Interstate BRIDGE Replacement Program

Equity Technical Report

September 2024

Oregon

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Equity Technical Report

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ACRONYMS AND ABBREVIATIONS

Abbreviation/Acronym	Definition
BIPOC	Black, Indigenous, and People of Color
BRT	bus rapid transit
CRC	Columbia River Crossing
CTR	Commute Trip Reduction
C-TRAN	Clark County Public Transit Benefit Area Authority
EAG	Equity Advisory Group
EO	Executive Order
FSCR	Flood Safe Columbia River
GIS	geographic information system
HCT	high-capacity transit
I-5	Interstate 5
IBR	Interstate Bridge Replacement
LPA	Locally Preferred Alternative
LRT	light-rail transit
LRV	light-rail vehicle
MAX	Metropolitan Area Express
NAVD 88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
ODOT	Oregon Department of Transportation
OECR	Office of Equity and Civil Rights
OTC	Oregon Transportation Commission
PMLS	Portland Metro Levee System
PNCD	Preliminary Navigation Clearance Determination
ROD	Record of Decision
RTC	Southwest Washington Regional Transportation Council
RTP	Regional Transportation Plan
SOV	single-occupancy vehicle

Abbreviation/Acronym	Definition
SR	State Route
TriMet	Tri-County Metropolitan Transportation District of Oregon
UFSWQD	Urban Flood Safety and Water Quality District
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDOT	U.S. Department of Transportation
WSDOT	Washington State Department of Transportation
WSTC	Washington State Transportation Commission

1. PROGRAM OVERVIEW

1.1 Introduction

This technical report describes the analysis of the potential equity impacts (i.e., benefits and burdens) pertaining to the Interstate Bridge Replacement (IBR) Program's Modified Locally Preferred Alternative (LPA). The report supplements the IBR Program's environmental justice analysis by broadening the focus to communities beyond minority and low-income populations, consistent with the IBR Program definition of equity:

The IBR Program defines equity in terms of both process and outcomes. Together, process equity and outcome equity contribute to addressing the harmful impacts of and removing longstanding injustices experienced by equity priority communities.

***Process Equity** means that the Program centers and prioritizes access, influence, and decision-making power for equity priority communities throughout the Program in establishing objectives, design, implementation, and evaluation of success.*

***Outcome Equity** is the result of successful Process Equity and is demonstrated by tangible transportation, community, and economic benefits for equity priority communities.*

The IBR Program defines equity priority communities are those that experience and/or have experienced discrimination and exclusion based on identity or status, such as:

- *Black, Indigenous, and People of Color (BIPOC)*
- *Tribal governments*
- *People with disabilities*
- *Communities with limited English proficiency*
- *Persons with lower incomes*
- *Houseless individuals and families*
- *Immigrants and refugees*
- *Young people*
- *Older adults*

The objectives of this report are to:

- Define the study area and the methods of data collection and evaluation used for the analysis (Chapter 2).
- Identify equity priority communities and their locations within the study area (Chapter 3).
- Analyze potential benefits and burdens resulting from the construction and operation of the Modified LPA in comparison to the No-Build Alternative (Chapters 4 and 5).
- Summarize the findings of the equity analysis and identify next steps (Chapter 6).

The IBR Program is a continuation of the previously suspended Columbia River Crossing (CRC) project with the same purpose to replace the aging I-5 Bridge across the Columbia River with a modern, seismically resilient multimodal structure. The proposed infrastructure improvements are located along a 5-mile stretch of the I-5 corridor that extends from approximately Victory Boulevard in Portland to State Route (SR) 500 in Vancouver as shown in Figure 1-1.

The Modified LPA is a modification of the CRC LPA, which completed the National Environmental Policy Act (NEPA) process with a signed Record of Decision (ROD) in 2011 and two re-evaluations that were completed in 2012 and 2013. The CRC project was discontinued in 2014. This Technical Report is evaluating the effects of changes in project design since the CRC ROD and re-evaluations, as well as changes in regulations, policy, and physical conditions.

1.2 Components of the Modified LPA

The basic components of the Modified LPA include:

- A new pair of Columbia River bridges—one for northbound and one for southbound travel—built west of the existing bridge. The new bridges would each include three through lanes, safety shoulders, and one auxiliary lane (a ramp-to-ramp connection on the highway that improves interchange safety by providing drivers with more space and time to merge, diverge, and weave) in each direction. When all highway, transit, and active transportation would be moved to the new Columbia River bridges, the existing Interstate Bridge (both spans) would be removed.
  - Three bridge configurations are under consideration: (1) double-deck truss bridges with fixed spans, (2) single-level bridges with fixed spans, and (3) single-level bridges with movable spans over the primary navigation channel. The fixed-span configurations would provide up to 116 feet of vertical navigation clearance, and the movable-span configuration would provide 178 feet of vertical navigation clearance in the open position. The primary navigation channel would be relocated approximately 500 feet south (measured by channel centerline) of its existing location near the Vancouver shoreline.
  - A two auxiliary lane design option (two ramp-to-ramp lanes connecting interchanges) across the Columbia River is also being evaluated. The second auxiliary lane in each direction of I-5 would be added from approximately Interstate Avenue/Victory Boulevard to SR 500/39th Street.
- A 1.9-mile light-rail transit (LRT) extension of the current Metropolitan Area Express (MAX) Yellow Line from the Expo Center MAX Station in North Portland, where it currently ends, to a terminus near Evergreen Boulevard in Vancouver. Improvements would include new stations at Hayden Island, downtown Vancouver (Waterfront Station), and near Evergreen Boulevard (Evergreen Station), as well as revisions to the existing Expo Center MAX Station. Park and rides to serve LRT riders in Vancouver could be included near the Waterfront Station and Evergreen Station. The Tri-County Metropolitan Transportation District of Oregon (TriMet), which operates the MAX system, would also operate the Yellow Line extension.

Figure 1-1. IBR Program Location Overview

  - Potential site options for park and rides include three sites near the Waterfront Station and two near the Evergreen Station (up to one park and ride could be built for each station location in Vancouver).
- Associated LRT improvements such as traction power substations, overhead catenary system, signal and communications support facilities, an overnight light-rail vehicle (LRV) facility at the Expo Center, 19 new LRVs, and an expanded maintenance facility at TriMet's Ruby Junction.
- Integration of local bus transit service, including bus rapid transit (BRT) and express bus routes, in addition to the proposed new LRT service.
- Wider shoulders on I-5 from Interstate Avenue/Victory Boulevard to SR 500/39th Street to accommodate express bus-on-shoulder service in each direction.
- Associated bus transit service improvements would include three additional bus bays for eight new electric double-decker buses at the Clark County Public Transit Benefit Area Authority (C-TRAN) operations and maintenance facility (see Section 1.2.7, Transit Operating Characteristics, for more information about this service).
- Improvements to seven I-5 interchanges and I-5 mainline improvements between Interstate Avenue/ Victory Boulevard in Portland and SR 500/39th Street in Vancouver. Some adjacent local streets would be reconfigured to complement the new interchange designs, and improve local east-west connections.
  - An option that shifts the I-5 mainline up to 40 feet westward in downtown Vancouver between the SR 14 interchange and Mill Plain Boulevard interchange is being evaluated.
  - An option that eliminates the existing C Street ramps in downtown Vancouver is being evaluated.
- Six new adjacent bridges across North Portland Harbor: one on the east side of the existing I-5 North Portland Harbor bridge and five on the west side or overlapping with the existing bridge (which would be removed). The bridges would carry (from west to east) LRT tracks, southbound I-5 off-ramp to Marine Drive, southbound I-5 mainline, northbound I-5 mainline, northbound I-5 on-ramp from Marine Drive, and an arterial bridge for local traffic with a shared-use path for pedestrians and bicyclists.
- A variety of improvements for people who walk, bike, and roll throughout the study area, including a system of shared-use paths, bicycle lanes, sidewalks, enhanced wayfinding, and facility improvements to comply with the Americans with Disabilities Act. These are referred to in this document as *active transportation* improvements.
- Variable-rate tolling for motorists using the river crossing as a demand-management and financing tool.

The transportation improvements proposed for the Modified LPA and the design options are shown in Figure 1-2. The Modified LPA includes all of the components listed above. If there are differences in environmental effects or benefits between the design options, those are identified in the sections below.

Figure 1-2. Modified LPA Components

Section 1.2.1, Interstate 5 Mainline, describes the overall configuration of the I-5 mainline through the study area, and Sections 1.2.2, Portland Mainland and Hayden Island (Subarea A), through Section 1.2.5, Upper Vancouver (Subarea D), provide additional detail on four geographic subareas (A through D), which are shown on Figure 1-3. In each subarea, improvements to I-5, its interchanges, and the local roadways are described first, followed by transit and active transportation improvements. Design options are described under separate headings in the subareas in which they would be located.

Table 1-1 shows the different combinations of design options analyzed in this Technical Report. However, **any combination of design options is compatible**. In other words, any of the bridge configurations could be combined with one or two auxiliary lanes, with or without the C Street ramps, a centered or westward shift of I-5 in downtown Vancouver, and any of the park-and-ride location options. Figures in each section show both the anticipated limit of ground disturbance, which includes disturbance from temporary construction activities, and the location of permanent infrastructure elements.

Figure 1-3. Modified LPA – Geographic Subareas

Table 1-1. Modified LPA and Design Options

Design Options	Modified LPA	Modified LPA with Two Auxiliary Lanes	Modified LPA Without C Street Ramps	Modified LPA with I-5 Shifted West	Modified LPA with a Single-Level Fixed-Span Configuration	Modified LPA with a Single-Level Movable-Span Configuration
Bridge Configuration	**Double-deck fixed-span***	Double-deck fixed-span	Double-deck fixed-span	Double-deck fixed-span	**Single-level fixed-span***	**Single-level movable-span***
Auxiliary Lanes	**One***	**Two***	One	One	One	One
C Street Ramps	**With C Street ramps***	With C Street ramps	**Without C Street Ramps***	With C Street ramps	With C Street ramps	With C Street ramps
I-5 Alignment	**Centered***	Centered	Centered	**Shifted West***	Centered	Centered
Park-and-Ride Options	**Waterfront:*** 1. Columbia Way (below I-5); 2. Columbia Street/SR 14; 3. Columbia Street/Phil Arnold Way **Evergreen:*** 1. Library Square; 2. Columbia Credit Union					

Bold text with an asterisk (*) indicates which design option is different in each configuration.

1.2.1 Interstate 5 Mainline

Today, within the 5-mile corridor, I-5 has three 12-foot-wide through lanes in each direction, an approximately 6- to 11-foot-wide inside shoulder, and an approximately 10- to 12-foot-wide outside shoulder with the exception of the Interstate Bridge, which has approximately 2- to 3-foot-wide inside and outside shoulders. There are currently intermittent auxiliary lanes between the Victory Boulevard and Hayden Island interchanges in Oregon and between SR 14 and SR 500 in Washington.

The Modified LPA would include three 12-foot through lanes from Interstate Avenue/Victory Boulevard to SR 500/39th Street and a 12-foot auxiliary lane from the Marine Drive interchange to the Mill Plain Boulevard interchange in each direction. Many of the existing auxiliary lanes on I-5 between the SR 14 and Main Street interchanges in Vancouver would remain, although they would be reconfigured. The existing auxiliary lanes between the Victory Boulevard and Hayden Island interchanges would be replaced with changes to on- and off-ramps and interchange reconfigurations. The Modified LPA would also include wider shoulders (12-foot inside shoulders and 10- to 12-foot outside shoulders) to be consistent with ODOT and WSDOT design standards. The wider inside shoulder would be used by express bus service to bypass mainline congestion, known as “bus on shoulder” (refer to Section 1.2.7, Transit Operating Characteristics). The shoulder would be available for express bus service when general-purpose speeds are below 35 miles per hour (mph).

Figure 1-4 shows a cross section of the collector-distributor (C-D)[1] roadways, Figure 1-5 shows the location of the C-D roadways, and Figure 1-6 shows the proposed auxiliary lane layout. The existing Interstate Bridge over the Columbia River does not have an auxiliary lane; the Modified LPA would add one auxiliary lane in each direction across the new Columbia River bridges.

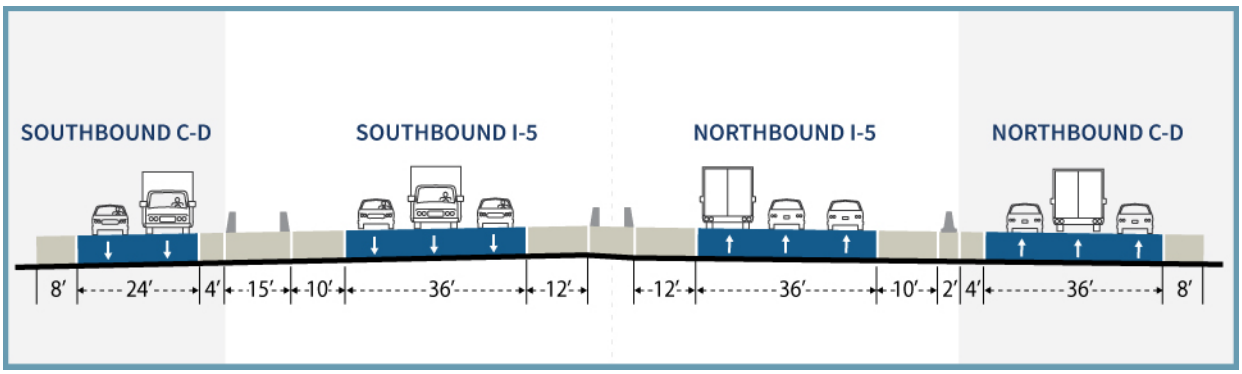
On I-5 northbound, the auxiliary lane that would begin at the on-ramp from Marine Drive would continue across the Columbia River bridge and end at the off-ramp to the C-D roadway, north of SR 14 (see Figure 1-5). The on-ramp from SR 14 westbound would join the off-ramp to the C-D roadway, forming the northbound C-D roadway between SR 14 and Fourth Plain Boulevard. The C-D roadway would provide access from I-5 northbound to the off-ramps at Mill Plain Boulevard and Fourth Plain Boulevard. The C-D roadway would also provide access from SR 14 westbound to the off-ramps at Mill Plain Boulevard and Fourth Plain Boulevard, and to the on-ramp to I-5 northbound.

On I-5 northbound, the Modified LPA would also add one auxiliary lane beginning at the on-ramp from the C-D roadway and ending at the on-ramp from 39th Street, connecting to an existing auxiliary lane from 39th Street to the off-ramp at Main Street. Another existing auxiliary lane would remain between the on-ramp from Mill Plain Boulevard to the off-ramp to SR 500.

On I-5 southbound, the off-ramp to the C-D roadway would join the on-ramp from Mill Plain Boulevard to form a C-D roadway. The C-D roadway would provide access from I-5 southbound to the off-ramp to SR 14 eastbound and from Mill Plain Boulevard to the off-ramp to SR 14 eastbound and the on-ramp to I-5 southbound.

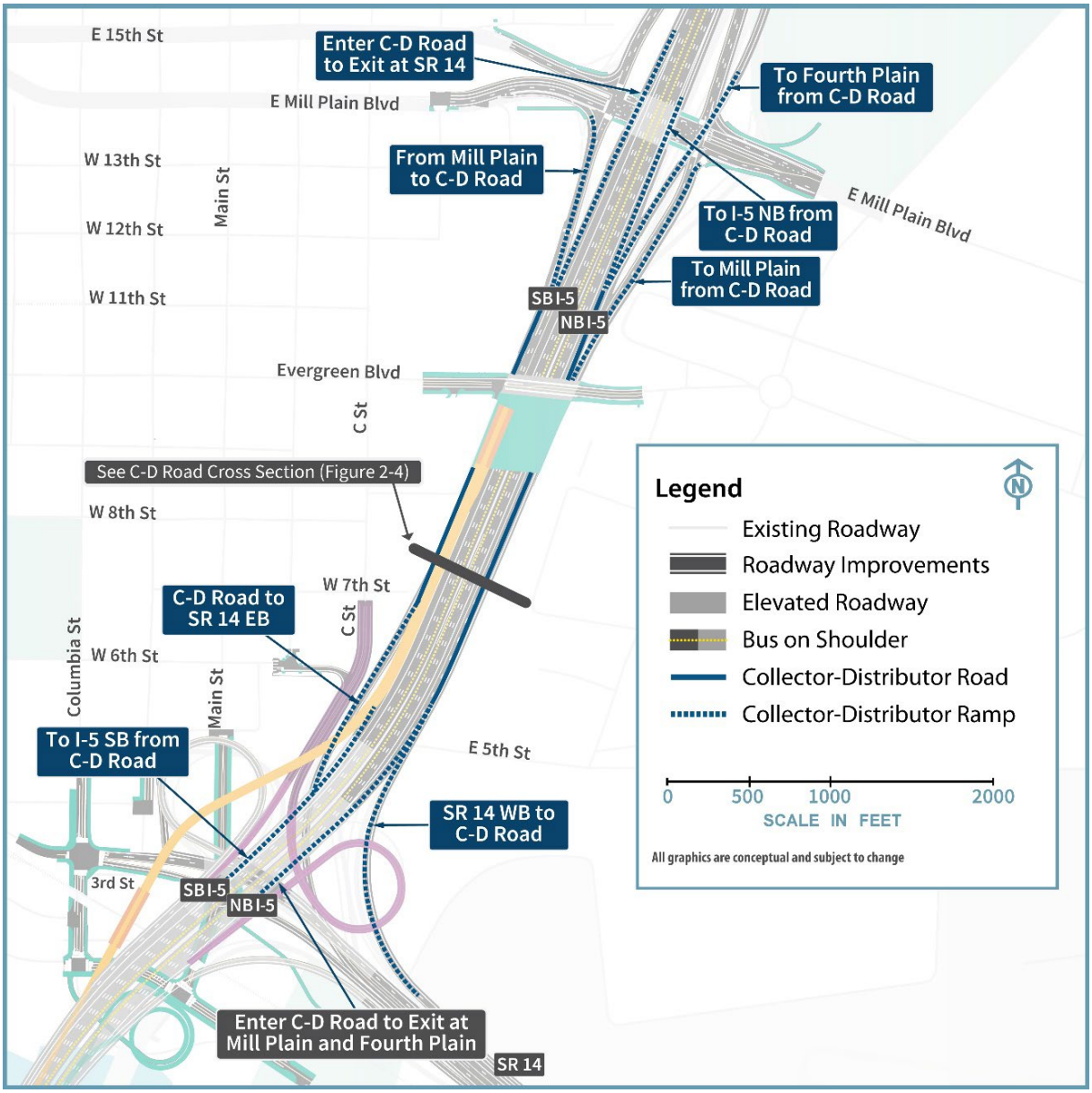
On I-5 southbound, an auxiliary lane would begin at the on-ramp from the C-D roadway and would continue across the southbound Columbia River bridge and end at the off-ramp to Marine Drive. The combined on-ramp from SR 14 westbound and C Street would merge into this auxiliary lane.

Figure 1-4. Cross Section of the Collector-Distributor Roadways



[1] A collector-distributer roadway parallels and connects the main travel lanes of a highway and frontage roads or entrance ramps.

Figure 1-5. Collector-Distributor Roadways



C-D = collector-distributor; EB = eastbound; NB = northbound; SB = southbound; WB = westbound

1.2.1.1 Two Auxiliary Lane Design Option

This design option would add a second 12-foot-wide auxiliary lane in each direction of I-5 with the intent to further optimize travel flow in the corridor. This second auxiliary lane is proposed from the Interstate Avenue/Victory Boulevard interchange to the SR 500/39th Street interchange.

On I-5 northbound, one auxiliary lane would begin at the combined on-ramp from Interstate Avenue and Victory Boulevard, and a second auxiliary lane would begin at the on-ramp from Marine Drive. Both auxiliary lanes would continue across the northbound Columbia River bridge, and the on-ramp

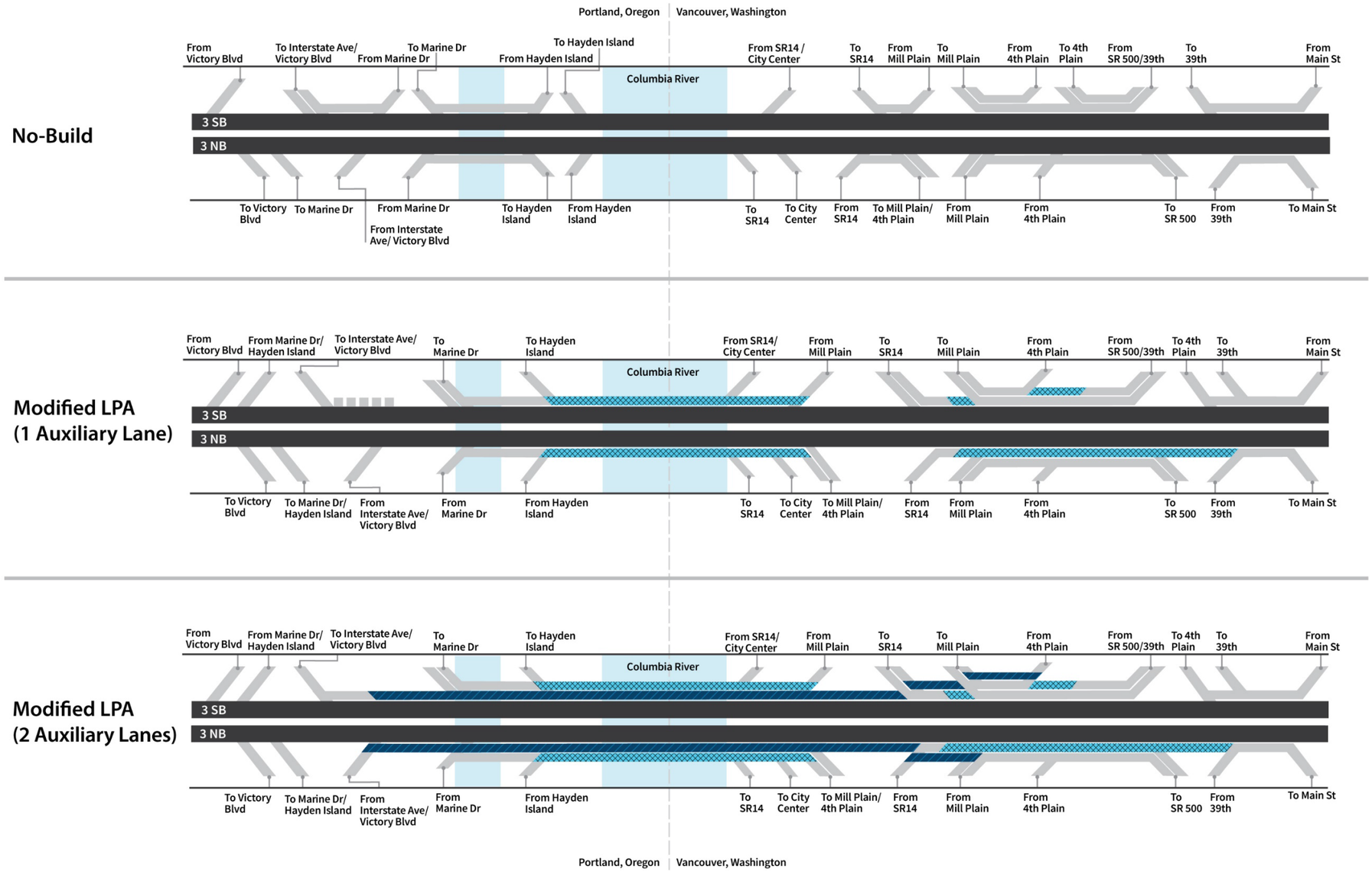
from Hayden Island would merge into the second auxiliary lane on the northbound Columbia River bridge. At the off-ramp to the C-D roadway, the second auxiliary lane would end but the first auxiliary lane would continue. A second auxiliary lane would begin again at the on-ramp from Mill Plain Boulevard. The second auxiliary lane would end at the off-ramp to SR 500, and the first auxiliary lane would connect to an existing auxiliary lane at 39th Street to the off-ramp at Main Street.

On I-5 southbound, two auxiliary lanes would begin at the on-ramp from SR 500. Between the on-ramp from Fourth Plain Boulevard and the off-ramp to Mill Plain Boulevard, one auxiliary lane would be added to the existing two auxiliary lanes. The second auxiliary lane would end at the off-ramp to the C-D roadway, but the first auxiliary lane would continue. A second auxiliary lane would begin again at the southbound I-5 on-ramp from the C-D roadway. Both auxiliary lanes would continue across the southbound Columbia River bridge, and the combined on-ramp from SR 14 westbound and C Street would merge into the second auxiliary lane on the southbound Columbia River bridge. The second auxiliary lane would end at the off-ramp to Marine Drive, and the first auxiliary lane would end at the combined off-ramp to Interstate Avenue and Victory Boulevard.

Figure 1-6 shows a comparison of the one auxiliary lane configuration and the two auxiliary lane configuration design option. Figure 1-7 shows a comparison of the footprints (i.e., the limit of permanent improvements) of the one auxiliary lane and two auxiliary lane configurations on a double-deck fixed-span bridge. For all Modified LPA bridge configurations (described in Section 1.2.3, Columbia River Bridges (Subarea B)), the footprints of the two auxiliary lane configurations differ only over the Columbia River and in downtown Vancouver. The rest of the corridor would have the same footprint. For all bridge configurations analyzed in this document, the two auxiliary lane option would add 16 feet (8 feet in each direction) in total roadway width compared to the one auxiliary lane option due to the increased shoulder widths for the one auxiliary lane option.[2] The traffic operations analysis incorporating both the one and two auxiliary lane design options applies equally to all bridge configurations in this Technical Report.

[2] Under the one auxiliary lane option, the width of each shoulder would be approximately 14 feet to accommodate maintenance of traffic during construction. Under the two auxiliary lane option, maintenance of traffic could be accommodated with 12-foot shoulders because the additional 12-foot auxiliary lane provides adequate roadway width. The total difference in roadway width in each direction between the one auxiliary lane option and the two auxiliary lane option would be 8 feet (12-foot auxiliary lane – 2 feet from the inside shoulder – 2 feet from the outside shoulder = 8 feet).

Figure 1-6. Comparison of Auxiliary Lane Configurations



Each scenario has three through lanes in each direction

- Existing Through Lanes
- Interchange Ramps and Existing Auxiliary Lanes
- Existing Auxiliary Lanes Removed
- One Auxiliary Lane added in Modified LPA
- Second Auxiliary Lane added in Modified LPA

Notes:

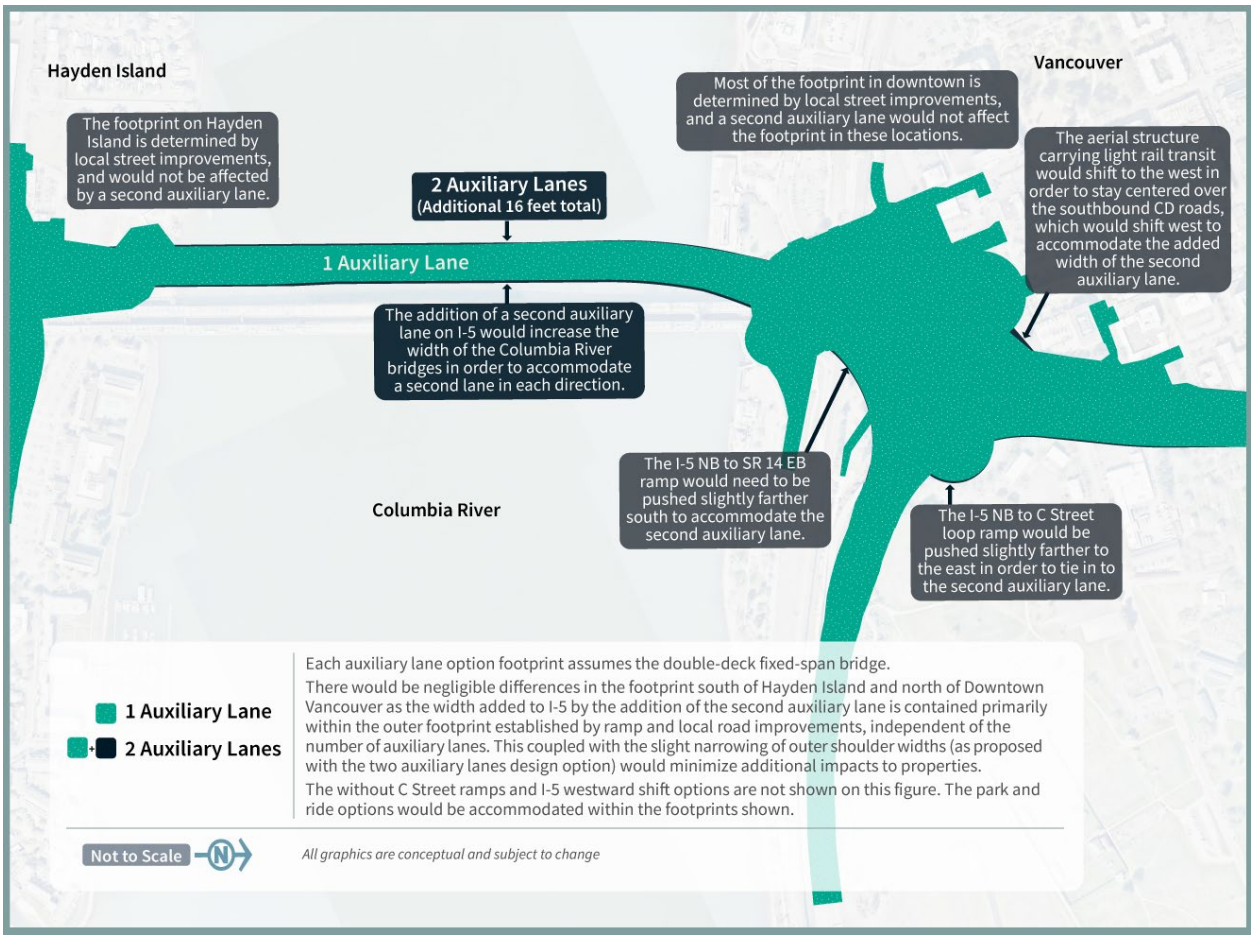
Collector Distributor Lanes not shown.

The traffic operations analysis incorporating both the one and two auxiliary lane design option applies equally to all bridge configuration options in this Draft SEIS.

The C Street ramp (NB to City Center) is an option.

Figure is not to scale.

Figure 1-7. Auxiliary Lane Configuration Footprint Differences



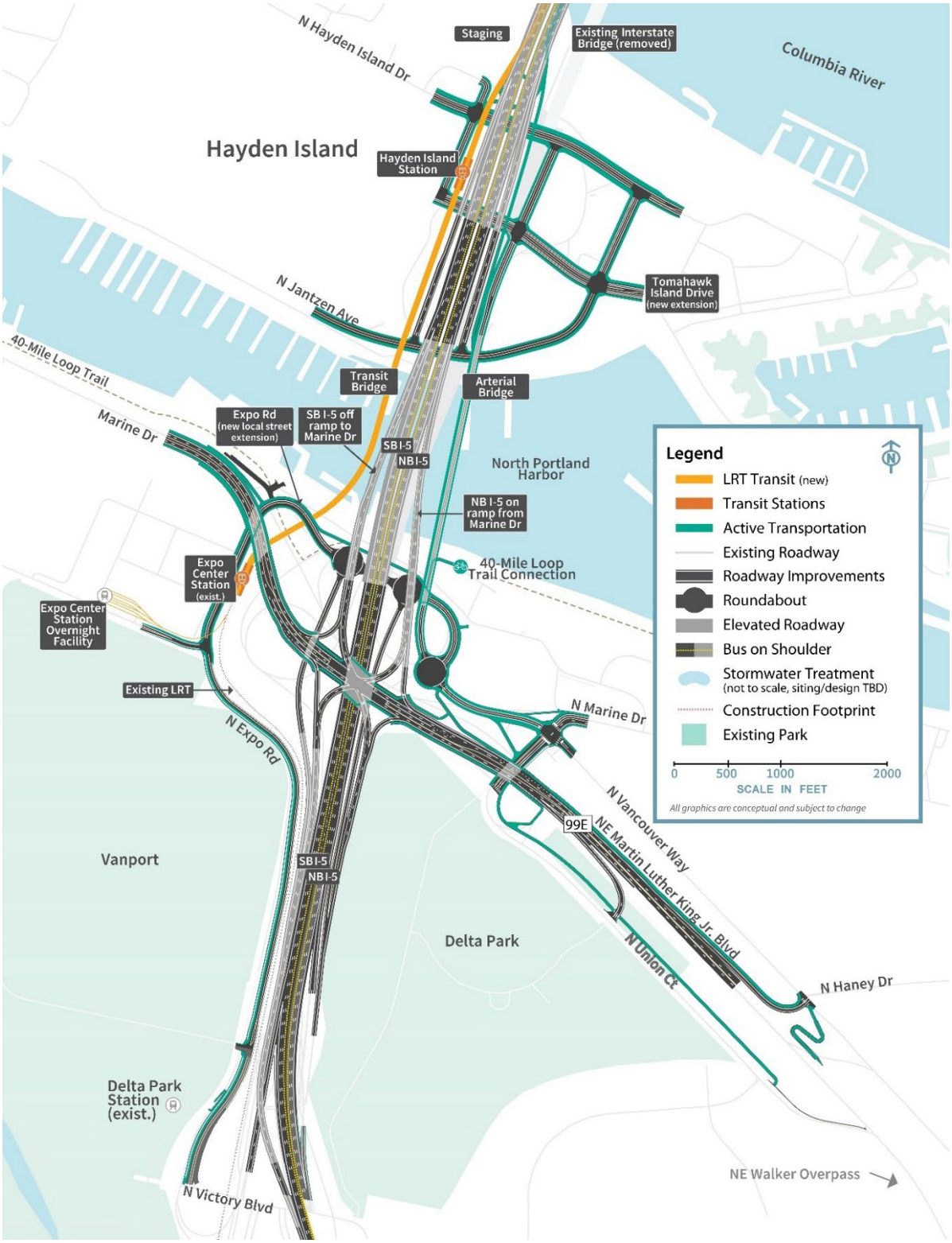
1.2.2 Portland Mainland and Hayden Island (Subarea A)

This section discusses the geographic Subarea A shown in Figure 1-3. See Figure 1-8 for highway and interchange improvements in Subarea A, including the North Portland Harbor bridge. Figure 1-8 illustrates the one auxiliary lane design option; please refer to Figure 1-6 and the accompanying description for how two auxiliary lanes would alter the Modified LPA's proposed design. Refer to Figure 1-3 for an overview of the geographic subareas.

Within Subarea A, the IBR Program has the potential to alter three federally authorized levee systems:

- The Oregon Slough segment of the Peninsula Drainage District Number 1 levee (PEN 1).
- The Oregon Slough segment of the Peninsula Drainage District Number 2 levee (PEN 2).
- The PEN1/PEN2 cross levee segment of the PEN 1 levee (Cross Levee).

Figure 1-8. Portland Mainland and Hayden Island (Subarea A)



LRT = light-rail transit; NB = northbound; SB = southbound; TBD = to be determined

The levee systems are shown on Figure 1-9, and intersections with Modified LPA components are described throughout Section 1.2.2, Portland Mainland and Hayden Island (Subarea A), where appropriate. Within Subarea A, the IBR Program study area intersects with PEN 1 to the west of I-5 and with PEN 2 to the east of I-5. PEN 1 and PEN 2 include a main levee along the south side of North Portland Harbor and are part of a combination of levees and floodwalls. PEN 1 and PEN 2 are separated by the Cross Levee that is intended to isolate the two districts if one of them fails. The Cross Levee is located along the I-5 mainline embankment, except in the Marine Drive interchange area where it is located on the west edge of the existing ramp from Marine Drive to southbound I-5.[3]

There are two concurrent efforts underway that are planning improvements to PEN1, PEN2, and the Cross Levee to reduce flood risk:

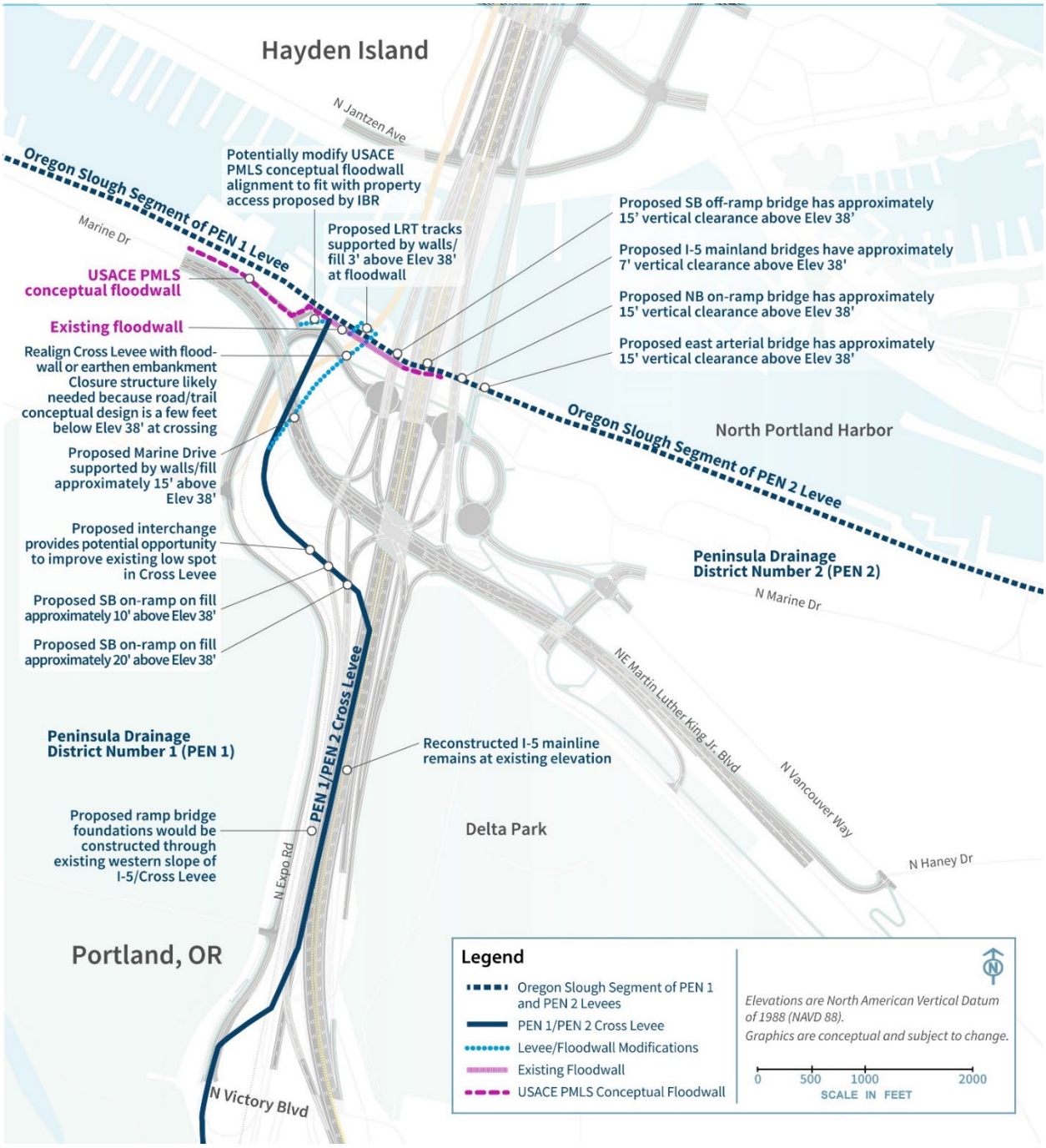
- The U.S. Army Corps of Engineers (USACE) Portland Metro Levee System (PMLS) project.
- The Flood Safe Columbia River (FSCR) program (also known as "Levee Ready Columbia").

The Urban Flood Safety and Water Quality District (UFSWQD)[4] is working with the USACE through the PMLS project, which includes improvements at PEN 1 and PEN 2 (e.g., raising these levees to elevation 38 feet North American Vertical Datum of 1988 [NAVD 88]).[5] Additionally, as part of the FSCR program, UFSWQD is studying raising a low spot in the Cross Levee on the southwest side of the Marine Drive interchange.

The IBR Program is in close coordination with these concurrent efforts to ensure that the IBR Program's design efforts consider the timing and scope of the PMLS and the FSCR proposed modifications. The intersection of the IBR Program proposed actions to both the existing levee configuration and the anticipated future condition based on the proposed PMLS and FSCR projects are described below, where appropriate.

[3] The portion of the original Denver Avenue levee alignment within the Marine Drive interchange area is no longer considered part of the levee system by UFSWQD.
[4] UFSWQD includes PEN 1 and PEN 2, Urban Flood Safety and Water Quality District No. 1, and the Sandy Drainage Improvement Company.
[5] NAVD 88 is a vertical control datum (reference point) used by federal agencies for surveying.

Figure 1-9. Levee Systems in Subarea A



1.2.2.1 Highways, Interchanges, and Local Roadways

VICTORY BOULEVARD/INTERSTATE AVENUE INTERCHANGE AREA

The southern extent of the Modified LPA would improve two ramps at the Victory Boulevard/Interstate Avenue interchange (see Figure 1-8). The first ramp improvement would be the southbound I-5 off-ramp to Victory Boulevard/ Interstate Avenue; this off-ramp would be braided below (i.e., grade separated or pass below) the Marine Drive to the I-5 southbound on-ramp (see the Marine Drive Interchange Area section below). The other ramp improvement would lengthen the merge distance for northbound traffic entering I-5 from Victory Boulevard and from Interstate Avenue.

The existing I-5 mainline between Victory Boulevard/Interstate Avenue and Marine Drive is part of the Cross Levee (see Figure 1-9). The Modified LPA would require some pavement reconstruction of the mainline in this area; however, the improvements would mostly consist of pavement overlay and the profile and footprint would be similar to existing conditions.

MARINE DRIVE INTERCHANGE AREA

The next interchange north of the Victory Boulevard/Interstate Avenue interchange is at Marine Drive. All movements within this interchange would be reconfigured to reduce congestion for motorists entering and exiting I-5. The new configuration would be a single-point urban interchange. The new interchange would be centered over I-5 versus on the west side under existing conditions. See Figure 1-8 for the Marine Drive interchange's layout and construction footprint.

The Marine Drive to I-5 southbound on-ramp would be braided over I-5 southbound to the Victory Boulevard/Interstate Avenue off-ramp. Martin Luther King Jr. Boulevard would have a new more direct connection to I-5 northbound.

The new interchange configuration would change the westbound Marine Drive and westbound Vancouver Way connections to Martin Luther King Jr. Boulevard. An improved connection farther east of the interchange (near Haney Street) would provide access to westbound Martin Luther King Jr. Boulevard for these two streets. For eastbound travelers on Martin Luther King Jr. Boulevard exiting to Union Court, the existing loop connection would be replaced with a new connection farther east (near the access to the East Delta Park Owens Sports Complex).

Expo Road from Victory Boulevard to the Expo Center would be reconstructed with improved active transportation facilities. North of the Expo Center, Expo Road would be extended under Marine Drive and continue under I-5 to the east, connecting with Marine Drive and Vancouver Way through three new connected roundabouts. The westernmost roundabout would connect the new local street extension to I-5 southbound. The middle roundabout would connect the I-5 northbound off-ramp to the local street extension. The easternmost roundabout would connect the new local street extension to an arterial bridge crossing North Portland Harbor to Hayden Island. This roundabout would also connect the local street extension to Marine Drive and Vancouver Way.

To access Hayden Island using the arterial bridge from the east on Martin Luther King Jr. Boulevard, motorists would exit Martin Luther King Jr. Boulevard at the existing off-ramp to Vancouver Way just west of the Walker Street overpass. Then motorists would travel west on Vancouver Way, through the intersection with Marine Drive and straight through the roundabout to the arterial bridge.

From Hayden Island, motorists traveling south to Portland via Martin Luther King Jr. Boulevard would turn onto the arterial bridge southbound and travel straight through the roundabout onto Vancouver Way. At the intersection of Vancouver Way and Marine Drive, motorists would turn right onto Union Court and follow the existing road southeast to the existing on-ramp onto Martin Luther King Jr. Boulevard.

The conceptual floodwall alignment from the proposed USACE PMLS project is located on the north side of Marine Drive, near two industrial properties, with three proposed closure structures[6] for property access. The Modified LPA would realign Marine Drive to the south and provide access to the two industrial properties via the new local road extension from Expo Road. Therefore, the change in access for the two industrial properties could require small modifications to the floodwall alignment (a potential shift of 5 to 10 feet to the south) and closure structure locations.

Marine Drive and the two southbound on-ramps would travel over the Cross Levee approximately 10 to 20 feet above the proposed elevation of the improved levee, and they would be supported by fill and retaining walls near an existing low spot in the Cross Levee.

The I-5 southbound on-ramp from Marine Drive would continue on a new bridge structure. Although the bridge's foundation locations have not been determined yet, they would be constructed through the western slope of the Cross Levee (between the existing I-5 mainline and the existing light-rail).

NORTH PORTLAND HARBOR BRIDGES

To the north of the Marine Drive interchange is the Hayden Island interchange area, which is shown in Figure 1-8. I-5 crosses over the North Portland Harbor when traveling between these two interchanges. The Modified LPA proposes to replace the existing I-5 bridge spanning North Portland Harbor to improve seismic resiliency.

Six new parallel bridges would be built across the waterway under the Modified LPA: one on the east side of the existing I-5 North Portland Harbor bridge and five on the west side or overlapping the location of the existing bridge (which would be removed). From west to east, these bridges would carry:

- The LRT tracks.
- The southbound I-5 off-ramp to Marine Drive.
- The southbound I-5 mainline.
- The northbound I-5 mainline.
- The northbound I-5 on-ramp from Marine Drive.
- An arterial bridge between the Portland mainland and Hayden Island for local traffic; this bridge would also include a shared-use path for pedestrians and bicyclists.

Each of the six replacement North Portland Harbor bridges would be supported on foundations constructed of 10-foot-diameter drilled shafts. Concrete columns would rise from the drilled shafts

[6] Levee closure structures are put in place at openings along the embankment/floodwall to provide flood protection during high water conditions.

and connect to the superstructures of the bridges. All new structures would have at least as much vertical navigation clearance over North Portland Harbor as the existing North Portland Harbor bridge.

Compared to the existing bridge, the two new I-5 mainline bridges would have a similar vertical clearance of approximately 7 feet above the proposed height of the improved levees (elevation 38 feet NAVD 88). The two ramp bridges and the arterial bridge would have approximately 15 feet of vertical clearance above the proposed height of the levees. The foundation locations for the five roadway bridges have not been determined at this stage of design, but some foundations could be constructed through landward or riverward levee slopes.

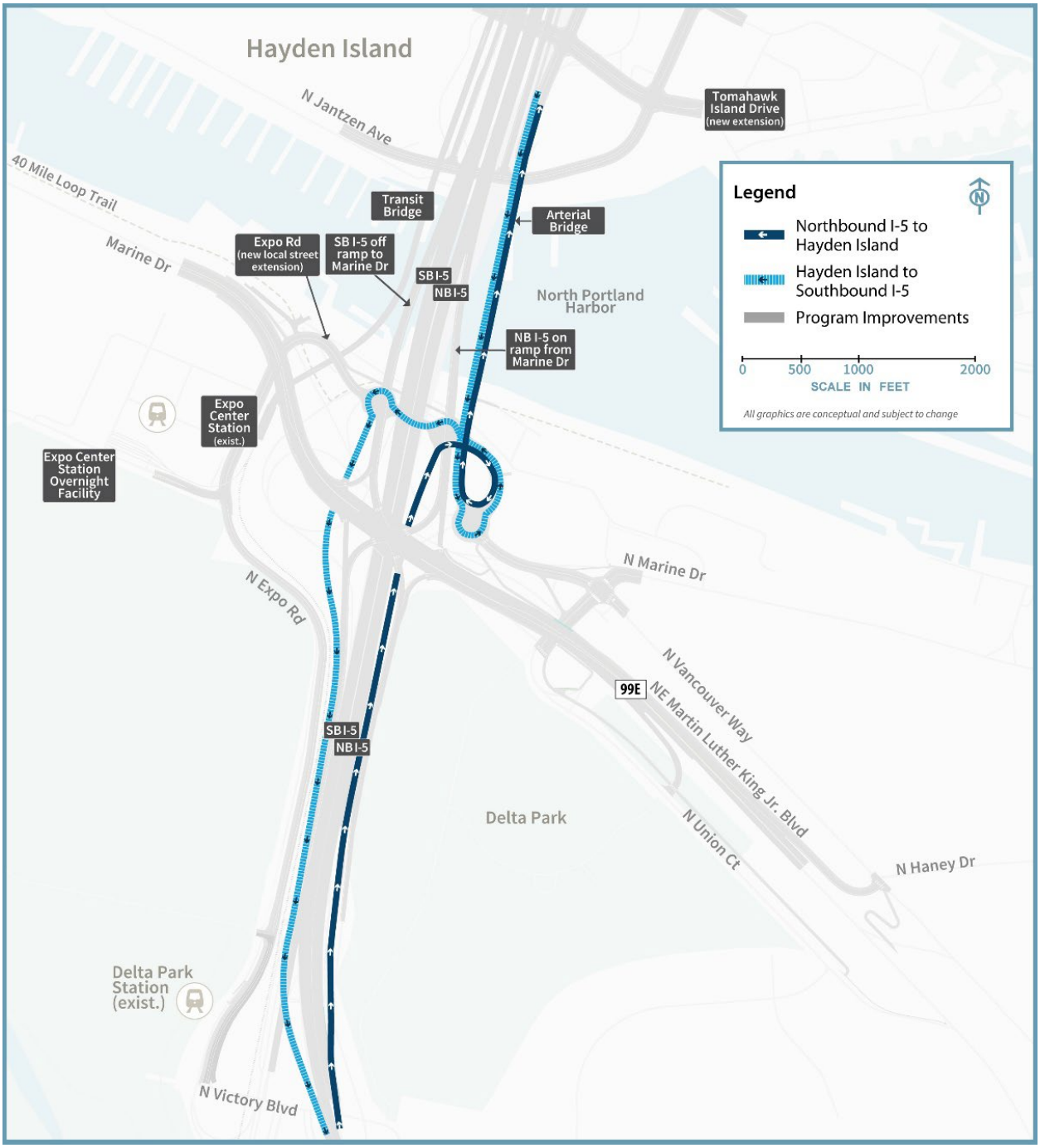
HAYDEN ISLAND INTERCHANGE AREA

All traffic movements for the Hayden Island interchange would be reconfigured. See Figure 1-8 for a layout and construction footprint of the Hayden Island interchange. A half-diamond interchange would be built on Hayden Island with a northbound I-5 on-ramp from Jantzen Drive and a southbound I-5 off-ramp to Jantzen Drive. This would lengthen the ramps and improve merging/diverging speeds compared to the existing substandard ramps that require acceleration and deceleration in a short distance. The I-5 mainline would be partially elevated and partially located on fill across the island.

There would not be a southbound I-5 on-ramp or northbound I-5 off-ramp on Hayden Island. Connections to Hayden Island for those movements would be via the local access (i.e., arterial) bridge connecting North Portland to Hayden Island (Figure 1-10). Vehicles traveling northbound on I-5 wanting to access Hayden Island would exit with traffic going to the Marine Drive interchange, cross under Martin Luther King Jr. Boulevard to the new roundabout at the Expo Road local street extension, travel east through this roundabout to the easternmost roundabout, and use the arterial bridge to cross North Portland Harbor. Vehicles on Hayden Island looking to enter I-5 southbound would use the arterial bridge to cross North Portland Harbor, cross under I-5 using the new Expo Road local street extension to the westernmost roundabout, cross under Marine Drive, merge with the Marine Drive southbound on-ramp, and merge with I-5 southbound south of Victory Boulevard.

Improvements to Jantzen Avenue may include additional left-turn and right-turn lanes at the interchange ramp terminals and active transportation facilities. Improvements to Hayden Island Drive would include new connections to the new arterial bridge over North Portland Harbor. The existing I-5 northbound and southbound access points from Hayden Island Drive would also be removed. A new extension of Tomahawk Island Drive would travel east-west through the middle of Hayden Island and under the I-5 interchange, thus improving connectivity across I-5 on the island.

Figure 1-10. Vehicle Circulation between Hayden Island and the Portland Mainland



NB = northbound; SB = southbound

1.2.2.2 Transit

A new light-rail alignment for northbound and southbound trains would be constructed within Subarea A (see Figure 1-8) to extend from the existing Expo Center MAX Station over North Portland Harbor to a new station at Hayden Island. An overnight LRV facility would be constructed on the southeast corner of the Expo Center property (see Figure 1-8) to provide storage for trains during hours when MAX is not in service. This facility is described in Section 1.2.6, Transit Support Facilities. The existing Expo Center MAX Station would be modified to remove the westernmost track and platform. Other platform modifications, including track realignment and regrading the station, are anticipated to transition to the extension alignment. This may require reconstruction of the operator break facility, signal/communication buildings, and traction power substations. Immediately north of the Expo Center MAX Station, the alignment would curve east toward I-5, pass beneath Marine Drive, cross the proposed Expo Road local street extension and the 40-Mile Loop Trail at grade, then rise over the existing levee onto a light-rail bridge to cross North Portland Harbor. On Hayden Island, proposed transit components include northbound and southbound LRT tracks over Hayden Island; the tracks would be elevated at approximately the height of the new I-5 mainline. An elevated LRT station would also be built on the island immediately west of I-5. The light-rail alignment would extend north on Hayden Island along the western edge of I-5 before transitioning onto the lower level of the new double-deck western bridge over the Columbia River (see Figure 1-8). For the single-level configurations, the light-rail alignment would extend to the outer edge of the western bridge over the Columbia River.

After crossing the new local road extension from Expo Road, the new light-rail track would cross over the main levee (see Figure 1-9). The light-rail profile is anticipated to be approximately 3 feet above the improved levees at the existing floodwall (and improved floodwall), and the tracks would be constructed on fill supported by retaining walls above the floodwall. North of the floodwall, the light-rail tracks would continue onto the new light-rail bridge over North Portland Harbor (as described above).

The Modified LPA's light-rail extension would be close to or would cross the north end of the Cross Levee. The IBR Program would realign the Cross Levee to the east of the light-rail alignment to avoid the need for a closure structure on the light-rail alignment. This realigned Cross Levee would cross the new local road extension. A closure structure may be required because the current proposed roadway is a few feet lower than the proposed elevation of the improved levee.

1.2.2.3 Active Transportation

In the Victory Boulevard interchange area (see Figure 1-8), active transportation facilities would be provided along Expo Road between Victory Boulevard and the Expo Center; this would provide a direct connection between the Victory Boulevard and Marine Drive interchange areas, as well as links to the Delta Park and Expo Center MAX Stations.

New shared-use path connections throughout the Marine Drive interchange area would provide access between the Bridgeton neighborhood (on the east side of I-5), Hayden Island, and the Expo Center MAX Station. There would also be connections to the existing portions of the 40-Mile Loop Trail, which runs north of Marine Drive under I-5 through the interchange area. The path would

continue along the extension of Expo Road under the interchange to the intersection of Marine Drive and Vancouver Way, where it would connect under Martin Luther King Jr. Boulevard to Delta Park.

East of the Marine Drive interchange, new shared-use paths on Martin Luther King Jr. Boulevard and on the parallel street, Union Court, would connect travelers to Marine Drive and across the arterial bridge to Hayden Island. The shared-use facilities on Martin Luther King Jr. Boulevard would provide westbound and eastbound cyclists and pedestrians with off-street crossings of the interchange and would also provide connections to both the Expo Center MAX Station and the 40-Mile Loop Trail to the west.

The new arterial bridge over North Portland Harbor would include a shared-use path for pedestrians and bicyclists (see Figure 1-8). On Hayden Island, pedestrian and bicycle facilities would be provided on Jantzen Avenue, Hayden Island Drive, and Tomahawk Island Drive. The shared-use path on the arterial bridge would continue along the arterial bridge to the south side of Tomahawk Island Drive. A parallel, elevated path from the arterial bridge would continue adjacent to I-5 across Hayden Island and cross above Tomahawk Island Drive and Hayden Island Drive to connect to the lower level of the new double-deck eastern bridge or the outer edge of the new single-level eastern bridge over the Columbia River. A ramp down to the north side of Hayden Island Drive would be provided from the elevated path.

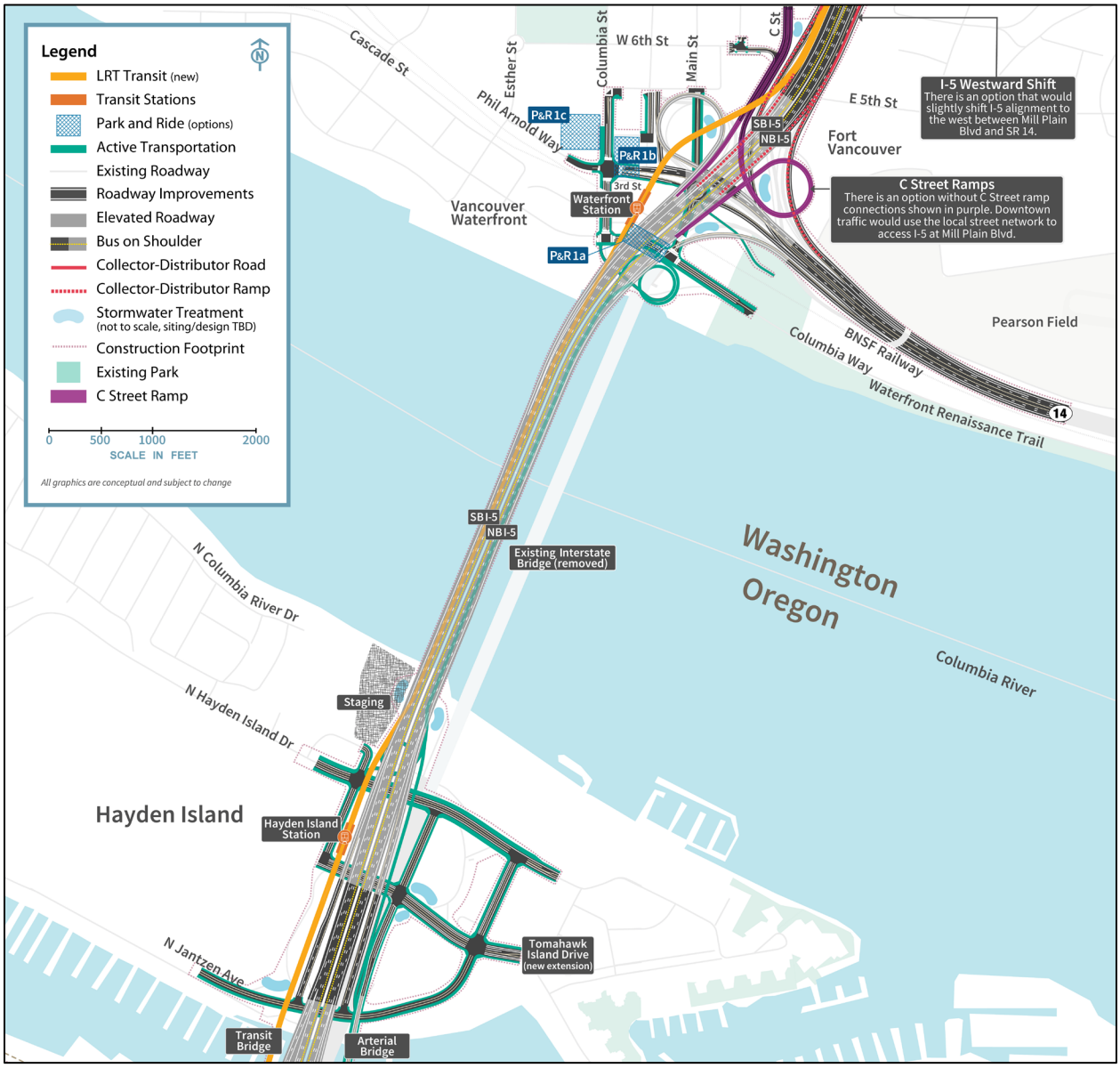
1.2.3 Columbia River Bridges (Subarea B)

This section discusses the geographic Subarea B shown in Figure 1-3. See Figure 1-11 for highway and interchange improvements in Subarea B. Refer to Figure 1-3 for an overview of the geographic subareas.

1.2.3.1 Highways, Interchanges, and Local Roadways

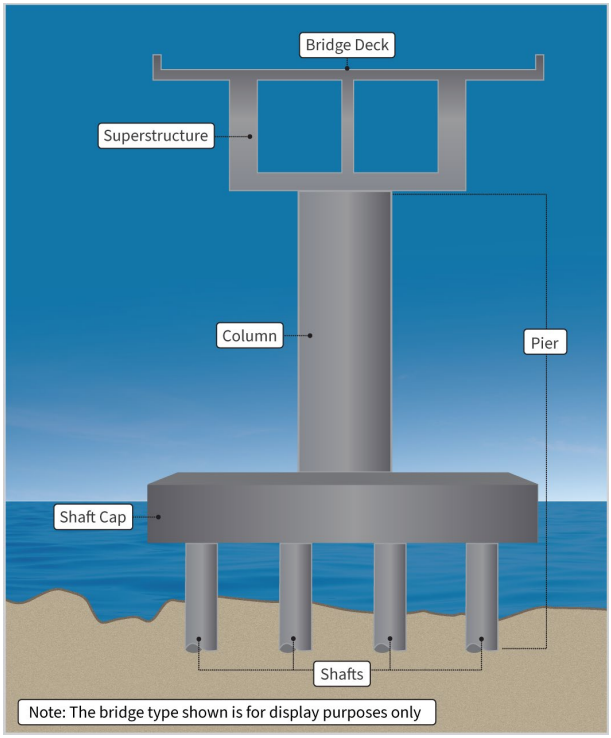
The two existing parallel I-5 bridges that cross the Columbia River would be replaced by two new parallel bridges, located west of the existing bridges (see Figure 1-11). The new eastern bridge would accommodate northbound highway traffic and a shared-use path. The new western bridge would carry southbound traffic and two-way light-rail tracks. Whereas the existing bridges each have three lanes with no shoulders, each of the two new bridges would be wide enough to accommodate three through lanes, one or two auxiliary lanes, and shoulders on both sides of the highway. Lanes and shoulders would be built to full design standards.

Figure 1-11. Columbia River Bridges (Subarea B)



As with the existing bridge (Figure 1-13), the new Columbia River bridges would provide three navigation channels: a primary navigation channel and two barge channels (see Figure 1-14). The current location of the primary navigation channel is near the Vancouver shoreline where the existing lift spans are located. Under the Modified LPA, the primary navigation channel would be shifted south approximately 500 feet (measured by channel centerlines), and the existing center barge channel would shift north and become the north barge channel. The new primary navigation channel would be 400 feet wide (this width includes a 300-foot congressionally or USACE-authorized channel plus a 50-foot channel maintenance buffer on each side of the authorized channel) and the two barge channels would also each be 400 feet wide.

Figure 1-12. Bridge Foundation Concept



The existing Interstate Bridge has nine in-water pier sets,[7] whereas the new Columbia River bridges (any bridge configuration) would be built on six in-water pier sets, plus multiple piers on land (pier locations are shown on Figure 1-14). Each in-water pier set would be supported by a foundation of drilled shafts; each group of shafts would be tied together with a concrete shaft cap. Columns or pier walls would rise from the shaft caps and connect to the superstructures of the bridges (see Figure 1-12).

BRIDGE CONFIGURATIONS

Three bridge configurations are being considered: (1) double-deck fixed-span (with one bridge type), (2) a single-level fixed-span (with three potential bridge types), and (3) a single-level movable-span (with one bridge type). Both the double-deck and single-level fixed-span configurations would provide 116 feet of vertical navigation clearance at their respective highest spans; the same as the CRC LPA. The CRC LPA included a double-deck fixed-span bridge configuration. The single-level fixed-span configuration was developed and is being considered as part of the IBR Program in response to physical and contextual changes (i.e., design and operational considerations) since 2013 that necessitated examination of a refinement in the double-deck bridge configuration (e.g., ingress and egress of transit from the lower level of the double-deck fixed-span configuration on the north end of the southbound bridge).

[7] A pier set consists of the pier supporting the northbound bridge and the pier supporting the southbound bridge at a given location.

Figure 1-13. Existing Navigation Clearances of the Interstate Bridge

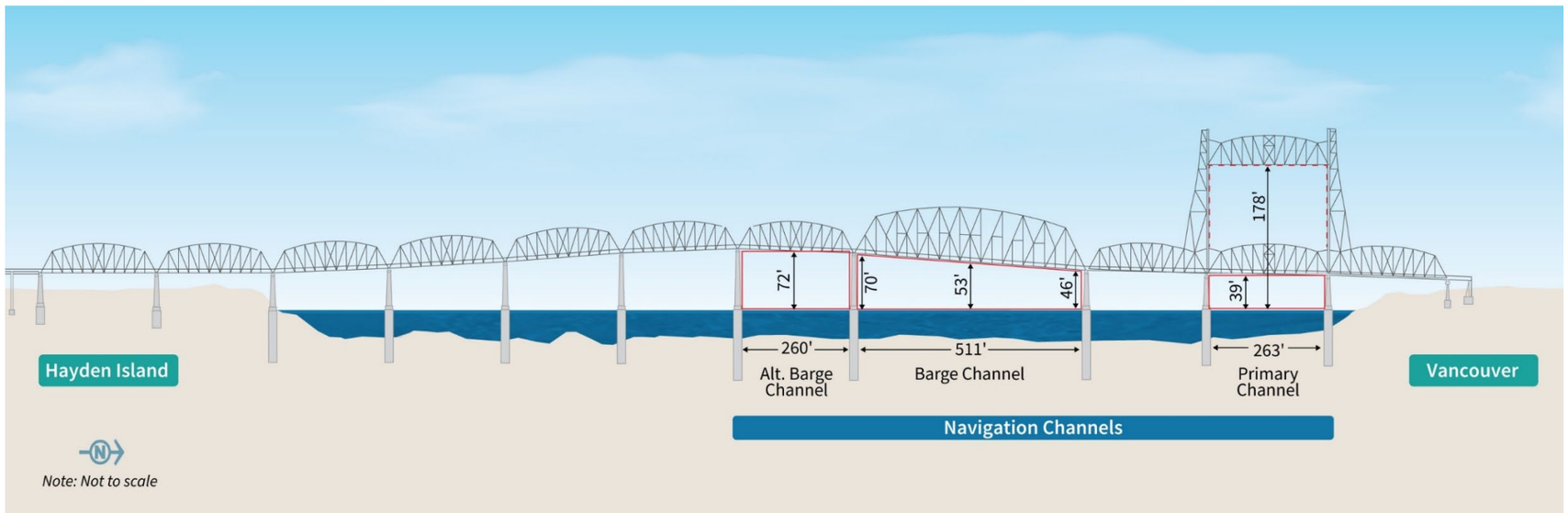
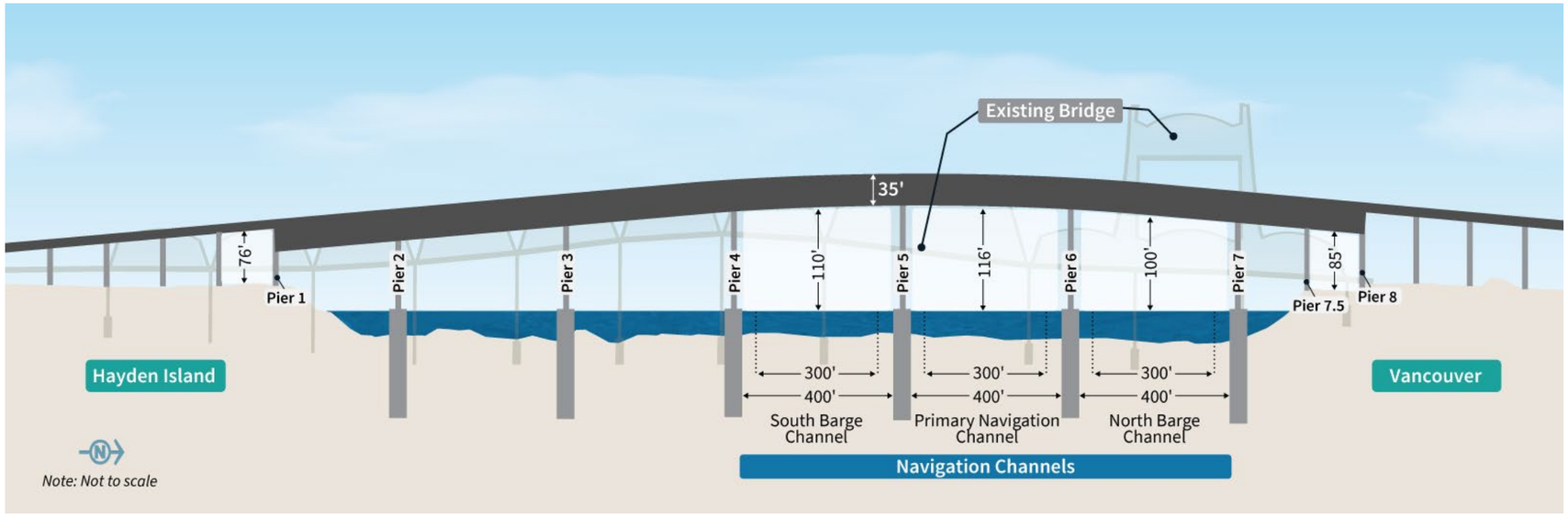


Figure 1-14. Profile and Navigation Clearances of the Proposed Modified LPA Columbia River Bridges with a Double-Deck Fixed-Span Configuration



Note: The location and widths of the proposed navigation channels would be same for all bridge configuration and bridge type options. The three navigation channels would each be 400 feet wide (this width includes a 300-foot congressionally or USACE-authorized channel (shown in dotted lines) plus a 50-foot channel maintenance buffer on each side of the authorized channel). The vertical navigation clearance would vary.

Consideration of the single-level movable-span configuration as part the IBR Program was necessitated by the U.S. Coast Guard's (USCG) review of the Program's navigation impacts on the Columbia River and issuance of a Preliminary Navigation Clearance Determination (PNCD) (USCG 2022). The USCG PNCD set the preliminary vertical navigation clearance recommended for the issuance of a bridge permit at 178 feet; this is the current vertical navigation clearance of the Interstate Bridge.

The IBR Program is carrying forward the three bridge configurations to address changed conditions, including changes in the USCG bridge permitting process, in order to ensure a permittable bridge configuration is within the range of options considered. The IBR Program continues to refine the details supporting navigation impacts and is coordinating closely with the USCG to determine how a fixed-span bridge may be permittable. Although the fixed-span configurations do not comply with the current USCG PNCD, they do meet the Purpose and Need and provide potential improvements to traffic (passenger vehicle and freight), transit, and active transportation operations.

Each of the bridge configurations assumes one auxiliary lane; two auxiliary lanes could be applied to any of the bridge configurations. All typical sections for the one auxiliary lane option would provide 14-foot shoulders to maintain traffic during construction of the Modified LPA and future maintenance.

Double-Deck Fixed-Span Configuration

The double-deck fixed-span configuration would be two side-by-side, double-deck, fixed-span steel truss bridges. Figure 1-15 is an example of this configuration (this image is subject to change and is shown as a representative concept; it does not depict the final design). The double-deck fixed-span configuration would provide 116 feet of vertical navigation clearance for river traffic using the primary navigation channel and 400 feet of horizontal navigation clearance at the primary navigation channel, as well as barge channels. This bridge height would not impede takeoffs and landings by aircraft using Pearson Field or Portland International Airport.

The eastern bridge would accommodate northbound highway traffic on the upper level and the shared-use path and utilities on the lower level. The western bridge would carry southbound traffic on the upper level and two-way light-rail tracks on the lower level. Each bridge deck would be 79 feet wide, with a total out-to-out width of 173 feet.[8]

Figure 1-16 is a cross section of the two parallel double-deck bridges. Like all bridge configurations, the double-deck fixed-span configuration would have six in-water pier sets. Each pier set would require 12 in-water drilled shafts, for a total of 72 in-water drilled shafts. Each individual shaft cap would be approximately 50 feet by 85 feet. This bridge configuration would have a 3.8% maximum grade on the Oregon side of the bridge and a 4% maximum grade on the Washington side.

[8] "Out-to-out width" is the measurement between the outside edges of the bridge across its width at the widest point.

Figure 1-15. Conceptual Drawing of a Double-Deck Fixed-Span Configuration

Note: Visualization is looking southwest from Vancouver.

Single-Level Fixed-Span Configuration

The single-level fixed-span configuration would have two side-by-side, single-level, fixed-span steel or concrete bridges. This report considers three single-level fixed-span bridge type options: a girder bridge, an extradosed bridge, and a finback bridge. The description in this section applies to all three bridge types (unless otherwise indicated). Conceptual examples of each of these options are shown on Figure 1-17. These images are subject to change and do not represent final design.

This configuration would provide 116 feet of vertical navigation clearance for river traffic using the primary navigation channel and 400 feet of horizontal navigation clearance at the primary navigation channel, as well as barge channels. This bridge height would not impede takeoffs and landings by aircraft using Pearson Field or Portland International Airport.

The eastern bridge would accommodate northbound highway traffic and the shared-use path; the bridge deck would be 104 feet wide. The western bridge would carry southbound traffic and two-way light-rail tracks; the bridge deck would be 113 feet wide. The I-5 highway, light-rail tracks, and the shared-use path would be on the same level across the two bridges, instead of being divided between two levels with the double-deck configuration. The total out-to-out width of the single-level fixed-span configuration (extradosed or finback options) would be 272 feet at its widest point, approximately 99 feet wider than the double-deck configuration. The total out-to-out width of the single-level fixed-span configuration (girder option) would be 232 feet at its widest point. Figure 1-18 shows a typical cross section of the single-level configuration. This cross section is a representative example of an extradosed or finback bridge as shown by the 10-foot-wide superstructure above the bridge deck; the girder bridge would not have the 10-foot-wide bridge columns shown on Figure 1-18.

There would be six in-water pier sets with 16 in-water drilled shafts on each combined shaft cap, for a total of 96 in-water drilled shafts. The combined shaft caps for each pier set would be 50 feet by 230 feet.

This bridge configuration would have a 3% maximum grade on both the Oregon and Washington sides of the bridge.

Figure 1-16. Cross Section of the Double-Deck Fixed-Span Configuration

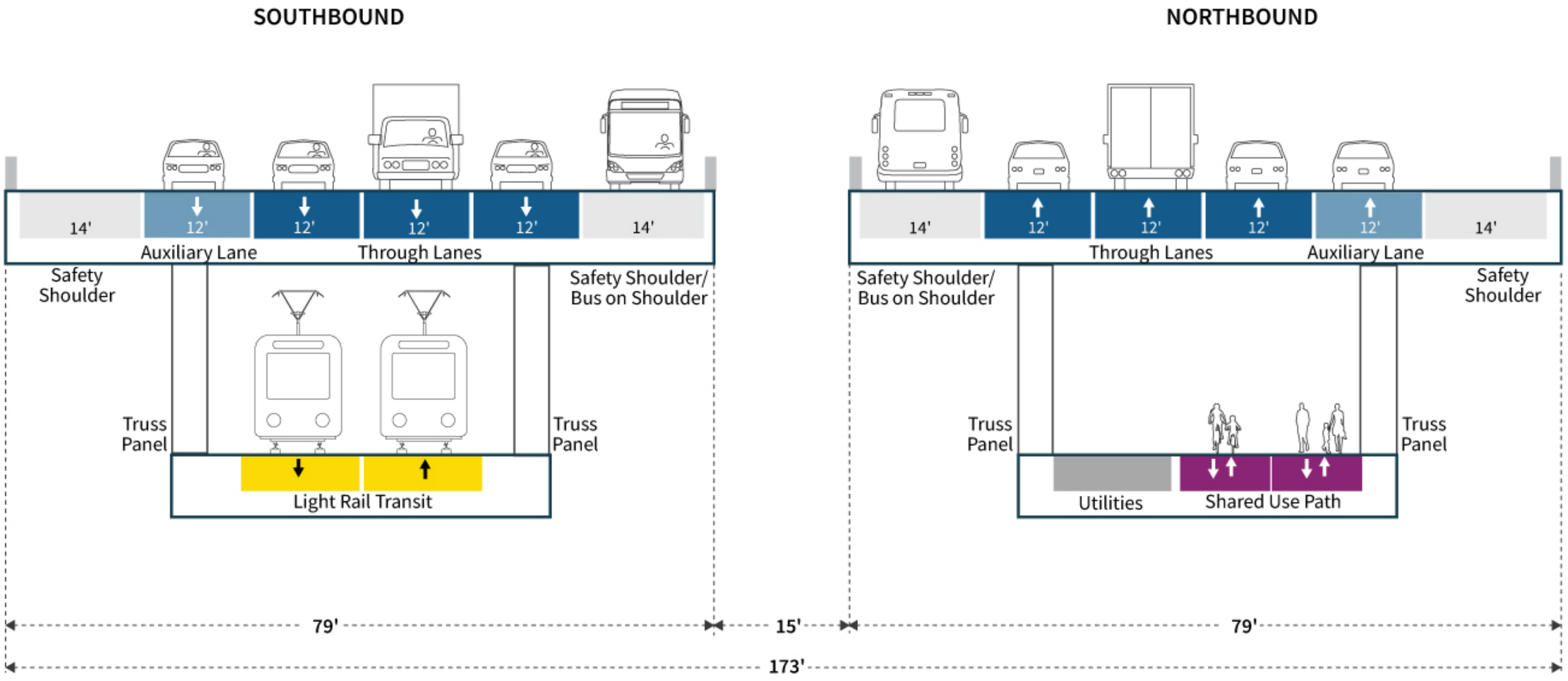
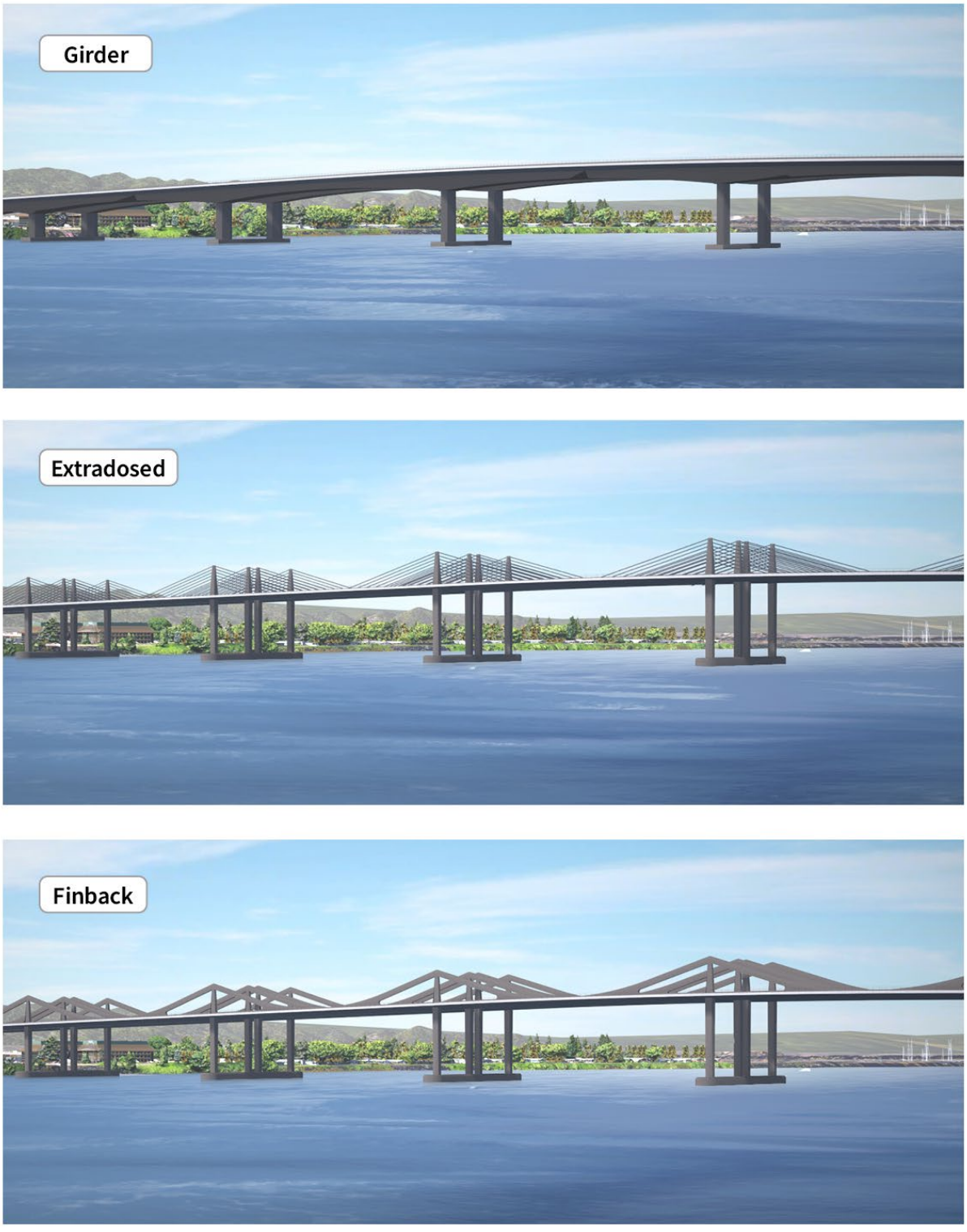
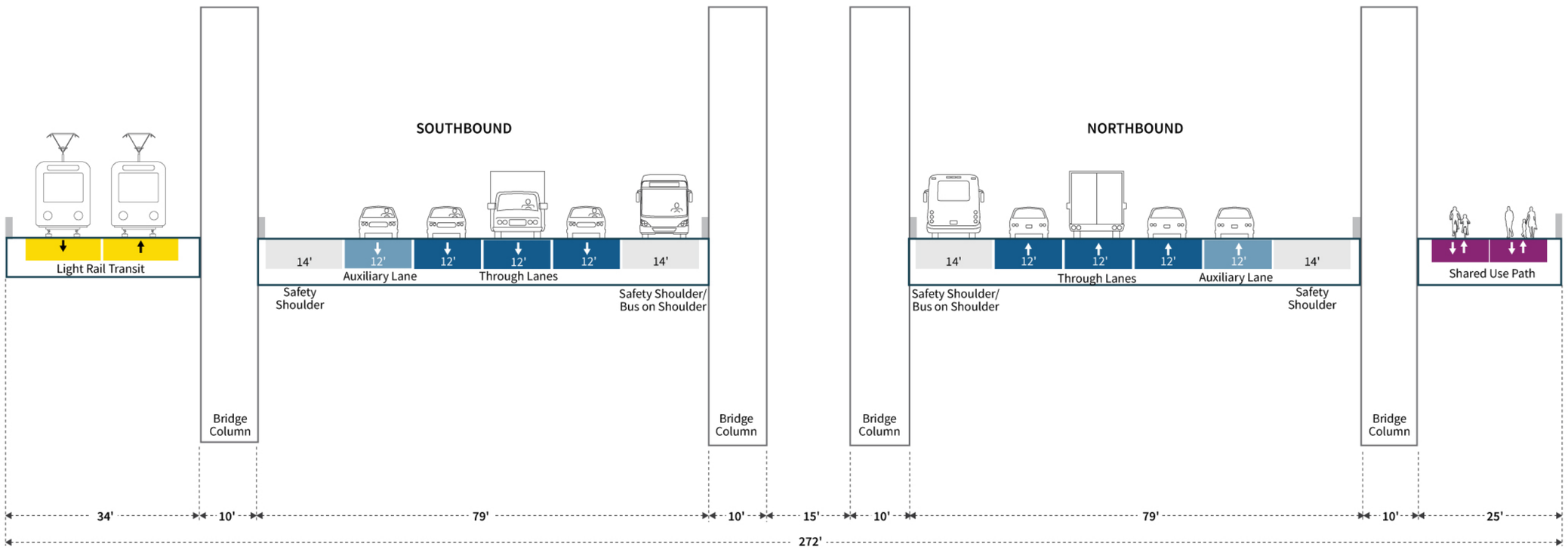


Figure 1-17. Conceptual Drawings of Single-Level Fixed-Span Bridge Types



Note: Visualizations are for illustrative purposes only. They do not reflect property impacts or represent final design. Visualization is looking southwest from Vancouver.

Figure 1-18. Cross Section of the Single-Level Fixed-Span Configuration (Extradosed or Finback Bridge Types)



Note: The cross section for a girder type bridge would be the same except that it would not have the four 10-foot bridge columns making the total out-to-out width 232 feet.

Single-Level Movable-Span Configuration

The single-level movable-span configuration would have two side-by-side, single-level steel girder bridges with movable spans between Piers 5 and 6. For the purpose of this report, the IBR Program assessed a vertical lift span movable-span configuration with counterweights based on the analysis in the *River Crossing Bridge Clearance Assessment Report – Movable-Span Options,* included as part of Attachment C in Appendix D, Design Options Development, Screening, and Evaluation Technical Report. A conceptual example of a vertical lift-span bridge is shown in Figure 1-19. These images are subject to change and do not represent final design.

A movable span must be located on a straight and flat bridge section (i.e., without curvature and with minimal slope). To comply with these requirements, and for the bridge to maintain the highway, transit, and active transportation connections on Hayden Island and in Vancouver while minimizing property acquisitions and displacements, the movable span is proposed to be located 500 feet south of the existing lift span, between Piers 5 and 6. To accommodate this location of the movable span, the IBR Program is coordinating with USACE to obtain authorization to change the location of the primary navigation channel, which currently aligns with the Interstate Bridge lift spans near the Washington shoreline.

The single-level movable-span configuration would provide 92 feet of vertical navigation clearance over the proposed relocated primary navigation channel when the movable spans are in the closed position, with 99 feet of vertical navigation clearance available over the north barge channel. The 92-foot vertical clearance is based on achieving a straight, movable span and maintaining an acceptable grade for transit operations. In addition, it satisfies the requirement of a minimum of 72 feet of vertical navigation clearance (the existing Interstate Bridge's maximum clearance over the alternate (southernmost) barge channel when the existing lift span is in the closed position).

In the open position, the movable span would provide 178 feet of vertical navigation clearance over the proposed relocated primary navigation channel.

Similar to the fixed-span configurations, the movable span would provide 400 feet of horizontal navigation clearance for the primary navigation channel and for each of the two barge channels.

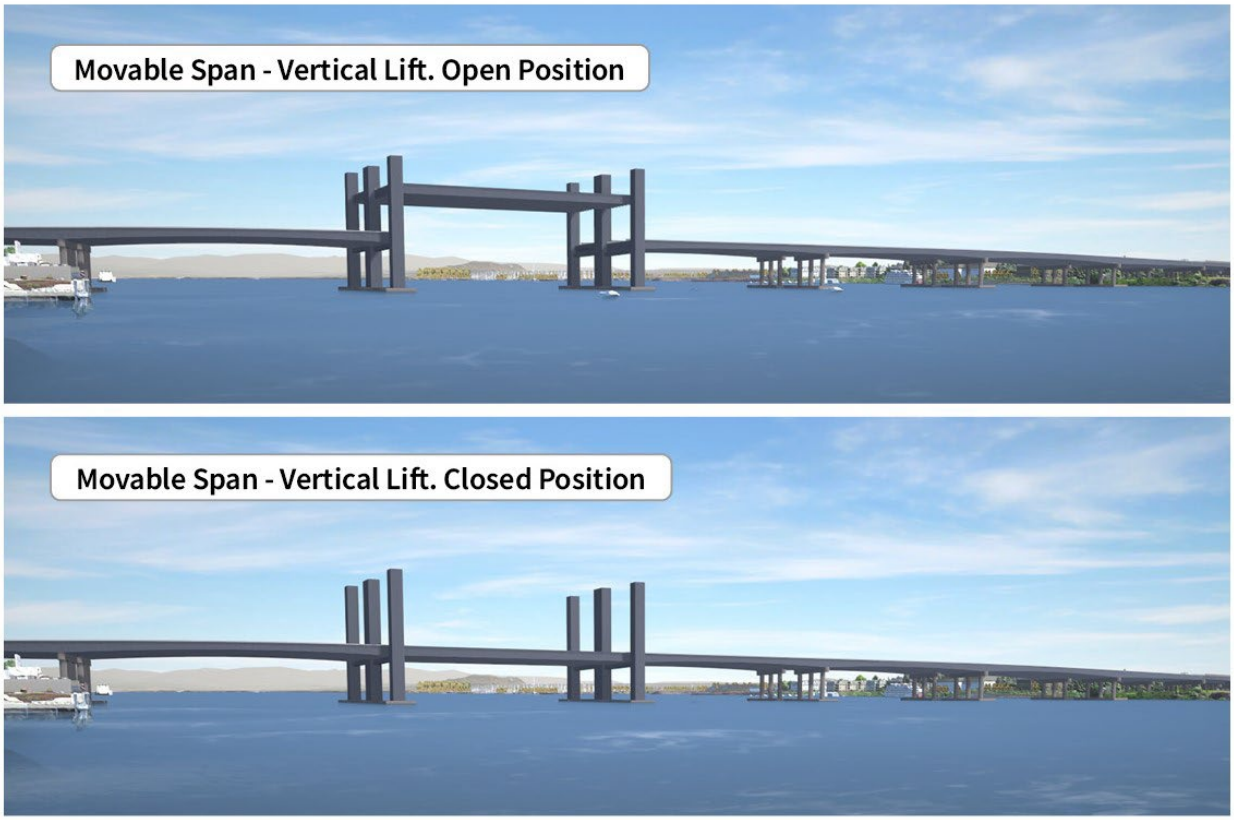
The vertical lift-span towers would be approximately 243 feet high; this is shorter than the existing lift-span towers, which are 247 feet high. This height of the vertical lift-span towers would not impede takeoffs and landings by aircraft using Portland International Airport. At Pearson Field, the Federal Aviation Administration issues obstacle departure procedures to avoid the existing Interstate Bridge lift towers; the single-level movable-span configuration would retain the same procedures.

Similar to the single-level fixed-span configuration, the eastern bridge would accommodate northbound highway traffic and the shared-use path, and the western bridge would carry southbound traffic and two-way light-rail tracks. The I-5 highway, light-rail tracks, and shared-use path would be on the same level across the bridges instead of on two levels as with the double-deck configuration. Cross sections of the single-level movable-span configuration are shown in Figure 1-20; the top cross section depicts the vertical lift spans (Piers 5 and 6), and the bottom cross section depicts the fixed spans (Piers 2, 3, 4, and 7). The movable and fixed cross sections are slightly different because the movable span requires lift towers, which are not required for the other fixed spans of the bridges.

There would be six in-water pier sets and two piers on land per bridge. The vertical lift span would have 22 in-water drilled shafts each for Piers 5 and 6; the shaft caps for these piers would be 50 feet by 312 feet to accommodate the vertical lift spans. Piers 2, 3, 4, and 7 would have 16 in-water drilled shafts each; the shaft caps for these piers would be the same as for the fixed-span options (50 feet by 230 feet). The vertical lift-span configuration would have a total of 108 in-water drilled shafts.

This single-level movable-span configuration would have a 3% maximum grade on the Oregon side of the bridge and a 1.5% maximum grade on the Washington side.

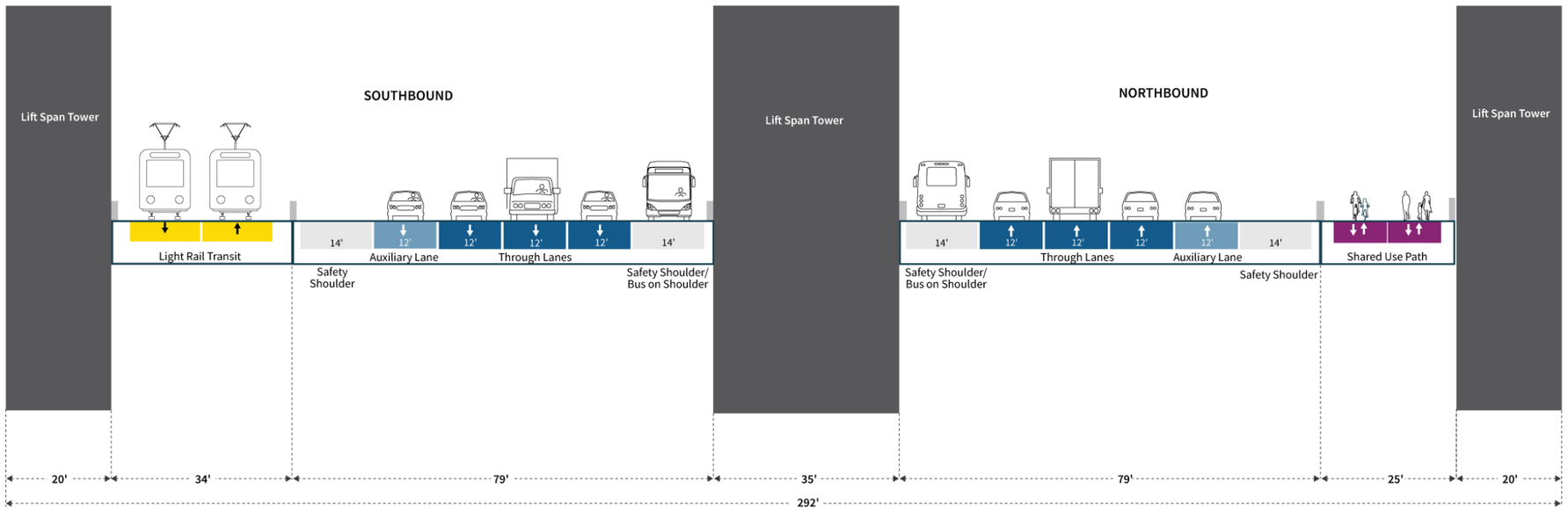
Figure 1-19. Conceptual Drawings of Single-Level Movable-Span Configurations in the Closed and Open Positions



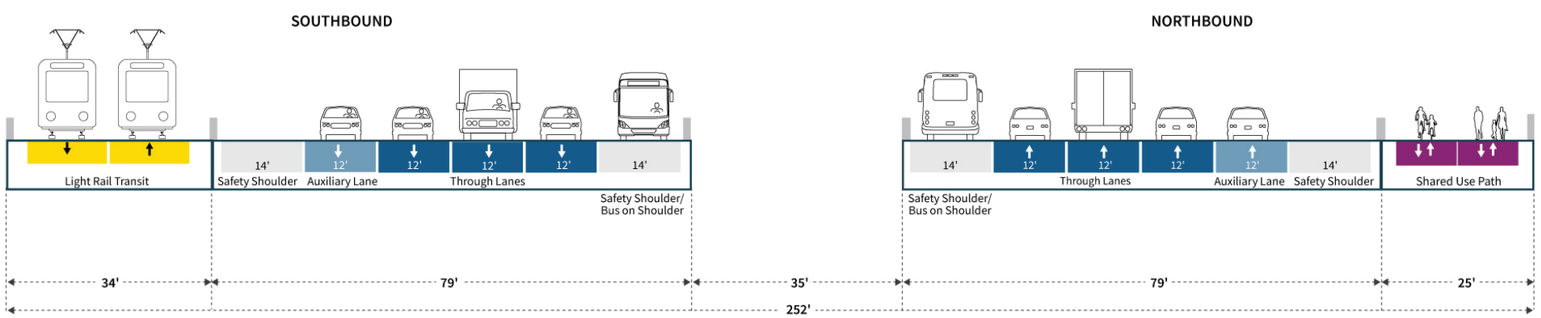
Note: Visualizations are for illustrative purposes only. They do not reflect property impacts or represent final design. Visualization is looking southeast (upstream) from Vancouver.

Figure 1-20. Cross Section of the Single-Level Movable-Span Bridge Type

Single-level Bridge with Movable Span - Vertical Lift Span Cross-section (Piers 5 and 6)



Single-level Bridge with Movable Span - Fixed Spans Cross-section (Piers 2, 3, 4, and 7)



Summary of Bridge Configurations

This section summarizes and compares each of the bridge configurations. Table 1-2 lists the key considerations for each configuration. Figure 1-21 compares each configuration's footprint. The footprints of each configuration would differ in only three locations: over the Columbia River and at the bridge landings on Hayden Island and Vancouver. The rest of the I-5 corridor would have the same footprint. Over the Columbia River, the footprint of the double-deck fixed-span configuration would be 173 feet wide. Comparatively, the finback or extradosed bridge types of the single-level fixed-span configuration would be 272 feet wide (approximately 99 feet wider), and the single-level fixed-span configuration with a girder bridge type would be 232 feet wide (approximately 59 feet wider). The single-level movable-span configuration would be 252 feet wide (approximately 79 feet wider than the double-deck fixed-span configuration), except at Piers 5 and 6, where larger bridge foundations would require an additional 40 feet of width to support the movable span. The single-level configurations would have a wider footprint at the bridge landings on Hayden Island and Vancouver because transit and active transportation would be located adjacent to the highway, rather than below the highway in the double-deck option.

Figure 1-22 compares the basic profile of each configuration. The lower deck of the double-deck fixed-span and the single-level fixed-span configuration would have similar profiles. The single-level movable-span configuration would have a lower profile than the fixed-span configurations when the span is in the closed position.

Figure 1-21. Bridge Configuration Footprint Comparison

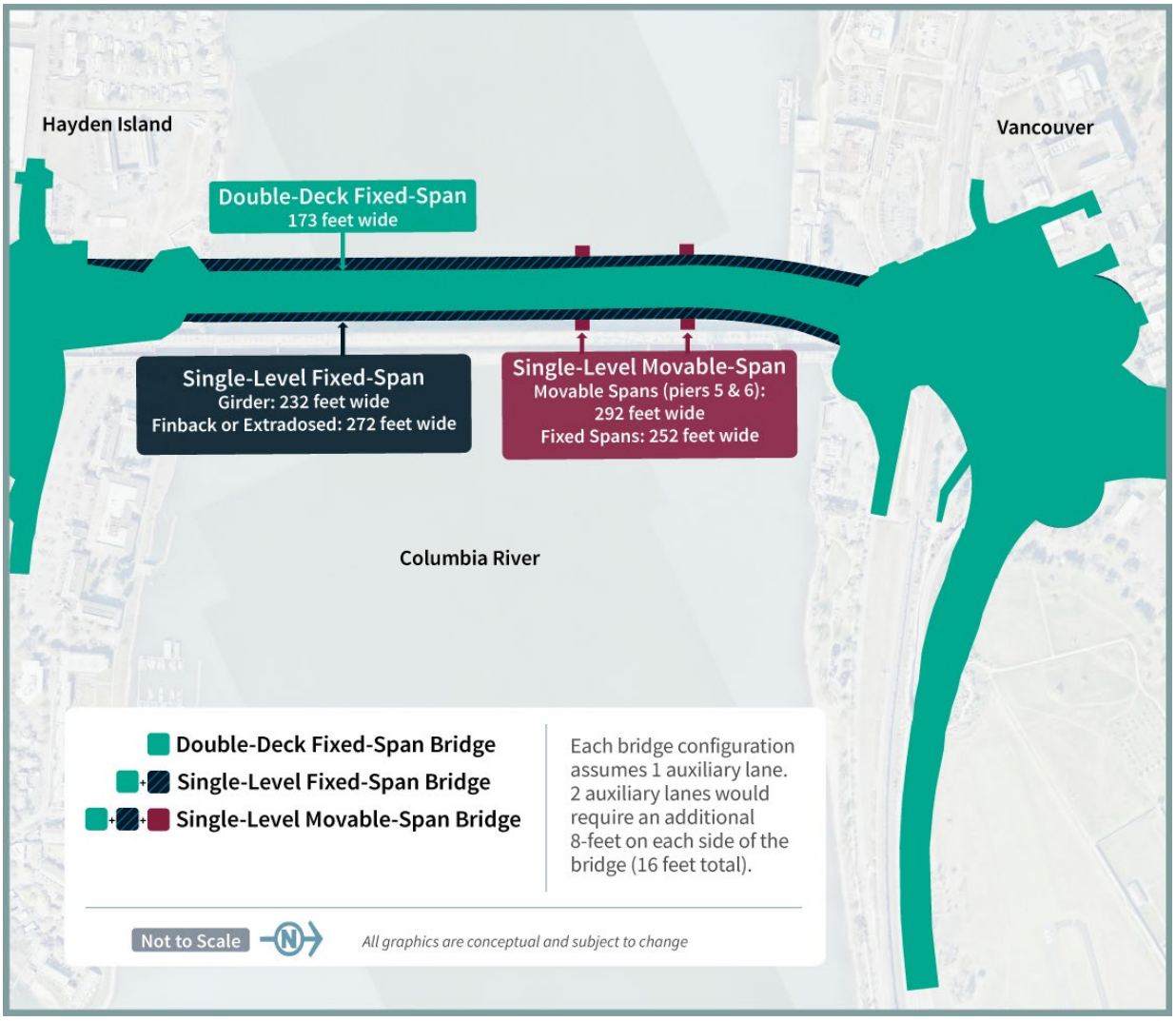
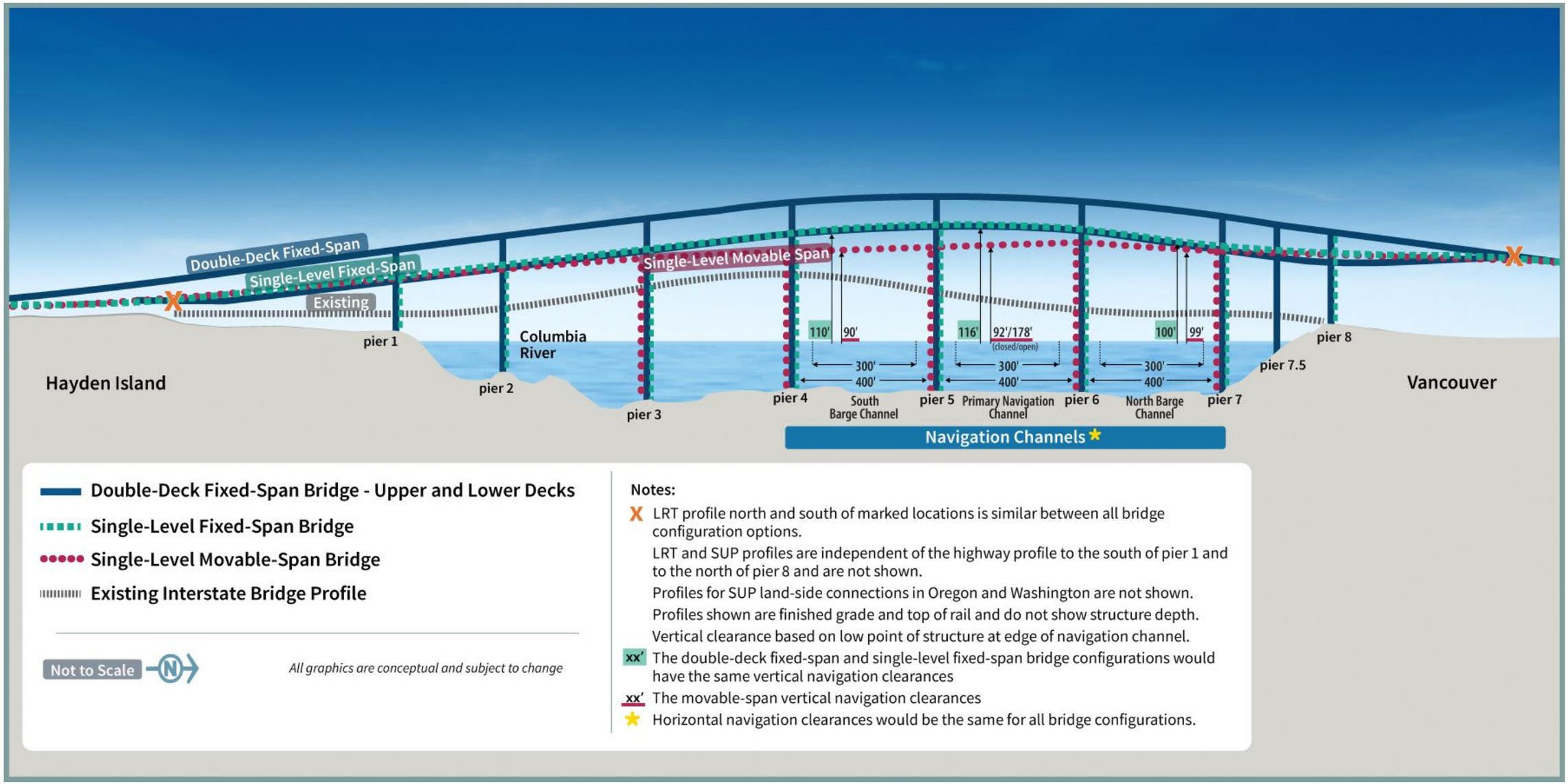


Figure 1-22. Bridge Configuration Profile Comparison



LRT = light-rail transit; SUP = shared-use path

Table 1-2. Summary of Bridge Configurations

	No-Build Alternative	Modified LPA with Double-Deck Fixed-Span Configuration	Modified LPA with Single-Level Fixed-Span Configuration [a]	Modified LPA with Single-Level Movable-Span Configuration
Bridge type	Steel through-truss spans.	Double-deck steel truss.	Single-level, concrete or steel girders, extradosed or finback.	Single-level, steel girders with vertical lift span.
Number of bridges	Two	Two	Two	Two
Movable-span type	Vertical lift span with counterweights.	N/A	N/A	Vertical lift span with counterweights.
Movable-span location	Adjacent to Vancouver shoreline.	N/A	N/A	Between Piers 5 and 6 (approximately 500 feet south of the existing lift span).
Lift opening restrictions	Weekday peak AM and PM highway travel periods. [b]	N/A	N/A	Additional restrictions to daytime bridge openings; requires future federal rulemaking process and authorization by USCG (beyond the assumed No-Build Alternative bridge restrictions for peak AM and PM highway travel periods).[b] Typical opening durations are assumed to be 9 to 18 minutes [c] for the purposes of impact analysis but would ultimately depend on various operational considerations related to vessel traffic and river and weather conditions. Additional time would also be required to stop traffic prior to opening and restart traffic after the bridge closes.
Out-to-out width [d]	138 feet total width.	173 feet total width.	Girder: 232 feet total width. Extradosed/Finback: 272 feet total width.	• 292 feet at the movable span. • 252 feet at the fixed spans.

	No-Build Alternative	Modified LPA with Double-Deck Fixed-Span Configuration	Modified LPA with Single-Level Fixed-Span Configuration [a]	Modified LPA with Single-Level Movable-Span Configuration
Deck widths	52 feet (SB) 52 feet (NB)	79 feet (SB) 79 feet (NB)	Girder: • 113 feet (SB) • 104 feet (NB) Extradosed/Finback: • 133 feet (SB) • 124 feet (NB)	113 feet SB fixed span. 104 feet NB fixed span.
Vertical navigation clearance	Primary navigation channel: • 39 feet when closed. • 178 feet when open. Barge channel: • 46 feet to 70 feet. Alternate barge channel: • 72 feet (maximum clearance without opening).	Primary navigation channel: • 116 feet maximum. North barge channel: • 100 feet maximum. South barge channel: • 110 feet maximum.	Primary navigation channel: • 116 feet maximum. North barge channel: • 100 feet maximum. South barge channel: • 110 feet maximum.	Primary navigation channel: • Closed position: 92 feet. • Open position: 178 feet. North barge channel: • 99 feet maximum. South barge channel: • 90 feet maximum.
Horizontal navigation clearance	263 feet for primary navigation channel. 511 feet for barge channel. 260 feet for alternate barge channel.	400 feet for all navigation channels (300-foot congressionally or USACE-authorized channel plus a 50-foot channel maintenance buffer on each side).	400 feet for all navigation channels (300-foot congressionally or USACE-authorized channel plus a 50-foot channel maintenance buffer on each side).	400 feet for all navigation channels (300-foot congressionally or USACE-authorized channel plus a 50-foot channel maintenance buffer on each side).
Maximum elevation of bridge component (NAVD 88)[e]	247 feet at top of lift tower.	166 feet.	Girder: 137 feet. Extradosed/Finback: 179 feet at top of pylons.	243 feet at top of lift tower.

	No-Build Alternative	Modified LPA with Double-Deck Fixed-Span Configuration	Modified LPA with Single-Level Fixed-Span Configuration [a]	Modified LPA with Single-Level Movable-Span Configuration
Movable span length (from center of pier to center of pier)	278 feet.	N/A	N/A	450 feet.
Number of in-water pier sets	Nine	Six	Six	Six
Number of in-water drilled shafts	N/A	72	96	108
Shaft cap sizes	N/A	50 feet by 85 feet.	50 feet by 230 feet.	Piers 2, 3, 4, and 7: 50 feet by 230 feet. Piers 5 and 6: 50 feet by 312 feet (one combined footing at each location to house tower/equipment for the lift span).
Maximum grade	5%	4% on the Washington side. 3.8% on the Oregon side.	3% on the Washington side. 3% on the Oregon side.	1.5% on the Washington side. 3% on the Oregon side.
Light-rail transit location	N/A	Below highway on SB bridge.	West of highway on SB bridge.	West of highway on SB bridge.
Express bus	Shared roadway lanes.	Inside shoulder of NB and SB (upper) bridges.	Inside shoulder of NB and SB bridges.	Inside shoulder of NB and SB bridges.
Shared-use path location	Sidewalk adjacent to roadway in both directions.	Below highway on NB bridge.	East of highway on NB bridge.	East of highway on NB bridge.

a When different bridge types are not mentioned, data applies to all bridge types under the specified bridge configuration.

b The No-Build Alternative assumes existing conditions that restrict bridge openings during weekday peak periods (Monday through Friday 6:30 a.m. to 9 a.m.; 2:30 p.m. to 6 p.m., excluding federal holidays). This analysis estimates the potential frequency for bridge openings for vessels requiring more than 99 feet of clearance.

c For the purposes of the transportation analysis (see the Transportation Technical Report), the movable-span opening time is assumed to be an average of 12 minutes.

d "Out-to-out width" is the measurement between the outside edges of the bridge across its width at the widest point.

e NAVD 88 (North American Vertical Datum of 1988) is a vertical control datum (reference point) used by federal agencies for surveying.

NB = northbound; SB = southbound; USCG = U.S. Coast Guard

1.2.4 Downtown Vancouver (Subarea C)

This section discusses the geographic Subarea C shown in Figure 1-3. See Figure 1-23 for all highway and interchange improvements in Subarea C. Refer to Figure 1-3 for an overview of the geographic subareas.

1.2.4.1 Highways, Interchanges, and Local Roadways

North of the Columbia River bridges in downtown Vancouver, improvements are proposed to the SR 14 interchange (Figure 1-23).

SR 14 INTERCHANGE

The new Columbia River bridges would touch down just north of the SR 14 interchange (Figure 1-23). The function of the SR 14 interchange would remain essentially the same as it is now, although the interchange would be elevated. Direct connections between I-5 and SR 14 would be rebuilt. Access to and from downtown Vancouver would be provided as it is today, but the connection points would be relocated. Downtown Vancouver I-5 access to and from the south would be at C Street as it is today, while downtown connections to and from SR 14 would be from Columbia Street at 3rd Street.

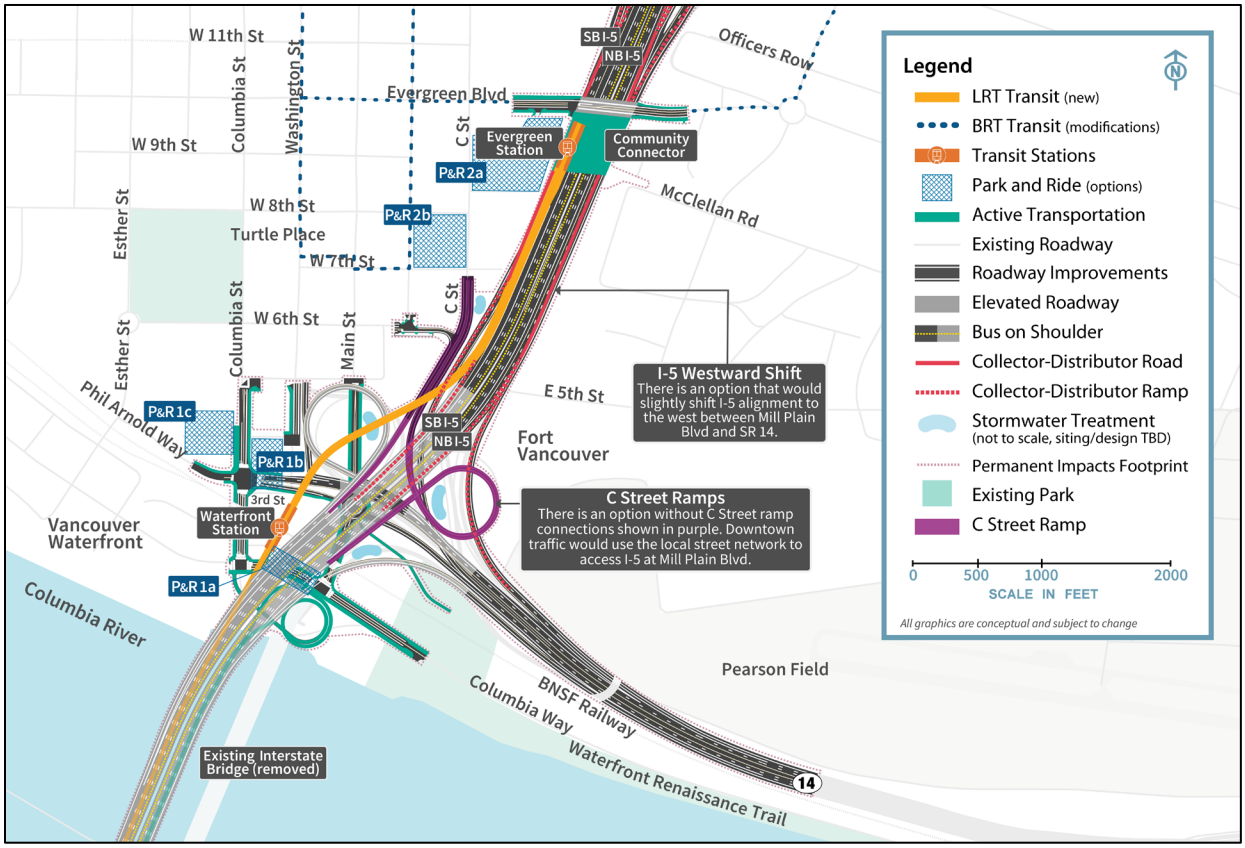
Main Street would be extended between 5th Street and Columbia Way. Vehicles traveling from downtown Vancouver to access SR 14 eastbound would use the new extension of Main Street to the roundabout underneath I-5. If coming from the west or south (waterfront) in downtown Vancouver, vehicles would use the Phil Arnold Way/3rd Street extension to the roundabout, then continue to SR 14 eastbound. The existing Columbia Way roadway under I-5 would be realigned to the north of its existing location and would intersect both the new Main Street extension and Columbia Street with T intersections.

In addition, the existing overcrossing of I-5 at Evergreen Boulevard would be reconstructed.

Design Option Without C Street Ramps

Under this design option, downtown Vancouver I-5 access to and from the south would be through the Mill Plain interchange rather than C Street. There would be no eastside loop ramp from I-5 northbound to C Street and no directional ramp on the west side of I-5 from C Street to I-5 southbound. The existing eastside loop ramp would be removed. This design option has been included because of changes in local planning that necessitate consideration of design options that reduce the footprint and associated direct and temporary environmental impacts in Vancouver.

Figure 1-23. Downtown Vancouver (Subarea C)



BRT = bus rapid transit; LRT = light-rail transit; NB = northbound; P&R = park and ride; SB = southbound

Design Option to Shift I-5 Westward

This design option would shift the I-5 mainline and ramps approximately 40 feet to the west between SR 14 and Mill Plain Boulevard. The westward I-5 alignment shift could also be paired with the design option without C Street ramps. The inclusion of this design option is due to changes in local planning, which necessitate consideration of design options that that shifts the footprint and associated direct and temporary environmental impacts in Vancouver.

1.2.4.2 Transit

LIGHT-RAIL ALIGNMENT AND STATIONS

Under the Modified LPA, the light-rail tracks would exit the highway bridge and be on their own bridge along the west side of the I-5 mainline after crossing the Columbia River (see Figure 1-23). The light-rail bridge would cross approximately 35 feet over the BNSF Railway tracks. An elevated light-rail station near the Vancouver waterfront (Waterfront Station) would be situated near the overcrossing of the BNSF tracks between Columbia Way and 3rd Street. Access to the elevated station would be primarily by elevator as the station is situated approximately 75 feet above existing ground level. A

stairwell(s) would be provided for emergency egress. The number of elevators and stairwells provided would be based on the ultimate platform configuration, station location relative to the BNSF trackway, projected ridership, and fire and life safety requirements. Passenger drop-off facilities would be located at ground level and would be coordinated with the C-TRAN bus service at this location. The elevated light-rail tracks would continue north, cross over the westbound SR 14 on-ramp and the C Street/6th Street on-ramp to southbound I-5, and then straddle the southbound I-5 C-D roadway. Transit components in the downtown Vancouver area are similar between the two SR 14 interchange area design options discussed above.

North of the Waterfront Station, the light-rail tracks would continue to the Evergreen Station, which would be the terminus of the light-rail extension (see Figure 1-23). The light-rail tracks from downtown Vancouver to the terminus would be entirely on an elevated structure supported by single columns, where feasible, or by columns on either side of the roadway where needed. The light-rail tracks would be a minimum of 27 feet above the I-5 roadway surface. The Evergreen Station would be located at the same elevation as Evergreen Boulevard, on the proposed Community Connector, and it would provide connections to C-TRAN's existing BRT system. Passenger drop-off facilities would be near the station and would be coordinated with the C-TRAN bus service at this location.

PARK AND RIDES

Up to two park and rides could be built in Vancouver along the light-rail alignment: one near the Waterfront Station and one near the Evergreen Station. Additional information regarding the park and rides can be found in the Transportation Technical Report.

> Park and rides can expand the catchment area of public transit systems, making transit more accessible to people who live farther away from fixed-route transit service, and attracting new riders who might not have considered using public transit otherwise.

Waterfront Station Park-and-Ride Options

There are three site options for the park and ride near the Waterfront Station (see Figure 1-23). Each would accommodate up to 570 parking spaces.

1. Columbia Way (below I-5). This park-and-ride site would be a multilevel aboveground structure located below the new Columbia River bridges, immediately north of a realigned Columbia Way.
2. Columbia Street/SR 14. This park-and-ride site would be a multilevel aboveground structure located along the east side of Columbia Street. It could span across (or over) the SR 14 westbound off-ramp to provide parking on the north and south sides of the off-ramp.
3. Columbia Street/Phil Arnold Way (Waterfront Gateway Site). This park-and-ride site would be located along the west side of Columbia Street immediately north of Phil Arnold Way. This park and ride would be developed in coordination with the City of Vancouver's Waterfront Gateway program and could be a joint-use parking facility not constructed exclusively for park-and-ride users.

Evergreen Station Park-and-Ride Options

There are two site options for the park and ride near the Evergreen Station (see Figure 1-23).

1. Library Square. This park-and-ride site would be located along the east side of C Street and south of Evergreen Boulevard. It would accommodate up to 700 parking spaces in a multilevel belowground structure according to a future agreement on City-owned property associated with Library Square. Current design concepts suggest the park and ride most likely would be a joint-use parking facility for park-and-ride users and patrons of other uses on the ground or upper levels as negotiated as part of future decisions.
2. Columbia Credit Union. This park-and-ride site is an existing multistory garage that is located below the Columbia Credit Union office tower along the west side of C Street between 7th Street and 8th Street. The existing parking structure currently serves the office tower above it and the Regal City Center across the street. This would be a joint-use parking facility, not for the exclusive use of park-and-ride users, that could serve as additional or overflow parking if the 700 required parking spaces cannot be accommodated elsewhere.

1.2.4.3 Active Transportation

Within the downtown Vancouver area, the shared-use path on the northbound (or eastern) bridge would exit the bridge at the SR 14 interchange, loop down on the east side of I-5 via a vertical spiral path, and then cross back below I-5 to the west side of I-5 to connect to the Waterfront Renaissance Trail on Columbia Street and into Columbia Way (see Figure 1-23). Access would be provided across state right of way beneath the new bridges to provide a connection between the recreational areas along the City's Columbia River waterfront east of the bridges and existing and future waterfront uses west of the bridges.

Active transportation components in the downtown Vancouver area would be similar without the C Street ramps and with the I-5 westward shift.

At Evergreen Boulevard, a community connector is proposed to be built over I-5 just south of Evergreen Boulevard and east of the Evergreen Station (see Figure 1-23). The structure is proposed to include off-street pathways for active transportation modes including pedestrians, bicyclists, and other micro-mobility modes, and public space and amenities to support the active transportation facilities. The primary intent of the Community Connector is to improve connections between downtown Vancouver on the west side of I-5 and the Vancouver National Historic Reserve on the east side.

1.2.5 Upper Vancouver (Subarea D)

This section discusses the geographic Subarea D shown in Figure 1-3. See Figure 1-24 for all highway and interchange improvements in Subarea D. Refer to Figure 1-3 for an overview of the geographic subareas.

1.2.5.1 Highways, Interchanges, and Local Roadways

Within the upper Vancouver area, the IBR Program proposes improvements to three interchanges—Mill Plain, Fourth Plain, and SR 500—as described below.

MILL PLAIN BOULEVARD INTERCHANGE

The Mill Plain Boulevard interchange is north of the SR 14 interchange (see Figure 1-24). This interchange would be reconstructed as a tight-diamond configuration but would otherwise remain similar in function to the existing interchange. The ramp terminal intersections would be sized to accommodate high, wide heavy freight vehicles that travel between the Port of Vancouver and I-5. The off-ramp from I-5 northbound to Mill Plain Boulevard would diverge from the C-D road that would continue north, crossing over Mill Plain Boulevard, to provide access to Fourth Plain Boulevard via a C-D roadway. The off-ramp to Fourth Plain Boulevard would be reconstructed and would cross over Mill Plain Boulevard east of I-5, similar to the way it functions today.

FOURTH PLAIN BOULEVARD INTERCHANGE

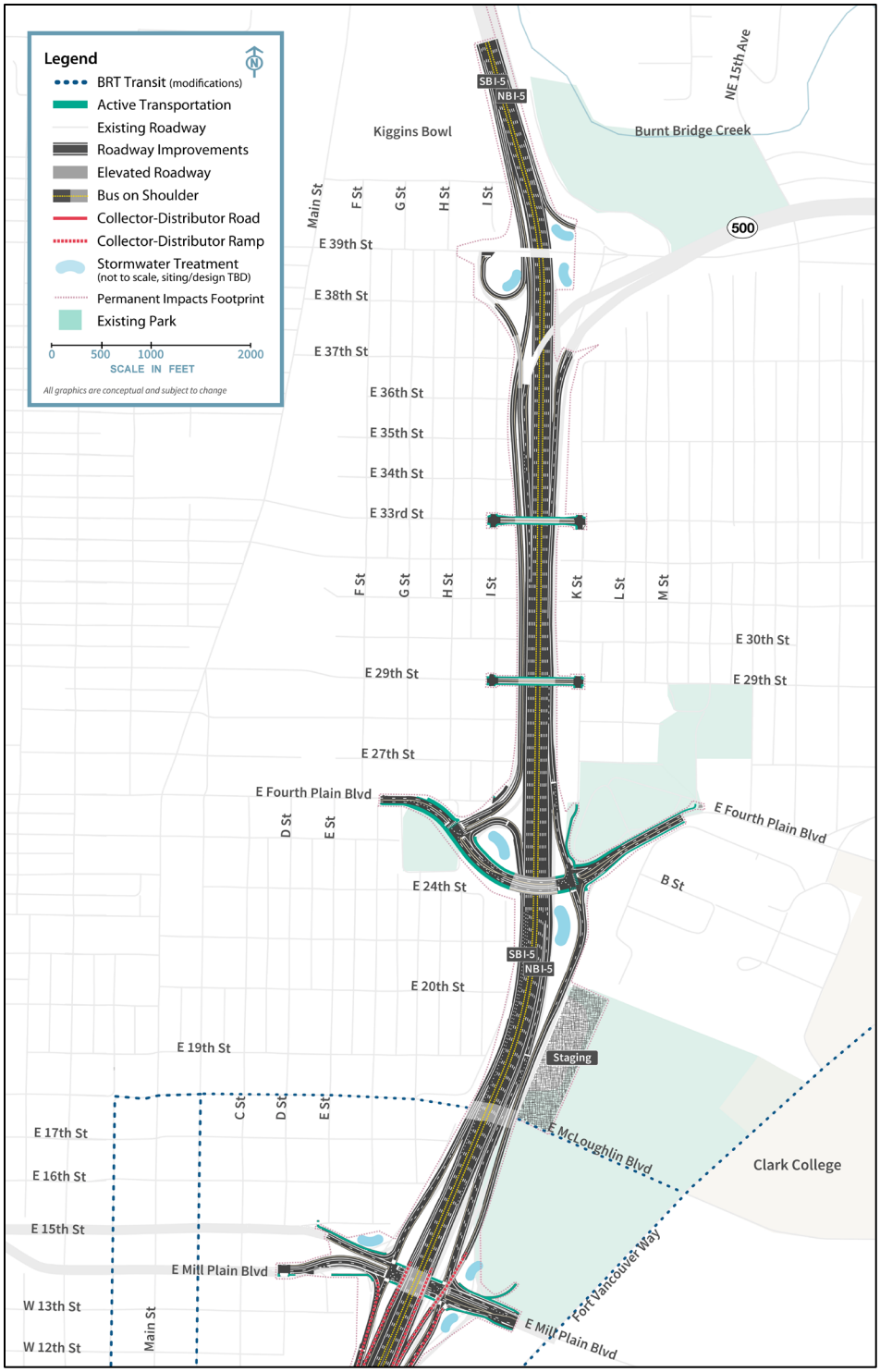
At the Fourth Plain Boulevard interchange (Figure 1-24), improvements would include reconstruction of the overpass of I-5 and the ramp terminal intersections. Northbound I-5 traffic exiting to Fourth Plain Boulevard would first exit to the northbound C-D roadway which provides off-ramp access to Fourth Plain Boulevard and Mill Plain Boulevard. The westbound SR 14 to northbound I-5 on-ramp also joins the northbound C-D roadway before continuing north past the Fourth Plain Boulevard and Mill Plain Boulevard off-ramps as an auxiliary lane. The southbound I-5 off-ramp to Fourth Plain Boulevard would be braided below the 39th Street on-ramp to southbound I-5. This change would eliminate the existing nonstandard weave between the SR 500 interchange and the off-ramp to Fourth Plain Boulevard. It would also eliminate the existing westbound SR 500 to Fourth Plain Boulevard off-ramp connection. The existing overcrossing of I-5 at 29th Street would be reconstructed to accommodate a widened I-5, provide adequate vertical clearance over I-5, and provide pedestrian and bicycle facilities.

SR 500 INTERCHANGE

The northern terminus of the I-5 improvements would be in the SR 500 interchange area (Figure 1-24). The improvements would primarily be to connect the Modified LPA to existing ramps. The off-ramp from I-5 southbound to 39th Street would be reconstructed to establish the beginning of the braided ramp to Fourth Plain Boulevard and restore the loop ramp to 39th Street. Ramps from existing I-5 northbound to SR 500 eastbound and from 39th Street to I-5 northbound would be partially reconstructed. The existing bridges for 39th Street over I-5 and SR 500 westbound to I-5 southbound would be retained. The 39th Street to I-5 southbound on-ramp would be reconstructed and braided over (i.e., grade separated or pass over) the new I-5 southbound off-ramp to Fourth Plain Boulevard.

The existing overcrossing of I-5 at 33rd Street would also be reconstructed to accommodate a widened I-5, provide adequate vertical clearance over I-5, and provide pedestrian and bicycle facilities.

Figure 1-24. Upper Vancouver (Subarea D)



BRT = bus rapid transit; TBD = to be determined

1.2.5.2 Transit

There would be no LRT facilities in upper Vancouver. Proposed operational changes to bus service, including I-5 bus-on-shoulder service, are described in Section 1.2.7, Transit Operating Characteristics.

1.2.5.3 Active Transportation

Several active transportation improvements would be made in Subarea D consistent with City of Vancouver plans and policies. At the Fourth Plain Boulevard interchange, there would be improvements to provide better bicycle and pedestrian mobility and accessibility; these include bicycle lanes, neighborhood connections, and a connection to the City of Vancouver's planned two-way cycle track on Fourth Plain Boulevard. The reconstructed overcrossings of I-5 at 29th Street and 33rd Street would provide pedestrian and bicycle facilities on those cross streets. No new active transportation facilities are proposed in the SR 500 interchange area. Active transportation improvements at the Mill Plain Boulevard interchange include buffered bicycle lanes and sidewalks, pavement markings, lighting, and signing.

1.2.6 Transit Support Facilities

1.2.6.1 Ruby Junction Maintenance Facility Expansion

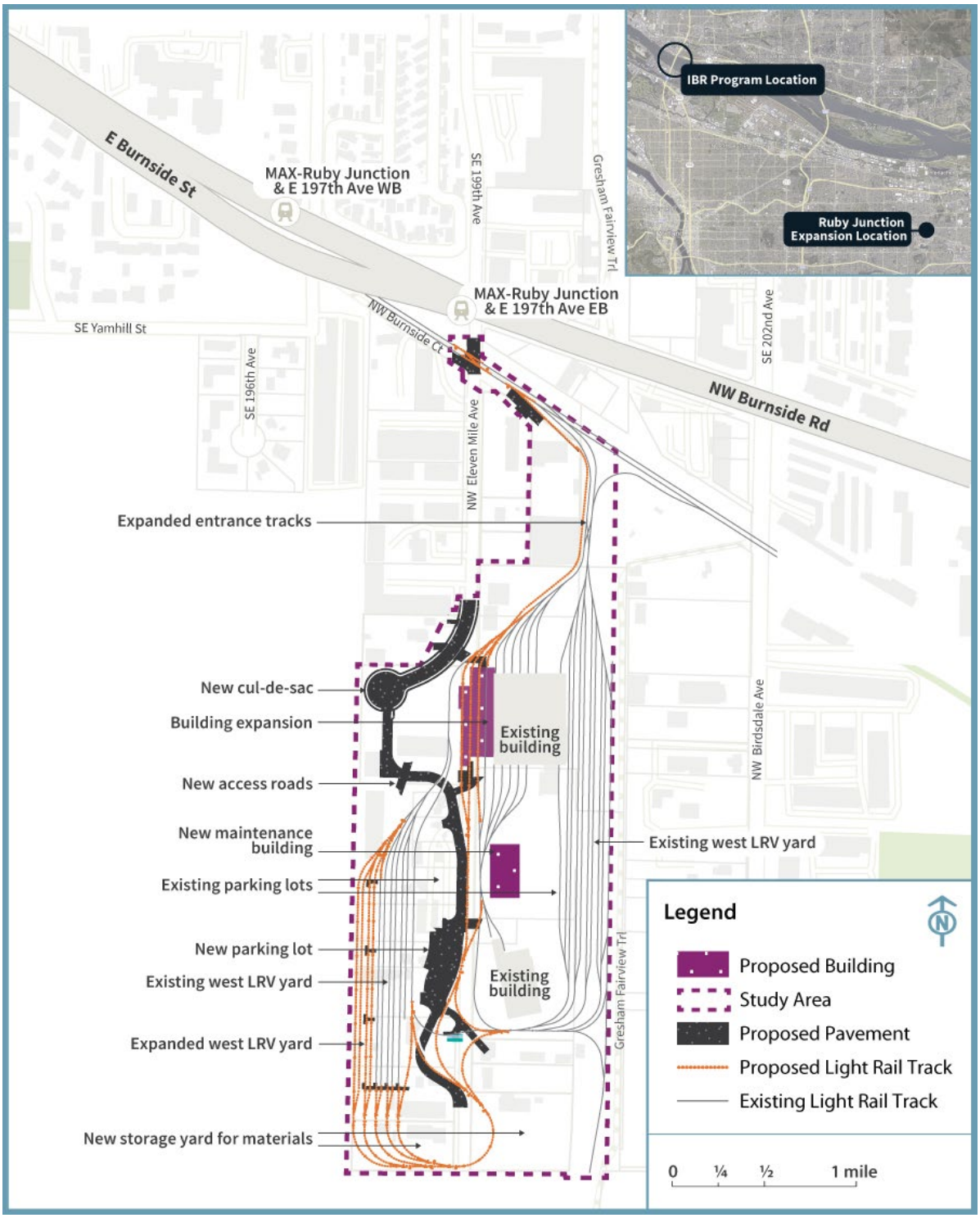
The TriMet Ruby Junction Maintenance Facility in Gresham, Oregon, would be expanded to accommodate the additional LRVs associated with the Modified LPA's LRT service (the Ruby Junction location relative to the study area is shown in Figure 1-25). Improvements would include additional storage for LRVs and maintenance materials and supplies, expanded LRV maintenance bays, expanded parking and employee support areas for additional personnel, and a third track at the northern entrance to Ruby Junction. Figure 1-25 shows the proposed footprint of the expansion.

The existing main building would be expanded west to provide additional maintenance bays. To make space for the building expansion, Eleven Mile Avenue would be vacated and would terminate in a new cul-de-sac west of the main building. New access roads would be constructed to maintain access to TriMet buildings south of the cul-de-sac.

The existing LRV storage yard, west of Eleven Mile Avenue, would be expanded to the west to accommodate additional storage tracks and a runaround track (a track constructed to bypass congestion in the maintenance yard). This expansion would require partial demolition of an existing TriMet building (just north of the LRV storage) and would require relocating the material storage yard to the properties just south of the south building.

All tracks in the west LRV storage yard would also be extended southward to connect to the proposed runaround track. The runaround track would connect to existing tracks near the existing south building. The connections to the runaround track would require partial demolition of an existing TriMet building plus full demolition of one existing building and partial demolition of another existing building on the private property west of the south end of Eleven Mile Avenue. The function of the existing TriMet building would either be transferred to existing modified buildings or to new replacement buildings on site.

Figure 1-25. Ruby Junction Maintenance Facility Study Area



EB = eastbound; LRV = light-rail vehicle; WB = westbound

The existing parking lot west of Eleven Mile Avenue would be expanded toward the south to provide more parking for TriMet personnel.

A third track would be needed at the north entrance to Ruby Junction to accommodate increased train volumes without decreasing service. The additional track would also reduce operational impacts during construction and maintenance outages for the yard. Constructing the third track would require reconstruction of Burnside Court east of Eleven Mile Avenue. An additional crossover would also be needed on the mainline track where it crosses Eleven Mile Avenue; it would require reconstruction of the existing track crossings for vehicles, bicycles, and pedestrians.

1.2.6.2 Expo Center Overnight LRV Facility

An overnight facility for LRVs would be constructed on the southeast corner of the Expo Center property (as shown on Figure 1-8) to reduce deadheading between Ruby Junction and the northern terminus of the MAX Yellow Line extension. Deadheading occurs when LRVs travel without passengers to make the vehicles ready for service. The facility would provide a yard access track, storage tracks for approximately 10 LRVs, one building for light LRV maintenance, an operator break building, a parking lot for operators, and space for security personnel. This facility would necessitate relocation and reconstruction of the Expo Road entrance to the Expo Center (including the parking lot gates and booths). However, it would not affect existing Expo Center buildings.

The overnight facility would connect to the mainline tracks by crossing Expo Road just south of the existing Expo Center MAX Station. The connection tracks would require relocation of one or two existing LRT facilities, including a traction power substation building and potentially the existing communication building, which are both just south of the Expo Center MAX Station. Existing artwork at the station may require relocation.

1.2.6.3 Additional Bus Bays at the C-TRAN Operations and Maintenance Facility

Three bus bays would be added to the C-TRAN operations and maintenance facility. These new bus bays would provide maintenance capacity for the additional express bus service on I-5 (see Section 1.2.7, Transit Operating Characteristics). Modifications to the facility would accommodate new vehicles as well as maintenance equipment.

1.2.7 Transit Operating Characteristics

1.2.7.1 LRT Operations

Nineteen new LRVs would be purchased to operate the extension of the MAX Yellow Line. These vehicles would be similar to those currently used for the TriMet MAX system. With the Modified LPA, LRT service in the new and existing portions of the Yellow Line in 2045 would operate with 6.7-minute average headways (defined as gaps between arriving transit vehicles) during the 2-hour morning peak period. Mid-day and evening headways would be 15 minutes, and late-night headways would be 30 minutes. Service would operate between the hours of approximately 5 a.m. (first southbound train leaving Evergreen Station) and 1 a.m. (last northbound train arriving at the station), which is consistent with current service on the Yellow Line. LRVs would be deadheaded at Evergreen Station

before beginning service each day. A third track at this northern terminus would accommodate layovers.

1.2.7.2 Express Bus Service and Bus on Shoulder

C-TRAN provides bus service that connects to LRT and augments travel between Washington and Oregon with express bus service to key employment centers in Oregon. Beginning in 2022, the main express route providing service in the IBR corridor, Route 105, had two service variations. One pattern provides service between Salmon Creek and downtown Portland with a single intermediate stop at the 99th Street Transit Center, and one provides service between Salmon Creek and downtown Portland with two intermediate stops: 99th Street Transit Center and downtown Vancouver. This route currently provides weekday service with 20-minute peak and 60-minute off-peak headways.

Once the Modified LPA is constructed, C-TRAN Route 105 would be revised to provide direct service from the Salmon Creek Park and Ride and 99th Street Transit Center to downtown Portland, operating at 5-minute peak headways with no service in the off-peak. The C-TRAN Route 105 intermediate stop service through downtown Vancouver would be replaced with C-TRAN Route 101, which would provide direct service from downtown Vancouver to downtown Portland at 10-minute peak and 30-minute off-peak headways.

Two other existing C-TRAN express bus service routes would remain unchanged after completion of the Modified LPA. C-TRAN Route 190 would continue to provide service from the Andresen Park and Ride in Vancouver to Marquam Hill in Portland. This route would continue to operate on SR 500 and I-5 within the study area. Route headways would be 10 minutes in the peak periods with no off-peak service. C-TRAN Route 164 would continue to provide service from the Fisher's Landing Transit Center to downtown Portland. This route would continue to operate within the study area only in the northbound direction during PM service to use the I-5 northbound high-occupancy vehicle lane in Oregon before exiting to eastbound SR 14 in Washington. Route headways would be 10 minutes in the peak and 30 minutes in the off-peak.

C-TRAN express bus Routes 105 and 190 are currently permitted to use the existing southbound inside shoulder of I-5 from 99th Street to the Interstate Bridge in Vancouver. However, the existing shoulders are too narrow for bus-on-shoulder use in the rest of the I-5 corridor in the study area. The Modified LPA would include inside shoulders on I-5 that would be wide enough (14 feet on the Columbia River bridges and 11.5 to 12 feet elsewhere on I-5) to allow northbound and southbound buses to operate on the shoulder, except where I-5 would have to taper to match existing inside shoulder widths at the north and south ends of the corridor. Figure 1-8, Figure 1-16, Figure 1-23, and Figure 1-24 show the potential bus-on-shoulder use over the Columbia River bridges. Bus on shoulder could operate on any of the Modified LPA bridge configurations and bridge types. Additional approvals (including a continuing control agreement), in coordination with ODOT, may be needed for buses to operate on the shoulder on the Oregon portion of I-5.

After completion of the Modified LPA, two C-TRAN express bus routes operating on I-5 through the study area would be able to use bus-on-shoulder operations to bypass congestion in the general-purpose lanes. C-TRAN Route 105 would operate on the shoulder for the full length of the study area. C-TRAN Route 190 would operate on the shoulder for the full length of the corridor except for the distance required to merge into and out of the shoulder as the route exits from and to SR 500. These

two express bus routes (105 and 190) would have a combined frequency of every 3 minutes during the 2045 AM and PM peak periods. To support the increased frequency of express bus service, eight electric double-decker or articulated buses would be purchased.

If the C Street ramps were removed from the SR 14 interchange, C-TRAN Route 101 could also use bus-on-shoulder operations south of Mill Plain Boulevard; however, if the C Street ramps remained in place, Route 101 could still use bus-on-shoulder operations south of the SR 14 interchange but would need to begin merging over to the C Street exit earlier than if the C Street ramps were removed. Route 101 would operate at 10-minute peak and 30-minute off-peak headways. C-TRAN Route 164 would not be anticipated to use bus-on-shoulder operations because of the need to exit to SR 14 from northbound I-5.

1.2.7.3 Local Bus Route Changes

The TriMet Line 6 bus route would be changed to terminate at the Expo Center MAX Station, requiring passengers to transfer to the new LRT connection to access Hayden Island. TriMet Line 6 is anticipated to travel from Martin Luther King Jr. Boulevard through the newly configured area providing local connections to Marine Drive. It would continue west to the Expo Center MAX Station. Table 1-3 shows existing service and anticipated future changes to TriMet Line 6.

As part of the Modified LPA, several local C-TRAN bus routes would be changed to better complement the new light-rail extension. Most of these changes would reroute existing bus lines to provide a transfer opportunity near the new Evergreen Station. Table 1-3 shows existing service and anticipated future changes to C-TRAN bus routes. In addition to the changes noted in Table 1-3, other local bus route modifications would move service from Broadway to C Street. The changes shown may be somewhat different if the C Street ramps are removed.

Table 1-3. Proposed TriMet and C-TRAN Bus Route Changes

Bus Route	Existing Route	Changes with Modified LPA
TriMet Line 6	Connects Goose Hollow, Portland City Center, N/NE Portland, Jantzen Beach and Hayden Island. Within the study area, service currently runs between Delta Park MAX Station and Hayden Island via I-5.	Route would be revised to terminate at the Expo Center MAX Station. Route is anticipated to travel from Martin Luther King Jr. Boulevard through the newly configured Marine Drive area, then continue west to connect via facilities on the west side of I-5 with the Expo Center MAX Station.

Bus Route	Existing Route	Changes with Modified LPA
C-TRAN Fourth Plain and Mill Plain bus rapid transit (The Vine)	Runs between downtown Vancouver and the Vancouver Mall Transit Center via Fourth Plain Boulevard, with a second line along Mill Plain Boulevard. In the study area, service currently runs along Washington and Broadway Streets through downtown Vancouver.	Route would be revised to begin/end near the Evergreen Station in downtown Vancouver and provide service along Evergreen Boulevard to Fort Vancouver Way, where it would travel to or from Mill Plain Boulevard or Fourth Plain Boulevard depending on clockwise/counterclockwise operations. The Fourth Plain Boulevard route would continue to serve existing Vine stations beyond Evergreen Boulevard.
C-TRAN #2 Lincoln	Connects the 99th Street Transit Center to downtown Vancouver via Lincoln and Kaufman Avenues. Within the study area, service currently runs along Washington and Broadway Streets between 7th and 15th Streets in downtown Vancouver.	Route would be modified to begin/end near C Street and 9th Street in downtown Vancouver.
C-TRAN #25 St. Johns	Connects the 99th Street Transit Center to downtown Vancouver via St. Johns Boulevard and Fort Vancouver Way. Within the study area, service currently runs along Evergreen Boulevard, Jefferson Street/Kaufman Avenue, 15th Street, and Franklin Street in downtown Vancouver.	Route would be modified to begin/end near C Street and 9th Street in downtown Vancouver.
C-TRAN #30 Burton	Connects the Fisher's Landing Transit Center with downtown Vancouver via 164th/162nd Avenues and 18th, 25th, 28th, and 39th Streets. Within the study area, service currently runs along McLoughlin Boulevard and on Washington and Broadway Streets between 8th and 15th Streets.	Route would be modified to begin/end near C Street and 9th Street in downtown Vancouver.
C-TRAN #60 Delta Park Regional	Connects the Delta Park MAX station in Portland with downtown Vancouver via I-5. Within the study area, service currently runs along I-5, Mill Plain Boulevard, and Broadway Street.	Route would be discontinued.

1.2.8 Tolling

Tolling cars and trucks that would use the new Columbia River bridges is proposed as a method to help fund the bridge construction and future maintenance, as well as to encourage alternative mode choices for trips across the Columbia River. Federal and state laws set the authority to toll the I-5 crossing. The IBR Program plans to toll the I-5 river bridge under the federal tolling authorization program codified in 23 U.S. Code Section 129 (Section 129). Section 129 allows public agencies to

impose new tolls on federal-aid interstate highways for the reconstruction or replacement of toll-free bridges or tunnels. In 2023, the Washington State Legislature authorized tolling on the Interstate Bridge, with toll rates and policies to be set by the Washington State Transportation Commission (WSTC). In Oregon, the legislature authorized tolling giving the Oregon Transportation Commission the authority to toll I-5, including the ability to set the toll rates and policies. Subsequently, the Oregon Transportation Commission (OTC) is anticipated to review and approve the I-5 tollway project application that would designate the Interstate Bridge as a "tollway project" in 2024. At the beginning of 2024, the OTC and the WSTC entered into a bi-state tolling agreement to establish a cooperative process for setting toll rates and policies. This included the formation of the I-5 Bi-State Tolling Subcommittee consisting of two commissioners each from the OTC and WSTC and tasked with developing toll rate and policy recommendations for joint consideration and adoption by each state's commission. Additionally, the two states plan to enter into a separate agreement guiding the sharing and uses of toll revenues, including the order of uses (flow of funds) for bridge construction, debt service, and other required expenditures. WSDOT and ODOT also plan to enter into one or more agreements addressing implementation logistics, toll collection, and operations and maintenance for tolling the bi-state facility.

The Modified LPA includes a proposal to apply variable tolls on vehicles using the Columbia River bridges with the toll collected electronically in both directions. Tolls would vary by time of day with higher rates during peak travel periods and lower rates during off-peak periods. The IBR Program has evaluated multiple toll scenarios generally following two different variable toll schedules for the tolling assessment. For purposes of this NEPA analysis, the lower toll schedule was analyzed with tolls assumed to range between $1.50 and $3.15 (in 2026 dollars as representative of when tolling would begin) for passenger vehicles with a registered toll payment account. Medium and heavy trucks would be charged a higher toll than passenger vehicles and light trucks. Passenger vehicles and light trucks without a registered toll payment account would pay an additional $2.00 per trip to cover the cost of identifying the vehicle owner from the license plate and invoicing the toll by mail.

The analysis assumes that tolling would commence on the existing Interstate Bridge—referred to as pre-completion tolling—starting April 1, 2026. The actual date pre-completion tolling begins would depend on when construction would begin. The traffic and tolling operations on the new Columbia River bridges were assumed to commence by July 1, 2033. The actual date that traffic and tolling operations on the new bridges begin would depend on the actual construction completion date. During the construction period, the two commissions may consider toll-free travel overnight on the existing Interstate Bridge, as was analyzed in the Level 2 Toll Traffic and Revenue Study, for the hours between 11 p.m. and 5 a.m. This toll-free period could help avoid situations where users would be charged during lane or partial bridge closures where construction delays may apply. Once the new I-5 Columbia River bridges open, twenty-four-hour tolling would begin.

Tolls would be collected using an all-electronic toll collection system using transponder tag readers and license plate cameras mounted to structures over the roadway. Toll collection booths would not be required. Instead, motorists could obtain a transponder tag and set up a payment account that would automatically bill the account holder associated with the transponder each time the vehicle crossed the bridge. Customers without transponders, including out-of-area vehicles, would be tolled by a license plate recognition system that would bill the address of the owner registered to that vehicle's license plate. The toll system would be designed to be nationally interoperable.

Transponders for tolling systems elsewhere in the country could be used to collect tolls on I-5, and drivers with an account and transponder tag associated with the Interstate Bridge could use them to pay tolls in other states for which reciprocity agreements had been developed. There would be new signage, including gantries, to inform drivers of the bridge toll. These signs would be on local roads, I-5 on-ramps, and on I-5, including locations north and south of the bridges where drivers make route decisions (e.g., I-5/I-205 junction and I-5/I-84 junction).

1.2.9 Transportation System- and Demand-Management Measures

Many well-coordinated transportation demand-management and system-management programs are already in place in the Portland-Vancouver metropolitan region. In most cases, the impetus for the programs comes from state regulations: Oregon's Employee Commute Options rule and Washington's Commute Trip Reduction law (described in the sidebar).

The physical and operational elements of the Modified LPA provide the greatest transportation demand-management opportunities by promoting other modes to fulfill more of the travel needs in the corridor. These include:

- Major new light-rail line in exclusive right of way, as well as express bus routes and bus routes that connect to new light-rail stations.
- I-5 inside shoulders that accommodate express buses.
- Modern bicycle and pedestrian facilities that accommodate more bicyclists and pedestrians and improve connectivity, safety, and travel time.
- Park-and-ride facilities.
- A variable toll on the new Columbia River bridges.

In addition to these fundamental elements of the Modified LPA, facilities and equipment would be implemented that could help existing or expanded transportation system management measures maximize the capacity and efficiency of the system. These include:

- Replacement or expanded variable message signs in the study area. These signs alert drivers to incidents and events, allowing them to seek alternate routes or plan to limit travel during periods of congestion.

State Laws to Reduce Commute Trips

Oregon and Washington have both adopted regulations intended to reduce the number of people commuting in single-occupancy vehicles (SOVs). Oregon's Employee Commute Options Program, created under Oregon Administrative Rule 340-242-0010, requires employers with over 100 employees in the greater Portland area to provide commute options that encourage employees to reduce auto trips to the work site. Washington's 1991 Commute Trip Reduction (CTR) Law, updated as the 2006 CTR Efficiency Act (Revised Code of Washington §70.94.521) addresses traffic congestion, air pollution, and petroleum fuel consumption. The law requires counties and cities with the greatest traffic congestion and air pollution to implement plans to reduce SOV demand. An additional provision mandates "major employers" and "employers at major worksites" to implement programs to reduce SOV use.

- Replacement or expanded traveler information systems with additional traffic monitoring equipment and cameras.
- Expanded incident response capabilities, which help traffic congestion to clear more quickly following accidents, spills, or other incidents.
- Queue jumps or bypass lanes for transit vehicles where multilane approaches are provided at ramp signals for on-ramps. Locations for these features will be determined during the detailed design phase.
- Active traffic management including strategies such as ramp metering, dynamic speed limits, and transit signal priority. These strategies are intended to manage congestion by controlling traffic flow or allowing transit vehicles to enter traffic before single-occupant vehicles.

1.3 Modified LPA Construction

The following information on the construction activities and sequence follows the information prepared for the CRC LPA. Construction durations have been updated for the Modified LPA. Because the main elements of the IBR Modified LPA are similar to those in the CRC LPA (i.e., multimodal river crossings and interchange improvements), this information provides a reasonable assumption of the construction activities that would be required.

The construction of bridges over the Columbia River sets the sequencing for other Program components. Accordingly, construction of the Columbia River bridges and immediately adjacent highway connections and improvement elements would be timed early to aid the construction of other components. Demolition of the existing Interstate Bridge would take place after the new Columbia River bridges were opened to traffic.

Electronic tolling infrastructure would be constructed and operational on the existing Interstate Bridge by the start of construction on the new Columbia River bridges. The toll rates and policies for tolling (including pre-completion tolling) would be determined after a more robust analysis and public process by the OTC and WSTC (refer to Section 1.2.8, Tolling).

1.3.1 Construction Components and Duration

Table 1-4 provides the estimated construction durations and additional information of Modified LPA components. The estimated durations are shown as ranges to reflect the potential for Program funding to be phased over time. In addition to funding, contractor schedules, regulatory restrictions on in-water work and river navigation considerations, permits and approvals, weather, materials, and equipment could all influence construction duration and overlap of construction of certain components. Certain work below the ordinary high-water mark of the Columbia River and North Portland Harbor would be restricted to minimize impacts to species listed under the Endangered Species Act and their designated critical habitat.

Throughout construction, active transportation facilities and three lanes in each direction on I-5 (accommodating personal vehicles, freight, and buses) would remain open during peak hours, except for short intermittent restrictions and/or closures. Advanced coordination and public notice would be given for restrictions, intermittent closures, and detours for highway, local roadway, transit, and

active transportation users (refer to the Transportation Technical Report, for additional information). At least one navigation channel would remain open throughout construction. Advanced coordination and notice would be given for restrictions or intermittent closures to navigation channels as required.

Table 1-4. Construction Activities and Estimated Duration

Component	Estimated Duration	Notes
Columbia River bridges	4 to 7 years	• Construction is likely to begin with the main river bridges. • General sequence would include initial preparation and installation of foundation piles, shaft caps, pier columns, superstructure, and deck.
North Portland Harbor bridges	4 to 10 years	• Construction duration for North Portland Harbor bridges is estimated to be similar to the duration for Hayden Island interchange construction. The existing North Portland Harbor bridge would be demolished in phases to accommodate traffic during construction of the new bridges.
Hayden Island interchange	4 to 10 years	• Interchange construction duration would not necessarily entail continuous active construction. Hayden Island work could be broken into several contracts, which could spread work over a longer duration.
Marine Drive interchange	4 to 6 years	• Construction would need to be coordinated with construction of the North Portland Harbor bridges.
SR 14 interchange	4 to 6 years	• Interchange would be partially constructed before any traffic could be transferred to the new Columbia River bridges.
Demolition of the existing Interstate Bridge	1.5 to 2 years	• Demolition of the existing Interstate Bridge could begin only after traffic is rerouted to the new Columbia River bridges.
Three interchanges north of SR 14	3 to 4 years for all three	• Construction of these interchanges could be independent from each other and from construction of the Program components to the south. • More aggressive and costly staging could shorten this timeframe.
Light-rail	4 to 6 years	• The light-rail crossing would be built with the Columbia River bridges. Light-rail construction includes all of the infrastructure associated with light-rail transit (e.g., overhead catenary system, tracks, stations, park and rides).

Component	Estimated Duration	Notes
Total construction timeline	9 to 15 years	• Funding, as well as contractor schedules, regulatory restrictions on in-water work and river navigation considerations, permits and approvals, weather, materials, and equipment, could all influence construction duration.

1.3.2 Potential Staging Sites and Casting Yards

Equipment and materials would be staged in the study area throughout construction generally within existing or newly purchased right of way, on land vacated by existing transportation facilities (e.g., I-5 on Hayden Island), or on nearby vacant parcels. However, at least one large site would be required for construction offices, to stage the larger equipment such as cranes, and to store materials such as rebar and aggregate. Criteria for suitable sites include large, open areas for heavy machinery and material storage, waterfront access for barges (either a slip or a dock capable of handling heavy equipment and material) to convey material to the construction zone, and roadway or rail access for landside transportation of materials by truck or train.

Two potential major staging sites have been identified (see Figure 1-8 and Figure 1-23). One site is located on Hayden Island on the west side of I-5. A large portion of this parcel would be required for new right of way for the Modified LPA. The second site is in Vancouver between I-5 and Clark College. Other staging sites may be identified during the design process or by the contractor. Following construction of the Modified LPA, the staging sites could be converted for other uses.

In addition to on-land sites, some staging activities for construction of the new Columbia River and North Portland Harbor bridges would take place on the river itself. Temporary work structures, barges, barge-mounted cranes, derricks, and other construction vessels and equipment would be present on the river during most or all of the bridges' construction period. The IBR Program is working with USACE and USCG to obtain necessary clearances for these activities.

A casting or staging yard could also be required for construction of the overwater bridges if a precast concrete segmental bridge design is used. A casting yard would require access to the river for barges, a slip or a dock capable of handling heavy equipment and material, a large area suitable for a concrete batch plant and associated heavy machinery and equipment, and access to a highway or railway for delivery of materials. As with the staging sites, casting or staging yard sites may be identified as the design progresses or by the contractor and would be evaluated via a NEPA re-evaluation or supplemental NEPA document for potential environmental impacts at that time.

1.4 No-Build Alternative

The No-Build Alternative illustrates how transportation and environmental conditions would likely change by the year 2045 if the Modified LPA is not built. This alternative makes the same assumptions as the Modified LPA regarding population and employment growth through 2045, and it assumes that the same transportation and land use projects in the region would occur as planned.

Regional transportation projects included in the No-Build Alternative are those in the financially constrained 2018 *Regional Transportation Plan* (2018 RTP) adopted in December 2018 by the Metro Council (Metro 2018) and in March 2019 (RTC 2019) by the Southwest Washington Regional Transportation Council (RTC) Board of Directors is referred to as the 2018 RTP in this report. The 2018 RTP has a planning horizon year of 2040 and includes projects from state and local plans necessary to meet transportation needs over this time period; financially constrained means these projects have identified funding sources. The Transportation Technical Report lists the projects included in the financially constrained 2018 RTP.

The implementation of regional and local land use plans is also assumed as part of the No-Build Alternative. For the IBR Program analysis, population and employment assumptions used in the 2018 RTP were updated to 2045 in a manner consistent with regional comprehensive and land use planning. In addition to accounting for added growth, adjustments were made within Portland to reallocate the households and employment based on the most current update to Portland's comprehensive plan, which was not complete in time for inclusion in the 2018 RTP.

Other projects assumed as part of the No-Build Alternative include major development and infrastructure projects that are in the permitting stage or partway through phased development. These projects are discussed as reasonably foreseeable future actions in the IBR Cumulative Effects Technical Report. They include the Vancouver Waterfront project, Terminal 1 development, the Renaissance Boardwalk, the Waterfront Gateway Project, improvements to the levee system, several restoration and habitat projects, and the Portland Expo Center.

In addition to population and employment growth and the implementation of local and regional plans and projects, the No-Build Alternative assumes that the existing Interstate Bridge would continue to operate as it does today. As the bridge ages, needs for repair and maintenance would potentially increase, and the bridge would continue to be at risk of mechanical failure or damage from a seismic event.

2. METHODS

This chapter describes the methods used to assess the potential equity impacts (benefits and burdens) resulting from the construction and operation of the Modified LPA. The scope of the analysis is broader than that of the required environmental justice analysis under NEPA, as the IBR Program has made a commitment to the community to center equity beyond legal and statutory requirements.

2.1 Policy Context

This analysis is consistent with federal and local plans, standards, and policy objectives to further equity in transportation. Key regulations, plans, and policies related to equity are listed below.

2.1.1 Federal

- Presidential Executive Order (EO) 13985: Advancing Racial Equity and Support for Underserved Communities Through the Federal Government (2021).
- Presidential EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994).
- Presidential EO 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All (2023).
- Council on Environmental Quality Climate and Economic Justice Screening Tool (2023)
- Presidential EO 14008: Tackling the Climate Crisis at Home and Abroad, including the Justice40 Initiative (2021)
- U.S. Department of Transportation (USDOT) Order 5610.2c, U.S. Department of Transportation Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (2021).
- Order 6640.23A, Federal Highway Administration Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (2012).
- Presidential EO 13166 – Improving Access to Services for Persons with Limited English Proficiency (2000).
- Title 42 United States Code Section 4601, Uniform Relocation Assistance and Real Property Acquisition Policies for Federal and Federally Assisted Programs.
- USDOT, Department of Transportation: Updated Environmental Justice Order 5610.2a (2012).
- Title VI of the Civil Rights Act of 1964.
- Title 49 of the Code of Federal Regulations Part 21, Nondiscrimination in Federally Assisted Programs of the Department of Transportation, Effectuation of Title VI of the Civil Rights Act of 1964.

2.1.2 State

- Orgon Department of Transportation (ODOT) 2021–2023 Strategic Action Plan — Equity Goals (2022).
- Washington State Department of Transportation (WSDOT) Diversity, Equity, & Inclusion Plan – Data Informed Decisions and Community Engagement strategies (2022).

2.1.3 Local

- City Council of the City of Vancouver Statement Regarding Racial Equity and Racial Justice (2020).
- City of Vancouver 2011–2030 Comprehensive Plan – Policy IM-13 Diversity (2011).
- City of Portland 2035 Comprehensive Plan – Goal 2.A, Goal 2.B, Goal 2.C, Goal 9.E, Policy 2.27, Policy 2.3, Policy 2.4, Policy 8.32, Policy 9.23, Policy 9.24, Policy 9.25, Policy 9.8, Policy 9.9 (2018).

2.2 Defining Equity, Setting Objectives

In tandem with the IBR Equity Advisory Group (EAG), the Program has adopted an equity framework[9] to guide the processes and desired outcomes in terms of furthering equity. At the core of the framework is a Program-specific equity definition and six equity objectives, which together form the basis for the analysis presented in this report.

2.2.1 IBR Definition of Equity

Please refer to Chapter 1, above, for definitions of Equity and Equity Priority Communities.

2.2.2 IBR Equity Objectives

The IBR Program has established six equity objectives:

1. **Mobility and accessibility** – Improve mobility, accessibility, and connectivity, especially for lower income travelers, people with disabilities, and historically underserved communities who experience transportation barriers.
2. **Physical design** – Integrate equity, area history, and culture into the physical design elements of the Program including bridge aesthetics, artwork, amenities, and impacts to adjacent land uses.
3. **Community benefits** – Find opportunities for and implement local community improvements in addition to required mitigations.

[9] The complete *IBR Program Equity Framework* can be accessed through the program website: https://www.interstatebridge.org/media/lkfj1xuz/ibr_equityframework_20220511_remediated.pdf.

4. **Workforce equity and economic opportunity** – Ensure that economic opportunities generated by the Program benefit minority and women owned firms, BIPOC workers, tribal governments, workers with disabilities, and young people. The Program will engage with both federally recognized Indian tribes which have Tribal Employment Rights Offices and those without.
5. **Decision-making processes** – Prioritize access, influence, and decision-making power for Equity Priority Communities throughout the Program in establishing objectives, design, implementation, and evaluation of success.
6. **Avoid further harm** – Actively seek out options with a harm-reduction priority rather than simply mitigate disproportionate impacts on historically impacted and underserved communities and populations.

Of these, the most relevant to this report are *Mobility and accessibility, Decision-making processes,* and *Avoid further harm.* The other three objectives pertain more closely to the IBR Program's advanced design and construction phases.

2.3 Precedent

While an equity technical report is not an established element of the NEPA process, there is local precedent for the practice. The environmental impact statement for the Multnomah County Earthquake Ready Burnside Bridge Project includes this type of report to assess impacts and benefits for historically marginalized populations that are not considered environmental justice communities under EO 12898. Potentially affected populations included in that assessment were:

- Unhoused populations
- Adults aged 65 and older
- Disability population
- Limited-English proficiency population

The report also examined impacts to social and emergency service providers because of these populations' reliance on them for access to housing, nutrition, health care, employment, case management, and other social services.

2.4 Study Area

This report analyzes benefits and burdens on four geographic levels:

- The IBR study area, which area runs along a 5-mile segment of Interstate 5 (I-5), approximately between the SR 500 interchange in Washington and the I-5/Columbia Boulevard interchange in Oregon. North of the Columbia River, the study area expands west of I-5 into downtown Vancouver to include potential high-capacity transit (HCT) alignments and park-and-ride locations. It also includes the TriMet Ruby Junction maintenance facility in Gresham, Oregon (see Figure 2-1).
- The IBR Program area is defined by the Transportation Analysis Zones in the Metro regional transportation model that intersect with the study area (Figure 2-1).

- A larger IBR Program area includes neighborhoods adjacent to the IBR study area (Figure 2-1).
- HCT station area half-mile walksheds (see Figure 2-2).
- The broader Portland-Vancouver-Hillsboro metropolitan area, as defined by the U.S. Census Bureau.

2.5 Data Collection Methods

This report is based on a variety of both quantitative and qualitative data sources. Demographic data were used as a starting point to assess the presence of equity priority communities living within the study area. The analysis also draws from quantitative data and findings from other relevant discipline reports including physical impacts from bridge construction and long-term operation. Qualitative data were drawn from sources that included the EAG and community engagement activities. The following sections summarize the specific data sources that were used to assess benefits and burdens on equity priority communities. Appendix A provides additional information on the demographic data and analysis presented in the Equity Technical Report.

2.5.1 Quantitative Data

The quantitative analysis relied heavily on geographic information system (GIS) analysis, using demographic, employment, and transportation network data sources, including:

- 2020 U.S. Census (U.S. Census Bureau 2020).
- 2016–2020 American Community Survey (U.S. Census Bureau 2022).
- 2022 Metro, Southwest Washington Regional Transportation Council (RTC), C-TRAN, TriMet, and IBR Analysis.
- Metro Regional Land Information System (Metro n.d.).
- 2022 Point-in-Time Counts (the counties of Multnomah and Clark [Clark County Council for the Homeless 2022; Multnomah County Joint Office of Homeless Services 2022]).

Note that using demographic data has inherent limitations in gauging impacts to communities. For example, communities of color are regularly undercounted by the U.S. Census Bureau; a Bureau analysis of the 2020 census found significant undercounts of Black or African American, Hispanic or Latino, and American Indian or Alaska Native populations.

2.5.2 Qualitative Data

The analysis also incorporates qualitative data derived from the Program's community engagement activities, which include listening sessions, partnerships with community-based organizations, surveys, attendance at community events, and others. It is informed through consultation with the EAG, which provides insight and input on the Program's processes, approaches, and decisions that may affect historically underserved and underrepresented communities.

Figure 2-1. Modified LPA Study Area and IBR Program Area as defined for the Benefits Analysis

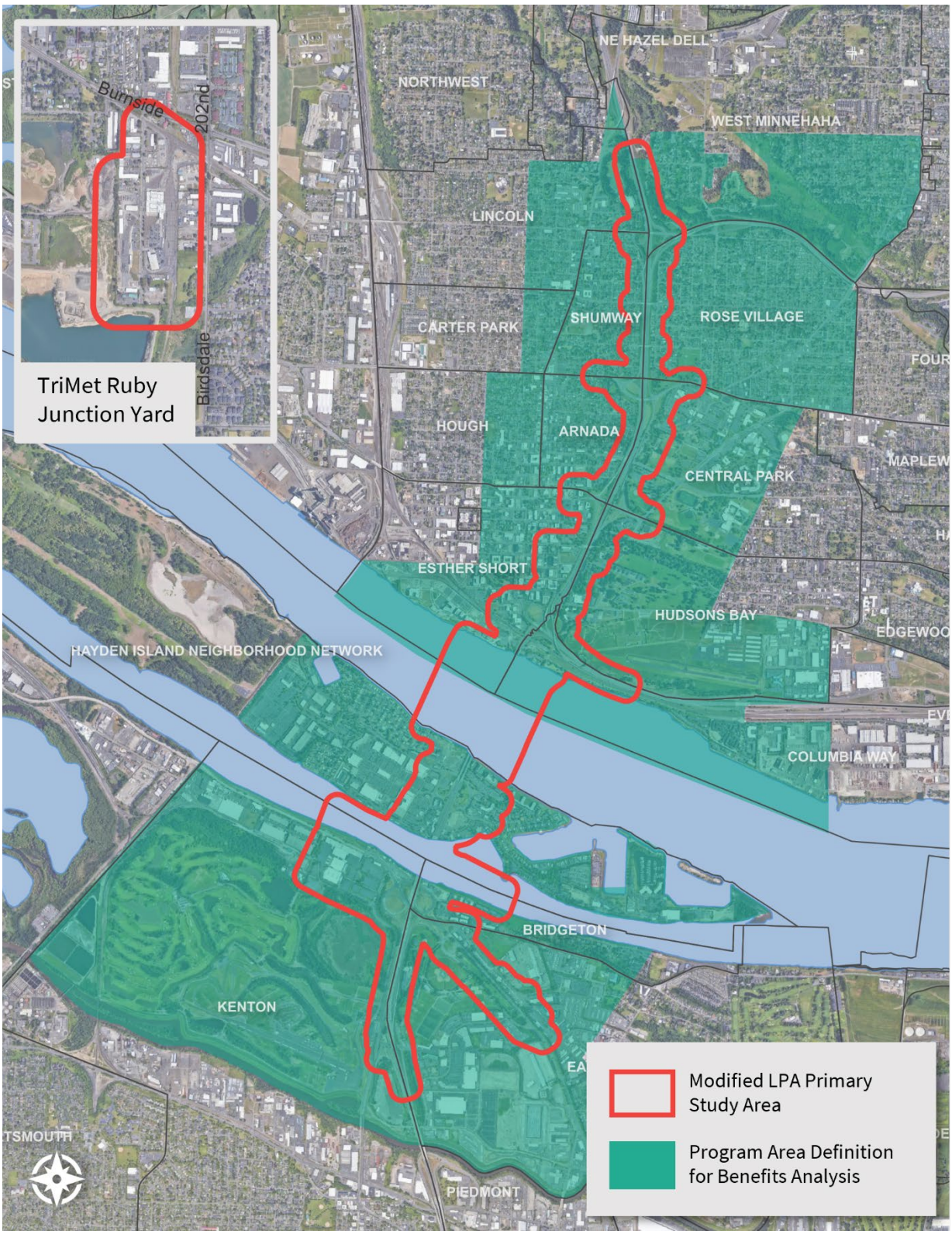
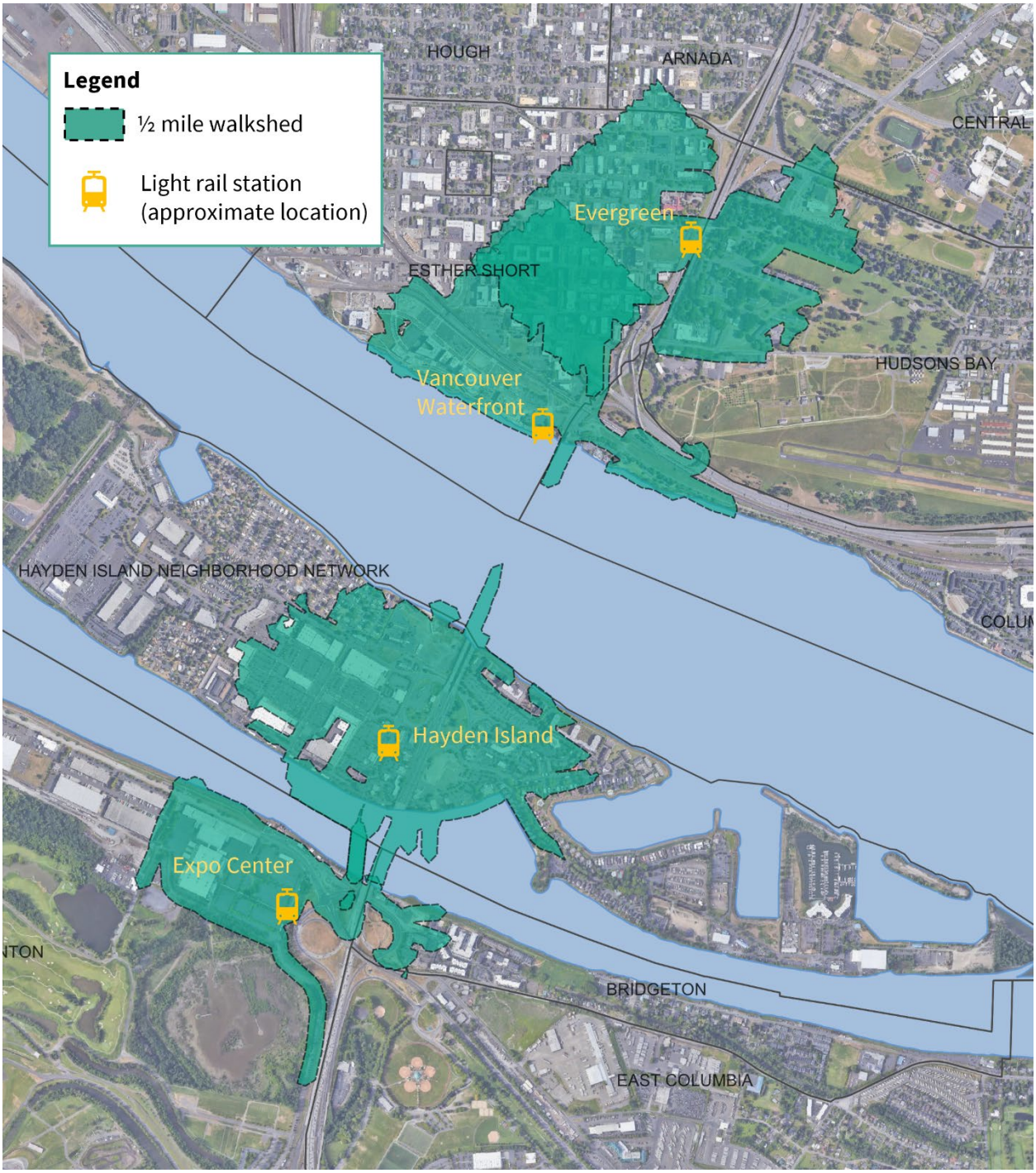


Figure 2-2. Modified LPA High-Capacity Transit (Light Rail) Stations and Half-Mile Walksheds (with Neighborhood Boundaries)



2.6 Technical Analysis Methods

Both benefits and burdens for equity priority communities related to the Modified LPA are evaluated.

2.6.1 Defining Equity Priority Communities

The IBR equity definition lists nine equity priority communities. Table 2-1 further defines these communities according to the data sources used for the analysis. Note that individuals can be members of multiple equity priority communities and thereby may experience compounded impacts of historical and current marginalization.

Table 2-1. IBR Program Equity Priority Communities

Equity Priority Community	Full Description	Data Source
Black, Indigenous, and People of Color (BIPOC)	People selecting any race/ethnicity combination besides White/non-Hispanic on the census.	2020 U.S. Census (Table P2)
Tribal Governments (Federally Recognized Tribes)	Sovereign nations as recognized by the U.S. Government; consultation with federally recognized tribes occurs through a government-to-government consultation process separate and distinct from public and community outreach and comment.	Enrollment data are held and managed by the tribes and are not incorporated into this report. The IBR Program is engaged in government-to-government consultation with tribal governments. Tribal members living within the IBR Program area are reflected in the U.S. Census data, although not specifically identified by tribal affiliation.
People with Disabilities	People living with a serious difficulty within four basic areas of functioning: hearing, vision, cognition, and ambulation.	2016–2020 American Community Survey (Table S1810)
Communities with Limited English Proficiency	People who indicate that they speak English less than “very well.”	2016–2020 American Community Survey (Table C16001)
Persons with Lower Incomes	People or households with income at or below 200% of the federal poverty level.	2016–2020 American Community Survey (Table C17002)
Houseless Individuals and Families	People and families lacking, or in need of, a house or dwelling.	2022 Multnomah County and Clark County Point in Time Counts
Immigrants and Refugees	People born outside of the U.S. (“Foreign Born Population”).	2016–2020 American Community Survey (Table DP02)
Young People	People under 25 years of age.	2016–2020 American Community Survey (Table B01001)

Equity Priority Community	Full Description	Data Source
Older Adults	People 65 years of age or older.	2016–2020 American Community Survey (Table B01001)

Sources: 2020 U.S. Census, Table P1 (U.S. Census Bureau 2020); 2016–2020 American Community Survey, Tables S1810, C16001, C17002, DP02, B01001 (U.S. Census Bureau 2022); Multnomah County Point-in-Time Counts (Multnomah County Joint Office of Homeless Services 2022); Clark County Point-in-Time Counts (Clark County Council for the Homeless 2022)

2.6.2 Benefits Analysis

The Mobility and Accessibility objective in the *IBR Program Equity Framework* is: "improve mobility, accessibility, and connectivity, especially for lower income travelers, people with disabilities, and historically underserved communities who experience transportation barriers." This section of the report examines the extent to which the Modified LPA furthers this objective across improvements by infrastructure type (HCT, active transportation, and highway).

2.6.2.1 High-Capacity Transit

The first component of the HCT analysis (referred to as High-Capacity Transit Analysis 1 in this report) combines demographic data (from the U.S. Census Bureau) and job location data (from a Metro/IBR model projecting land use and transportation conditions in 2045[10]) to estimate how the light rail alignment in the Modified LPA would impact transit riders' mobility. Access to jobs is used as a proxy for access to services (e.g., grocery stores, health care, and education) because those destinations are also job centers. As described in Appendix A, the analysis calculated the average number of jobs reachable via HCT within 45 minutes during AM peak (7 a.m. to 9 a.m.) and midday (12 p.m. to 1 p.m.) hours. The AM peak was used to reflect access to jobs during typical morning commute hours and midday was used to reflect access to services outside of typical commuting hours. Estimated changes in access via transit between the No-Build Alternative and the Modified LPA are provided for each equity priority community and their counterparts[11] for which data are available[12] for the IBR Program area and the broader Portland-Vancouver metropolitan area.

The second component of the HCT analysis (referred to as High-Capacity Transit Analysis 2) examines the demographics of each station area[13] (residents within a half-mile walk of the station as shown in Figure 2-2; this threshold is commonly used as a maximum distance transit riders will walk to access

[10] A detailed description of the model is included in Appendix H of the Transportation Technical Report.
[11] "Counterpart" is defined as someone who is not considered a member of the corresponding equity priority community. For example, the counterpart to members of the BIPOC community are those whose race/ethnicity combination is White Non-Hispanic/Latino; the counterpart to people with disabilities is people who do not have a disability, etc.
[12] Data are not available for houseless individuals and families.
[13] Station area walksheds do not align exactly with census geographies. Population estimates are calculated by determining the percentage of a census block group or tract's land area the walkshed covers, then multiplying this percentage by the total census block group or tract total population. This assumes an even distribution of the population throughout each census block group or tract, which is not necessarily the case in reality. Therefore, these estimates have a margin of error.

HCT) and compares the percentage of this population comprised of equity priority community members to the IBR Program area and the Portland-Vancouver metropolitan area. The purpose of these comparisons is to assess potential disparities between the makeup of the Program area and the areas best served by light rail stations in the Modified LPA and to provide an informational comparison to the region at large.

An important caveat is that this approach combines current census data with projected transit service and distribution of jobs in 2045. Therefore, while the analysis serves as one indicator of equity, it should be recognized that changes in both employment and population will occur between now and 2045.

2.6.2.2 Active Transportation

The Modified LPA includes several improvements serving pedestrians and bicyclists. The equity analysis conducted for active transportation is qualitative in nature and relies on the Program's community engagement to ensure consistency with feedback received.

2.6.2.3 Highway/Driving

Rising housing costs throughout the Portland metropolitan area, particularly with respect to rent in neighborhoods near the Portland core, have led to significant migration from Multnomah County to Clark County for many seeking to reduce housing cost burdens. This has impacted commute times and transportation costs for those who now must cross the Columbia River into Oregon for work or to access other essential destinations. As such, improvements in driving conditions may carry differential impacts between equity priority communities and their counterparts.

The driving access analysis combines demographic and jobs data to estimate how the highway improvements under the Modified LPA would impact drivers' mobility. As with transit, the indicator used is access to jobs, which is used as a proxy for access to other types of services (e.g., grocery stores, health care, education) because those destinations are also job centers. This analysis estimates these impacts by conducting a similar analysis to that conducted for HCT, as described in Appendix A.

2.6.3 Burdens Analysis

This report compiles the information gathered and analyzed across multiple technical reports to examine how equity priority communities would potentially be impacted in the short and long term by the Modified LPA. Results are presented for five categories:

3. Property acquisitions
4. Residential displacements
5. Commercial displacements
6. Temporary construction-related impacts
7. Long-term air quality impacts

Results are provided as a matrix that lists equity priority communities and anticipated impacts across these five categories.

3. QUANTIFYING AND MAPPING EQUITY PRIORITY COMMUNITIES

3.1 Share of Population

> The IBR Program is consulting with 10 federally recognized Indian Tribes. While there are no reservations within the IBR Program area, these tribes are sovereign nations who have identified an interest in the Program. Enrollment data is held and managed by the tribes and therefore is not incorporated into this report. However, Tribal members living within the IBR Program area are reflected in the U.S. Census data, although not specifically identified by tribal affiliation.

Table 3-1 shows the percentages of each equity priority community (except tribal governments and houseless individuals and families)[14] residing in the IBR Program area and the Portland-Vancouver metropolitan area. People with disabilities, persons with lower incomes, and older adults make up a larger share of the IBR Program area population than in the metropolitan area as a whole. Percentages of young people and immigrants and refugees are lower in the IBR Program area, while percentages of BIPOC and limited-English proficiency populations are similar between the two geographies.

Table 3-1. Percent of Equity Priority Communities within the IBR Program Area and Portland-Vancouver Metropolitan Area

Equity Priority Community	IBR Program Area	Portland-Vancouver Metropolitan Area
Black, Indigenous, and People of Color	30%	31%
People with Disabilities	15%	12%
Communities with Limited English Proficiency	6%	6%
Persons with Lower Incomes	32%	24%
Immigrants and Refugees	9%	13%
Young People (Under 25)	25%	29%
Older Adults (65+)	18%	15%

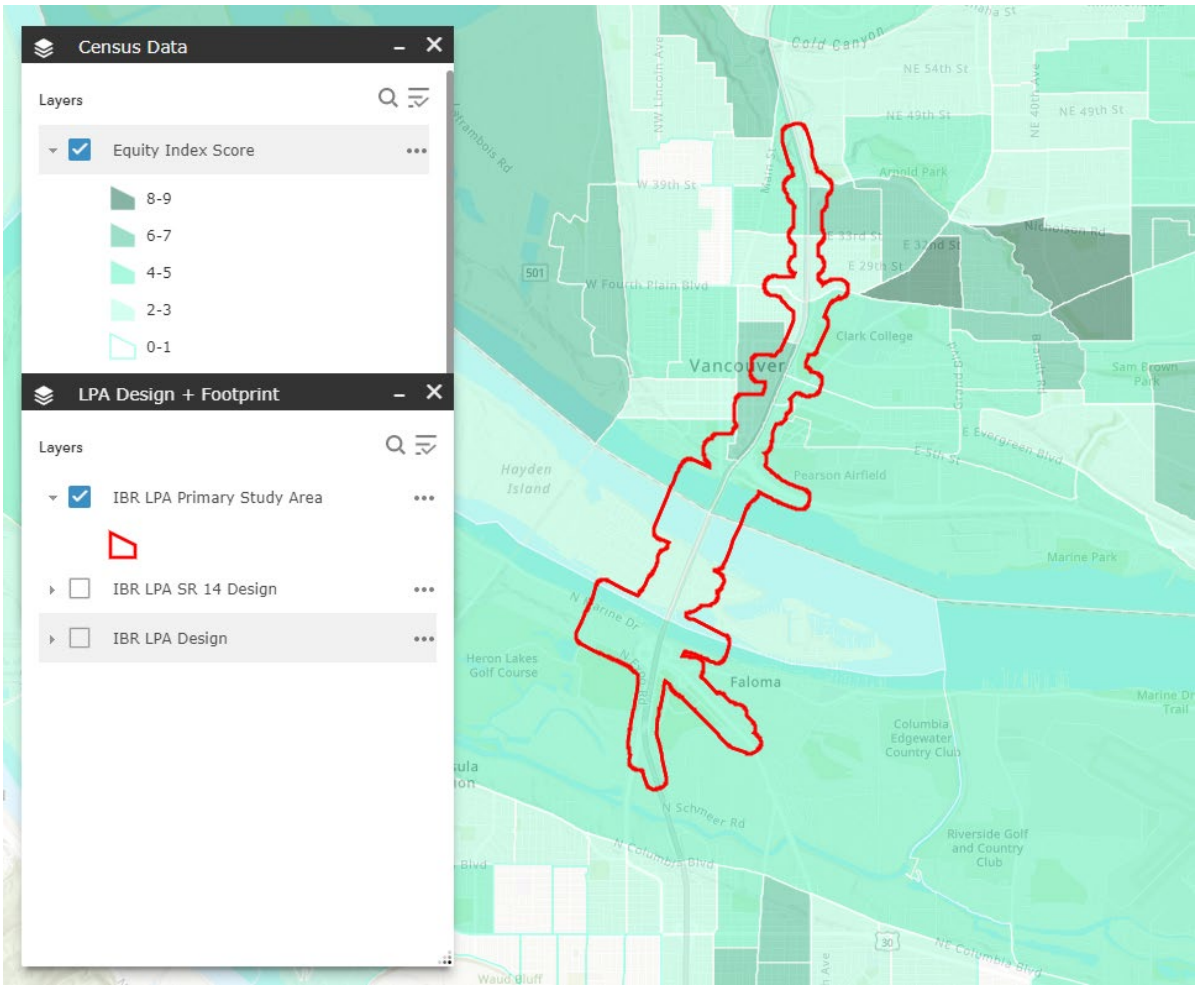
U.S. Census Bureau 2022, Tables B03002, S1810, C16001, C17002, DP02, Table B01001.

[14] Because tribes are sovereign nations with members living throughout local communities across Oregon, Washington, reservations, the United States, and beyond, elements of equity for tribal governments are discussed separately from other equity priority communities, which can be evaluated, in part, with demographic data. Data for houseless individuals and families is not shown because the geographic area for which this data is available is too large to determine a count for the IBR Program area; this community is discussed further in Section 5.1.1.

3.2 Equity Index

Early in the Modified LPA development process, IBR staff developed an equity index to identify areas where equity priority communities live in the Program area and broader metropolitan region, with the exception of tribal governments and houseless individuals and families. The index assigns points to geographic areas (block groups or census tracts) where there is an above-average percentage of priority populations in comparison to the region as a whole. For example, 25% of the region's households are low-income according to the American Community Survey, so if more than 25% of households in a block group were low-income, it was awarded a point. Figure 3-1 shows a screenshot of this interactive web-based tool, revealing that equity priority communities are concentrated most heavily in downtown Vancouver and just to the east of the study area. The broader IBR Program area (shown in Figure 2-1) includes additional portions of the equity priority communities east of the study area in Vancouver.

Figure 3-1. Screenshot of IBR Equity Index



4. DISTRIBUTION OF PROGRAM BENEFITS

One of the six core objectives in the *IBR Program Equity Framework* is to "improve mobility, accessibility, and connectivity, especially for lower income travelers, people with disabilities, and historically underserved communities who experience transportation barriers." Equitable progress toward this objective would mean that equity priority communities benefit more than their counterparts. This analysis examines the extent to which the Modified LPA would meet this standard across improvements by infrastructure type (HCT, active transportation, and highway).

4.1 High-Capacity Transit

As described in Section 2.6.2.1, two analyses were performed for high-capacity transit: the first to estimate how the light rail alignment in the Modified LPA would impact transit riders' mobility (measured as access to jobs), and the second to assess potential disparities between the makeup of the IBR Program area and the areas best served by light rail stations in the Modified LPA. The results of both analyses are summarized below. As previously noted, access to jobs is used as a proxy for access to services (e.g., grocery stores, health care, and education) because those destinations are also job centers.

4.1.1 Findings of High-Capacity Transit Analysis 1: Transit Access Improvements

As shown in Table 4-1, the IBR Program area analysis for the Modified LPA estimates that each demographic group would be able to reach an average of between 67% and 131% more jobs during the morning peak and an average of between 43% and 83% more jobs during midday (within a 45-minute transit trip) compared to the No-Build Alternative. These increases would equate to about 15,600 to 31,900 jobs during the morning peak and 9,900 to 21,900 jobs during midday.

The degree of access improvements for the Modified LPA would differ between equity priority communities and their counterparts. For IBR Program area residents, three demographic groups—people with disabilities, persons with lower incomes, and older adults—would likely see greater increases than their counterparts during either or both the morning peak and midday hours. On the other hand, BIPOC communities, those with limited English proficiency, immigrants and refugees, and young people would experience an increase in accessibility, but the increase would be less than for their demographic counterparts.

Table 4-1. Transit Access Improvements Analysis for Equity Priority Community Residents in the IBR Program Area: Percentage Increase in Jobs Access for Modified LPA Compared to No-Build Alternative (45-minute Travel Time)

Equity Priority Community	Morning Peak		Midday	
	Increase for Average [a] Member of Community	Increase for Average Counterpart [b]	Increase for Average Member of Community	Increase for Average Counterpart
Black, Indigenous, and People of Color	85%	107%	55%	68%
People with Disabilities	111%	96%	66%	59%
Communities with Limited English Proficiency	67%	100%	43%	61%
Persons with Lower Incomes	100%	92%	60%	60%
Immigrants and Refugees	71%	101%	46%	61%
Young People (Under 25)	74%	102%	47%	64%
Older Adults (65+)	131%	87%	83%	55%

Sources: Metro 2045 Regional Model; 2020 Census (U.S. Census Bureau 2020); 2016-2020 American Community Survey (U.S. Census Bureau 2022).

Note: Due to overlap within equity priority communities (i.e., individuals who belong to more than one community), the total increase in jobs for all equity priority community members cannot be determined.

a Average access is calculated based on residential distribution of each demographic group and weighted accordingly.

b "Counterpart" is defined as someone who is not considered a member of the corresponding equity priority community. For example, the counterpart to members of the BIPOC community are those whose race/ethnicity combination is White Non-Hispanic/Latino; the counterpart to people with disabilities is people who do not have a disability, and so on.

At the regional level (Portland-Vancouver metropolitan area), average access improvements under the Modified LPA would be minimal (1% to 3% or about 350 to 1,500 jobs) compared to the No-Build Alternative (Table 4-2). This is because the HCT investment included in the Modified LPA would not affect many of the 45-minute transit trips across the region. Estimated access improvements from the Modified LPA are similar when comparing equity priority communities and their demographic counterparts at the regional level.

Table 4-2. Transit Access Improvements Analysis for Equity Priority Community Residents in the Portland-Vancouver Metropolitan Area: Percentage Increase in Jobs Access over No-Build Alternative – 45-minute Travel Time

Equity Priority Community	Morning Peak		Midday	
	Increase for Average [a] Member of Community	Increase for Average Counterpart [b]	Increase for Average Member of Community	Increase for Average Counterpart
Black, Indigenous, and People of Color	2%	3%	1%	1%
People with Disabilities	3%	2%	1%	1%
Communities with Limited English Proficiency	2%	2%	1%	1%
Persons with Lower Incomes	3%	2%	1%	1%
Immigrants and Refugees	2%	3%	1%	1%
Young People (Under 25)	2%	2%	1%	1%
Older Adults (65+)	3%	2%	1%	1%

Sources: 2022 Metro, RTC, C-TRAN, TriMet, and IBR Analysis; 2020 Census (U.S. Census Bureau 2020); 2016–2019 American Community Survey (U.S. Census Bureau 2022)

Note: Due to overlap within equity priority communities (i.e., individuals who belong to more than one community), the total increase in jobs for all equity priority community members cannot be determined.

a Average access is calculated based on residential distribution of each demographic group and weighted accordingly.

b "Counterpart" is defined as someone who is not considered a member of the corresponding equity priority community. For example, the counterpart to members of the BIPOC community are those whose race/ethnicity combination is White Non-Hispanic/Latino; the counterpart to people with disabilities is people who do not have a disability, and so on.

4.1.2 Findings of High-Capacity Transit Analysis 2: Station Area Demographics

Table 4-3 displays the results of the station area demographic analysis for the Modified LPA across each equity priority community for which data was available. The following summarizes the comparisons by demographic group:

- **BIPOC population** percentages are similar between the IBR Program area as a whole and the residents of the station area walksheds (30% and 26%, respectively). This is also similar to the metropolitan area at large.
- **People with disabilities** account for a higher proportion of the IBR Program area population than the metropolitan area (16% and 12%, respectively), and station walksheds have particularly high concentrations of people with disabilities (an estimated 17% of the population across all stations).

- **Limited-English proficiency population** percentages are relatively low across all station areas compared to the IBR Program area as a whole.
- **Low-income residents** account for a higher percentage of station walksheds on the Washington side of the river than the IBR Program area as a whole and the metropolitan area.
- **Immigrants and refugees** ("foreign born populations" in the American Community Survey) account for an estimated 5% of the population in station area walksheds as compared to 9% of the IBR Program area. Both are lower than the 13% average across the metropolitan area.
- **Age** – The station area walksheds have relatively high percentages of older adults and low percentages of young people compared to both the IBR Program area as a whole and the metropolitan area.

Demographic characteristics of station area walksheds are relatively similar to those of the IBR Program area as a whole, indicating that access improvements are similar for equity priority communities within the walksheds, as well as the larger IBR Program area and Portland-Vancouver metropolitan area.

Table 4-3. Equity Priority Communities in High-Capacity Transit Station Area Walksheds, IBR Program Area, and Portland-Vancouver Metropolitan Area (Percentage of Total Population)

Community	Expo Center Walkshed	Hayden Island Walkshed	Vancouver Waterfront Walkshed	Evergreen Walkshed	All station walksheds combined	IBR Program Area	Metropolitan Area
Black, Indigenous, and People of Color	35%	27%	21%	28%	26%	30%	31%
People with Disabilities	11%	11%	24%	16%	17%	16%	12%
Communities with Limited English Proficiency	3%	1%	5%	3%	3%	6%	6%
Persons with Lower Incomes	25%	11%	42%	34%	31%	31%	24%
Immigrants and Refugees	6%	2%	7%	5%	5%	9%	13%
Young People (under 25)	10%	11%	13%	20%	16%	23%	29%
Older Adults (65+)	33%	28%	31%	17%	24%	18%	15%

Sources: 2020 Census (U.S. Census Bureau 2020); 2016–2020 American Community Survey (U.S. Census Bureau 2022)

4.1.3 Community and Equity Advisory Group Input Regarding High-Capacity Transit

As described in the fall 2021 IBR Community Engagement Report (IBR 2021), feedback received through multiple EAG meetings, a series of listening sessions for members of equity priority communities, and a community survey revealed broad support for HCT generally and light rail specifically. Many community members expressed a desire to better connect Portland and Vancouver via public transit as the region grows and the two communities become less bifurcated.

The community survey asked respondents about their preferred new station locations using a menu of options. The most popular selections were the Vancouver waterfront, Clark College, and Hayden Island; this was consistent across demographic groups. Informed by early equity analysis, the EAG also advocated for a station at Clark College, recommending the Program address any gaps in service that might arise by opting to terminate the line at Evergreen Boulevard.

The work to respond to this recommendation and analysis has already begun with a plan developed by the IBR Program and C-TRAN to optimize service across the transit network. Service improvements would leverage the multiple lines currently serving Clark College (i.e., The Vine BRT as well as local bus Lines 25 and 30) to ensure convenient connections from HCT to the school and surrounding neighborhoods.

4.1.4 Other High-Capacity Transit Equity Considerations

The mere presence of HCT does not guarantee that equity priority communities would reap its benefits. Other IBR Program considerations are crucial to furthering equitable mobility and accessibility, including:

- Station design that ensures accessibility for people with disabilities.
- System safety and comfort.
- Service information available in multiple languages.
- Measures to ease transportation cost burdens (e.g., TriMet's Low-Income Fare program).

Addressing these considerations would require a joint effort between the IBR Program, transit providers, local jurisdictions, and community partners. These considerations are anticipated to be addressed in the advanced design, construction, and service operation phases of the IBR Program.

4.2 Active Transportation

The IBR Program area currently lacks adequate bicycle and pedestrian facilities. In response, the Modified LPA would include significant improvements to local active transportation infrastructure. New facilities included in the Modified LPA would support north-south bicycle and pedestrian travel through the corridor and provide east-west connections across I-5. Specific elements would include:

- New shared-use paths on the Columbia River bridges, Marine Drive interchange, Hayden Island interchange, and the SR 14 interchange.

- Improved east-west connectivity (bicycle lanes, sidewalks, and signage) at Mill Plain Boulevard, Fourth Plain Boulevard, 29th Street, and 33rd Street.
- A Community Connector (wide pedestrian crossing) at Evergreen Boulevard.

Many community members, agency partners, and advisory group members have voiced their support for high-quality active transportation facilities; their feedback has informed the design and location of improvements. The EAG specifically asked that the IBR Program reconnect neighborhoods divided by I-5 wherever possible. The EAG also urged the IBR Program to prioritize accessibility for people with disabilities, which is a key element of design engineering.

The Active Transportation Community Working Group, which convened in fall 2021, provided another source of input. Common themes heard from this group included:

- Wider sidewalks.
- Physical barriers to support bicycle safety.
- Direct and easily navigable routes.
- Linkages to the regional transportation network.

In alignment with community and EAG feedback, the active transportation components of the Modified LPA would support the equity objective to "improve mobility, accessibility, and connectivity, especially for lower income travelers, people with disabilities, and historically underserved communities that experience transportation barriers." The facilities would provide new, safe connections where none currently exist and would improve the quality of those present.

Several of the Modified LPA design options would have different long-term effects on active transportation. Experiences could differ for the various age and ability levels, depending on grade, height, and distance of each option. The bridge configurations would have the following different impacts on active transportation:

- People walking, bicycling, or rolling on the shared-use path would be more exposed to noise from highway vehicles on the single-level fixed-span and the single-level movable-span configurations compared to the double-deck configuration. Blind and low-vision individuals could experience the greatest noise interference in their active transportation as they use sound to aid navigation.
- The single-level movable-span configuration would have a lower bridge height over the Columbia River than the double-deck fixed-span configuration and the single-level fixed-span configuration; a lower bridge height would decrease the length and steepness of the uphill and downhill grades for all users on the shared-use path.
- Some equity priority communities are more affected by discrimination and violence, and they might prefer the single-level fixed-span or single-level movable-span configurations because they provide visibility to active transportation users from passing vehicles, thereby potentially providing an increased sense of security. In comparison, with the double-deck fixed-span configuration, active transportation users would travel on the lower bridge deck and would not be visible from passing vehicles on the upper decks.

- With the single-level movable-span configuration, active transportation users could experience additional travel delays when bridge openings would occur. These delays would be similar to the No-Build Alternative. However, fewer bridge openings are anticipated with the Modified LPA single-level movable-span configuration because they would have increased vertical navigation clearance in the closed position that would allow more vessels to travel under the bridge in the closed position compared to the existing Interstate Bridge.

These differences in the experiences of active transportation users could adversely affect equity priority communities more than the general population—in particular, BIPOC, low-income, and people with disabilities—due to their greater reliance on modes besides driving.

4.3 Highway and Driving Improvements

4.3.1 Driving Access Analysis

As shown in Table 4-4, the IBR Program area analysis estimates that each demographic group would be able to reach an average of 18% to 20% more jobs during the morning peak and an average of about 3% more jobs during the midday (within a 45-minute drive) under the Modified LPA compared to the No-Build Alternative. This increase would equate to about 180,000 to 197,000 jobs during the morning peak and 35,800 to 44,000 jobs during the midday. Estimated access improvements are similar for all IBR Program area residents from equity priority communities and their demographic counterparts.

At the regional level, average access improvements from the Modified LPA would be 3% to 4% (30,000 to 37,000 jobs) during the morning peak and about 1% (11,400 to 13,700 jobs) at midday compared to the No-Build Alternative (Table 4-5). Estimated access improvements would be similar when comparing equity priority communities and their demographic counterparts at the regional level.

The design option of a second auxiliary lane in each direction through the corridor would have a slightly greater increase in jobs access for all demographic groups due to faster travel times from less congestion.

Table 4-4. Driving Access Improvements for Equity Priority Community Residents in the IBR Program Area: Percentage Increase in Jobs Access with the Modified LPA Compared to No-Build Alternative (45-minute Travel Time)

	Morning Peak		Midday	
Equity Priority Community	Increase for Average [a] Member of Community	Increase for Average Counterpart [b]	Increase for Average Member of Community	Increase for Average Counterpart
Black, Indigenous, and People of Color	19%	19%	3%	3%
People with Disabilities	19%	19%	3%	3%

	Morning Peak		Midday	
Communities with Limited English Proficiency	20%	19%	3%	3%
Persons with Lower Incomes	20%	19%	3%	3%
Immigrants and Refugees	19%	19%	3%	3%
Young People (Under 25)	20%	19%	3%	3%
Older Adults (65+)	18%	19%	3%	3%

Sources: 2022 Metro, RTC, C-TRAN, TriMet, and IBR Analysis; 2020 Census (U.S. Census Bureau 2020); 2016-2020 American Community Survey (U.S. Census Bureau 2022).

a Average access is calculated based on residential distribution of each demographic group and weighted accordingly.

b Counterpart" is defined as someone who is not considered a member of the corresponding equity priority community. For example, the counterpart to members of the BIPOC community are those whose race/ethnicity combination is White Non-Hispanic/Latino; the counterpart to people with disabilities is people who do not have a disability, and so on.

Table 4-5. Access Improvements for Equity Priority Community Residents in the Portland-Vancouver Metropolitan Area: Percentage Increase in Jobs Access with the Modified LPA Compared to No-Build Alternative (45-minute Travel Time)

Equity Priority Community	Morning Peak		Midday	
	Increase for Average [a] Member of Community	Increase for Average Counterpart [b]	Increase for Average Member of Community	Increase for Average Counterpart
Black, Indigenous, and People of Color	3%	4%	1%	1%
People with Disabilities	4%	3%	1%	1%
Communities with Limited English Proficiency	3%	4%	1%	1%
Persons with Lower Incomes	3%	3%	1%	1%
Immigrants and Refugees	3%	4%	1%	1%
Young People (Under 25)	4%	3%	1%	1%
Older Adults (65+)	4%	3%	1%	1%

Sources: Metro 2045 Regional Model; 2020 Census (U.S. Census Bureau 2020); 2016-2019 American Community Survey (U.S. Census Bureau 2022)

a Average access is calculated based on residential distribution of each demographic group and weighted accordingly.

b "Counterpart" is defined as someone who is not considered a member of the corresponding equity priority community. For example, the counterpart to members of the BIPOC community are those whose race/ethnicity combination is White Non-Hispanic/Latino; the counterpart to people with disabilities is people who do not have a disability, and so on.

4.3.2 Equity Advisory Group Input Regarding Highway and Driving Improvements

The EAG expressed interest in understanding potential property and environmental impacts associated with the design options. They also recommended that the IBR Program consider the disproportionate impact that congestion can have on people working long hours or multiple shifts, workers who often must adhere to strict shift schedules, and parents—particularly single parents.

4.3.3 Other Highway and Driving Equity Considerations

Numerous studies have found that BIPOC individuals—in particular, African Americans—experience disproportionately high rates of traffic-related injuries and fatalities (see American Journal of Preventive Medicine 2022; REACH 2021; Governors Highway Safety Association 2021). While the extent of this issue is not known with respect to the IBR Program area specifically, implications of these studies are relevant. As the IBR Program moves forward, design decisions would consider improving safety for BIPOC users of the transportation system.

4.4 Tribal Government Consultation

In addition to the benefits associated with increased transit options and improved highway and active transportation, the government-to-government consultation process is encouraging improved and timely communication between the IBR Program and tribes. This process enables tribal governments to understand the Program, ask questions, and participate in issue identification and solution strategies, which could lead to protection of culturally sensitive resources, increased input into the design of the Program, and avoidance, minimization, and mitigation measures of potential impacts to resources valued by tribal governments.

4.5 Community Benefits

The IBR Program's Community Benefits Advisory Group is developing recommendations for community benefit efforts to achieve the greatest positive benefit to communities in the IBR Program area and broader region, in alignment with the Program's equity framework and community priorities. Recommendations from this advisory group will be shared with the larger community for input. This advisory group is collaborating with the EAG, Community Advisory Group, and IBR Program to identify benefits that could be incorporated into the Final Supplemental Environmental Impact Statement as mitigation strategies, construction contracts as design and construction specifications, or other documents as appropriate to ensure accountability for implementation of community benefits.

5. DISTRIBUTION OF PROGRAM BURDENS

5.1 Short- and Long-Term Effects

Table 5-1 lists where the percentage of equity priority communities is above average compared to the population of the Portland-Vancouver metropolitan area, and the property acquisition and displacement, construction-related, and air quality impacts identified across five geographic subareas: Oregon Mainland, Hayden Island, Downtown Vancouver, Upper Vancouver, and Ruby Junction.

All subareas have high concentrations of multiple equity priority communities. The IBR Program has conducted outreach to potentially affected communities in each of these subareas and will continue to engage the community and consult with the EAG to identify and address potential impacts throughout the IBR Program phases.

Table 5-1. IBR Program Subareas, Equity Priority Communities with Above Average Representation, and Impacts from the Modified LPA

IBR Program Subarea	Equity Priority Communities with Above Average Representation [a]	Property Acquisitions and Displacements	Construction-Related Impacts	Long-Term Air Quality
Oregon Mainland	• BIPOC • Low-Income • People with Disabilities • Older Adults	• 4 single-family homes displaced (3 floating homes, 1 on land). • 5 retail/service businesses displaced. • 20 partial parcel acquisitions.	• Temporary increase in noise levels and air emissions and increases in truck traffic during construction, particularly in areas immediately adjacent to I-5. • Temporary effects on visual quality (e.g., construction equipment and activities blocking views, high-visibility signage, lighting during nighttime work). • Traffic detours and road closures. • Traffic spillovers in the Bridgeton, East Columbia, and Kenton neighborhoods.	Not expected to be adversely impacted as a result of the Modified LPA.
Hayden Island	• People with Disabilities • Older Adults	• 32 single-family homes displaced (all floating homes). • 15 retail/service businesses displaced. • 20 partial parcel acquisitions.	• Temporary increase in noise levels and air emissions and increases in truck traffic during construction, particularly in areas immediately adjacent to I-5. • Residents living in floating homes and the mobile home park may be particularly exposed to emissions from construction equipment due to their proximity to both the highway and transit alignments. • Temporary effects on visual quality. • Traffic detours and road closures.	Not expected to be adversely impacted as a result of the Modified LPA.

IBR Program Subarea	Equity Priority Communities with Above Average Representation [a]	Property Acquisitions and Displacements	Construction-Related Impacts	Long-Term Air Quality
Downtown Vancouver	• Low-Income • People with Disabilities • Older Adults	• 10 office/professional/healthcare businesses displaced. • 31 partial parcel acquisitions.	• Temporary increase in noise levels and air emissions and increases in truck traffic during construction, particularly in areas immediately adjacent to I-5. • Temporary effects on visual quality. • Traffic detours and road closures. • Temporary closures of east-west bicycle and pedestrian connections at SR 14, Evergreen Boulevard, and Mill Plain Boulevard.	Not expected to be adversely impacted as a result of the Modified LPA.
Upper Vancouver	• BIPOC • Limited English proficiency • Low-Income • Older Adults • Young People	• 7 single-family homes displaced. • 33 multifamily units displaced (I-5 Mainline Westward Shift design option only). • 58 partial parcel acquisitions.	• Temporary increase in noise levels and air emissions and increases in truck traffic during construction, particularly in areas immediately adjacent to I-5. • Temporary effects on visual quality. • Traffic detours and road closures. • Temporary closures of east-west bicycle and pedestrian connections at McLoughlin Boulevard, Fourth Plain Boulevard, 29th Street, and 33rd Street. • Traffic spillovers in the Minnehaha, Rose Village, Central Park, Hudson's Bay, and Columbia Way neighborhoods.	Not expected to be adversely impacted as a result of the Modified LPA.

IBR Program Subarea	Equity Priority Communities with Above Average Representation [a]	Property Acquisitions and Displacements	Construction-Related Impacts	Long-Term Air Quality
Ruby Junction	• BIPOC • Immigrants and Refugees • Low-Income • Young People	• 3 retail/service businesses displaced.	• Temporary increase in noise levels and air emissions and increases in truck traffic during construction. • Temporary effects on visual quality. • Traffic detours and road closures.	Not expected to be adversely impacted as a result of the Modified LPA.

Sources: 2020 Census (U.S. Census Bureau 2020), 2016–2020 American Community Survey (U.S. Census Bureau 2022)

a Specific equity priority communities are listed where their percentage of the population is above average for the Portland-Vancouver metropolitan area in at least one census tract in that geographic area.

BIPOC = Black, Indigenous, and People of Color

5.1.1 Houseless Populations

Construction of the Modified LPA would likely affect houseless individuals and families living in the IBR Program area during construction. Those living within existing or to-be-acquired right of way would be displaced and those living nearby may experience construction externalities, such as noise, vibration, and pollution.

While many experiencing houselessness either choose or are forced to relocate regularly, others remain in place for extended times when they have found a safe location with limited disturbances. Multnomah and Clark Counties have Point-in-Time Count data that provides a census of the houseless population every two years; however, the geographic area for this data is too large to determine a count for the IBR Program area (Clark County's figures are only available at the county level and Multnomah County's street count areas are shown in Figure 5-1). Table 5-2 shows houseless population counts for these areas. Note that counts do not necessarily reflect the number of people who may be impacted by the Modified LPA, as these population counts are likely to change by the time construction begins.

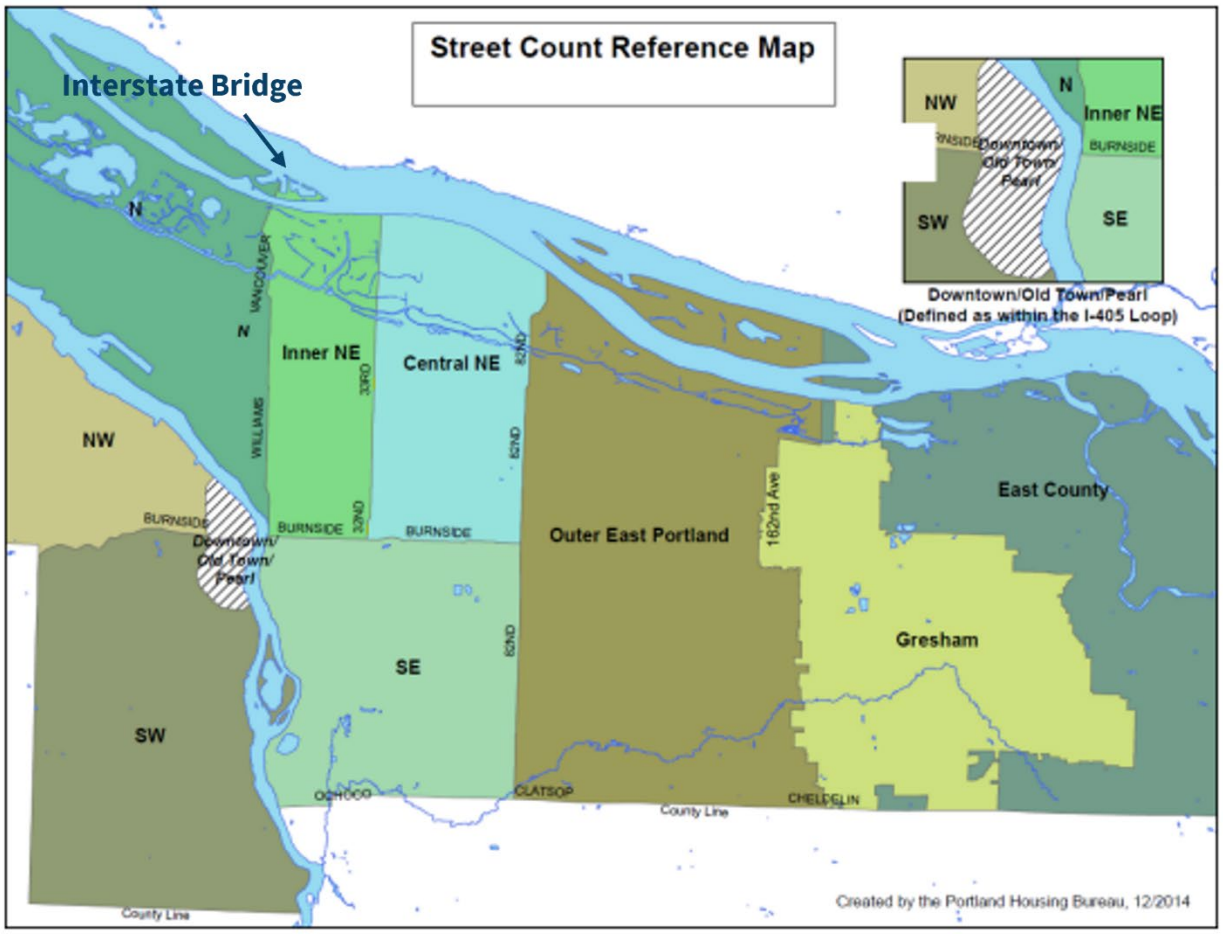
Given these data limitations, determining the degree of impact to this community will require extensive in-person outreach in partnership with agencies and organizations providing related services. As design progresses and construction is scheduled, the IBR Program will continue to coordinate with local jurisdictions and aid organizations to determine potential impacts, such as displacements of houseless individuals and the effects of construction-related closures or transit delays on access to food assistance and other resources.

Table 5-2. Multnomah County Houseless Populations for Geographic Areas Containing the IBR Program Area

Geographic Area	Houseless Population
Inner Northeast Portland	123 households
North Portland	226 households
Clark County	625 persons

Sources: Point-in-Time Counts for Multnomah County (Multnomah County Joint Office of Homeless Services 2022) and Clark County (Clark County Council for the Homeless 2022)

Figure 5-1. Multnomah County Point-in-Time Geographic Areas



Source: Multnomah County Joint Office of Homeless Services 2022

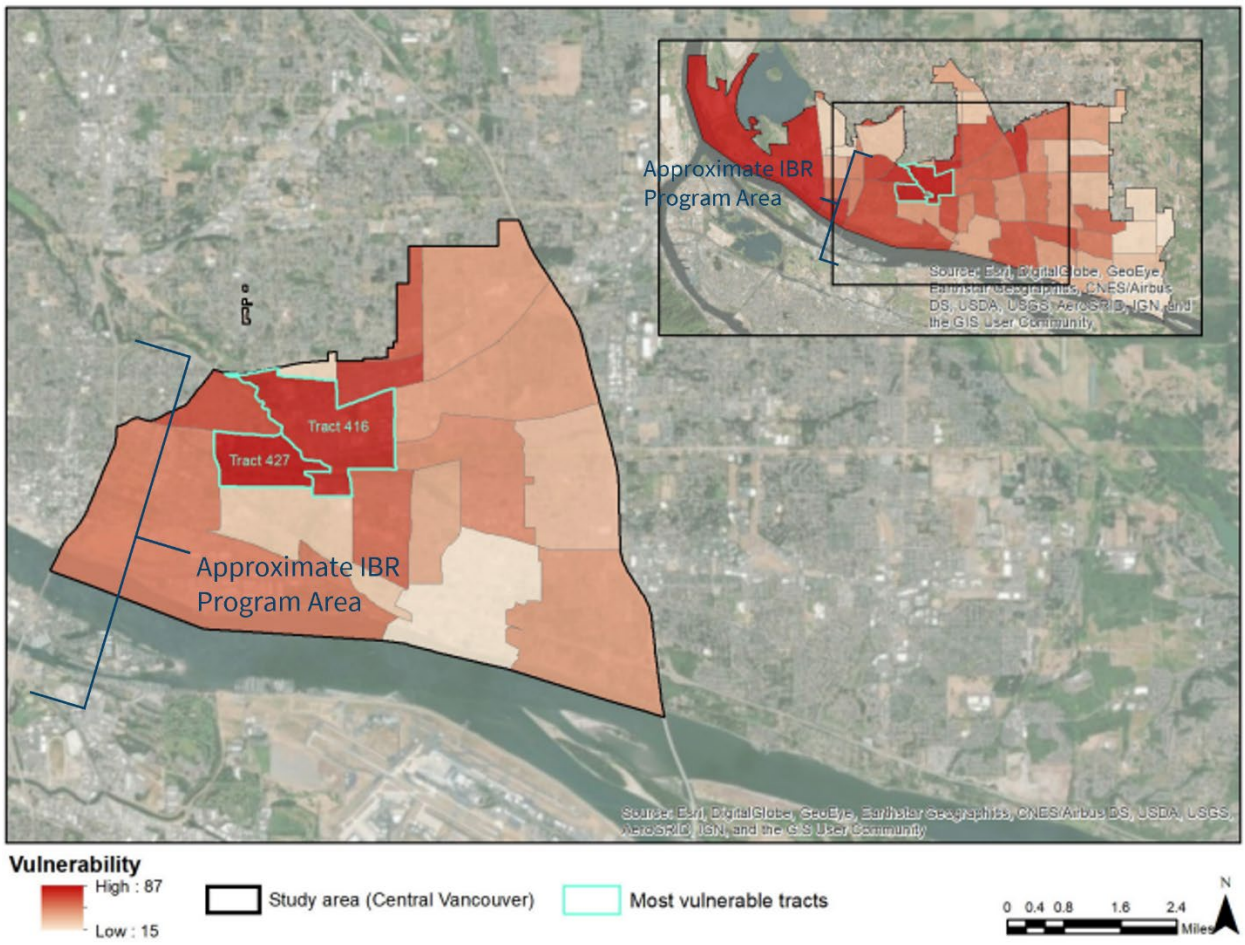
5.2 Tolling

The Modified LPA tolling program would place a burden on low-income travelers, who are disproportionately BIPOC. The Environmental Justice Technical Report provides a summary of issues and research related to tolling equity, including potential mitigation measures. Toll rates and policies, including a possible low-income toll program, would be jointly set by the Oregon Transportation Commission and Washington State Transportation Commission. Both commissions have supported the study of a low-income toll program, including how such a program could be implemented in each state, and will continue to work together to determine an approach for the IBR Program.

6. INDIRECT EFFECTS

Over time, there would be an increased risk of residential displacement where the Modified LPA improves neighborhood amenities and livability, potentially increasing housing costs to unaffordable levels for lower-income residents. An analysis conducted in 2019 for the City of Vancouver as part of an anti-displacement plan identified downtown Vancouver, the Meadow Homes neighborhood, and the Maplewood neighborhood as particularly vulnerable to neighborhood change and residential displacement (Figure 6-1) (Reside Vancouver 2019). These neighborhoods are home to a large concentration of equity priority communities. Downtown Vancouver is home to high concentrations of BIPOC residents, low-income households, people with disabilities, and seniors. While the Meadow Homes and Maplewood neighborhoods are not in the IBR Program area, they are located a short distance east and are also home to a large concentration of equity priority communities. Property and housing prices in these neighborhoods may also be indirectly affected by the Modified LPA improvements.

Figure 6-1. Reside Vancouver Anti-Displacement Plan Vulnerability Assessment Map Showing IBR Program Area



Map: Vulnerability Assessment - Spatial Reperesentation of Central Vancouver
Source: American Community Survey, 5-year estimates, 2017

Inset: City of Vancouver

7. POTENTIAL AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

7.1 Long-Term Benefits and Effects

The following regulatory and IBR Program-specific measures are proposed to address long-term and temporary effects on equity priority communities.

7.1.1 Regulatory Requirements

- Comply with the Uniform Relocation Act. When displacement cannot be avoided, federal and state regulations require property to be purchased at fair market value and all displaced residents to be provided with replacement housing and relocation assistance. Federal regulations, such as the Uniform Relocation Act, and state statutes determine the standards and procedures for providing such replacement housing, based on the characteristics of individual households. Relocation benefit packages usually include replacement housing for owners and renters, moving costs, and assistance in locating replacement housing. Relocation benefits for businesses can include moving costs, site search expenses, and business reestablishment expenses.

7.1.2 Program-Specific Mitigation

- Work with residents and community members to understand impacts and avoid, minimize, or mitigate those impacts.
- Develop a package of community benefits, which may be captured in a variety of documents, including contract specifications, environmental documents, a potential workforce agreement, and either a community benefits plan or report. Community benefits are likely to include a variety of investments and strategies to ensure workforce and contracting equity, enhance the local community, and offset burdens associated with construction and operation.

7.2 Temporary Effects

7.2.1 Regulatory Requirements

Required measures to minimize construction impacts, such as construction best management practices, would also reduce impacts to equity priority communities. These measures are used to address construction effects such as temporary easements, noise, dust, emissions from construction vehicles, and visual clutter.

7.2.2 Program-Specific Mitigation

- Coordinate with local jurisdictions and other organizations offering services to people experiencing unsheltered houselessness in areas directly affected by construction activities. Services would be provided in advance of construction and could include harm reduction, access to health services, and emergency shelter or alternate housing options.

8. SYNOPSIS AND NEXT STEPS

The Modified LPA would benefit equity priority communities with increased mobility and accessibility choices—specifically, the HCT and active transportation program elements. These new transportation improvements would help address existing gaps for those who depend on modes other than auto transportation. While all members of the local community would have access to 50% or more jobs via improved mode choices compared to the No-Build Alternative, the HCT analysis did identify some differences in terms of distribution of benefits (i.e., increased access) between equity priority communities living in the study area and their non-equity priority counterparts. To address this, the Program is working closely with C-TRAN to optimize the transit network and create convenient bus connections from the Evergreen Station to surrounding racially diverse neighborhoods.

Study area communities would experience some adverse impacts related to property acquisitions and construction. The IBR Program team is conducting additional research to supplement the analysis presented in this report on the extent of these impacts on equity priority communities; this research will inform potential strategies to avoid, minimize, and/or mitigate those impacts. In addition to technical analysis, this research will include continued engagement with the IBR Program's advisory groups, partner agencies, and the community.

The IBR Program is also in the early stages of investigating and identifying potential community benefits through a collaborative effort with the community and guided by the *IBR Program Equity Framework*. Possible types of community benefits could include a variety of investments and strategies to enhance the local community, align new infrastructure with communities' future visions and plans, and offset burdens associated with the construction and operation of the Modified LPA.

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Appendix A

Appendix A provides additional details on the demographic information and the methodology used for the jobs access analysis presented in the Equity Technical Report. As noted in the report, access to jobs is used as a proxy for access to services (e.g., grocery stores, health care, and education) as those destinations are also job centers.

DEMOGRAPHIC INFORMATION AND CALCULATIONS

Table A-1 lists the demographic groups that make up the nine equity priority communities identified by the IBR Program and the data sources used for the analysis.

Table A-1. IBR Program Equity Priority Communities

Equity Priority Community	Full Description	Data Source
Black, Indigenous, and People of Color (BIPOC)	People selecting any race/ethnicity combination besides White/non-Hispanic on the census form.	2020 U.S. Census (Table P2)
Tribal Governments (Federally Recognized Tribes)	Sovereign nations as recognized by the U.S. Government; consultation with federally recognized tribes occurs through a government-to-government consultation process separate and distinct from public and community outreach and comment.	Enrollment data are held and managed by the tribes and are not incorporated into this report. The IBR Program is engaged in government-to-government consultation with 10 tribal governments. Tribal members living within the IBR Program area are reflected in the U.S. Census data, although not specifically identified by tribal affiliation.
People with Disabilities	People living with a serious difficulty within one or more of four basic areas of functioning: hearing, vision, cognition, and ambulation.	2016–2020 American Community Survey (Table S1810)
Communities with Limited English Proficiency	People who indicate that they speak English less than “very well.”	2016–2020 American Community Survey (Table C16001)
Persons with Lower Incomes	People or households with income at or below 200% of the federal poverty level.	2016–2020 American Community Survey (Table C17002)
Houseless Individuals and Families	People and families lacking, or in need of, a house or dwelling.	2022 Multnomah County and Clark County Point in Time Counts

Equity Priority Community	Full Description	Data Source
Immigrants and Refugees	People born outside of the U.S. ("Foreign Born Population" in the American Community Survey).	2016–2020 American Community Survey (Table DP02)
Young People	People under 25 years of age.	2016–2020 American Community Survey (Table B01001)
Older Adults	People 65 years of age or older.	2016–2020 American Community Survey (Table B01001)

Seven of the nine equity priority communities were analyzed within three different geographic levels. Two of the equity priority communities (Tribal governments and houseless individuals and families) were not analyzed because data are not available.

- **Census block groups.** U.S. Census block groups are used in the spatial analysis to capture the demographic differences within the IBR Program study area, which runs along a 5-mile segment of I-5 approximately between the I-5/Victory Boulevard interchange in Oregon and the State Route 500 interchange in Washington. Census block groups are a unit of geography between a census block and census tract and are generally defined to contain between 600 and 3,000 people. The block groups were used to determine the presence of equity priority communities within the Program area.
- **Transportation Analysis Zones (TAZ).** A TAZ is a unit of geography that reflects localized travelsheds and is used in transportation planning models to assess transportation projects. The equity analysis evaluated all TAZs that intersect with the IBR Program study area to evaluate access to jobs and services. Land use assumptions used in the calculation of jobs accessible to people by TAZ were developed by Oregon Metro and the Southwest Regional Transportation Council. These land use assumptions include jurisdiction-reviewed forecast growth in population, households and employment. The forecasts and subsequent TAZ allocations are based on a set of regionally agreed upon regulatory and market assumptions. The two agencies coordinated the development of land use allocations in a manner consistent with underlying comprehensive plans and information provided by their jurisdictions as part of the Regional Transportation Plan process.
- **Portland-Vancouver-Hillsboro metropolitan statistical area**. As defined by the U.S. Census Bureau, a metropolitan statistical area is a core area containing a substantial population nucleus and adjacent communities that are highly economically and socially integrated with that core. This area is referred to in this appendix as the Portland-Vancouver metropolitan area.

Spatial data (TIGER/Line Shapefiles) were also used in the analysis. This includes data from the 2020 Census and American Community Survey, obtained from the U.S. Census Bureau, and data for TAZs in the IBR Program area, obtained from Oregon Metro.

Table A-2 provides detailed information on the presence and population size of equity priority communities in the IBR Program area and metropolitan area for each of the three geographic levels.

Table A-3 shows the estimated number of equity priority community members that reside within a half-mile (the "walkshed") of each light-rail station proposed as part of the Modified LPA, as well as in the IBR Program area (neighborhoods adjacent to the IBR study area) and the metropolitan area. No new light-rail stations would be constructed under the No-Build Alternative; therefore, a walkshed analysis is not applicable.

Table A-2. Population of Equity Priority Communities in the IBR Program Area and Portland-Vancouver Metropolitan Area

Equity Priority Community	IBR Program Area (Individuals and Percentage of Total Population) by Census Block Group	IBR Program Area (Individuals and Percentage of Total Population) by TAZ	Portland-Vancouver Metropolitan Area (Individuals and Percentage of Total Population)
Black, Indigenous, and People of Color [a]	6,459 (30%)	6,338 (30%)	786,276 (31%)
People with Disabilities	3,199 (16%)	3,141 (15%)	292,952 (12%)
Communities with Limited English Proficiency	1,205 (6%)	1,205 (6%)	157,484 (6%)
Persons with Lower Incomes	6,153 (31%)	6,460 (32%)	577,759 (24%)
Immigrants and Refugees	1,940 (9%)	1,775 (9%)	314,491 (13%)
Young People (Under 25)	4,831 (23%)	5,076 (25%)	726,363 (29%)
Older Adults (65+)	3,733 (18%)	3,587 (18%)	368,320 (15%)
Total Population (including non-equity priority communities)	21,176	20,401	2,472,774

Sources: 2016–2020 American Community Survey (ACS) (U.S. Census Bureau 2022); 2020 Census (U.S. Census Bureau 2020); Metro 2045 Regional Model.

Notes: Due to overlap within equity priority communities (i.e., individuals who belong to more than one community), the total population of all equity priority community members cannot be determined.

Data are not available to perform analysis for houseless individuals and families.

[a] The data source for the Black, Indigenous, and People of Color population is the 2020 Census, and the percentage reflects the total population reported in the 2020 Census. All other demographic data, including the total population row at the bottom, is from the 2016-2020 ACS.

Table A-3. Equity Priority Communities in High-Capacity Transit Station Area Walksheds, IBR Program Area, and Portland-Vancouver Metropolitan Area (Percentage of Total Population)

Equity Priority Community	Expo Center Station Walkshed	Hayden Island Station Walkshed	Waterfront Station Walkshed	Evergreen Station Walkshed	All Station Walksheds Combined [a]	IBR Program Area	Portland-Vancouver Metropolitan Area
Black, Indigenous, and People of Color [b]	50 35%	183 27%	223 21%	351 28%	704 26%	6,459 30%	786,276 31%
People with Disabilities	5 11%	61 11%	220 24%	218 16%	418 17%	3,199 16%	292,952 12%
Communities with Limited English Proficiency	4 3%	6 1%	44 5%	35 3%	72 3%	1,205 6%	157,484 6%
Persons with Lower Incomes	29 25%	60 11%	386 42%	449 34%	771 31%	6,153 31%	577,759 24%
Immigrants and Refugees	7 6%	13 2%	61 7%	67 5%	127 5%	1,940 9%	314,491 13%
Young People (under 25)	11 10%	58 11%	117 13%	261 20%	394 16%	4,831 23%	726,363 29%
Older Adults (65+)	38 33%	148 28%	286 31%	229 17%	608 24%	3,733 18%	368,320 15%
Total Population	115	535	917	1,327	2,485	21,176	2,472,774

Sources: 2020 Census (U.S. Census Bureau 2020); 2016–2020 American Community Survey (ACS) (U.S. Census Bureau 2022).
Notes:
Due to overlap within equity priority communities (i.e., individuals who belong to more than one community), the total number of equity priority community members cannot be determined. The percentages shown are the percentage of a given community in the specified walkshed.
For each of the walksheds, the denominators used to determine percentages for demographic groups vary due to data being available at different geographic levels (i.e., census tract vs. block group). Figures should be read as rough estimates only.
Data are not available to perform analysis for houseless individuals and families.
a "All station walksheds combined" is not an aggregate of the given populations in each walkshed due to overlap in the Waterfront Station and Evergreen Station walksheds.
[b] The data source for BIPOC population is the 2020 Census, and the percentage reflects the total population as reported in the 2020 Census. All other demographic data, including the total population row at the bottom, is from the 2016-2020 ACS.

JOBS ACCESS METHODOLOGY

This section summarizes the methodology used to prepare the jobs-access analysis.

The analysis estimated the number of jobs accessible to each of the seven equity priority communities listed in Table A-2 under the Modified LPA and the No-Build Alternative. The number of jobs accessible was first calculated for each TAZ, then averaged over all TAZs. Since members of equity priority communities are not evenly distributed throughout the Program area TAZs, the jobs access measure was computed as a weighted average.[1] In other words, the greater the proportion of an equity priority community that lives in a TAZ, the more that TAZ influenced the overall average access to jobs for the equity priority group.

Calculations used in this analysis involved developing travel time information from assignments that are the final step in the regional travel demand modeling process. Travel times were calculated for all origin-destination pairs in the region. These times were used to assess the number of jobs that were accessible to each TAZ within a specified threshold (30 minutes, 45 minutes etc.).

The following steps were used to estimate the average number of jobs a person in an equity priority community can reach by travel mode (transit or vehicle).

Step 1: Estimate equity priority community populations of TAZs

Because the regional model does not have inputs for demographic information (e.g., BIPOC, low-income), the first step is to approximate how many people from each equity priority community live in each TAZ. Step 1 calculated the number of equity priority community members within a TAZ based on the number of equity priority community members within the overlapping census block. This was done through the following process:

1. Using a geographical information system (GIS), perform a spatial overlay[2] of census block groups and TAZs.
2. Using the census data included in the GIS layers, determine the total population of each equity priority community (e.g., low-income population, BIPOC population, etc.) in each intersecting census block group.
3. Using GIS spatial analysis tools, determine the percentage of each intersecting census block group's land area contained within the TAZ.
4. Multiply the percentages of land area by the corresponding population figures for each intersecting census block group.
5. Aggregate (sum) the results.

[1] Data weighting is a statistical technique used to give differing importance to the values of a dataset when calculating an average, or any other statistic that describes the dataset values.

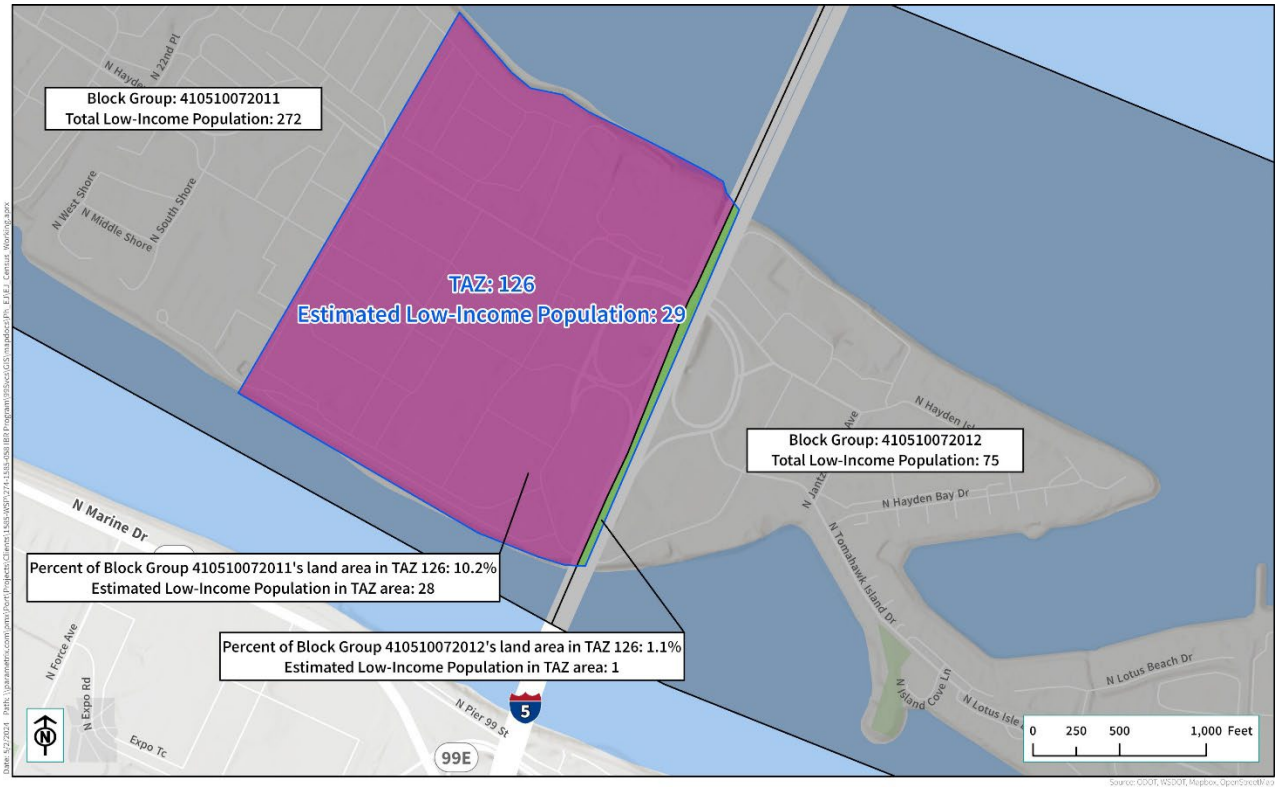
[2] A spatial overlay is a GIS operation in which two or more maps or layers are superimposed for the purpose of showing the relationships among features that occupy the same geographic space.

For example, TAZ 126 in the IBR Program area intersects with two census block groups. Table A-4 illustrates how the estimated low-income population for TAZ 126 was determined. As shown, the estimated low-income population in TAZ 126 is 29 people.

Table A-4. Estimated Low-Income Population in TAZ 126

Census Block Groups Intersecting with TAZ 126	Total Low-Income Population in Census Block Group (A)	Percentage of Census Block Group's Land Area within TAZ 126 (B)	Estimated Low-Income Population from Block Group within TAZ 126 (A x B)
410510072011	272	10.2%	28
410510072012	75	1.1%	1
Total Low-Income Population in TAZ 126	n/a	n/a	29

Figure 1. Census Blocks Groups Overlapping with TAZ 126



Step 2: Determine the proportion of each equity priority community's population living in each TAZ

In this step, the population of each equity priority community living in a TAZ was divided by the total population of that community across a larger geographic area using TAZ data (i.e., the IBR Program area—see Figure 2-1 in the Equity Technical Report—or the Portland-Vancouver Metropolitan Area). This yields the weighting factor for each TAZ.

Continuing with the low-income population example in TAZ 126 from Step 1:

- TAZ 126 low-income population: 29
- Total IBR Program area low-income population (by TAZ): 6,460
- 29/6,460 = **0.0045 weighting factor**
  - Interpretation: TAZ 126 contains 0.45% of the IBR Program area's low-income population.

Step 3: Calculate the weighted average

Next, the weighting factors yielded in Step 2 and the estimated number of jobs for each TAZ were combined to calculate the average number of jobs per TAZ. This average was calculated using data for all TAZs that include members of a given equity priority group.

The equity analysis uses information from the Oregon Metro 2045 regional travel demand model, which is developed, maintained, and implemented for projects in the Portland metropolitan region by staff at Metro. The model was used to estimate the number of jobs accessible to people using the projected 2045 transportation network. Separate estimates were developed for the No-Build Alternative and the Modified LPA to determine how the Modified LPA's proposed transportation improvements would affect access to jobs. Additional details on the model can be found in the Travel Demand Modeling Methods Report (Appendix H of the Transportation Technical Report).

Continuing with the example from Step 2, under the No-Build Alternative, the jobs access model estimates that a person can reach 47,550 jobs from TAZ 126 and 13,335 jobs from TAZ 127 within a 45-minute midday transit trip. For the sake of this example, it is assumed that TAZ 126 and 127 make up the entire Program area and that TAZ 127 contains 1.12% of the IBR Program area's low-income population. Applying the weighting factors to determine the average number of jobs accessible to a low-income person across both TAZs yields the following:

Average jobs = (47,550 x 0.0045 + 13,335 x 0.0112) / (0.0047 + 0.0112) = 22,851 jobs

- Interpretation: Within the IBR Program area, a low-income person under the No-Build scenario would have access to 22,851 jobs, on average.

Step 3 was performed for:

- Each of the seven equity priority communities for which data were available
- Time of day (morning peak [7 a.m. to 9 a.m.] was used to reflect access to jobs during typical morning commute hours and midday [12 p.m. to 1 p.m.]) was used to reflect access to services outside of typical commuting hours).

- Travel mode (transit and vehicle)

Table A-5 through Table A-18 list the results of the jobs access analysis. Each table shows the estimated number of jobs accessible to a given equity priority community or to its counterpart[3] residing in the IBR Program area and in the metropolitan area. These are jobs that would be accessible during the morning peak and midday within a 45-minute transit trip or drive under the No-Build Alternative and the Modified LPA. Due to overlap within equity priority communities (i.e., individuals who belong to more than one community), the total increase in jobs for all equity priority community members cannot be determined.

As shown in the tables, the Modified LPA would substantially increase access to jobs for equity priority communities compared to the No-Build Alternative. Within the IBR Program area, access to jobs by transit during the morning peak period would increase by 67% to 131% compared to No-Build, while access to jobs by driving would improve by 18% to 20%. During the midday, access improvements compared to No-Build would be somewhat lower but still substantial: between 43% and 83% for access by transit and approximately 3% for access by driving. Jobs access for equity priority communities within the Portland-Vancouver metropolitan area would increase slightly (between 2% and 4%) with the Modified LPA compared to No-Build. Counterpart communities within the IBR Program area would also experience substantial improvements in access to jobs under the Modified LPA; some of the improvements would be higher than those for the equity priority communities, while others would be lower. Within the metropolitan region, increases in access for counterpart communities would be similar to those for the equity priority communities.

[3] "Counterpart" is defined as someone who is not considered a member of the corresponding equity priority community. For example, the counterpart to members of the BIPOC community is people whose race/ethnicity combination is White Non-Hispanic/Latino; the counterpart to people with disabilities is people who do not have a disability, and so on.

Table A-5. Average Change in Jobs Access by Transit and Driving for the BIPOC Equity Priority Community

Type of Trip	Morning Peak No-Build Alternative	Morning Peak Modified LPA	Morning Peak Change	Midday No-Build Alternative	Midday Modified LPA	Midday Change
45-minute transit trip (IBR Program area)	26,284	48,537	+22,253 (85%)	26,678	41,232	+14,554 (55%)
45-minute transit trip (Portland-Vancouver metropolitan area)	55,207	56,392	+1,185 (2%)	48,517	48,990	+473 (1%)
45-minute drive (IBR Program area)	999,847	1,185,128	+185,281 (19%)	1,324,109	1,363,834	+39,725 (3%)
45-minute drive (Portland-Vancouver metropolitan area)	1,036,597	1,068,478	+31,881 (3%)	1,242,737	1,255,019	+12,282 (1%)

Sources: Metro 2045 Regional Model; 2020 Census (U.S. Census Bureau 2020).

Table A-6. Average Change in Jobs Access by Transit and Driving for the BIPOC Counterpart

Type of Trip	Morning Peak No-Build Alternative	Morning Peak Modified LPA	Morning Peak Change	Midday No-Build Alternative	Midday Modified LPA	Midday Change
45-minute transit trip (IBR Program area)	25,074	51,857	+26,783 (107%)	26,657	44,712	+18,055 (68%)
45-minute transit trip (Portland-Vancouver metropolitan area)	46,245	47,430	+1,185 (3%)	40,995	41,466	+471 (1%)
45-minute drive (IBR Program area)	997,339	1,184,452	+187,113 (19%)	1,325,298	1,364,417	+39,119 (3%)
45-minute drive (Portland-Vancouver metropolitan area)	1,003,417	1,041,099	+37,682 (4%)	1,215,509	1,229,318	+13,809 (1%)

Sources: Metro 2045 Regional Model; 2020 Census (U.S. Census Bureau 2020).

Table A-7. Average Change in Jobs Access by Transit and Driving for the People with Disabilities Equity Priority Community

Type of Trip	Morning Peak No-Build Alternative	Morning Peak Modified LPA	Morning Peak Change	Midday No-Build Alternative	Midday Modified LPA	Midday Change
45-minute transit trip (IBR Program area)	25,071	52,915	+27,844 (111%)	27,581	45,736	+18,155 (66%)
45-minute transit trip (Portland-Vancouver metropolitan area)	51,450.00	52,835.00	+1,385 (3%)	45,620.00	46,175.00	+555 (1%)
45-minute drive (IBR Program area)	993,630	1,183,619	+189,989 (19%)	1,323,905	1,363,542	+39,637 (3%)
45-minute drive (Portland-Vancouver metropolitan area)	1,015,310	1,052,268	+36,958 (4%)	1,223,806	1,236,548	+12,742 (1%)

Sources: Metro 2045 Regional Model; 2016-2020 American Community Survey (U.S. Census Bureau 2022).

Table A-8. Average Change in Jobs Access by Transit and Driving for the People with Disabilities Counterpart

Type of Trip	Morning Peak No-Build Alternative	Morning Peak Modified LPA	Morning Peak Change	Midday No-Build Alternative	Midday Modified LPA	Midday Change
45-minute transit trip (IBR Program area)	25,811	50,688	+24,877 (96%)	27,405	43,632	+16,227 (59%)
45-minute transit trip (Portland-Vancouver metropolitan area)	48,196	49,331	+1,135 (2%)	42,660	43,114	+454 (1%)
45-minute drive (IBR Program area)	994,704	1,183,752	+189,048 (19%)	1,323,015	1,363,578	+40,563 (3%)
45-minute drive (Portland-Vancouver metropolitan area)	1,015,073	1,050,053	+34,980 (3%)	1,224,028	1,237,343	+13,315 (1%)

Sources: Metro 2045 Regional Model; 2016-2020 American Community Survey (U.S. Census Bureau 2022).

Table A-9. Average Change in Jobs Access by Transit and Driving for the People with Limited English Proficiency Equity Priority Community

Type of Trip	Morning Peak No-Build Alternative	Morning Peak Modified LPA	Morning Peak Change	Midday No-Build Alternative	Midday Modified LPA	Midday Change
45-minute transit trip (IBR Program area)	23,475	39,144	+15,669 (67%)	23,129	33,081	+9,952 (43%)
45-minute transit trip (Portland-Vancouver metropolitan area)	53,348	54,259	+911 (2%)	46,748	47,118	+370 (1%)
45-minute drive (IBR Program area)	985,882	1,179,728	+193,846 (20%)	1,314,968	1,358,072	+43,104 (3%)
45-minute drive (Portland-Vancouver metropolitan area)	1,035,539	1,066,725	+31,186 (3%)	1,241,499	1,252,865	+11,366 (1%)

Sources: Metro 2045 Regional Model; 2016-2020 American Community Survey (U.S. Census Bureau 2022).

Table A-10. Average Change in Jobs Access by Transit and Driving for the People with Limited English Proficiency Counterpart

Type of Trip	Morning Peak No-Build Alternative	Morning Peak Modified LPA	Morning Peak Change	Midday No-Build Alternative	Midday Modified LPA	Midday Change
45-minute transit trip (IBR Program area)	25,837	51,772	+25,935 (100%)	27,701	44,634	+16,933 (61%)
45-minute transit trip (Portland-Vancouver metropolitan area)	48,239	49,420	+1,181 (2%)	42,741	43,214	+473 (1%)
45-minute drive (IBR Program area)	995,081	1,183,982	+188,901 (19%)	1,323,663	1,363,916	+40,253 (3%)
45-minute drive (Portland-Vancouver metropolitan area)	1,013,666	1,049,158	+35,492 (4%)	1,222,775	1,236,155	+13,380 (1%)

Sources: Metro 2045 Regional Model; 2016-2020 American Community Survey (U.S. Census Bureau 2022).

Table A-11. Average Change in Jobs Access by Transit and Driving for the People with Lower Incomes Equity Priority Community

Type of Trip	Morning Peak No-Build Alternative	Morning Peak Modified LPA	Morning Peak Change	Midday No-Build Alternative	Midday Modified LPA	Midday Change
45-minute transit trip (IBR Program area)	25,516	50,949	+25,433 (100%)	27,503	43,937	+16,434 (60%)
45-minute transit trip (Portland-Vancouver metropolitan area)	59,300	60,790	+1,490 (3%)	52,600	53,214	+614 (1%)
45-minute drive (IBR Program area)	987,298	1,180,820	+193,522 (20%)	1,319,808	1,361,292	+41,484 (3%)
45-minute drive (Portland-Vancouver metropolitan area)	1,038,656	1,073,890	+35,234 (3%)	1,242,535	1,254,575	+12,040 (1%)

Sources: Metro 2045 Regional Model; 2016-2020 American Community Survey (U.S. Census Bureau 2022).

Table A-12. Average Change in Jobs Access by Transit and Driving for the People with Lower Incomes Counterpart

Type of Trip	Morning Peak No-Build Alternative	Morning Peak Modified LPA	Morning Peak Change	Midday No-Build Alternative	Midday Modified LPA	Midday Change
45-minute transit trip (IBR Program area)	25,071	48,207	+23,136 (92%)	26,112	41,729	+15,617 (60%)
45-minute transit trip (Portland-Vancouver metropolitan area)	46,426	47,480	+1,054 (2%)	41,029	41,440	+411 (1%)
45-minute drive (IBR Program area)	995,081	1,184,306	+189,225 (19%)	1,323,895	1,364,193	+40,298 (3%)
45-minute drive (Portland-Vancouver metropolitan area)	1,010,929	1,045,854	+34,925 (3%)	1,221,872	1,235,409	+13,537 (1%)

Sources: Metro 2045 Regional Model; 2016-2020 American Community Survey (U.S. Census Bureau 2022).

Table A-13. Average Change in Jobs Access by Transit and Driving for the Immigrants and Refugees Equity Priority Community

Type of Trip	Morning Peak No-Build Alternative	Morning Peak Modified LPA	Morning Peak Change	Midday No-Build Alternative	Midday Modified LPA	Midday Change
45-minute transit trip (IBR Program area)	25,023	42,903	+17,880 (71%)	24,878	36,261	+11,383 (46%)
45-minute transit trip (Portland-Vancouver metropolitan area)	54,612	55,554	+942 (2%)	47,808	48,162	+354 (1%)
45-minute drive (IBR Program area)	999,453	1,185,569	+186,116 (19%)	1,321,146	1,363,112	+41,966 (3%)
45-minute drive (Portland-Vancouver metropolitan area)	1,043,269	1,073,198	+29,929 (3%)	1,247,487	1,259,812	+12,325 (1%)

Sources: Metro 2045 Regional Model; 2016-2020 American Community Survey (U.S. Census Bureau 2022).

Table A-14. Average Change in Jobs Access by Transit and Driving for the Immigrants and Refugees Counterpart

Type of Trip	Morning Peak No-Build Alternative	Morning Peak Modified LPA	Morning Peak Change	Midday No-Build Alternative	Midday Modified LPA	Midday Change
45-minute transit trip (IBR Program area)	25,762	51,801	+26,039 (101%)	27,674	44,685	+17,011 (61%)
45-minute transit trip (Portland-Vancouver metropolitan area)	47,658	48,856	+1,198 (3%)	42,276	42,758	+482 (1%)
45-minute drive (IBR Program area)	994,073	1,183,558	+189,485 (19%)	1,323,342	1,363,616	+40,274 (3%)
45-minute drive (Portland-Vancouver metropolitan area)	1,010,830	1,046,840	+36,010 (4%)	1,220,442	1,233,829	+13,387 (1%)

Sources: Metro 2045 Regional Model; 2016-2020 American Community Survey (U.S. Census Bureau 2022).

Table A-15. Average Change in Jobs Access by Transit and Driving for the Young People (Under 25) Equity Priority Community

Type of Trip	Morning Peak No-Build Alternative	Morning Peak Modified LPA	Morning Peak Change	Midday No-Build Alternative	Midday Modified LPA	Midday Change
45-minute transit trip (IBR Program area)	25,137	43,619	+18,482 (74%)	25,867	38,019	+12,152 (47%)
45-minute transit trip (Portland-Vancouver metropolitan area)	44,025	44,978	+953 (2%)	38,757	39,129	+372 (1%)
45-minute drive (IBR Program area)	979,434	1,177,423	+197,989 (20%)	1,314,760	1,358,800	+44,040 (3%)
45-minute drive (Portland-Vancouver metropolitan area)	993,451	1,030,810	+37,359 (4%)	1,209,316	1,223,008	+13,692 (1%)

Sources: Metro 2045 Regional Model; 2016-2020 American Community Survey (U.S. Census Bureau 2022).

Table A-16. Average Change in Jobs Access by Transit and Driving for the Young People (Under 25) Counterpart

Type of Trip	Morning Peak No-Build Alternative	Morning Peak Modified LPA	Morning Peak Change	Midday No-Build Alternative	Midday Modified LPA	Midday Change
45-minute transit trip (IBR Program area)	25,237	50,882	+25,645 (102%)	26,780	43,889	+17,109 (64%)
45-minute transit trip (Portland-Vancouver metropolitan area)	51,638	52,877	+1,239 (2%)	45,760	46,254	+494 (1%)
45-minute drive (IBR Program area)	997,733	1,185,116	+187,383 (19%)	1,325,197	1,364,757	+39,560 (3%)
45-minute drive (Portland-Vancouver metropolitan area)	1,027,251	1,061,268	+34,017 (3%)	1,233,842	1,246,823	+12,981 (1%)

Sources: Metro 2045 Regional Model; 2016-2020 American Community Survey (U.S. Census Bureau 2022).

Table A-17. Average Change in Jobs Access by Transit and Driving for the Older Adults (65+) Equity Priority Community

Type of Trip	Morning Peak No-Build Alternative	Morning Peak Modified LPA	Morning Peak Change	Midday No-Build Alternative	Midday Modified LPA	Midday Change
45-minute transit trip (IBR Program area)	24,328	56,202	+31,874 (131%)	26,515	48,455	+21,940 (83%)
45-minute transit trip (Portland-Vancouver metropolitan area)	44,771	45,978	+1,207 (3%)	39,602	40,098.00	+496 (1%)
45-minute drive (IBR Program area)	1,009,639	1,189,402	+179,763 (18%)	1,331,587	1,367,413	+35,826 (3%)
45-minute drive (Portland-Vancouver metropolitan area)	1,005,796	1,042,614	+36,818 (4%)	1,217,703	1,231,103	+13,400 (1%)

Sources: Metro 2045 Regional Model; 2016-2020 American Community Survey (U.S. Census Bureau 2022).

Table A-18. Average Change in Jobs Access by Transit and Driving for the Older Adults (65+) Counterpart

Type of Trip	Morning Peak No-Build Alternative	Morning Peak Modified LPA	Morning Peak Change	Midday No-Build Alternative	Midday Modified LPA	Midday Change
45-minute transit trip (IBR Program area)	25,400	47,555	+22,155 (87%)	26,561	41,142	+14,581 (55%)
45-minute transit trip (Portland-Vancouver metropolitan area)	50,208	51,353	+1,145 (2%)	44,417	44,868	+451 (1%)
45-minute drive (IBR Program area)	989,668	1,181,879	+192,211 (19%)	1,320,683	1,362,392	+41,709 (3%)
45-minute drive (Portland-Vancouver metropolitan area)	1,019,343.00	1,054,026.00	+34,683 (3%)	1,228,202.00	1,241,355.00	+13,153 (1%)

Sources: Metro 2045 Regional Model; 2016-2020 American Community Survey (U.S. Census Bureau 2022).