Chapter 2

Project Alternatives

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Multnomah County

2 Project Alternatives

2.1 Overview of the Process Used to Identify and Narrow Alternatives and Options

This chapter describes the alternatives evaluated in this Draft EIS and summarizes how they were identified and refined through planning studies and scoping processes.

2.1.1 Multnomah County Bridges Capital Improvement Plan and EQRB Feasibility Study

In 2015, the *Multnomah County Willamette River Bridges Capital Improvement Plan (2015–2034)* prioritized creating a Burnside Street river crossing that can withstand a major earthquake (Multnomah County 2015). The adoption of the improvement plan led to the EQRB Feasibility Study which was initiated in fall 2016. That study is documented in the *EQRB Feasibility Study Report* (Multnomah County 2018).

During the feasibility study, 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. The feasibility study investigated:

- Preservation alternatives that would implement standard preservation and maintenance to the existing bridge but that would not involve seismic retrofit work.
- Seismic retrofit alternatives that would modify the existing bridge to make it more resistant to seismic activity.
- Replacement alternatives that would replace the existing bridge with a new bridge or tunnel.
- Enhanced seismic retrofit alternatives that would replace some sections of the existing bridge and retrofit all others.
- Enhancing another bridge (other than the Burnside Bridge) where traffic would be rerouted after a major earthquake.

The project team evaluated the long list of potential alternatives against screening criteria that reflected the Project's problem statement, stakeholder input, and technical considerations. The results were presented to project committees for feedback and were shared publicly through online events and in-person open houses. This process led to the recommendation to advance four bridge alternatives for further study:

- Enhanced Seismic Retrofit – Replace some bridge elements, such as the section over the I-5/I-84 corridor and railroad tracks, and upgrade the other bridge elements to meet current seismic standards.
- Replacement: Fixed Bridge – Build a new fixed (no movable parts) bridge with a maximum clearance of 97 feet over the navigation channel (based on additional information, the maximum vertical clearance needed was revised to 147 feet). The new bridge would not open so it would need to be high enough to allow ships to pass. To achieve acceptable roadway grades (or how steep the roadway is), the west landing of such a bridge would touch down about three blocks farther west than the current bridge, near NW 5th Avenue.
- Replacement: Movable Bridge – Build a new bridge with a movable span (to let ships pass) at approximately the same height and location as the current bridge.

- Replacement: Movable Bridge, NE Connection – Build a new bridge with a movable span at approximately the same height as the current bridge. Couch Street would be extended westward over the water and connect to the main bridge before the movable span to create a split bridge east of the movable span.

The draft *Feasibility Study Report* was made available to the public and project stakeholders during the month of September 2018 for review and comment at in-person and online open houses and on the project website. The feasibility study was completed in November 2018 after public and agency comments were received, and the draft EQRB Project Purpose and Need and range of alternatives were endorsed by the Project's Policy Group and adopted by the Multnomah County Board of Commissioners for further study prior to initiating the Draft EIS process.

2.1.2 Informal Scoping and Screening

Following the feasibility study, the project team conducted additional analysis and gathered stakeholder input to further evaluate, test, and refine the recommended alternatives prior to initiating an EIS. This "informal scoping" was conducted in compliance with:

- NEPA requirements
- Executive Order (E.O.) 13807 on Establishing Discipline, Accountability in the Environmental Review and Permitting Process for Infrastructure (August 2017)[1]
- One Federal Decision Memorandum of Understanding (MOU) on implementing E.O. 13807 (April 2018)[2]
- Integration of Planning and Environmental Review (23 U.S.C. Section 168 as amended by the FAST Act), and FHWA guidance on Planning and Environment linkages (November 2016)[3]
- FHWA guidance for planning "major infrastructure projects" consistent with the E.O. 13807 and the One Federal Decision MOU (October 2018)[4]

Planning and Environment Linkages (PEL) is a collaborative and integrated approach to decision-making that engages the public, agencies, and tribes and considers environmental, community, and economic goals early in the planning process and continues through project development and delivery. Integrating these considerations and engaging stakeholders and agencies before formally initiating NEPA, as well as through the NEPA process, can result in a project that better incorporates multiple interests and objectives, while also reducing redundancy and the duration of the project development process. It focuses mainly on pre-Notice of Intent (NOI) activities and outlines how agencies can conduct planning-phase analyses and make planning-phase decisions that they can use in the subsequent environmental review phase. It lays out various requirements including notification and timing with an emphasis on public and agency involvement.

The PEL approach developed for the EQRB Project followed 23 U.S.C. 168 and 23 U.S.C. 139(f)(4)(E) to screen alternatives, eliminate unreasonable alternatives and eliminate alternatives from detailed analysis before formally starting the EIS. The PEL approach also helps implement requirements of E.O. 13807, such as the goal to complete the EIS process in not more than 2 years. To ensure compliance with the E.O. and to secure the benefits of linking planning and NEPA, the project team developed a PEL strategy to guide

[1] https://www.whitehouse.gov/presidential-actions/presidential-executive-order-establishing-discipline-accountability-environmental-review-permitting-process-infrastructure/

[2] https://www.whitehouse.gov/wp-content/uploads/2018/04/MOU-One-Federal-Decision-m-18-13-Part-2-1.pdf

[3] https://www.fhwa.dot.gov/hep/guidance/pel/pelqa2016.pdf

[4] https://www.environment.fhwa.dot.gov/nepa/oneFederal_pre-NOI.aspx

informal scoping work. This strategy, including a summary of progress through the NOI and formal scoping, is included as Attachment N to this Draft EIS.

Analysis and input during informal scoping led to further revisions to the range of alternatives:

- The High Fixed Bridge was dropped from further consideration to avoid the added impacts and costs of this alternative and because it could not reasonably meet the US Coast Guard vertical clearance requirements.
- Further geotechnical analysis clarified a heightened risk of seismic damage to any bridge piers[5] located within deep, liquefiable soils located near both the east and west banks of the river. This led to the development of a "long-span" alternative that would use above deck structure (such as a tied-arch or cable-stayed design) to allow much greater distance between bridge piers so as to minimize locating piers within those zones.
- Agency and stakeholder input influenced the development and location of pedestrian, bicycle, and Americans with Disabilities Act (ADA)–accessible connections at both the east and west ends of the bridge.
- Input from social services agencies influenced revisions to the west bridge abutment location so that the replacement alternatives could avoid blocking essential access doors to the Portland Rescue Mission during construction.
- During the feasibility study, the project team identified a high probability that the alternatives being considered would demolish a popular skatepark located under the east approach of the Burnside Bridge. During informal scoping, skatepark users requested that mitigation be considered. The project team also identified the skatepark as likely eligible for listing on the National Register of Historic Places. Through refined design and construction approaches, three of the four build alternatives to be studied in the EIS would be able to preserve the skatepark.

2.2 Alternatives Carried Forward to the Draft EIS

This Draft EIS evaluates a No-Build Alternative and four build alternatives including the Enhanced Seismic Retrofit Alternative and three replacement alternatives. For all the build alternatives, this Draft EIS also evaluates four different options for managing cross-river traffic during construction.

2.2.1 No-Build Alternative

The No-Build Alternative assumes that all other programmed and planned projects move forward, but that the Burnside Bridge would remain seismically vulnerable. Because the Project is intended to serve two very different, reasonably foreseeable future conditions (i.e., both before and after the next CSZ earthquake), the No-Build Alternative is similarly defined in two scenarios: no-build conditions prior to the next major earthquake and no-build conditions after the next major earthquake.

For the pre-earthquake scenario, the focus of the analysis is on daily traffic and active transportation operations, whereas the post-earthquake scenario analyzes how the existing Burnside Bridge would affect emergency response and recovery after the next CSZ earthquake. The following outlines the fundamental assumptions behind the two No-Build Alternative scenarios.

[5] Pier (aka, bent) – An intermediate vertical support under a bridge, made up of one or more columns connected at their top-most ends by a cap, strut, or other member. A pier is sometimes differentiated from a bent by the number of columns (one vs. more than one, respectively).

No-Build Pre-Earthquake

The No-Build Alternative includes future projects and anticipated land use changes (see Section 3.4, Land Use). It also anticipates population and employment growth consistent with Metro regional forecasts, and other documented, major trends, such as a changing climate. The No-Build Alternative transportation network is based on the existing network plus changes included in the *2018 Regional Transportation Plan* (Metro 2018) and the *Transportation for Everyone Central City in Motion Implementation Plan* (City of Portland n.d.c). Land use is based on relevant City of Portland land use plans and development trends. Future climate assumptions are based on the best available projections and estimates. The Burnside Bridge lane assignment cross sections evaluated for the No-Build Alternative are based on currently adopted plans, which includes an eastbound transit-only lane, consistent with the Enhanced Transit Corridor study. Note that while the build alternatives of the Burnside Bridge discussed in Section 2.2.2 are being designed with considerations of a future streetcar running across the bridge, no such improvement would be completed for the No-Build Alternative within the 2045 future year considered for traffic, freight, and transit.

No-Build Post-Earthquake

The next major CSZ earthquake is expected to cause widespread regional damage from the Oregon Coast to the Cascade Mountains. The particular effect that would be unique to the No-Build Alternative is the collapse of the existing Burnside Bridge, thus leaving the downtown area without a viable way to cross the Willamette River, possibly for months. Under the west end of the bridge, concrete columns containing very little steel reinforcement would fail early during a CSZ earthquake. Weak soils underlying the extent of the bridge and liquefiable soils under the east approach would lead to collapse of support columns, piers, and other structural bridge components during and after the earthquake. This would lead to failure of the bridge superstructure with portions breaking and falling into the river, onto Naito Parkway, TriMet MAX Red and Blue lines, SW 1st Avenue, Governor Tom McCall Waterfront Park (Waterfront Park), the Vera Katz Eastbank Esplanade (Eastbank Esplanade), I-5, I-84, the Union Pacific Railroad (UPRR) mainline tracks and SE 1st, 2nd, and 3rd Avenues. Bridge debris would obstruct all modes of ground and water transportation, blocking transportation infrastructure valued at over one billion dollars that relies on the bridge. With other bridges out of service, Portland would be divided by the Willamette River, leaving tens of thousands stranded. Emergency responders would be unable to cross the river to aid victims, fight fires, address other emergencies or facilitate evacuation.

The No-Build Alternative would also result in higher immediate casualties to people on and under the bridge. There are no permanent residences beneath the bridge but at any given time, dozens to hundreds of people work, shop, recreate, commute or shelter beneath the bridge including at the Portland Saturday Market, the Burnside Skatepark, the Eastside Esplanade, Waterfront Park, multiple businesses, as well as in cars, trucks, buses, and trains and on sidewalks and bicycle paths on and beneath the bridge.

Long-term recovery would be hampered for months due to the lack of a usable bridge to support debris clearing and removal, transport of fuel and materials, and reconstruction of power, water, and sewer facilities as well as other infrastructure necessary to allow jobs, school, commerce, government, and daily activities to return to normal. Significant delay in recovery would adversely affect the region for years.

Other details of the conditions and impacts of the No-Build Alternative post-earthquake, including transportation operations and emergency response and recovery, are described in Chapter 3.

2.2.2 Build Alternatives – Common Elements of Operations and Design

Four build alternatives have been advanced for further evaluation in this Draft EIS:

- The Enhanced Seismic Retrofit Alternative, which would partially retrofit the existing bridge, as well as replace major components required to meet seismic design criteria.
- Three replacement bridge alternatives, which would demolish the existing bridge structure and build a new bridge at the same location. The three replacement alternatives are the Replacement Alternative with Short-span Approach, the Replacement Alternative with Long-span Approach, and the Replacement Alternative with Couch Extension.

Additionally, there are two primary options for managing traffic during construction (with and without a temporary bridge detour). For the temporary bridge, there are three modal options: all modes, transit and bicycle/pedestrian, and bicycle/pedestrian only.

All build alternatives would include lighting that would meet local standards for illumination of eastbound and westbound roadways, pedestrians, and bicycle lanes. Lighting under publicly accessible portions of the bridge approaches would also be installed consistent with local standards for public spaces, roads, and parks, as applicable.

With regard to existing utilities, reasonable attempts have been made to avoid utility infrastructure with the proposed build alternatives. Foundation elements have been located to avoid impacting large-diameter combined sewer overflow pipes. Smaller utilities that are near the surface have been avoided where practical, but some temporary utility relocations would be required.

On the existing Burnside Bridge, not all stormwater runoff from road surfaces is captured, with some runoff from the center of the bridge flowing directly into the river. Under all build alternatives, stormwater would be captured from roadways and sidewalks on the entire bridge and would be routed to stormwater treatment facilities.

All build alternatives would also include improved pedestrian and bicycle access located near the western and eastern ends of the bridge and connecting to pedestrian and bicycle facilities beneath the bridge. On the west side, existing direct access to 1st Avenue below the bridge is via a set of stairs on each side of the bridge that extend down to the sidewalk on the west side of 1st Avenue. There are three options being considered to provide direct active transportation access between the bridge deck and 1st Avenue in the future:

1. In-kind stairs on the north and south sides of the bridge
2. In-kind stairs on the north side of the bridge and a new ramp (Portland Saturday Market Administration site) and stairs on the south side of the bridge
3. In-kind stairs on the north side of the bridge and a new ramp (Mercy Corps Parking site) and stairs on the south side of the bridge

Options 2 and 3 also have the potential to include a mid-block signalized pedestrian and bicycle crossing near the west end of the bridge.

Near the east end of the bridge, there is existing stair access from the south side (eastbound sidewalk) of the bridge to the Eastbank Esplanade, about 50 feet below the bridge. The Project proposes to replace this with an ADA-accessible facility. Multiple options are being considered for the Eastbank Esplanade access:

- Stairs and an elevator on the north and south sides of the bridge
- Stairs and an elevator on the south side only with a mid-block crossing
- Ramps on the north and south sides of the bridge and stairs on the south side

- Ramp and stairs on the south side only with a signalized mid-block pedestrian and bicycle crossing on the bridge deck

The options analyzed in this Draft EIS represent the range of options being considered. See Attachment G for conceptual designs for representative access options. See Section S.5 in the Summary for further discussion regarding unresolved issues related to the potential active transportation access options.

Daily Operations (Pre-Earthquake)

Under normal operations, all build alternatives would provide access across the bridge for the same transportation modes that presently use the bridge. Additionally, all build alternatives are being designed to accommodate potential future streetcar service on the Burnside Bridge in the event that service is expanded in the future as first identified in the *Portland Streetcar System Concept Plan* (Portland Streetcar 2009).

All the build alternatives would accommodate all surface transportation modes that presently pass under the bridge. As under existing conditions, park and recreation features would connect under the bridge on both sides, and improved access to these features from the bridge itself are included in the designs.

All the build alternatives would also continue to permit commercial, recreational, and government water vessels to navigate under or past the bridge, using a lift bridge or drawbridge to accommodate taller marine vessels. The US Coast Guard (USCG) requires that all current ship traffic be safely accommodated with adequate clearances, which for the Burnside Bridge results in a water crossing span with at least 147-foot vertical clearance (when raised) above the ordinary high water mark and 205-foot-wide horizontal clearance.

Seismic Resiliency

The Project would build a seismically resilient Burnside Street lifeline crossing over the Willamette River that would remain fully operational and accessible for vehicles and other modes of transportation following a CSZ earthquake of up to a 9.0 magnitude on the Richter scale, providing a reliable crossing for emergency response, evacuation, and economic recovery. The relevant seismic design criteria that are the basis of all four build alternatives can be found in the EQRB *Seismic Design Criteria Report*.

All build alternatives would be designed and constructed to provide clearance between the bridge and adjacent buildings to allow independent movement during a seismic event. Presently, buildings and elevated highway infrastructure are very close (in some cases, with only a one-inch gap) to the bridge elements, and there is likelihood of them knocking into each other during a major seismic event.

2.2.3 Enhanced Seismic Retrofit Alternative

Under the Retrofit Alternative, retrofitted elements would be visually similar to the existing bridge elements, whereas the replacement approaches would appear substantially different. Figure 2.2-1 shows an aerial view of the Retrofit Alternative. Figure 2.2-2 shows which elements would be retrofitted or replaced. See Table 2.2-1 for the major bridge elements. Table 4.1-1, Enhanced Seismic Retrofit Alternative – Elements Replaced vs. Retrofitted, in the *EQRB Description of Alternatives* report describes which of the major bridge elements under this alternative would be replaced or retrofitted. Attachment G includes additional figures for the Retrofit Alternative and all the replacement alternatives. Additional visualizations of the Retrofit Alternative can be seen in Figures 3.12-4 through 3.12-6.

This alternative would provide the same modal connections at each end of the bridge as presently exist. See Figure 2.2-1. Under this alternative, the bridge width would not change. Cross sections for the travelway are shown in Figure 2.2-3.

Note that some existing bridge elements have been in service for close to 100 years. Retrofitting only some parts of the bridge would mean that some elements not retrofitted would be in service for approximately

200 years. Because of this, more maintenance would be required for the Retrofit Alternative than for any of the replacement alternatives.

Figure 2.2-1. Enhanced Seismic Retrofit Alternative

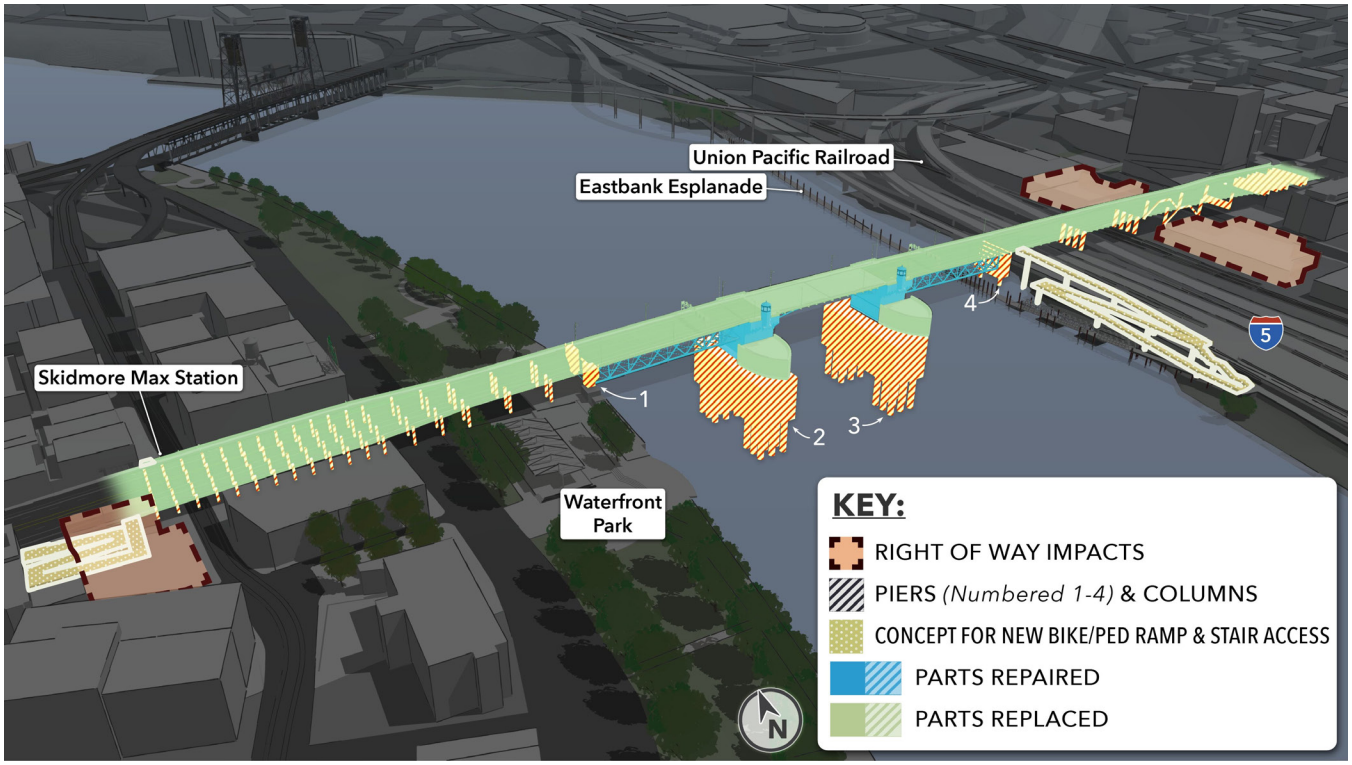


Table 2.2-1. Major Bridge Elements by Alternative

Element	Retrofit Alternative	Short-Span Alternative	Long-Span Alternative	Couch Extension
Piers and bents	Encase existing Piers 2 and 3 in concrete; Add multiple deep reinforced concrete foundation columns to Piers 1-4. Seismic upgrade of all 34 existing on-land support bents and E and W bridge abutments. 7 bents located in GHZ.	Replace all piers on deep foundations; Bent on both approaches supported by columns on drilled shafts. Stabilize soils surrounding 5 bents located in the GHZ on both approaches to protect against lateral spreading during a seismic event.	Same as Short-span. Stabilize soils surrounding 1 bent located in GHZ in east approach.	Same as Short-span. Stabilize soils surrounding 8 bents located in GHZ in both approaches.
West approach	13 bents west of Naito Pkwy and 5 in Waterfront Park.	4 bents west of Naito Pkwy and 2 in Waterfront Park.	4 bents west of Naito Pkwy and 1 in Waterfront Park.	4 bents west of Naito Pkwy and 2 in Waterfront Park.
East approach	15 bents on land and 1 in river.	4 bents on land and 1 in river.	2 bents on land and 0 in river.	10 bents on land and 2 in river.
Movable bridge span	Retrofit or replace existing bascule span leaf.	Could be a bascule span or vertical lift bridge.	Same as Short-span.	Same as Short-span.

E = east; GHZ = geologic hazard zone (see Section S.3 and Figure S-14); W = west.

Figure 2.2-2. Enhanced Seismic Retrofit Alternative – Structures Replaced and Retrofitted

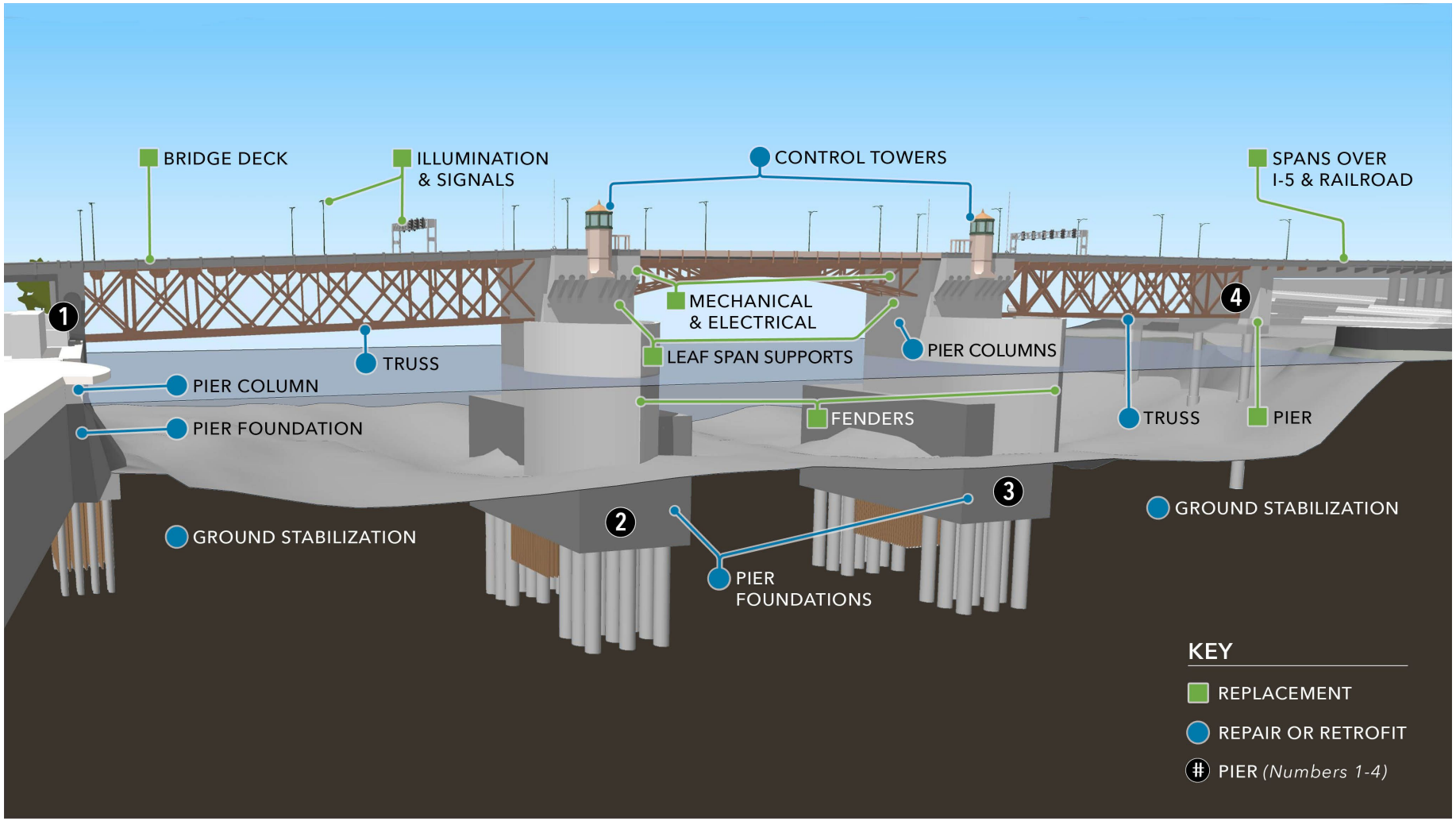
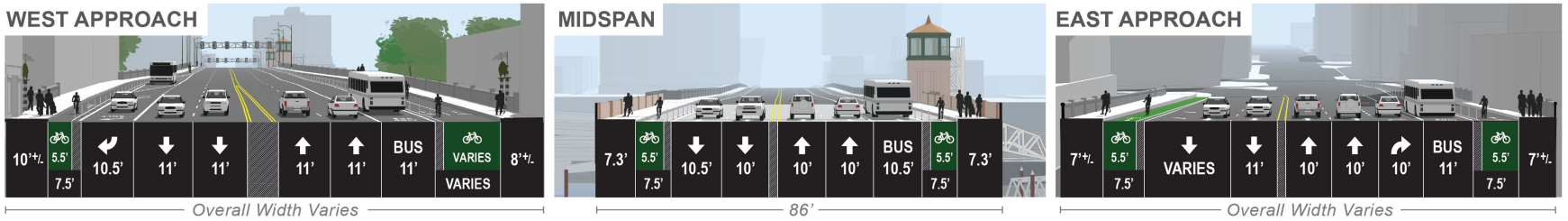
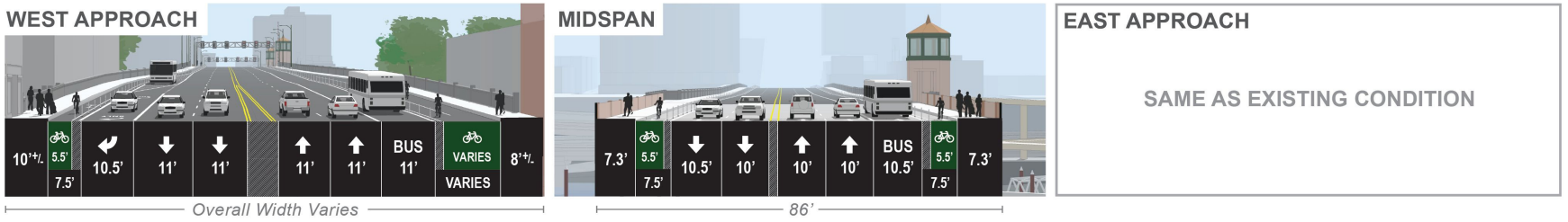


Figure 2.2-3. Lane Configurations

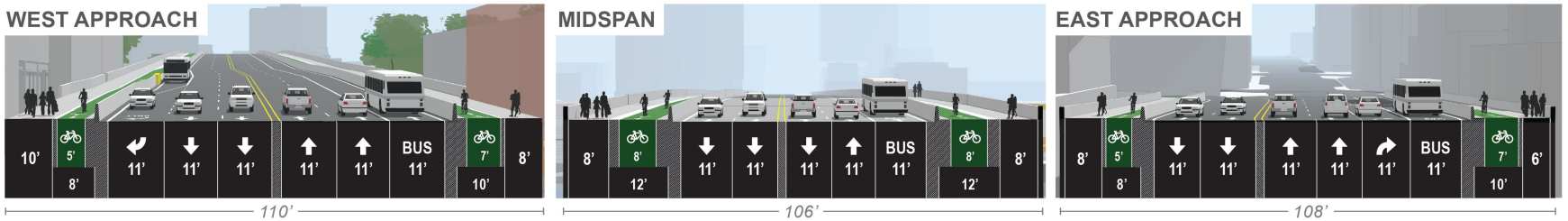
EXISTING CONDITION / NO-BUILD OPTION



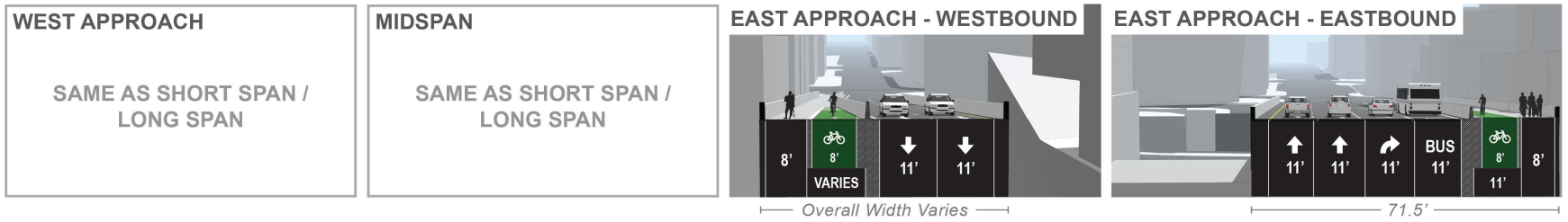
ENHANCED SEISMIC RETROFIT



SHORT SPAN / LONG SPAN *(SHORT SPAN SHOWN)*



COUCH EXTENSION



2.2.4 Replacement Alternatives

The three replacement alternatives under consideration would completely remove and replace the existing Burnside Bridge. They would measure approximately 2,290 feet in total length and, like the existing bridge, are comprised of three separate segments: the west approach spans, the east approach spans, and a movable center span system that would be constructed over the primary navigation channel. Movable bascule[6] span and vertical lift span options are considered for replacement of the existing movable span. The proposed span layouts would each also have catwalks under the bridge deck for maintenance, inspections, and access to machinery. It is expected that the opening or closing of either movable-span option under normal operating conditions would be similar to existing conditions and the design would protect from catastrophic damage were an earthquake to strike during a bridge opening. Other bridge operations, such as lowering gates and protective barriers, would add additional time. The three replacement alternatives are described below.

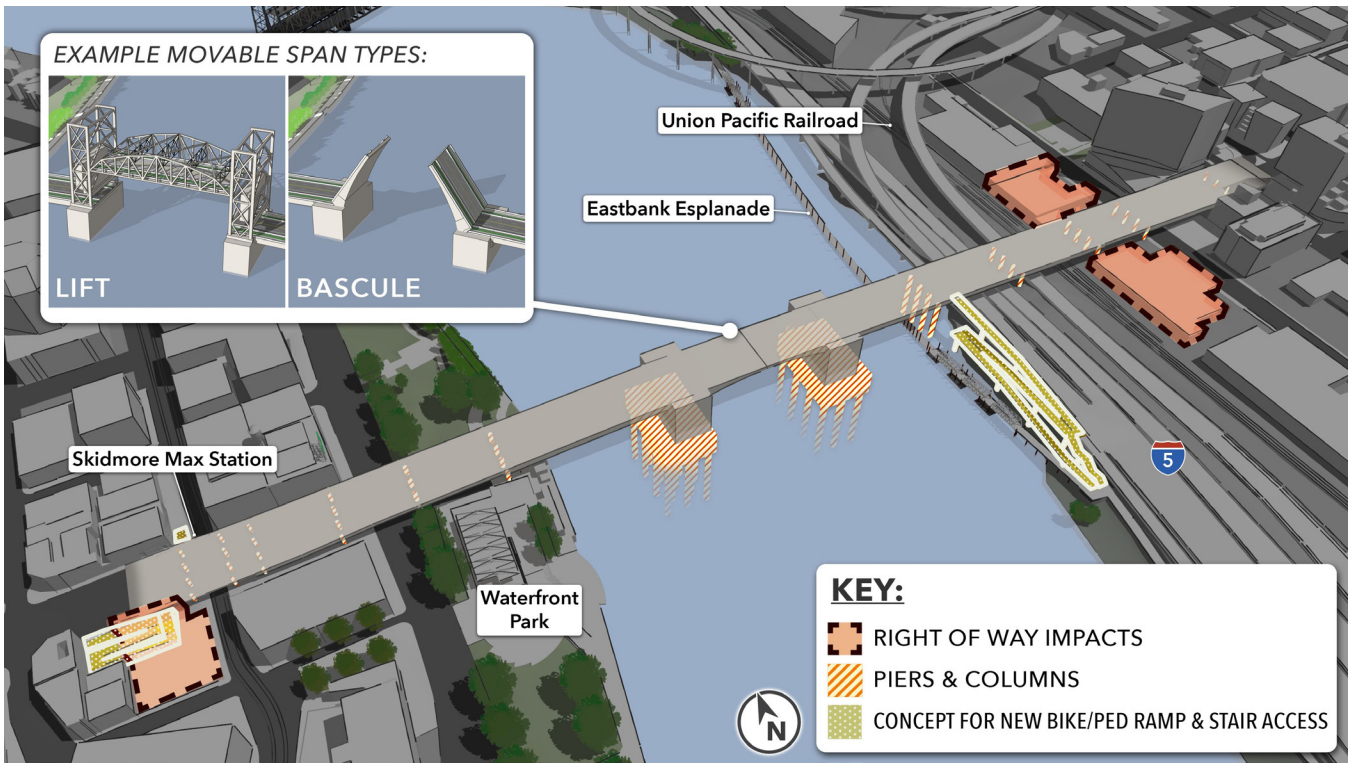
Replacement Alternative with Short-Span Approach

The Short-span Alternative would construct a new bridge to replace the existing structure on the existing alignment. The Short-span Alternative generally consists of structural members below the bridge deck and has the same connection to W Burnside from the west approach and only slightly modified connections to NE Couch Street and E Burnside from the east approach. The east and west approaches of the Short-span Alternative would be comprised each of six spans connecting to a central movable span. On the west approach, it would span the TriMet Skidmore Fountain Station and east- and westbound tracks. It would also clear-span the existing Pier 1 bent along the river wall. On the east approach, it would place one bent east of the Eastbank Esplanade to maintain an obstruction-free navigation channel. Figure 2.2-4 shows an aerial view of the proposed layout including the proposed locations of bents and span sections, as well as bascule and vertical lift options for the movable span. Additional visualizations of the Short-span Alternative can be seen in Figures 3.12-4 through 3.12-6 and in Attachment G. See Table 2.2-1 for additional information on major bridge elements.

Figure 2.2-3 shows the bridge widths at three different points along the bridge for the Short-span Alternative. As shown, this alternative would provide substantially more space for bicycle and pedestrian infrastructure on the bridge than the Retrofit Alternative. Connection points for bicycles and connections at either end of the bridge would be the same as for the Retrofit Alternative (see also Appendix C of the *EQRB Bridge Replacement Technical Report* [Multnomah County 2021e]).

[6] Bascule – A bridge with one or two leaves which rotate from a horizontal to a near-vertical position, providing unlimited vertical clearance above.

Figure 2.2-4. Replacement Alternative Short-Span Approach



Replacement Alternative with Long-Span Approach

Except where identified below, the Long-span Alternative would be the same as the Short-span Alternative.

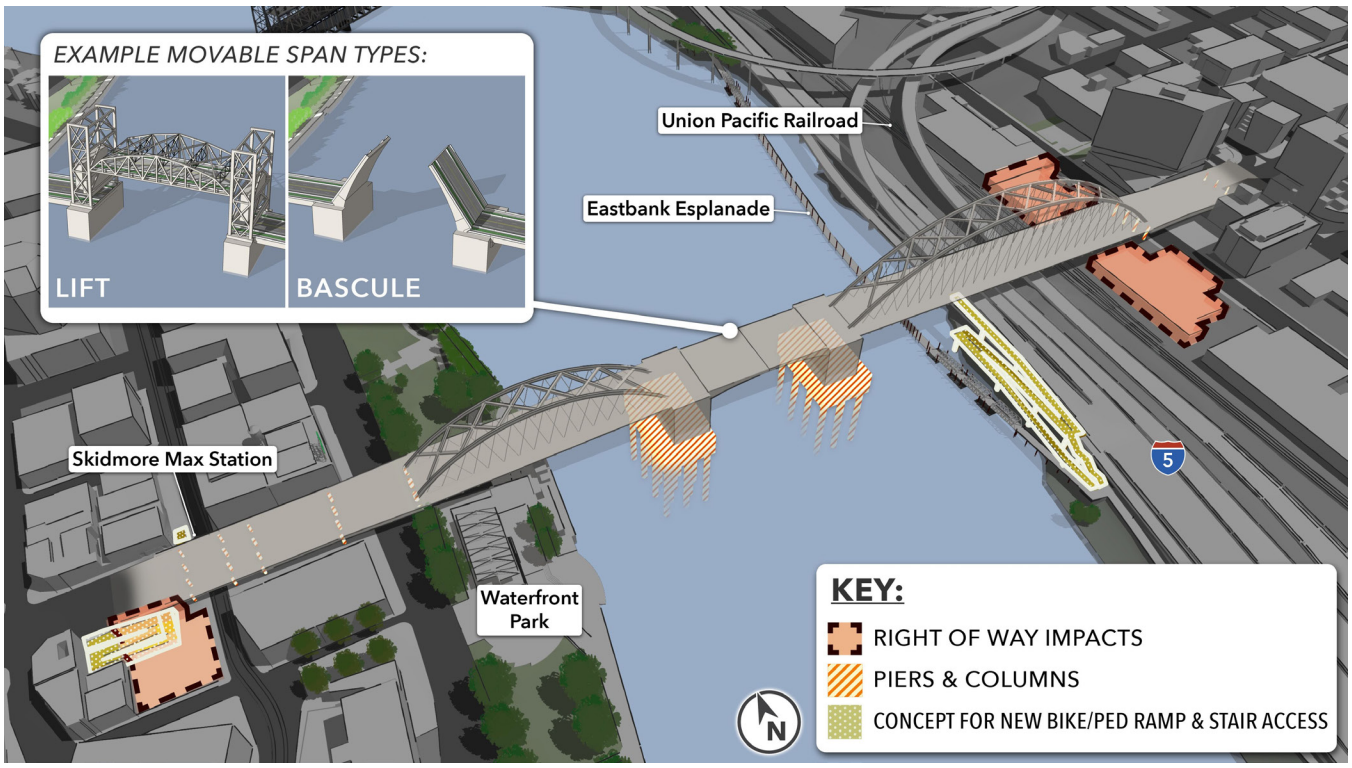
Under the Long-span Alternative, large segments of the east and west approaches would be supported by abovedeck superstructure thus eliminating piers, bents, deep foundation, and soil improvement work in those sections. Common long-span bridge types include tied-arch and cable-stayed bridges (see Figure S-15 in the Summary and Figure 3.12-3). For the east approach, the height of the superstructure above the bridge deck could range from about 140 feet for a tied-arch bridge to about 250 feet or more for a cable-stayed bridge.

The Long-span Alternative would combine some of the spans discussed in the Short-span Alternative into single spans. On the west side, it would include a clear span extending from the movable span in the river approximately 450 feet to the east side of Naito Parkway. On the east side, the Long-span Alternative would clear span from the movable span in the river to just west of SE 2nd Avenue, approximately 740 feet. See Table 2.2-1 for additional information on major bridge elements.

Compared to the Short-span Alternative, the Long-span Alternative would eliminate a pier/bent in Waterfront Park, eliminate an in-water pier/bent near the eastern shoreline, and eliminate two sets of upland bents on the east side, west of SE 2nd Avenue.

Figure 2.2-5 shows an aerial view of the Long-span Alternative with the proposed location of bents and bridge span sections assuming the superstructure would be a tied-arch span. It also includes potential bascule and vertical lift configurations. See Attachment G for additional potential configurations for this alternative. Additional visualizations of the Long-span Alternative can be seen in Figures 3.12-4 through Figure 3.12-6.

Figure 2.2-5. Replacement Alternative with Long-Span Approach



Replacement Alternative with Couch Extension

The Couch Extension Alternative has the same west approach and movable-span sections as the Short-span Alternative but would provide a different configuration for the east approach section. The east approach span would extend the Burnside/Couch couplet approximately 1,100 feet farther west on a viaduct over SE 3rd and 2nd Avenues, the UPRR tracks, the freeway ramps, I-5, and the river, thus resulting in a bridge that splits just east of the movable span.

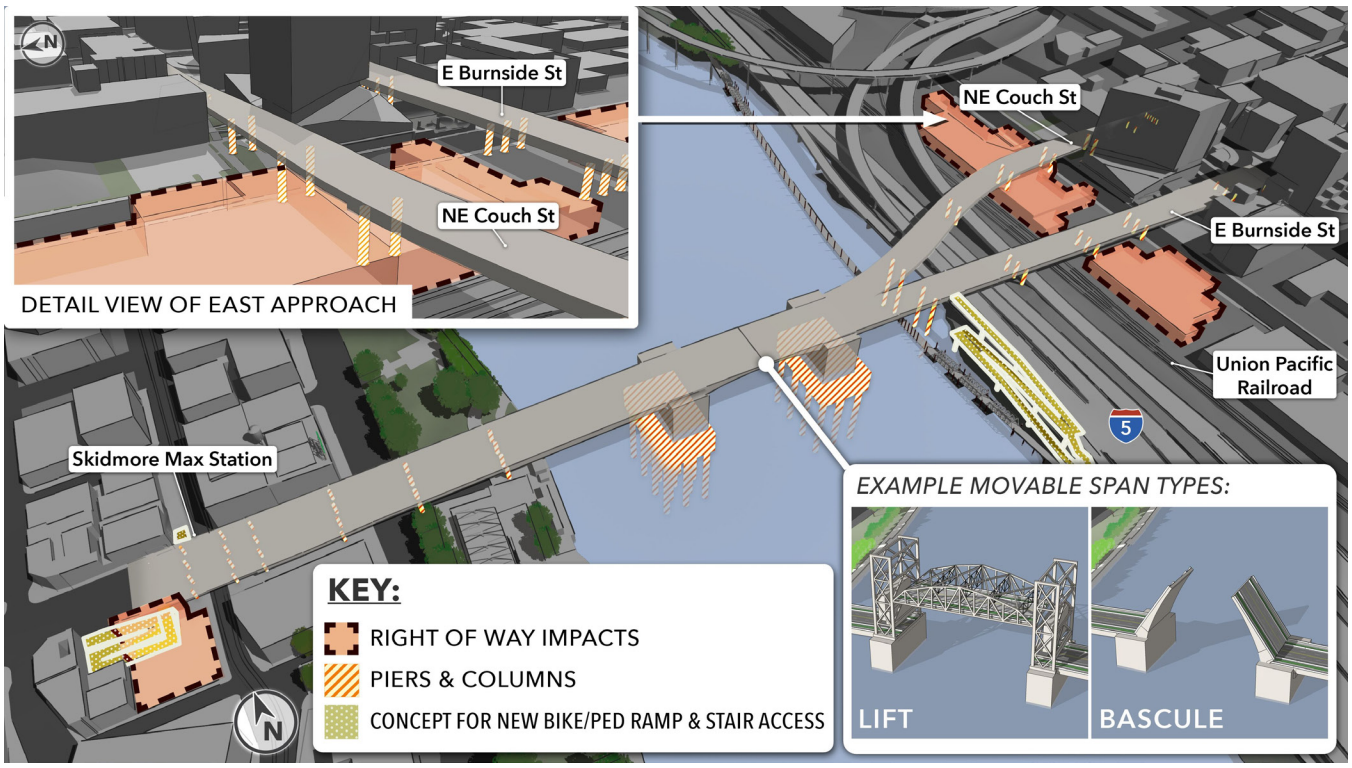
Figure 2.2-6 shows an aerial view of the proposed layout with the proposed locations of bents and bridge span sections, as well both the bascule and vertical lift options. See Table 2.2-1 for more information on major bridge elements. Additional visualizations of the Couch Extension Alternative can be seen in Figures 3.12-4 through Figure 3.12-6 and in Attachment G.

Other than the westward extension of Couch Street, traffic patterns and mode allocation on the bridge would be the same as for the Short- and Long-span Alternatives. Figure 2.2-3 shows the expected bridge widths at three different points along the bridge.

In comparison to the other build alternatives, the Couch Extension would eliminate an existing bicycle/pedestrian path, change vertical alignments of SE 3rd Avenue and Couch Street, and require additional business displacements and property acquisitions.

This Draft EIS considers three different modal options for a temporary bridge: (1) two general traffic lanes (one in each direction) allowing all motor vehicles, bicycle lanes, and sidewalks; (2) two bus-only lanes (no other motor vehicles), bicycle lanes, and sidewalks; or (3) bicycles and pedestrians only (no motor vehicles).

Figure 2.2-6. Replacement Alternative with Couch Extension



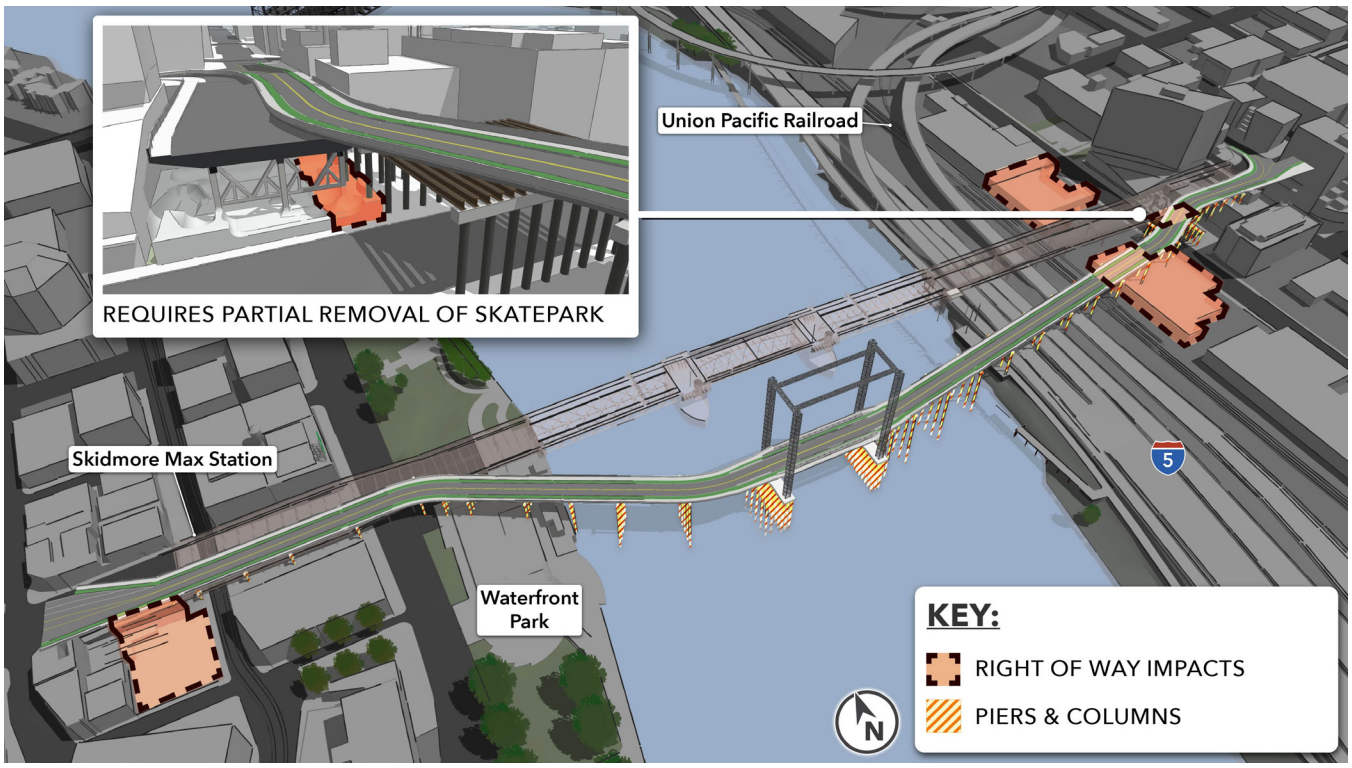
2.2.5 Temporary Bridge Option

Neither vehicles nor people will be able to cross the existing Burnside Bridge during construction of a retrofit or replacement bridge. A temporary bridge could be constructed to allow some level of vehicular, pedestrian, and bicycle traffic to cross the Willamette River at Burnside during construction. A temporary detour bridge would help reduce the impacts on cross-river travel but it would not accommodate all of the bridge's current vehicle travel demands. The temporary bridge options would allow emergency vehicle access.

If selected, a temporary bridge would be installed to the south of the permanent bridge and tie into the permanent east and west approach spans. The temporary bridge would include a movable lift section over the active navigation channel to accommodate river traffic up to 147 feet above the ordinary high water mark as required by the USCG (see Figure 2.2-7).

The temporary bridge would need to span over mainline I-5, the Morrison off-ramp, the I-84 westbound to I-5 southbound on-ramp, and the I-5 northbound to I-84 eastbound ramp in a single span. This span (about 170 feet) would need to be set during a full closure of I-5, the I-84 ramps, and the Morrison exit. Due to an assumed limited closure window, it is likely that some sections of the temporary bridge would need to be pre-built and launched or lifted into place. The temporary bridge would also span the UPRR tracks and would require coordination and approval from UPRR. Installation would require temporarily closing the Eastbank Esplanade and rerouting users. The temporary bridge would also require partial removal and temporary closure of the Burnside Skatepark.

Figure 2.2-7. Example of Temporary Bridge for the Short-Span Alternative



2.2.6 No Temporary Bridge Option

If the option of not using a temporary detour bridge is chosen, a full closure of the river crossing at Burnside Street would occur for 2 years for the Retrofit Alternative and for 4 years for any of the replacement alternatives. Traffic management could include rerouting transit (bus), vehicular, bicycle, and pedestrian trips to other river crossings, as well as potentially implementing travel demand and transportation system management to reduce vehicle trips and encourage more transit, pedestrian, and bicycle use. Transit detours would likely occur across the Steel Bridge. Vehicle, bicycle, and pedestrian traffic would likely be detoured over the Steel Bridge, the Morrison Bridge, and the Hawthorne Bridge. Other bridges adjacent to the Burnside Bridge carry more large freight trucks than does the Burnside Bridge, primarily because of their better connectivity to I-5. Depending on their destinations, freight trucks that would typically use the Burnside Bridge would likely use the Morrison Bridge or other bridges during construction.

2.2.7 Construction Activities

Construction Duration

The expected duration of project construction is 3.5 to 6.5 years, dependent upon the alternative and whether a temporary detour bridge is used. See Table 2.2-2 for more information regarding construction impact extent and closure timeframes.

Construction Access and Staging

Trucks hauling construction materials and debris to and from the site would be coming from and going to multiple locations in the region. Trucking to and from the project site would occur essentially continually throughout the process although truck traffic volumes would vary by phase of construction, time of day, and day of the week.

Daily worker trips would also vary by phase and season, with approximately 100 people at the peak of construction and likely dropping to about 20 to 40 people during the winter. Construction would generally follow a 5-day work week except when nighttime and weekend work would occur for work over or around I-5/I-84 ramps and UPRR tracks. Construction activity that would require temporary closure of the MAX light rail transit line under the west end of the Burnside Bridge would likely involve 24-hour, 7-day work weeks to reduce the duration of closure.

Offsite Staging Yards are anticipated due to limited storage space onsite, and to minimize impacts to the adjacent park facilities and land uses. It is assumed that any offsite storage yard(s) would have a dock or at least riverfront access with potential to construct a temporary dock. The contractor would pre-stage materials and equipment at the yard and then load materials onto barges, as needed, to be shipped to the project area. The County may secure offsite yard(s) or let the contractor do so during the preconstruction phase.

In-Water Work Activity

All of the alternatives would require extensive in-water work, much of it inside cofferdams[7] that would isolate that work from the river itself to minimize sediment disturbance in the river and to minimize potential noise impacts to fish and other aquatic organisms from construction activities that would occur below the ordinary high water of the Willamette River. No dredging is anticipated during construction but there will likely be rip-rap removal around the existing large piers.

Typical activities that would occur inside of cofferdams includes sealing and dewatering the cofferdams so that work in the dry could occur, installation and removal of temporary work bridges, demolition of existing in-water piers and Pier 1 (replacement alternatives), modification of the harbor wall at Pier 1 (Retrofit Alternative), installation of large-diameter drilled shafts for the main river piers, and installation of pipe caps and main river piers.

With the Retrofit Alternative, retrofitting Pier 1 located at the Portland Harbor Wall will require temporarily removing approximately 150 to 175 feet of the wall for approximately 6 months to 2 years. Retrofitting that pier and removing the wall is not necessary for any other alternative due to either shifting the pier to a new location or in the case of the Long-span Alternative, spanning over the area, thus precluding the need for a pier.

Temporary Freeway, Rail, Street and Trail Closures

All of the build alternatives would require temporary highway lane closures to demolish and replace the Burnside Bridge elements over I-5 and I-84. Lane closures are anticipated to be for limited evening hours or on weekends, with dozens anticipated.

For construction access and equipment, adjacent city streets would routinely be occupied by large equipment and would need to be closed to allow equipment and material access. For the temporary bridge, temporary closures to city streets would be approximately double those without a temporary bridge due to the need to erect the permanent girders in two phases versus one phase required without a temporary bridge.

The build alternatives would also impact UPRR by construction work over and adjacent to the tracks including existing deck demolition, existing column and foundation demolition, new girder erection, and false deck installation/removal.

[7] Cofferdam – a water-tight, temporary enclosure that is installed in a body of water and dewatered to allow construction of piers and other bridge support structures.

Bus operations during construction would be the same with all build alternatives but would differ depending on whether or not they include a temporary bridge. Without a temporary bridge that accommodates buses, TriMet would need to redirect its bus service to adjacent bridges during construction. With a temporary bridge, bus service could be maintained for the majority of the construction period although there would be intermittent closures of the temporary bridge. Bus route detours would likely be to the Steel Bridge and the Morrison Bridge.

During construction of the west approach, TriMet's MAX operations would be affected around Skidmore Fountain. For the Retrofit Alternative, the bridge deck removal, protection of the catenary system,[8] and foundation widening would require a closure of the MAX station and light rail transit movements. For all of the replacement alternatives, TriMet's light rail transit operations would need to be temporarily shut down to allow for superstructure and substructure demolition. A temporary catenary system would need to be set up to keep light rail transit operational during construction activities. See Table 2.2-2 for closure durations.

All the build alternatives would impact the use of the Eastbank Esplanade. Temporary closures would require rerouting pedestrians and bicycles around this section of the trail and onto streets and sidewalks. Construction of a temporary detour bridge would extend the duration of trail closure by approximately 4 months for each build alternative. See Table 2.2-2 for closure durations. See Section 3.1, Transportation, and Section 3.10, Parks and Recreation, for additional impact discussion.

Access for Pedestrians and Vehicles to Businesses, Residences and Public Services

Access to local businesses and residences would be maintained whenever possible and traffic management such as flagging, signage and detours would be implemented as needed. Work would be phased from street to street to accommodate reasonable access to local businesses and residences.

Construction activities would require temporary closure of multiple pedestrian and vehicle access points into existing buildings. Most of the temporary access closures could be mitigated with alternative access or temporary modifications to enable access during construction. Details of the temporary access impacts are discussed in Chapter 3.

On-Street Parking Impacts

All the build alternatives would include temporary and permanent impacts to on-street parking.

Property Acquisitions and Relocations

All the build alternatives would need to acquire property adjacent to the existing right-of-way either for construction or for permanent use for project improvements. Additionally, there are some properties adjacent to the construction footprints of all the build alternatives that would not require acquisition of property rights for construction, but they would be impacted due to temporary and/or permanent access closures during or resulting from construction. None of the alternatives would displace residences (see Section 3.3, Acquisitions and Relocations).

Temporary Use of Governor Tom McCall Waterfront Park

Construction would temporarily use portions of Waterfront Park. Portland Saturday Market would be temporarily displaced for up to 3.5 to 6.5 years, and other uses would be temporarily prohibited in the affected portions of the park. See Section 3.3, Acquisitions and Relocations, and Section 3.10, Parks and Recreation, for more information.

[8] Catenary system – the series of electric wires used to power light rail transit.

Temporary Use of Public Property

Construction activities would require temporary use of publicly owned property such as parking lots on City right-of-way under the bridge on both sides of the river that are being leased to adjacent property owners. These City lease agreements include bridge maintenance clauses. Temporary and permanent easements needed over and under the Willamette River would be secured via the Oregon Department of State Land easement application process. Temporary use of public property would also include potential construction staging areas.

2.2.8 Cost Estimates

The current cost estimates range from $800 to $1,095 million for the range of build alternatives being considered in the Draft EIS. Building a temporary bridge for motor vehicles and/or bicyclists and pedestrians would add approximately $60 to $90 million on top of these estimates. Based on current estimates, the Preferred Alternative is the lowest-cost alternative and the Couch Extension is the highest-cost. Given the current conceptual level of design, these preliminary cost estimates are expressed as a “probable range,” which means that there is an estimated 80 percent probability that the final costs would be within the low and high end of the range for each alternative. The cost range for each alternative (see Draft EIS Attachment O, *Cost Risk Assessment Summary Sheets*) reflects the range of potential bridge types and an assessment of risks with each bridge alternative. As the project design advances, the cost range will narrow. The final cost will be influenced by design details, bridge type selection, risk mitigation, using the Construction Manager/General Contractor contracting method to identify cost-saving opportunities, and market conditions at the time of construction.

Table 2.2-2 Construction Impacts, Closure Extents, and Timeframes by Build Alternative

Facility Impacted	Retrofit Alternative No Temp. Bridge (Detour Traffic)	Retrofit Alternative With Temp. Bridge	Short-span Alternative No Temp. Bridge (Detour Traffic)	Short-span Alternative With Temp. Bridge	Long-span Alternative No Temp. Bridge (Detour Traffic)	Long-span Alternative With Temp. Bridge	Couch Extension No Temp. Bridge (Detour Traffic)	Couch Extension With Temp. Bridge
Waterfront Park	3.5-year closure within boundary of potential construction impacts	5-year closure within boundary of potential construction impacts	4.5-year closure within boundary of potential construction impacts	6.5-year closure within boundary of potential construction impacts	Same as Short-span	Same as Short-span	Same as Short-span	Same as Short-span
Willamette River Greenway Trail	Portion of trail within Waterfront Park closed for same duration as Park; detours in place for construction duration	Portion of trail within Waterfront Park closed for same duration as Park; detours in place for construction duration	Portion of trail within Waterfront Park closed for same duration as Park; detours in place for construction duration	Portion of trail within Waterfront Park closed for same duration as Park; detours in place for construction duration	Same as Short-span	Same as Short-span	Same as Short-span	Same as Short-span
Japanese American Historical Plaza	Southern portion of plaza would be closed for same duration as Waterfront Park	Southern portion of plaza would be closed for same duration as Waterfront Park	Southern portion of plaza would be closed for same duration as Waterfront Park	Southern portion of plaza would be closed for same duration as Waterfront Park	Same as Short-span	Same as Short-span	Same as Short-span	Same as Short-span
Ankeny Plaza Structure	Closure for duration of construction but no impacts to Ankeny Plaza structure	Structure deconstructed and stored for Waterfront Park construction duration	Closure for duration of construction but no impacts to Ankeny Plaza structure	Structure deconstructed and stored for Waterfront Park construction duration	Same as Short-span	Same as Short-span	Same as Short-span	Same as Short-span
Bill Naito Legacy Fountain	No closure of fountain and associated hardscape	Fountain and hardscape closed for same duration as Waterfront Park	No closure of fountain and associated hardscape	Fountain and hardscape closed for same duration as Waterfront Park	Same as Short-span	Same as Short-span	Same as Short-span	Same as Short-span
Vera Katz Eastbank Esplanade	26 months; detours in place for construction duration	30 months; detours in place for construction duration	30 months; detours in place for construction duration	34 months; detours in place for construction duration	18 months; detours in place for construction duration	22 months; detours in place for construction duration	Same as Short-span	Same as Short-span

Facility Impacted	Retrofit Alternative No Temp. Bridge (Detour Traffic)	Retrofit Alternative With Temp. Bridge	Short-span Alternative No Temp. Bridge (Detour Traffic)	Short-span Alternative With Temp. Bridge	Long-span Alternative No Temp. Bridge (Detour Traffic)	Long-span Alternative With Temp. Bridge	Couch Extension No Temp. Bridge (Detour Traffic)	Couch Extension With Temp. Bridge
Burnside Skatepark	Permanently. Could not be rebuilt in current location after project completion.	Permanently. Could not be rebuilt in current location after project completion.	4 months full closure	8 months full closure. Partial demolition of southern portion.	Same as Short-span	Same as Short-span	Same as Short-span	Same as Short-span
River Crossing on Burnside Street	2-year closure	All modes - No long-term closures, Transit/bike/ped – 2 years to automobiles, Bike/ped - 2 years to automobiles and transit	4-year closure	All modes - No long-term closures, Transit/bike/ped – 4 years to automobiles, Bike/ped - 4 years to automobiles and transit	Same as Short-span	Same as Short-span	Same as Short-span	Same as Short-span
Saturday Market Location	3.5-year closure or use of alternative location	5-year closure or use of alternative location	4.5-year closure or use of alternative location	6.5-year closure or use of alternative location	Same as Short-span	Same as Short-span	Same as Short-span	Same as Short-span
Skidmore Fountain MAX station	Approximately 8 weeks	In two phases, each approximately 8 weeks for a total of 16 weeks	Approximately 5 weeks	In two phases, each approximately 5 weeks for a total of 10 weeks	Same as Short-span	Same as Short-span	Same as Short-span	Same as Short-span
Navigation Channel/Willamette River Water Trail	Intermittent closures - 2 to 10 closures; each closure up to 3 weeks	Intermittent closures - 2 to 10 closures; each closure up to 3 weeks; up to two additional closures of 2 weeks for installation/removal of temporary movable span	Intermittent closures - 2 to 10 closures; each closure up to 3 weeks	Intermittent closures - 2 to 10 closures; each closure up to 3 weeks; up to two additional closures of 2 weeks for installation/removal of temporary movable span	Same as Short-span	Same as Short-span	Same as Short-span	Same as Short-span
Overall Construction Duration	**3.5 years**	**5 years**	**4.5 years**	**6.5 years**	**Same as Short-span**	**Same as Short-span**	**Same as Short-span**	**Same as Short-span**

2.3 Preferred Alternative

Following almost 2 years of meetings, analysis, and input, in June 2020, the Project's Community Task Force (CTF) recommended that the Long-span Approach Alternative and the No Temporary Bridge Option be the Preferred Alternative. Their process to reach that recommendation included identifying the community's values, defining evaluation criteria and measures, and reviewing analysis of the alternatives' and options' performance and impacts. They also considered input from the 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 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 Preferred Alternative recommendation, was provided back to the CTF who then reconfirmed their recommendation in September 2020. The recommendation was then endorsed by the project's Policy Group on October 2, 2020. The Multnomah County Board of Commissions adopted a resolution on October 29, 2020, expressing approval for the recommended Preferred Alternative.

The Draft EIS will further solicit public input on the Preferred Alternative, and it will be open to comment and potential revision throughout the NEPA process. Following the Draft EIS public comment period, there will be additional coordination with participating and permitting agencies, stakeholders, and the public, as well as refinement of the design and analysis, before the FHWA endorses the final action through the NEPA Record of Decision that is expected to be issued in October 2021.

The CTF recommendation included consideration of how the alternatives performed on 49 different criteria covering 13 different topics. The Long-span Alternative scored 25 and 20 percent higher than the Retrofit Alternative and the Couch Extension Alternative, respectively, and just a little higher (about 4 percent) than the Short-span Alternative. In addition to the scoring, the CTF and others who have weighed in, considered other factors. The primary advantages of the Long-span Alternative are:

- Seismic Resiliency – All the build alternatives would be seismically resilient but the Long-span Alternative would carry the least risk. It would place the fewest piers in the geologically hazardous zones, particularly on the east side. A large earthquake is expected to liquefy the entire eastern slope up to 100 feet deep which would cause lateral spread (essentially a land/mudslide) that would exert massive lateral forces on any piers on that slope. The other alternatives would include significant jet grouting to stabilize the slope but the Long-span Alternative would largely avoid the risk with a very long approach span that would eliminate all but one pier in those zones.
- Parks and Recreation – With the fewest columns under the bridge, the Long-span Alternative would open up space in Waterfront Park, create views to the river from the park space under the bridge, and improve personal security in the public spaces under the bridge. It would also protect the Burnside Skatepark that would be removed under the Retrofit Alternative, and would have the shortest duration closure of the Eastbank Esplanade during construction.
- Social Services and Equity – Like the other replacement alternatives, the Long-span Alternative would maintain the operations of the Portland Rescue Mission during construction (which would be temporarily displaced under the Retrofit Alternative), and it would provide the greatest improvements to bicycle and pedestrian capacity, comfort, and safety on the bridge.
- Natural Resources – The Long-span Alternative would have the smallest permanent footprint in the river and would avoid placing any piers in shallow water habitat.
- Cost – The Long-span Alternative would be the lowest-cost alternative.

The No Temporary Bridge (Full Closure) Option scored higher than any of the temporary bridge options but only slightly higher than the All Modes Option. While the Full Closure Option would cause more congestion and out-of-direction travel during construction, it has substantial advantages in other regards. The CTF expressed that the travel impacts of the Full Closure Option were outweighed by its cost savings, shorter construction duration, and lower impacts on other important resources. The primary advantages of the Full Closure Option are:

- Lower Cost – It would save about $60 to $90 million in construction costs.
- Seismic Resiliency – By shaving 1.5 to 2 years off the construction duration, the region would secure a seismically resilient crossing that much sooner.
- Shorter Duration Construction Impacts – The duration of all construction-related impacts including noise, air emissions, disruption to travel, disruption to businesses and social services, would be shortened by about 1.5 to 2 years.
- Lower Resource Impacts – It would avoid the added physical impacts of a temporary bridge to Waterfront Park and the Burnside Skatepark, have less impact on in-water habitat and flooding, preserve four mature trees in the park, and have a shorter duration closure of the Eastbank Esplanade, Waterfront Park, and the Waterfront Trail.

More information on the Preferred Alternative evaluation and recommendation can be found in Attachment H, *Preferred Alternative Evaluation Memo*.

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