	$ 250,000.00	$ 1,000,000.00
			CONSTRUCTION SUBTOTAL	**$ 1,707,053.51**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	10%	$ 170,705.35
Aesthetics Premium	0%	$ -
	SUBTOTAL	$ 1,877,758.87
	CMGC Multiplier	1.50
	SUBTOTAL	**$ 2,816,638.30**

TOTAL PROJECT COSTS

Contingency	40%	$ 1,126,655.32
Preliminary Engineering (PE)	15%	$ 422,495.74
Construction Engineering	15%	$ 422,495.74
Right-of-Way	0%	$ -
Total Project Cost before Inflation (2023 $)		**$ 4,788,285.11**

ESCALATION

Construction Year Midpoint:	**2029**	% per Yr	No. Years	
Construction Escalation		3.5%	6	23% $ 1,000,880.47
ROW Escalation		5.0%	6	34% $ -
Total Project After Inflation				**$ 5,789,165.57**

ESCALATION

Construction Year Midpoint:	**2031**	% per Yr	No. Years	
Construction Escalation		3.5%	8	32% $ 1,383,121.52
ROW Escalation		5.0%	8	48% $ -
Total Project After Inflation				**$ 6,171,406.63**

Construction Escalation only applied to CE, Contingency, Total Construction Costs
ROW Escalation only applied to ROW Project Costs
CMGC Multiplier applied to Total Construction costs to represent "All In" construction costs

EQRB FUNDING METHODOLOGY

BASE CONSTRUCTION COSTS

Work Item	Unit	Quantity	Unit Cost	Total
VERTICAL LOAD PREMIUM	LS	1	$ 471,369.00	$ 471,369.00
ASYMMETRICAL MUP PREMIUM	LS	0	$ 3,485,308.54	$ -
LATERAL STABILITY PREMIUM	LS	1	$ 235,684.51	$ 235,684.51
Joint Premium	EA	4	$ 250,000.00	$ 1,000,000.00
0	0	0	$ -	
0	0	0	$ -	
0	0	0	$ -	
0	0	0	$ -	
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
			CONSTRUCTION SUBTOTAL	**$ 1,707,053.51**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	11.00%	$ 187,775.89
Temporary Protection and Direction of Traffic	1.50%	$ 25,605.80
Erosion Control	1.00%	$ 17,070.54
Pollution Control Plan	0.10%	$ 1,707.05
Clearing and Grubbing	0.00%	$ -
Aesthetics Premium	0.00%	$ -
	SUBTOTAL	**$ 1,939,212.79**

TOTAL PROJECT COSTS

Contract Contingency	10.00%	$ 193,921.28
Construction Contingency	3.50%	$ 67,872.45
Project Management	5.00%	$ 96,960.64
Design Engineering	25.00%	$ 484,803.20
Construction Management	15.00%	$ 290,881.92
Project Engineering and Management Overhead	80.00%	$ 698,116.61
Right-of-Way	2.00%	$ 38,784.26
Art	2.00%	$ 38,784.26
Total Project Cost before Inflation (2023 $)		**$ 3,849,337.39**

ESCALATION AND ALLOWANCE FOR DESIGN REFINEMENTS

Construction Year Midpoint: **2031**		
Escalation	5.10%	$ 1,502,247.06
Allowance for Design Refinement	30.00%	$ 1,582,204.78
Total Project After Inflation (2031 $)		**$ 6,933,789.24**

Construction Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost
Design Refinement Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost

HIGH RANGE

EQRB FUNDING METHODOLOGY

Bridge Name: Burnside Bridge Connector - Burnside Bridge Premium Opt 2a
Owner: PBOT City Ramp Concept
Concept By: KPFF
Cost Estimating Check By: HDR

BASE CONSTRUCTION COSTS

Work Item	Unit	Quantity	Unit Cost	Total
VERTICAL LOAD PREMIUM	LS	0	$ 471,369.00	$ -
ASYMMETRICAL MUP PREMIUM	LS	1	$ 3,485,308.54	$ 3,485,308.54
LATERAL STABILITY PREMIUM	LS	0	$ 235,684.51	$ -
ISOLATION JOINT PREMIUM	EA	0	$ 250,000.00	$ -
			CONSTRUCTION SUBTOTAL	**$ 3,485,308.54**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	10%	$ 348,530.85
Aesthetics Premium	0%	$ -
	SUBTOTAL	$ 3,833,839.40
	CMGC Multiplier	1.50
	SUBTOTAL	**$ 5,750,759.09**

TOTAL PROJECT COSTS

Contingency	40%	$ 2,300,303.64
Preliminary Engineering (PE)	15%	$ 862,613.86
Construction Engineering	15%	$ 862,613.86
Right-of-Way	0%	$ -
Total Project Cost before Inflation (2023 $)		**$ 9,776,290.46**

ESCALATION

Construction Year Midpoint:	**2029**	% per Yr	No. Years	
Construction Escalation		3.5%	6	23% $ 2,043,507.84
ROW Escalation		5.0%	6	34% $ -
Total Project After Inflation				**$ 11,819,798.30**

ESCALATION

Construction Year Midpoint:	**2031**	% per Yr	No. Years	
Construction Escalation		3.5%	8	32% $ 2,823,933.30
ROW Escalation		5.0%	8	48% $ -
Total Project After Inflation (2031 $)				**$ 12,600,223.76**

Construction Escalation only applied to CE, Contingency, Total Construction Costs
ROW Escalation only applied to ROW Project Costs
CMGC Multiplier applied to Total Construction costs to represent "All In" construction costs

EQRB FUNDING METHODOLOGY

BASE CONSTRUCTION COSTS

Work Item	Unit	Quantity	Unit Cost	Total
VERTICAL LOAD PREMIUM	LS	0	$ 471,369.00	$ -
ASYMMETRICAL MUP PREMIUM	LS	1	$ 3,485,308.54	$ 3,485,308.54
LATERAL STABILITY PREMIUM	LS	0	$ 235,684.51	$ -
ISOLATION JOINT PREMIUM	EA	0	$ 250,000.00	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
			CONSTRUCTION SUBTOTAL	**$ 3,485,308.54**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	11.00%	$ 383,383.94
Temporary Protection and Direction of Traffic	1.50%	$ 52,279.63
Erosion Control	1.00%	$ 34,853.09
Pollution Control Plan	0.10%	$ 3,485.31
Clearing and Grubbing	0.00%	$ -
Aesthetics Premium	0.00%	$ -
	SUBTOTAL	**$ 3,959,310.50**

TOTAL PROJECT COSTS

Contract Contingency	10.00%	$ 395,931.05
Construction Contingency	3.50%	$ 138,575.87
Project Management	5.00%	$ 197,965.53
Design Engineering	25.00%	$ 989,827.63
Construction Management	15.00%	$ 593,896.58
Project Engineering and Management Overhead	80.00%	$ 1,425,351.78
Right-of-Way	2.00%	$ 79,186.21
Art	2.00%	$ 79,186.21
Total Project Cost before Inflation (2023 $)		**$ 7,859,231.35**

ESCALATION AND ALLOWANCE FOR DESIGN REFINEMENTS

Construction Year Midpoint:	**2031**	
Escalation	5.10%	$ 3,067,153.12
Allowance for Design Refinement	30.00%	$ 3,230,403.62
Total Project After Inflation (2031 $)		**$ 14,156,788.09**

Construction Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost.
Design Refinement Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost.

HIGH RANGE

EQRB FUNDING METHODOLOGY

Bridge Name: Burnside Bridge Connector - Burnside Bridge Premium Opt 2b
Owner: PBOT City Ramp Concept
Concept By: KPFF
Cost Estimating Check By: HDR

BASE CONSTRUCTION COSTS

Work Item	Unit	Quantity	Unit Cost	Total
VERTICAL LOAD PREMIUM	LS	0.5	$ 471,369.00	$ 235,684.50
ASYMMETRICAL MUP PREMIUM	LS	1	$ 3,485,308.54	$ 3,485,308.54
LATERAL STABILITY PREMIUM	LS	0	$ 235,684.51	$ -
ISOLATION JOINT PREMIUM	EA	1	$ 250,000.00	$ 250,000.00
			CONSTRUCTION SUBTOTAL	**$ 3,970,993.04**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	10%	$ 397,099.30
Aesthetics Premium	0%	$ -
	SUBTOTAL	$ 4,368,092.35
	CMGC Multiplier	1.50
	SUBTOTAL	**$ 6,552,138.52**

TOTAL PROJECT COSTS

Contingency	40%	$ 2,620,855.41
Preliminary Engineering (PE)	15%	$ 982,820.78
Construction Engineering	15%	$ 982,820.78
Right-of-Way	0%	$ -
Total Project Cost before Inflation (2023 $)		**$ 11,138,635.48**

ESCALATION

Construction Year Midpoint:	**2029**	% per Yr	No. Years	
Construction Escalation		3.5%	6	23% $ 2,328,274.61
ROW Escalation		5.0%	6	34% $ -
Total Project After Inflation				**$ 13,466,910.10**

ESCALATION

Construction Year Midpoint:	**2031**	% per Yr	No. Years	
Construction Escalation		3.5%	8	32% $ 3,217,453.88
ROW Escalation		5.0%	8	48% $ -
Total Project After Inflation				**$ 14,356,089.36**

Construction Escalation only applied to CE, Contingency, Total Construction Costs
ROW Escalation only applied to ROW Project Costs
CMGC Multiplier applied to Total Construction costs to represent "All In" construction costs

EQRB FUNDING METHODOLOGY

BASE CONSTRUCTION COSTS

Work Item	Unit	Quantity	Unit Cost	Total
VERTICAL LOAD PREMIUM	LS	0.5	$ 471,369.00	$ 235,684.50
ASYMMETRICAL MUP PREMIUM	LS	1	$ 3,485,308.54	$ 3,485,308.54
LATERAL STABILITY PREMIUM	LS	0	$ 235,684.51	$ -
ISOLATION JOINT PREMIUM	EA	1	$ 250,000.00	$ 250,000.00
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
0	0	0	$ -	$ -
			CONSTRUCTION SUBTOTAL	**$ 3,970,993.04**

TOTAL CONSTRUCTION COSTS

Contractor Mobilization	11.00%	$ 436,809.23
Temporary Protection and Direction of Traffic	1.50%	$ 59,564.90
Erosion Control	1.00%	$ 39,709.93
Pollution Control Plan	0.10%	$ 3,970.99
Clearing and Grubbing	0.00%	$ -
Aesthetics Premium	0.00%	$ -
	SUBTOTAL	**$ 4,511,048.10**

TOTAL PROJECT COSTS

Contract Contingency	10.00%	$ 451,104.81
Construction Contingency	3.50%	$ 157,886.68
Project Management	5.00%	$ 225,552.40
Design Engineering	25.00%	$ 1,127,762.02
Construction Management	15.00%	$ 676,657.21
Project Engineering and Management Overhead	80.00%	$ 1,623,977.31
Right-of-Way	2.00%	$ 90,220.96
Art	2.00%	$ 90,220.96
Total Project Cost before Inflation (2023 $)		**$ 8,954,430.47**

ESCALATION AND ALLOWANCE FOR DESIGN REFINEMENTS

Construction Year Midpoint:	**2031**		
Escalation		5.10%	$ 3,494,566.86
Allowance for Design Refinement		30.00%	$ 3,680,566.62
Total Project After Inflation (2031 $)			**$ 16,129,563.94**

Construction Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost
Design Refinement Escalation only applied to Contract Contingency, Construction Contingency, PM, Design Engr, CM and Total Construction Cost

Appendix C. Preliminary Ramp Connection Project Prospectus (ODOT Part 3)

PRELIM. NEPA CLASS
CE

ODOT ENVIRONMENTAL PROSPECTUS

Oregon Department of Transportation

PROJECT NAME			REGION	KEY NUMBER	FEDERAL AID NUMBER
Burnside Bridge_Esplanade Connection			1	NA	NA
CITY	COUNTY	FHWA NEXUS	PROJECT SPONSOR		
Portland	Multnomah	PE funding	LPA		

HIGHWAY NAME	BEGIN MP	END MP
Burnside Street		

LATITUDE	LONGITUDE	TOWNSHIP	RANGE	SECTION
-122.6662	45.5229	1N	1E	34

PROJECT DESCRIPTION (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

The City of Portland will replace the existing stair connection between the Burnside Bridge and the Vera Katz Eastbank Esplanade with a ramp that will be bicycle and ADA accessible. The new ramp termini are expected to be constructed in the same vicinity as the existing termini. The new ramp would require foundation elements to be located within the Willamette River

Checklist questions marked with an asterisk (*) indicate that the question is related to the qualifying thresholds ("kickouts") identified in the 2015 PCE Agreement.

Estimated Right of Way Impacts

Right of Way

	Yes	No	Unknown
1. * Will the project involve temporary or permanent acquisition of right-of-way?	☐	☐	☒
2. * Will the project result in the temporary or permanent displacement of persons or businesses?	☐	☒	☐

Railroads

	Yes	No	Unknown
3. Will the project involve work on or adjacent to railroad-owned property?	☐	☒	☐

Utilities

	Yes	No	Unknown
4. Will the project involve substantial impact to or relocation of existing reimbursable utilities that could create a disruption to service or additional environmental impacts??	☐	☒	☐

RIGHT OF WAY IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

While the replacement ramp would occupy a footprint larger than the existing stair connector, it is assumed the bridge and esplanade connection points would be in the vicinity as the existing connection points. If the ramp termini does shift it is not expected to result in additional ROW impacts.

Estimated Traffic/Transportation Impacts

	CURRENT ADT	FUTURE ADT	Unknown	N/A
5. What are the current and future ADT volumes for the project?	35,000	34,000	☐	☐

TRAFFIC/TRANSPORTATION COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

The current ADT across the Burnside Bridge is approximately 35,000 vehicles and is expected to decline to 34,000 ADT by 2045. As proposed, the improved bicycle and pedestrian access from the Eastbank Esplanade to the Burnside Bridge would not impact the current or future ADT of Burnside Street.

Estimated Land Use Impacts

6. Is the project outside of an Urban Growth Boundary?	☐ Yes	☒ No	☐ Partially
7. If the project is outside the UGB, is it expected to require new right-of-way?	☐ Yes	☐ No	☒ N/A
8. If the project is outside the UGB, is the project allowed, or conditionally allowed, by the rules for Transportation Planning on Rural Lands (OAR 660-012-0065)?	☐ Yes	☐ No	☒ N/A
9. Region Planner's opinion that the project conforms with:			
a. Transportation Planning Rule	☒ Yes	☐ No	
b. * Statewide Planning Goals	☒ Yes	☐ No	
c. Comprehensive Plan and/or Transportation System Improvement Plan (city, county or both)	☒ Yes	☐ No	
10. Is the project located within the Oregon Coastal Zone?	☐ Yes	☒ No	
11. Will areas of Forest or Exclusive Farm Use (EFU), or Open Space Reserve zoning be impacted by the project?	☐ Yes	☒ No	
12. Will the project result in the conversion of prime farmland, unique farmland, or land of statewide or local importance by the Farmland Protection Policy Act?	☐ Yes	☒ No	

13. What are the general uses of land adjacent to the project area?	☒ Residential ☒ Commercial ☐ Farm/Forest ☒ Public ☐ Other (explain below)

LAND USE IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)
Consistent with the City of Portland land use goals, the project would improve connectivity to the Willamette River and the Eastbank Esplanade. The ramp would be developed within the River Zone and would be required to demonstrate compliance with the City of Portland Title 33 Planning and Zoning City Code.

Estimated Socioeconomic Impacts

14. * Will the project involve displacements of key businesses, business districts, commercial/ industrial areas, or public facilities?	☐ Yes ☒ No ☐ Unknown
15. * Will the project involve temporary or permanent changes to travel patterns, access to goods/ services, or parking that appear important to business, business districts, commercial/ industrial areas, community events, or neighborhoods? (Explain below)	☐ Yes ☒ No ☐ Unknown
16. Will the project divide or disrupt an established community, or affect neighborhood character or stability?	☐ Yes ☒ No ☐ Unknown
17. Will the project temporarily or permanently affect emergency and/or public services?	☐ Yes ☐ No ☒ Unknown
18. Does visual inspection and/or information sources such as census data indicate the presence of low-income or minority populations within or near the project area?	☒ Yes ☐ No
19. Does visual inspection and/or other information sources indicate the presence of elderly, handicapped, or transit-dependent populations?	☒ Yes ☐ No

SOCIOECONOMIC IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)
There are known low-income populations and low income service providers on the west side of the Burnside Bridge, the opposite side of the Willamette River from where the ramp is proposed. The construction of the ramp is unlikely to impact those populations and providers. The project falls within Census Tract 21, which has a low income population of 39%, approximately 11% higher than the reported Multnomah County reported low-income population. The minority population of Tract 21 is 23%, 8% percent lower than the reported minority population of Multnomah County. Construction of the ramp may require temporary disruption of traffic along Burnside Street, but those disruptions are expected to be short in duration and traffic would either be accommodated through temporary traffic control measures or temporary diversions to other Willamette River crossings. The project should coordinate any closures or detours with emergency services located immediately east of I-5

Estimated Water Resources and Wetlands Impacts

Stormwater

20. Will the project trigger the need for stormwater treatment?	☐ Yes ☐ No ☒ Unknown

Waters of the U.S./State

21. Are there waters of the U.S. or State within the project area? (If no, skip to Question 30)	☒ Yes ☐ No
22.* Is the project within a FEMA 100-year flood plain?	☒ Yes ☐ No
23.* Is the project within a FEMA regulated floodway?	☒ Yes ☐ No
24. Will the project occur in or over publically owned submerged or submersible lands?	☒ Yes ☐ No ☐ Unknown
25.* Will the project require a new USCG Bridge Permit?	☐ Yes ☐ No ☒ Unknown
26. Will the project require modification to an existing USCG Bridge Permit or Temporary Rule Change?	☐ Yes ☐ No ☒ Unknown
27. Will there be any fill or removal from waters of the U.S. or state?	☒ Yes ☐ No ☐ Unknown
28. Will fill or removal take place in waters of the State listed by DSL as Essential Salmonid Habitat?	☒ Yes ☐ No ☐ N/A
29. Will fill or removal take place in waters of the State that are Aquatic Resources of Special Concern?	☐ Yes ☒ No ☐ N/A

Water Supply Wells

30. Will any active wells be impacted by the project?	☐ Yes ☒ No ☐ Unknown

Wetlands

31. Are wetlands potentially present in the project area?	☐ Yes ☒ No

32. Do soil surveys indicate hydric soils in the project area?	☐ Yes ☒ No
33. Is wetland vegetation evident from visual inspection?	☐ Yes ☒ No
34. Will the project fill or remove material from wetlands?	☐ Yes ☒ No ☐ Unknown
35. * Will the project require an Individual Permit, Nationwide Permit, General Authorization or General Permit?	☒ Yes ☐ No ☐ Unknown

WATER RESOURCES AND WETLANDS IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

The project will provide a new connection between the Burnside Bridge and the floating Eastbank Esplanade. The new connection will likely require foundations and supports founded within the OHW of the Willamette River. There are no other wetlands or waterbodies that would impacted by the project. The new ramp connection would include elements within the regulated floodway of the Willamette River. Additional evaluation is required to determine if the project would result in an increase in the regulatory floodway elevation. The project would need to adhere to the City of Portland no net fill floodplain development standards.

Estimated Biological Resources Impacts

Threatened, Endangered and/or Sensitive Species

36. Does the project have the potential to affect migratory birds and/or bats?	☒ Yes ☐ No
37. Are there USFWS T&E species, Proposed species, or critical habitat in the project's area of potential impact?	☐ Yes ☒ No
38. Are there NMFS T&E species, Proposed species, or critical habitat in the project's area of potential impact?	☒ Yes ☐ No
39. Are there State T&E or Proposed species present that are not federally listed?	☐ Yes ☒ No
40. Is the project located on or adjacent to BLM or USFS land?	☐ Yes ☒ No
41.* Will the project require an individual project-level formal consultation under Section 7 of the Endangered Species Act?	☐ Yes ☒ No ☐ Unknown

In-Water Work

42. Are any streams or water bodies potentially impacted by the project?	☒ Yes ☐ No
43. Will the project require in-water work?	☒ Yes ☐ No ☐ Unknown

Fish Passage

44. Will the project trigger the Oregon State Fish Passage Statute (ORS 509.585)?	☒ Yes ☐ No ☐ Unknown
45. Are there any culverts within the project limits that are on the ODFW priority list for replacement/retrofit?	☐ Yes ☒ No

Wildlife Passage

46. Is the project within a wildlife collision hot spot, priority wildlife linkage area, or an area otherwise known to be a barrier to wildlife passage?	☐ Yes ☒ No

Noxious Weeds

47. Are there known noxious weed populations in the project area?	☐ Yes ☒ No

BIOLOGICAL RESOURCES IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

The project will impact the Lower Willamette River. The Lower Willamette River is known to contain the following ESA listed species: Chinook salmon, Coho Salmon, Upper Willamette Steelhead, Eulachon, and Green sturgeon. The project will require coverage for take of ESA listed species. To minimize effects, the project should complete all in water work during the in water work window.

Construction of elements below the bankfull width of the Willamette River will also require ODFW concurrence of a fish passage plan.

Marine mammals are known to use this section of the Willamette River. While there are no haul outs in proximity to the proposed construction, in water construction activities could result in harm if appropriate minimization measures are not included in the project (for example, stopping in water work activities when a marine mammal comes within 100 feet of the work area). The project should develop and implement a plan that will avoid harm to marine mammals.

Estimated Cultural Resources Impacts

Archaeological Resources

48. Are there known archaeological sites in the project area?	☐ Yes ☒ No ☐ Unknown
49. Will the project entail disturbance of previously undisturbed ground?	☐ Yes ☒ No ☐ Unknown

50. Will archaeologically sensitive areas (confluence of rivers, headlands, coves, overlooks, etc.) be affected?	☒ Yes ☐ No
51. If the project is on or adjacent to BLM or USFS land, does contact with BLM or USFS archaeologist indicate any issues?	☐ Yes ☐ No ☒ N/A

Historic resources (Built)

52. Does the SHPO historic database list any resources in the project area?	☒ Yes ☐ No ☐ Unknown
53. Will there be any impacts to known historic resources (either listed or determined eligible for listing in the National Register of Historic Places)?	☐ Yes ☒ No ☐ Unknown
54. Does any city/county comprehensive plan list any buildings/items in the project area as Goal 5 resources?	☐ Yes ☒ No ☐ Unknown
55. Are any buildings in the project area thought to be 50 years old or older?	☒ Yes ☐ No
56. Are there any apparent/unique structures of potential historical interest?	☒ Yes ☐ No

Section 4(f)

57. * Could the project impact any archaeological or historic resources eligible for protection under Section 4(f) of the Department of Transportation Act?	☐ Yes ☒ No ☐ Unknown

CULTURAL RESOURCES IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

The Burnside Bridge is listed on the National Register of Historic Places; however, the bridge is expected to be replaced with the construction of the Earthquake Ready Burnside Project. There are no other historic resources within the anticipated area of potential impact. The project area overlaps with the API of the Earthquake Ready Burnside Project (EQRB). Archaeological research completed for EQRB did not include any "Areas with Archaeological Potential" within the anticipated API of this project.

Estimated Parks / Recreation and Visual Impacts

Parks/Recreation Areas

58. * Could the project impact any parks, recreation areas, or wildlife/waterfowl refuges eligible for protection under Section 4(f) of the Department of Transportation Act?	☒ Yes ☐ No ☐ Unknown
59. Could the project cause a Section 6(f) conversion or temporary occupancy of park or recreation area property encumbered by Land and Water Conservation funds?	☐ Yes ☒ No ☐ Unknown

Wild and Scenic Rivers

60. Is the project area within ¼ mile of the bank of an Oregon Scenic Waterway?	☐ Yes ☒ No
61. * Will the project affect waterways designated as National Wild and Scenic Rivers?	☐ Yes ☒ No

Visual

62. Will the project involve any potential triggers for visual impact analysis?	☐ Yes ☒ No ☐ Unknown

PARKS / RECREATION AND VISUAL IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

The ramp will connect the Eastbank Esplanade with the Burnside Bridge. The Eastbank Esplanade has been determined to be a 4(f) resource. Short term closures of the Eastbank Esplanade will likely be required to connect the ramp to the esplanade and construct overhead elements of the ramp. The duration of these closures are unknown and it is not clear if they would result in a de minimis ore greater impact to the esplanade. There are no Land and Water Conservation Grants for any projects within the API.

Estimated Air Quality and Noise Impacts

Air Quality

63. Is the project in an air quality nonattainment or maintenance area?	☐ Yes ☒ No
64. Is the project type exempt from conformity or Mobile Source Air Toxic analysis (MSAT)? (If yes, skip to Question 69)	☒ Yes ☐ No

Noise

70. Are noise-sensitive land-uses present within 500 feet of the project roadway?	☒ Yes ☐ No
71. Does the project require a noise analysis?	☐ Yes ☒ No ☐ Unknown
72. Does the project qualify for a screening analysis?	☐ Yes ☐ No ☐ Unknown ☒ N/A

AIR QUALITY AND NOISE IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

The project will not result in a horizontal or vertical shift of the roadway. It will construct a bike and pedestian accessible ramp that connects the roadway to an existing trail network. This project will not trigger the need to conduct a noise analysis

Estimated Hazardous Materials / Waste Impacts

73. Does the project involve right-of-way acquisition or subsurface disturbance (e.g., excavation or drilling)? (If no, skip to Question 76)	☒ Yes ☐ No
74. Does a search of DEQ databases (LUST, UST or ECSI) indicate the presence of any potentially contaminated sites within or adjacent to the project area?	☒ Yes ☐ No
75. Does a search of the Oregon Fire Marshal's Hazardous Materials Incident database indicate any hazardous materials releases within the project area?	☐ Yes ☒ No
76. Are there known current or historical land uses within or adjacent to the project area that could possibly have involved the use or storage of hazardous materials?	☒ Yes ☐ No
77. Will the project include any structure (including buildings or bridges) demolition, repair, or removal of potentially hazardous materials (e.g., lighting or electrical equipment, hydraulic equipment, bridge mechanics, striping paint, bridge/barrier paint, treated timbers, etc.)?	☒ Yes ☐ No

HAZARDOUS MATERIALS / WASTE IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

The Burnside bridge is known to contain high levels of lead and suspected on containing asbestos material; however, the replacement of the Burnside bridge is expected to complete prior to this project. The upstream limits of the Portland Harbor Superfund Site is located at the Steel Bridge, approximately 0.3 miles downstream from the project area. Impacts to the Superfund site are not expected. River sediment samples from close proximity of the API were tested during the development of the EQRB Project. There were no indications of hazardous materials persent in any of the samples taken.

Estimated Geological / Geotechnical Impacts

Geological Resources/Geotechnical

78. Will an ODOT owned/permitted material source be offered for this project?	☐ Yes ☒ No ☐ Unknown
79. Will ODOT owned/permitted disposal sites be offered for this project?	☐ Yes ☒ No ☐ Unknown
80. If an ODOT owned/permitted disposal or material source site is being offered, has it been previously cleared to federal environmental standards?	☐ Yes ☐ No ☒ N/A
81. Is drilling/subsurface exploration anticipated?	☒ Yes ☐ No

GEOLOGICAL / GEOTECHNICAL IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

The ramp will likely be supported by foundations within the Willamette River. Additional subsurface explorations within the Willamette River is likely to support the design.

Stakeholder Concerns / Public Involvement

STAKEHOLDER CONCERNS / PUBLIC INVOLVEMENT COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

Key Environmental Issues and Requirements

KEY ENVIRONMENTAL ISSUES AND REQUIREMENTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

ESA Compliance via FAHP or SLOPES (pending federal nexus)
MMPA coordination will be required to develop an plan that would avoid harm or require IHA
Duration and extent of construction impacts need to be understood to determine 4(f) path
DSL/USACE (404 and maybe 408) permits will be required
Coordination with USCG will be required to determine if a Bridge Permit modification is necessary

Potentially Required Permits / Approvals / Clearances

82. Local Land Use	☒ Yes ☐ No ☐ Unknown
83. Local Agency Floodplain Permit	☒ Yes ☐ No ☐ Unknown
84. U.S. Corps of Engineers Section 404 and DEQ Section 401 Cert	☒ Yes ☐ No ☐ Unknown
85. U.S. Corps of Engineers Section 10	☐ Yes ☒ No ☐ Unknown
86. DSL Removal/Fill	☒ Yes ☐ No ☐ Unknown
87. U.S. Corps of Engineers Section 408 (federal facilities)	☐ Yes ☐ No ☒ Unknown
88. NPDES 1200-CA permit (or 1200-C permit for local agencies)	☒ Yes ☐ No ☐ Unknown
89. U.S. Coast Guard New Bridge Permit	☐ Yes ☐ No ☒ Unknown
90. U.S. Coast Guard Permit Modification	☐ Yes ☐ No ☒ Unknown
91. U.S. Coast Guard Construction Plan Approval	☒ Yes ☐ No ☐ Unknown
92. FAHP Programmatic BO	☒ Yes ☐ No ☐ Unknown

93. SLOPES Programmatic BO ☐ Yes ☒ No ☐ Unknown

94. Individual Biological Opinion ☐ Yes ☒ No ☐ Unknown

95. Marine Mammal Protection Act IHA ☐ Yes ☐ No ☒ Unknown

96. ODFW Fish Passage Plan Approval ☒ Yes ☐ No ☐ Unknown

97. State Endangered Species Act ☐ Yes ☒ No ☐ Unknown

98. No Effect Memo ☒ Yes ☐ No ☐ Unknown

99. Archaeological Excavation Permit ☐ Yes ☒ No ☐ Unknown

100. Section 106 – State Historic Preservation Officer (Historic–Built) ☒ Yes ☐ No ☐ Unknown

101. Section 106 – State Historic Preservation Officer (Archaeological) ☒ Yes ☐ No ☐ Unknown

102. Section 4(f) temporary occupancy ☐ Yes ☒ No ☐ Unknown

103. Section 4(f) *de minimis* ☒ Yes ☐ No ☐ Unknown

104. Section 4(f) Programmatic ☐ Yes ☒ No ☐ Unknown

105. Section 4(f) Evaluation – Individual ☐ Yes ☒ No ☐ Unknown

106. Section 6(f) Temporary Occupancy or Conversion ☐ Yes ☒ No ☐ Unknown

107. Wild and Scenic River Section 7 Determination ☐ Yes ☒ No ☐ Unknown

108. Oregon Scenic Waterways ☐ Yes ☒ No ☐ Unknown

109. FHWA Noise ☐ Yes ☒ No ☐ Unknown

110. * Air Conformity ☐ Yes ☒ No ☐ Unknown

111. Hazardous Materials Study ☒ Yes ☐ No ☐ Unknown

112. DOGAMI Permit ☐ Yes ☒ No ☐ Unknown

113. Other (specify):

114. Other (specify):

115. Other (specify):

116. Other (specify):

117. Other (specify):

118. Other (specify):

Preliminary NEPA Classification

Based upon the answers and content above, please answer the following questions:

23 CFR 771.117(a) – Would the project involve any of the following effects:

119. Induce significant impacts to planned growth or land use for an area? ☐ Yes ☒ No ☐ Unknown

120. Require relocation of significant numbers of people? ☐ Yes ☒ No ☐ Unknown

121. Have a significant impact on any natural, cultural, recreational, historic or other resources? ☐ Yes ☒ No ☐ Unknown

122. Involve significant air, noise, or water quality impacts? ☐ Yes ☒ No ☐ Unknown

123. Have significant impacts on travel patterns? ☐ Yes ☒ No ☐ Unknown

23 CFR 771.117(b) – Would the project involve unusual circumstances such as:

124. Significant environmental impacts? ☐ Yes ☒ No ☐ Unknown

125. Substantial controversy on environmental grounds? ☐ Yes ☒ No ☐ Unknown

126. Significant impacts to properties protected by Section 4(f) of the DOT Act or Section 106 of the National Historic Preservation Act? ☐ Yes ☒ No ☐ Unknown

127. Inconsistencies with any federal, state, or local law, requirements or administrative determination relating to the environmental aspects of the project? ☐ Yes ☒ No ☐ Unknown

Based upon questions 119-127 and the Environmental Prospectus responses, identify the project's preliminary NEPA class of action:

- ☐ Programmatic Categorical Exclusion (PCE)
- ☒ Documented Categorical Exclusion (CE)
- ☐ Environmental Assessment (EA)
- ☐ Environmental Impact Statement (EIS)

For preliminary PCEs and CEs, identify the up to three category(ies) of project work from the activities listed in CFR 771.117(c) and CFR771.117(d):

APPLICABLE CATEGORY	APPLICABLE CATEGORY	APPLICABLE CATEGORY
(c)(3)	(c)(23)	

Signatures

Digital signature/date are required from the preparer and/or ODOT REC.

PREPARER NAME AND TITLE	ODOT REC NAME AND TITLE
PREPARER DIGITAL SIGNATURE AND DATE	ODOT REC DIGITAL SIGNATURE AND DATE

Appendix D. 3D Ramp Connection Concept Graphics

Image 1: City Spiral Ramp Connection to the Burnside Bridge (Plan View)

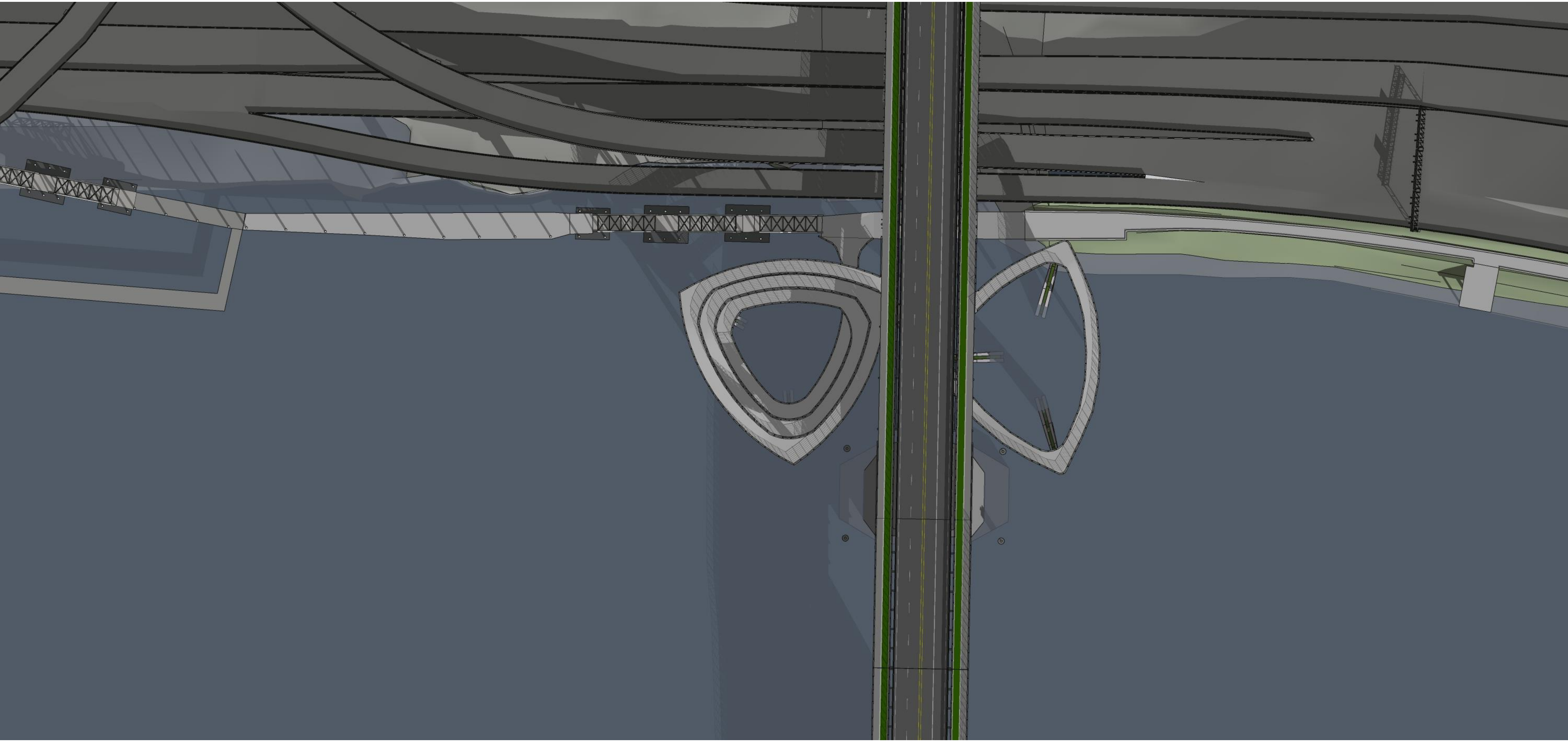


Image 2: City Spiral Ramp Connection to the Burnside Bridge (North Side Only) (Plan View)

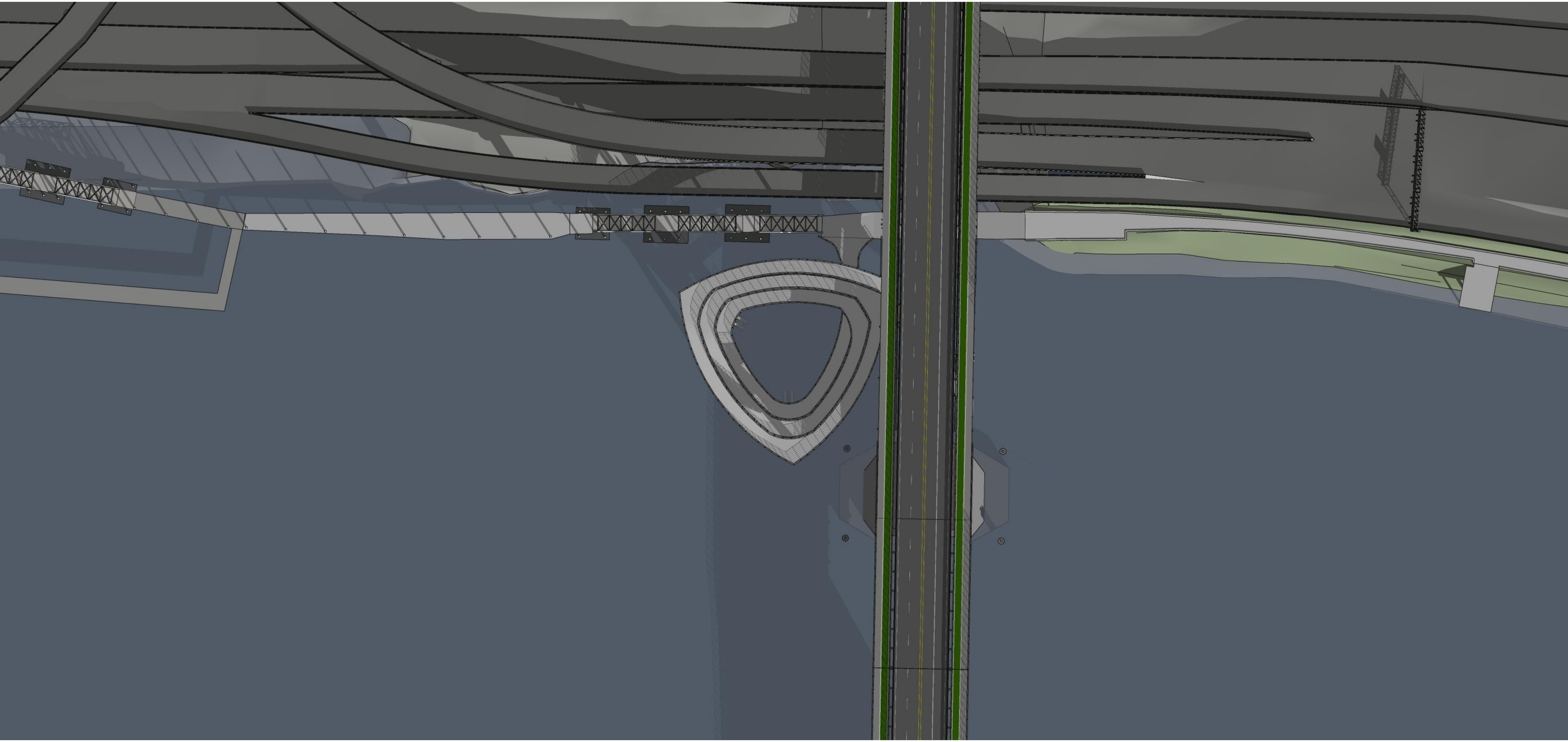


Image 3: City Spiral Ramp Connection to the Burnside Bridge (Isometric View Looking Southwest)

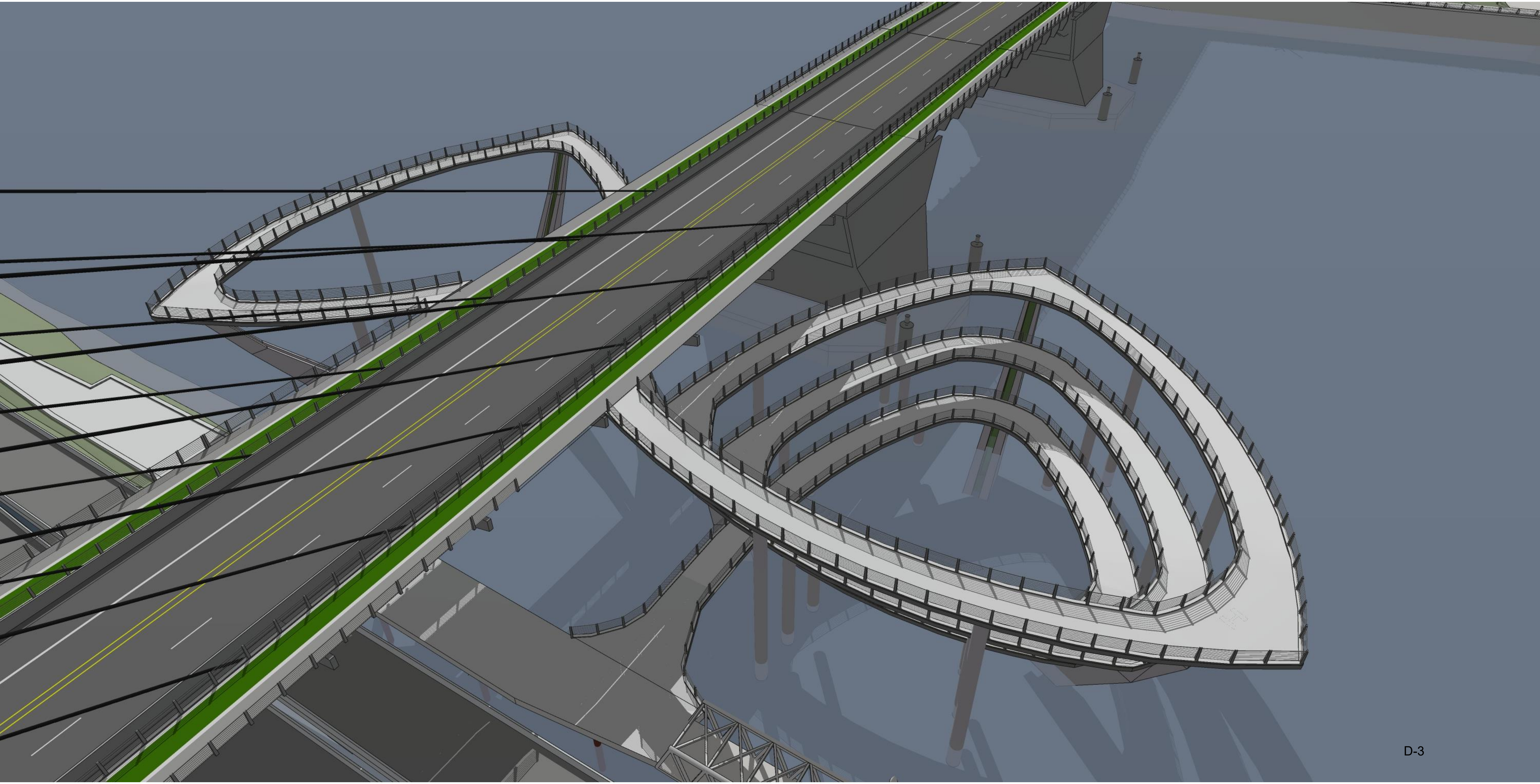


Image 4: City Spiral Ramp Connection to the Burnside Bridge (Elevation View Looking South)

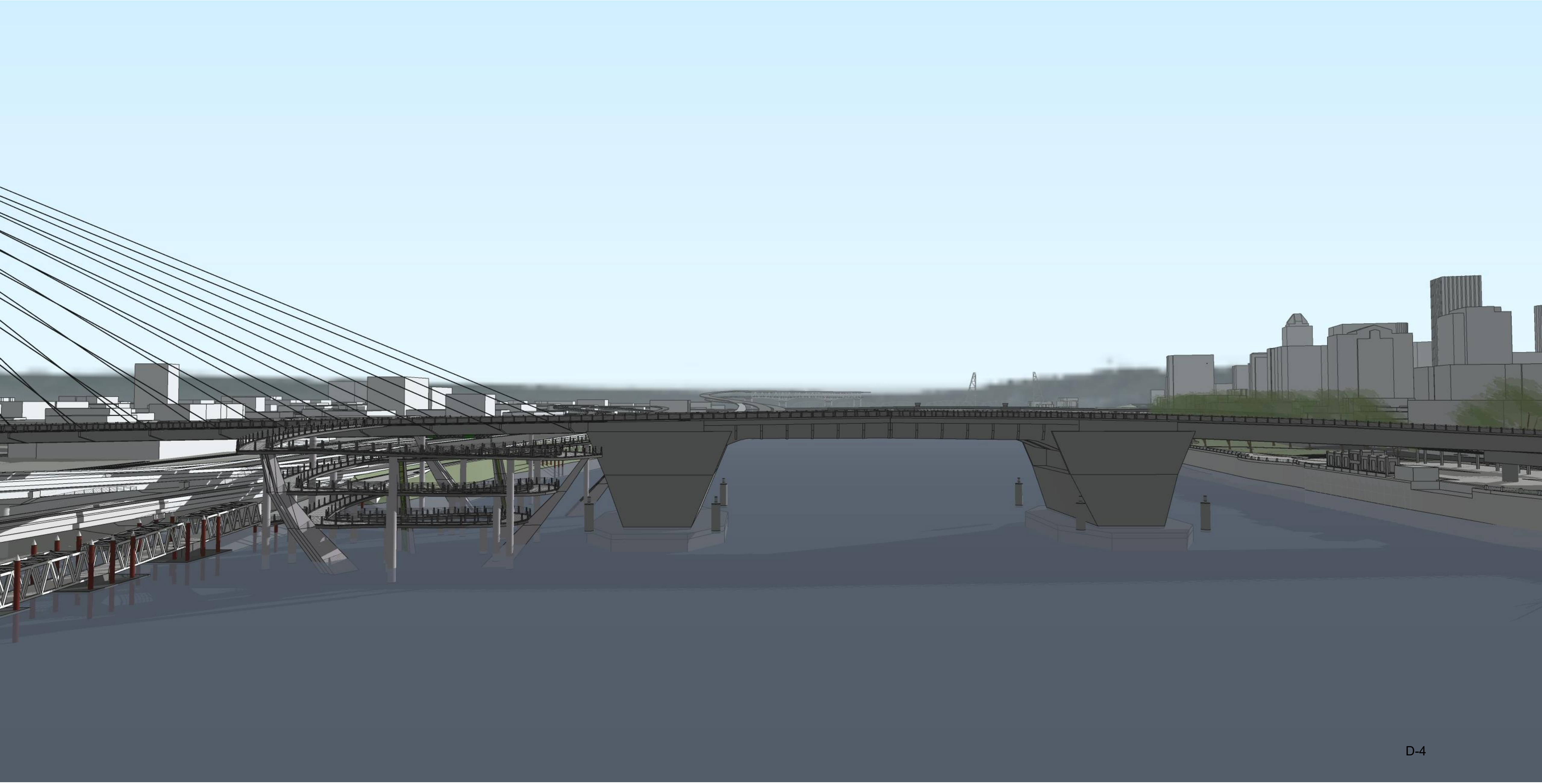


Image 5: City Spiral Ramp Connection to the Burnside Bridge (Elevation View Looking North)

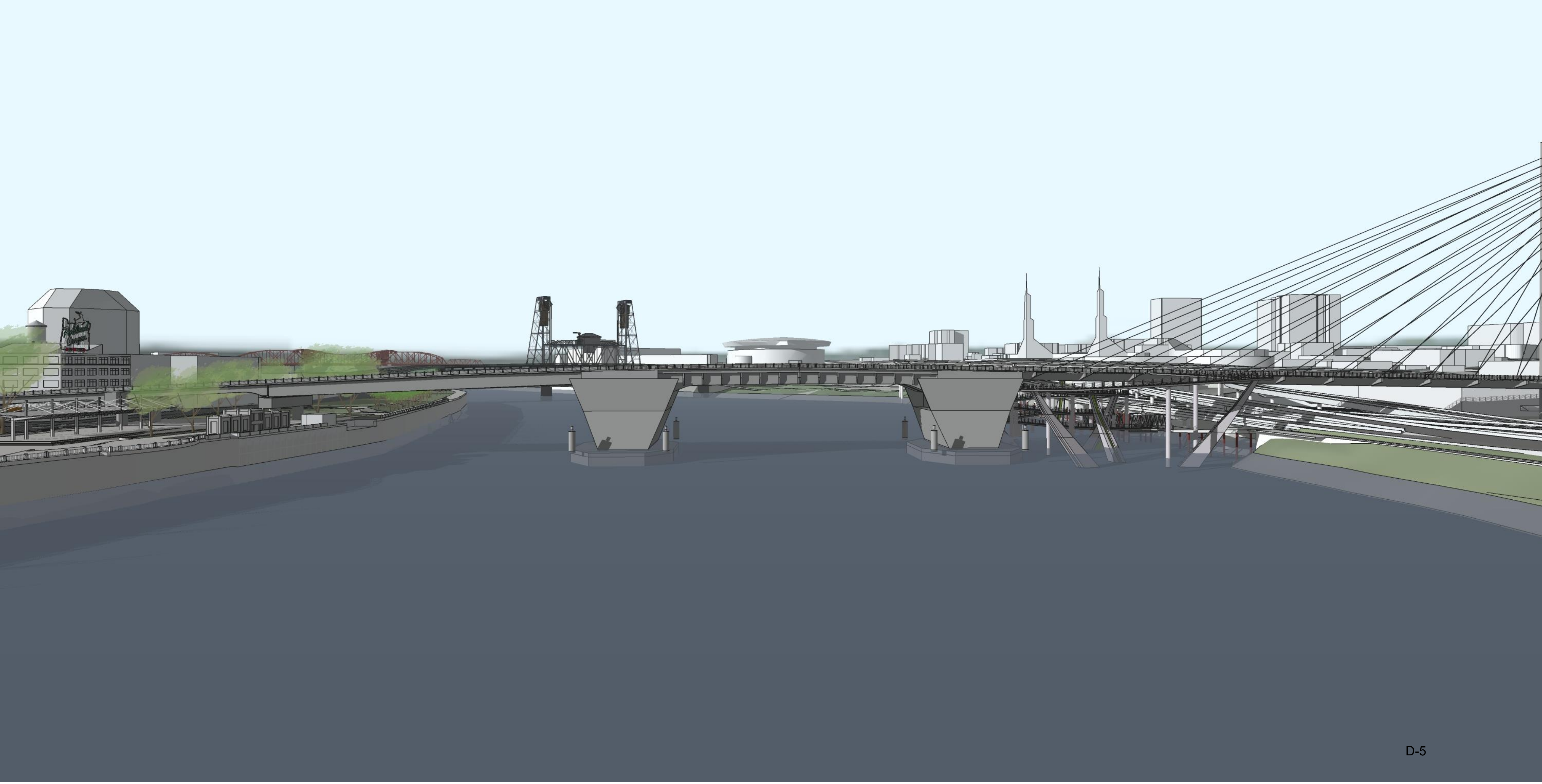


Image 6: City Spiral Ramp Connection to the Burnside Bridge (Elevation View Looking Southeast)

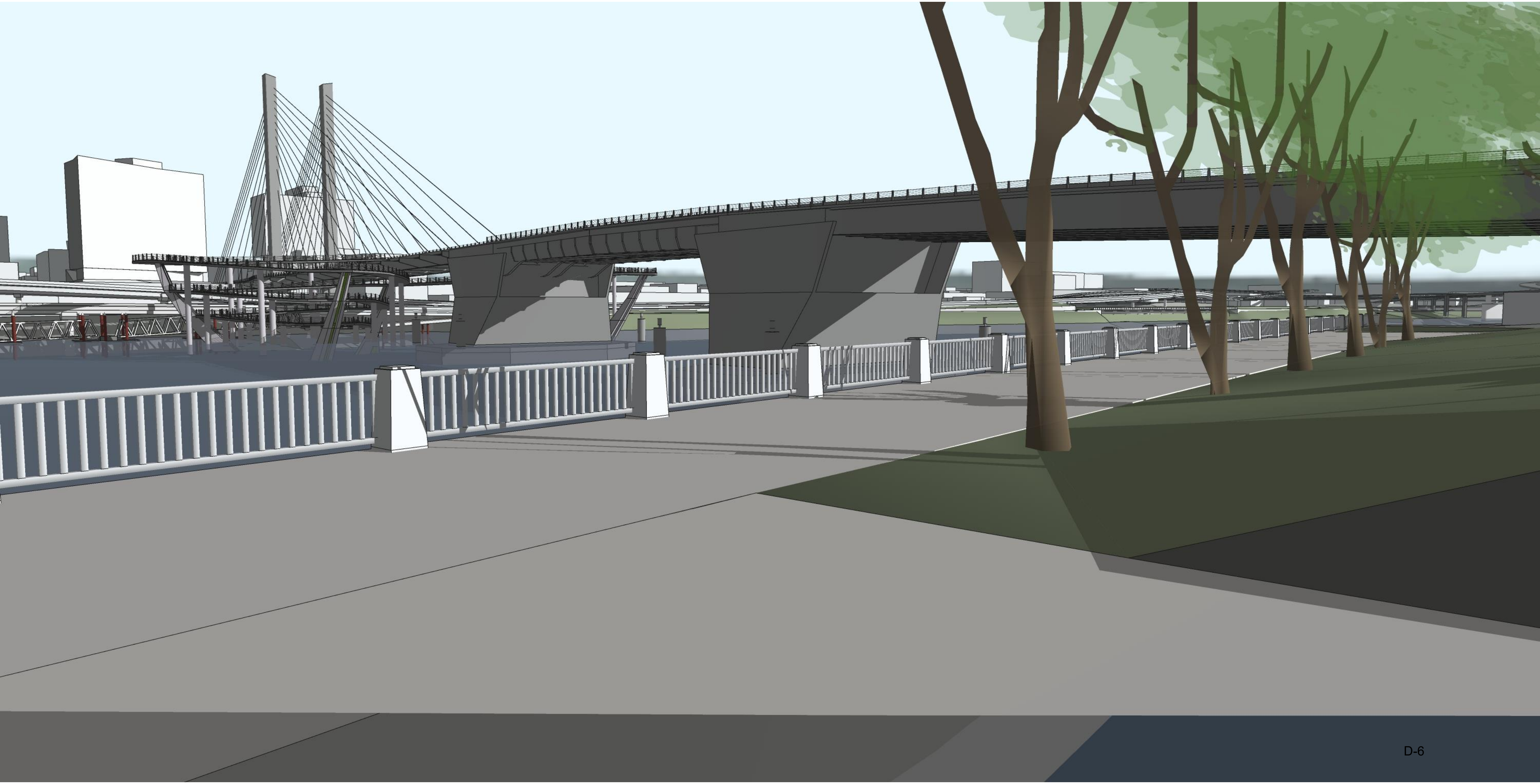


Image 7: City Spiral Ramp Connection (South-side Elevation View Looking North)

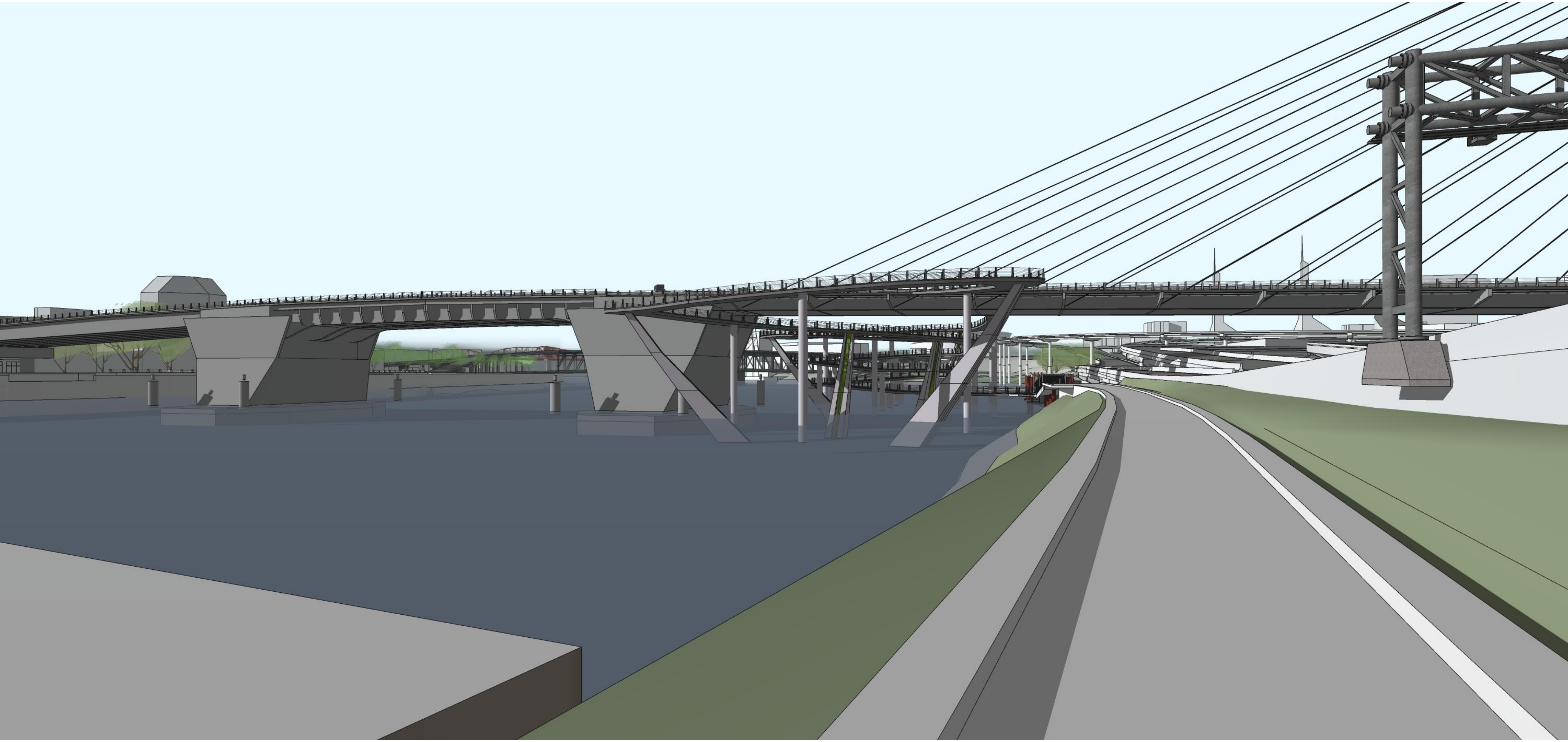


Image 8: City Spiral Ramp Connection under the Burnside Bridge (Elevation View Looking North)

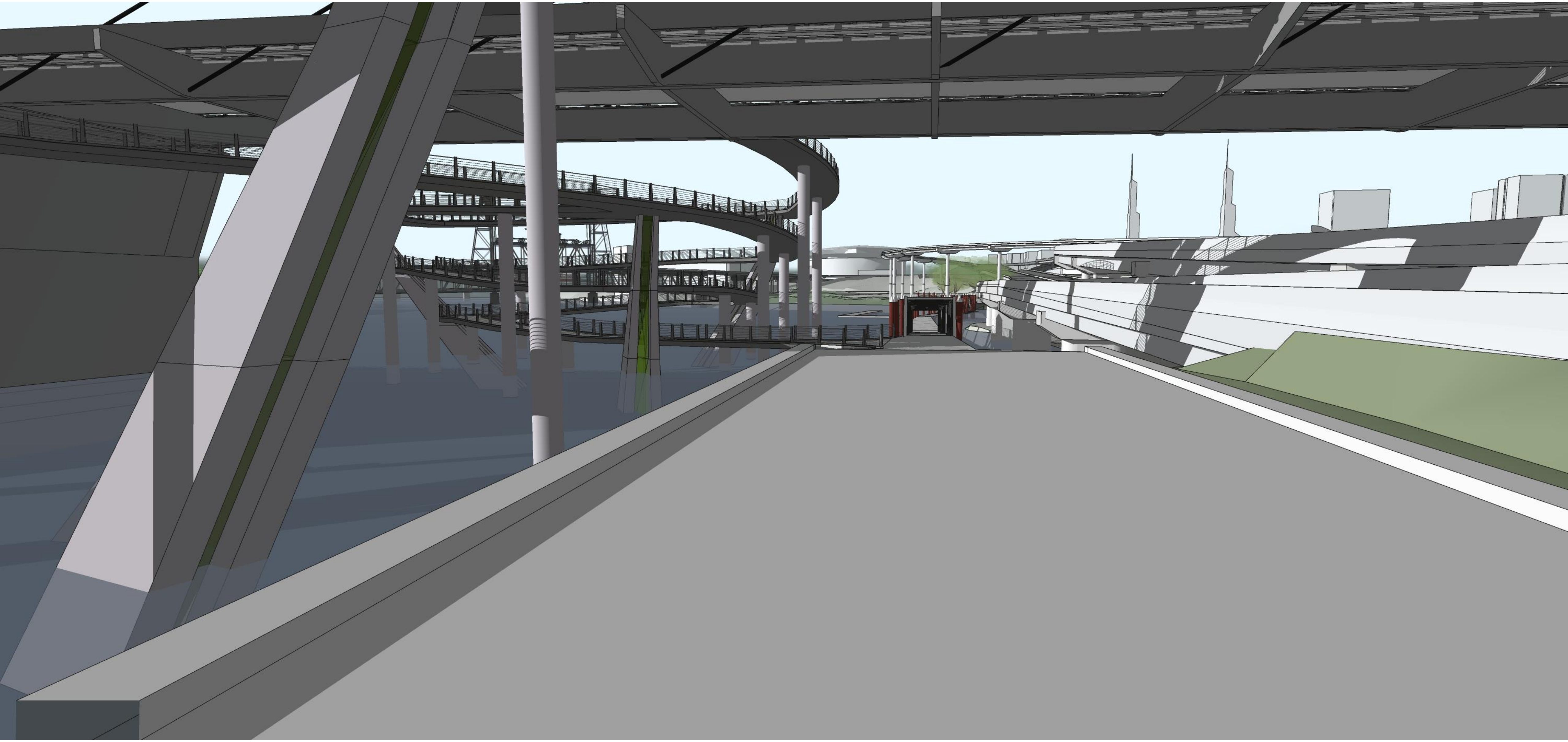


Image 9: City Spiral Ramp Connection from Eastbank Esplanade (Elevation View Looking South)

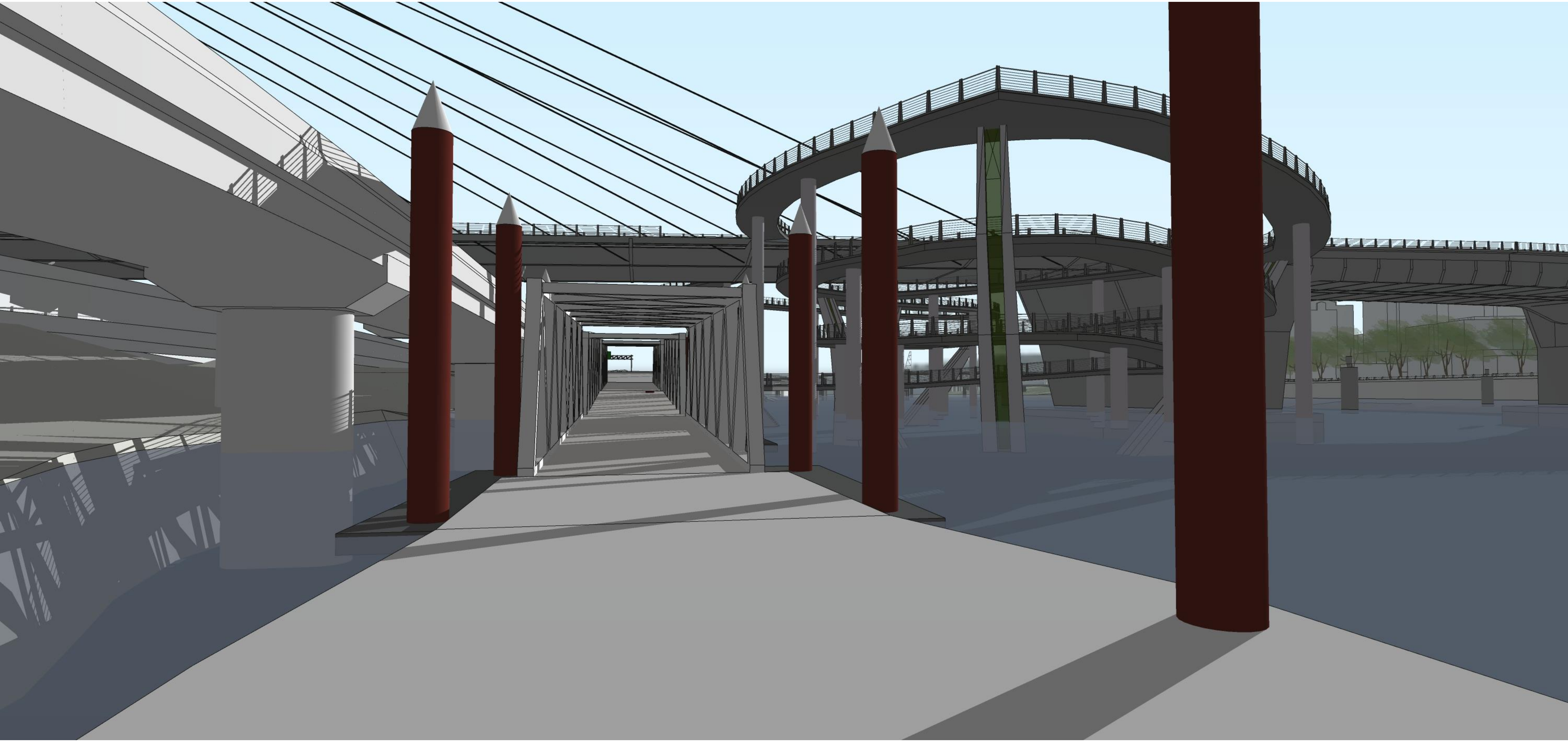


Image 10: City Spiral Ramp Connection under the Burnside Bridge (Elevation View Looking South)

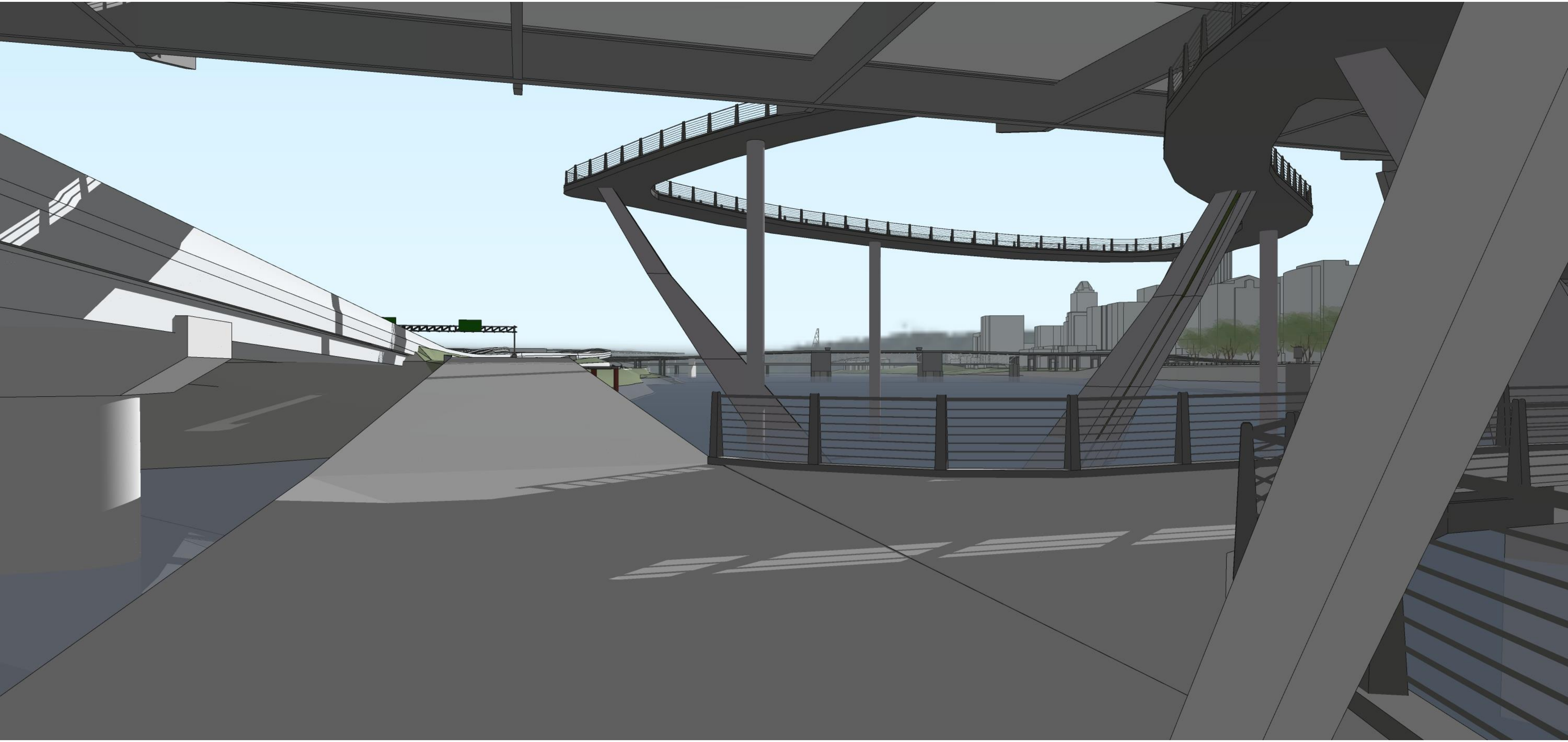


Image 11: City Ramp Connection from under the Burnside Bridge (Elevation View Looking North)

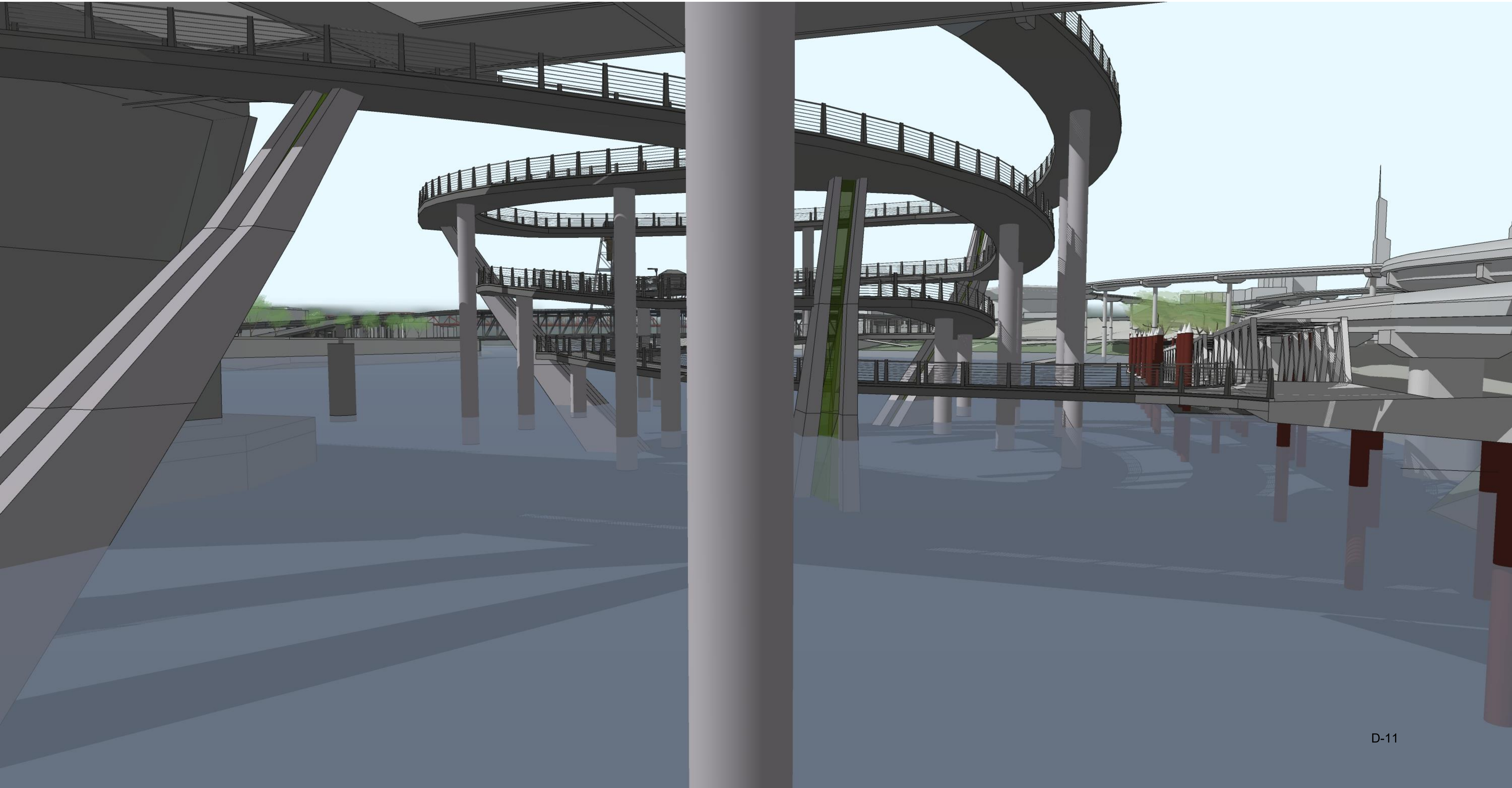


Image 12: City Spiral Ramp Connection from on top of the Burnside Bridge (View Looking North)

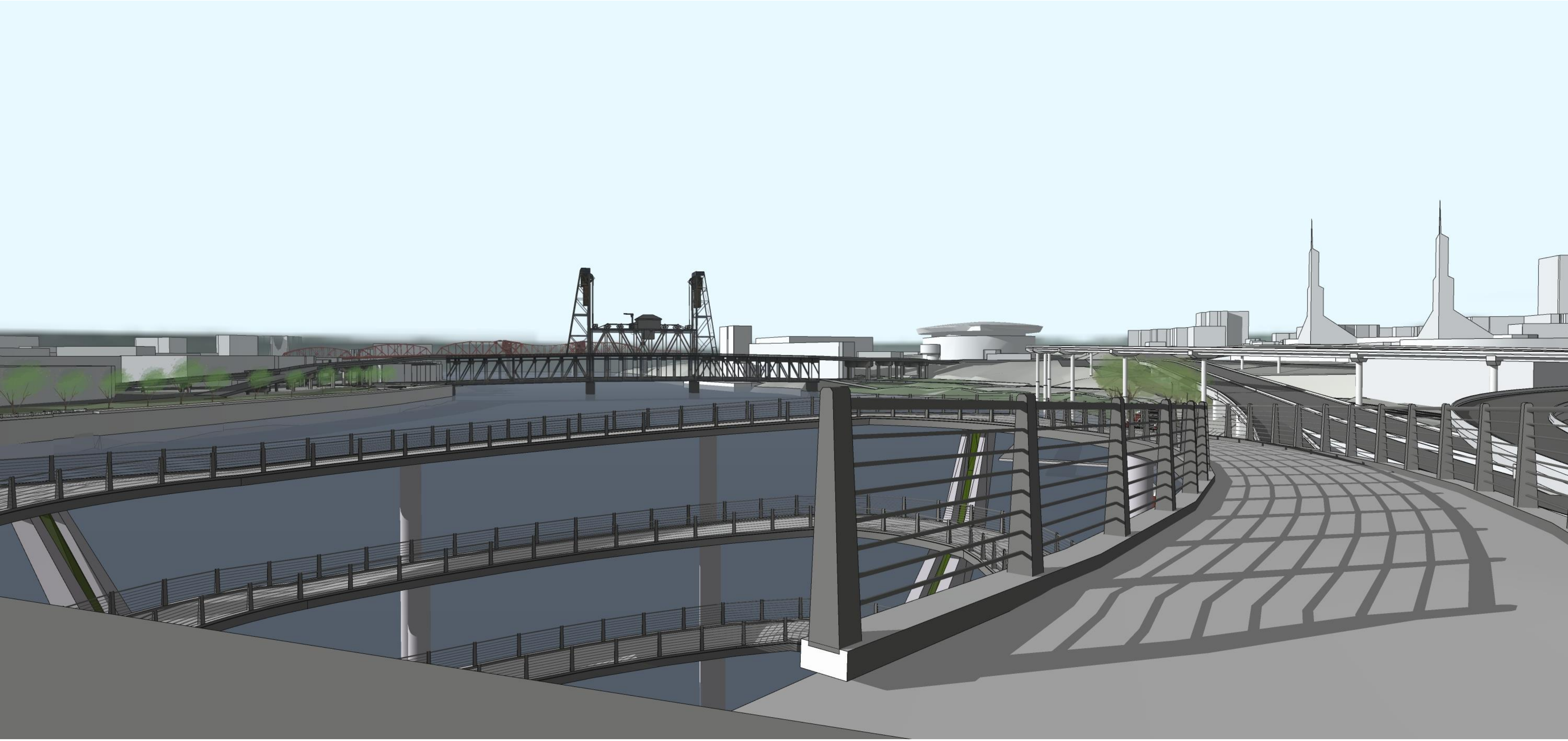
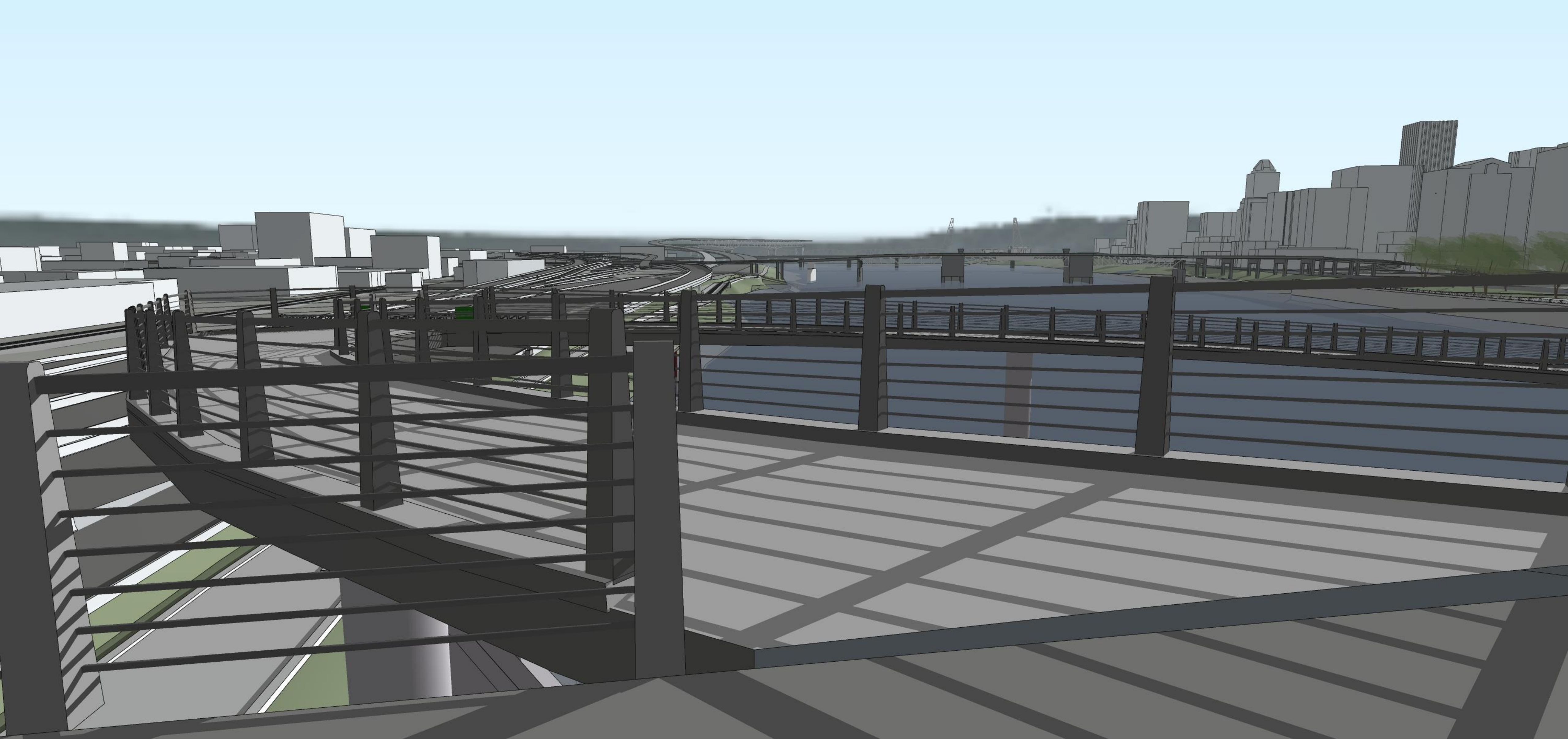


Image 13: City Spiral Ramp Connection from on top of the Burnside Bridge (View Looking South)



Appendix E. Stakeholder Meetings List

The following Stakeholders Meetings were conducted to support the development of this Report:

- 5/24/23 – Technical Coordination Kickoff Meeting #1
- 5/30/23 – Technical Coordination Kickoff Meeting #2
- 5/31/23 – USCG Coordination Meeting
- 6/21/23 – PBOT / PBEM Coordination Meeting
- 7/12/23 – Joint Technical / Senior Leadership Team Coordination Meeting
- 8/8/23 – EQRB Bike-Ped Connectivity Meeting #1
- 8/9/23 – Technical Coordination (Data Needs) Meeting
- 8/15/23 – Ramp Environmental Impacts and Permitting Meeting
- 8/17/23 – TriMet Coordination Meeting
- 8/22/23 – Ramp Cost Estimate Meeting
- 8/28/23 – Technical Coordination (Cross Section Focus) Meeting
- 8/29/23 – Portland Streetcar Coordination Meeting
- 9/9/23 – EQRB Bike-Ped Connectivity Meeting #2
- 9/11/23 – County Bridge Maintenance Meeting
- 9/14/23 – ODOT Bridge Inspection (John Fickett) Meeting
- 9/20/23 – Technical Team (Ramp Connection Focus) Meeting
- 9/27/23 – Technical Team (Cross Section Focus) Meeting

The following Stakeholders coordination was conducted to support the development of this Report:

- Parks / PBOT (by PBOT)
- Portland Freight (by PBOT)
- Portland Fire and Rescue (by PBOT)
- Multnomah County Office of Emergency Management (by County)