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- 1 **DRAFT Modified LPA Two Auxiliary Lane**
- 2 **Design Option Technical Report**
- 3 June 2023



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3 **Option Technical Report**





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## 1 ACRONYMS AND ABBREVIATIONS

2

3	ADA	Americans with Disabilities Act
4	BIPOC	Black, Indigenous, and People of Color
5	BLTS	Bike level of traffic stress
6	CIA	Contributing impervious area
7	CRC	Columbia River Crossing
8	EMF	Electric and Magnetic Fields
9	FHWA	Federal Highway Administration
10	FTA	Federal Transit Administration
11	GHG	Greenhouse gas
12	I-5	Interstate 5
13	IBR	Interstate Bridge Replacement
14	LPA	Locally Preferred Alternative
15	NEPA	National Environmental Policy Act
16	NM	Nautical Mile
17	ODOT	Oregon Department of Transportation
18	ROD	Record of Decision
19	SEIS	Supplemental Environmental Impact Statement
20	VMT	Vehicle miles traveled
21	WSDOT	Washington State Department of Transportation

## 1. INTRODUCTION

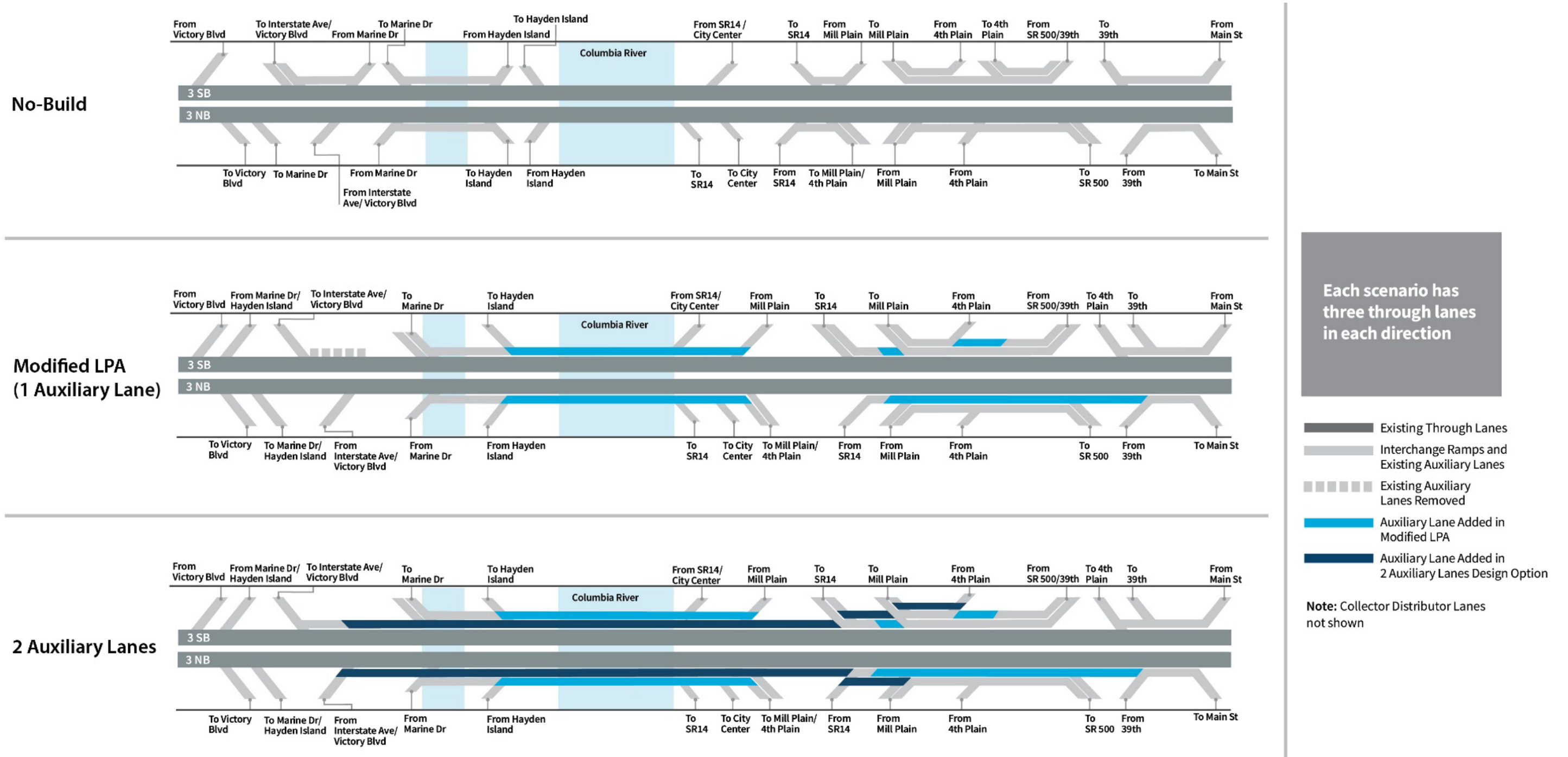
The Interstate Bridge Replacement (IBR) program will replace the aging Interstate 5 (I-5) Bridge across the Columbia River with a modern, seismically resilient multimodal structure and the program would construct associated infrastructure improvements along a 5-mile stretch of the I-5 corridor in Portland, Oregon, and Vancouver, Washington. Through a collaborative process with the federal lead agencies—the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA)—and the local and regional agencies sponsoring the IBR program, a Modified Locally Preferred Alternative (LPA) has been developed. The Modified LPA is a modification of the LPA selected for the Columbia River Crossing (CRC) project, which completed the NEPA process with a signed Record of Decision (ROD) in 2011 and two re-evaluations completed in 2012 and 2013. The IBR program’s Modified LPA and Modified LPA design options will be evaluated in a Supplemental Environmental Impact Statement (SEIS).

A component of the Modified LPA is the lane configuration on I-5. The Modified LPA includes three through lanes and one auxiliary lane in each direction of I-5 between the Marine Drive interchange and the Mill Plain interchange. The Modified LPA Two Auxiliary Lane Design Option includes adding a second auxiliary lane across the Columbia River bridges in each direction of I-5. The differences in auxiliary lane configurations are described in more detail in the following section. A visual comparison of the auxiliary lane configurations for the No-Build Alternative, Modified LPA, and Modified LPA Two Auxiliary Lane Design Option is provided in Figure 1-1. The design footprints for the Modified LPA and Modified LPA Two Auxiliary Lane Design Option are the same except at the new Columbia River bridges and the SR 14 interchanges. The footprint differences in these areas are illustrated in Figure 1-2.

This technical report summarizes the impacts and benefits to the environment anticipated to result from the Modified LPA Two Auxiliary Lane Design Option. This analysis will be incorporated into the discipline-specific technical reports, which also evaluate the Modified LPA with three through lanes and one auxiliary lane in each direction of I-5. A comparative analysis across all environmental disciplines excluding transportation is presented in Table 3-1, followed by separate tables providing summaries of the equity analysis (Table 4-1) and the air quality, energy, and climate analyses (Table 5-1). The transportation analysis of the Modified LPA Two Auxiliary Lane Design Option is contained in the Transportation Technical Report.

*Please refer to the separate IBR Program Description file on the portal for a draft description of the Modified LPA, Modified LPA Construction, and the No-Build Alternative. The analysis for each resource in this report will be moved to the topic-specific resource reports, which will include the complete IBR program description in its final version.*

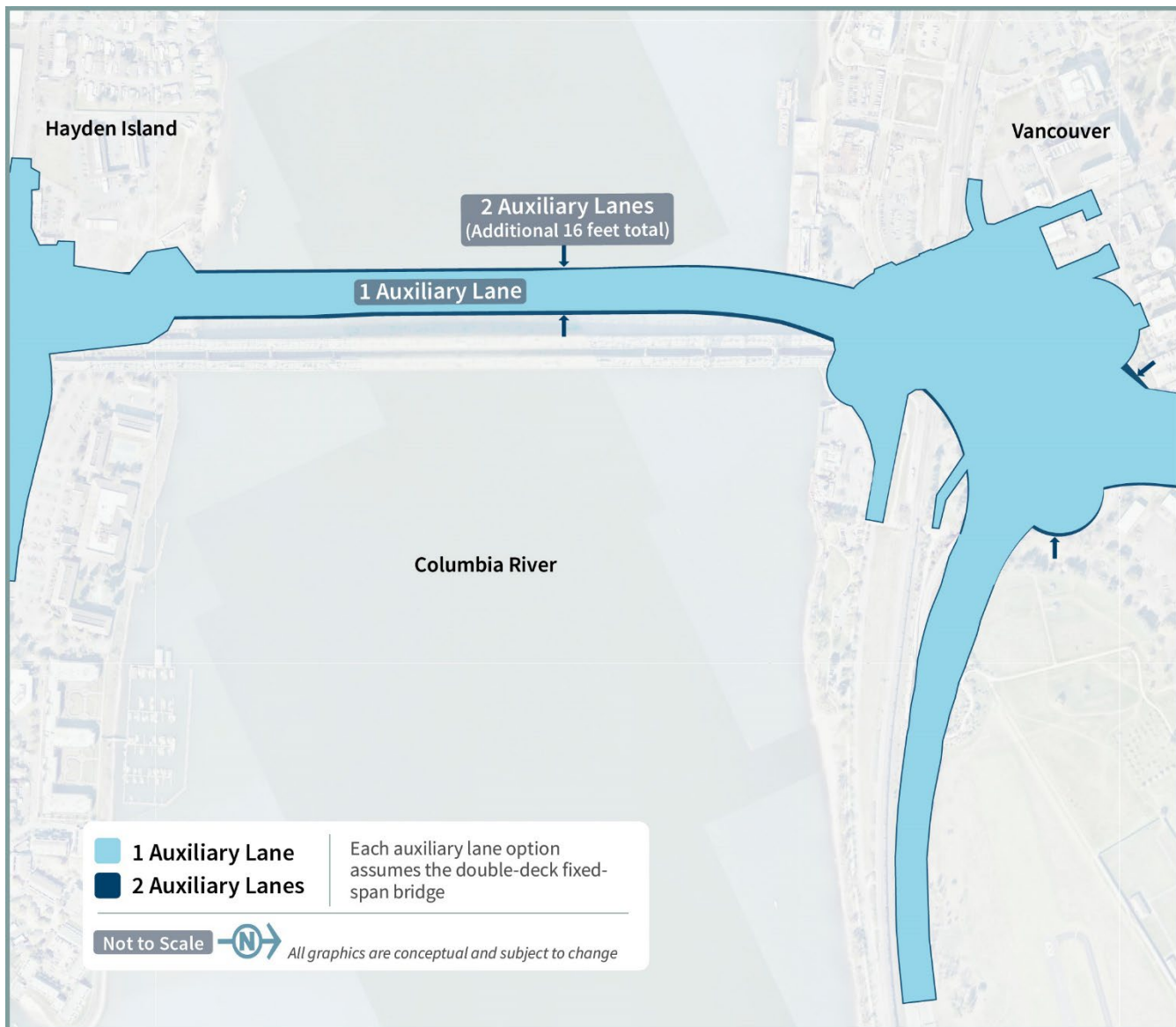
1 Figure 1-1. Comparison of Configurations for Auxiliary Lane Options



2



1 Figure 1-2. Comparison of Footprints for Auxiliary Lane Options



2

## 2. AUXILIARY LANE OPTIONS

Auxiliary lanes are ramp-to-ramp connections that allow vehicles to enter and exit the roadway outside of through-traffic lanes and optimize traffic flow by giving drivers space to accelerate, decelerate, weave, merge and diverge safely. Auxiliary lanes address close interchange spacing; short merge, diverge, or weaving areas; high on- and off-ramp volumes; high vehicle crash locations; and lane balancing. Auxiliary lanes are particularly important in major freight corridors where larger semi-trailer trucks comprise substantial portions of the vehicle mix because they help trucks accelerate, decelerate, and weave between these closely spaced interchanges and varying ramp and freeway grades.

The Modified LPA includes the addition of one auxiliary lane to address these goals. However, I-5 does not meet all transportation performance standards with this configuration, and close interchange spacing remains an issue. As described in the Transportation Technical Report, adding a second auxiliary lane improves I-5 transportation performance. This chapter describes the configuration of the auxiliary lane options evaluated in this report. The complete description of the Modified LPA can be found in Chapter 2 of the SEIS.

### 2.1 No-Build Alternative

The No-Build Alternative would maintain the existing lane configuration, as shown in Figure 1-1. Currently, within the 5-mile stretch of I-5, auxiliary lanes connect the following interchanges: Interstate Avenue/Victory Boulevard to Marine Drive (southbound only), Marine Drive to Hayden Island, SR 14 to SR 500 with a gap between the E Mill Plain Boulevard on- and off-ramps, and E 39th Street to Main Street. On I-5 southbound between the SR 500/E 39th Street and E Fourth Plain Boulevard interchanges and between the E Fourth Plain Boulevard and E Mill Plain Boulevard interchanges, there is a second auxiliary lane.

However, there are no auxiliary lanes on the Interstate Bridge to connect the Hayden Island and SR 14 interchanges. The Interstate Bridge is the primary source of congestion in the study area. In addition, all seven of the interchanges within the IBR program study area are spaced below the minimum 1-mile standard making it difficult for vehicles to enter and exit the freeway at freeway speeds; this contributes to congestion and collisions.

### 2.2 Modified LPA

Figure 1-1 shows the proposed Modified LPA auxiliary lane layout. The Modified LPA would add one auxiliary lane in each direction across the new Columbia River bridges, which would allow for weave, merge, and diverge movements outside the through lanes between N Marine Drive and E Mill Plain Boulevard. This auxiliary lane would help alleviate the complex merging and weaving movements that currently cause traffic congestion in the corridor. All 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 changed due to the braided off-ramp design at Victory Boulevard.

## 1 2.3 Modified LPA Two Auxiliary Lane Design Option

2 The Modified LPA Two Auxiliary Lane Design Option consists of two auxiliary lanes in both the northbound and  
3 southbound directions across the Columbia River bridges. Figure 1-1 shows the proposed Modified LPA Two  
4 Auxiliary Lane Design Option layout. The additional auxiliary lane would add 16 feet in total roadway width  
5 compared to the Modified LPA. With the Modified LPA Two Auxiliary Lane Design Option, in addition to the first  
6 auxiliary lane in each direction between the N Marine Drive and E Mill Plain Boulevard interchanges, an  
7 additional second auxiliary lane would be added from Interstate Avenue/Victory Boulevard to E Mill Plain  
8 Boulevard. This would connect the existing auxiliary lanes to the Main Street interchange in the northbound  
9 direction of I-5, and to SR 500/39th Street in the southbound direction.



### 3. ENVIRONMENTAL IMPACTS AND BENEFITS FOR AUXILIARY LANE OPTIONS

For each environmental resource area, Table 3-1 summarizes the impacts and benefits of the Modified LPA and the Modified LPA Two Auxiliary Lane Design Option compared to the No-Build Alternative. The Modified LPA Two Auxiliary Lane Design Option is compared to the Modified LPA for simplicity. These impacts are based on conceptual design and are subject to change. For the purposes of this analysis, both the Modified LPA and the Modified LPA Two Auxiliary Lane Design Options assume double-deck fixed-span bridges, the C Street ramps, and a centered I-5 alignment in downtown Vancouver. These impacts are based on conceptual design and are subject to change. The analysis year for all alternatives and design options is 2045.

Table 3-1. Comparison of Environmental Impacts and Benefits for Auxiliary Lane Scenarios (2045)

Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
<b>Aviation</b>	The historical hazard to aviation from the lift-span towers of the Interstate Bridge would be maintained.	<ul style="list-style-type: none"> <li>Signs and luminaires on the new Columbia River bridges are expected to penetrate the Part 77 aviation surfaces up to 13 feet, which is less than the 70-foot penetrations of the existing lift towers that would remain in the No-Build Alternative. Per the Federal Aviation Administration, the 13-foot penetrations were identified as acceptable since they improve the existing condition.</li> <li>No penetrations into the 20:1 approach aviation surface would occur.</li> <li>The most stringent climb gradient for airplanes departing from Pearson Field would be 427 feet per Nautical Mile (NM) which is needed to clear signs or lights along I-5 northbound at the C Street ramp. This is less than the existing most</li> </ul>	Same as the Modified LPA.



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
		<p>stringent climb gradient, which is 650 feet/NM, needed to clear the existing lift towers.</p> <ul style="list-style-type: none"> <li>Wildlife in and around airports is a hazard to aviation. Consolidated structural elements would reduce the areas on which birds can land and roost, compared to the existing bridges.</li> </ul>	
<p><b>Navigation</b></p>	<ul style="list-style-type: none"> <li>River navigation would continue to be impacted by the need for the S-curve maneuver for barge channels, the reduced horizontal clearance in the primary channel from the authorized navigation channel width (263 feet), and in the event of an earthquake, the seismic deficiencies of the North Portland Harbor bridge and Interstate Bridge.</li> <li>The bridge provides 178 feet of vertical navigation clearance when the lift span is in the open position. In</li> </ul>	<ul style="list-style-type: none"> <li>Reduced maximum navigation clearance of 116 feet compared to 178 feet for the No-Build Alternative. Some current river users may be limited in future activities or require modifications to vessels or business operations.</li> <li>River traffic delays would be eliminated for vessels currently requiring a bridge lift to navigate, because a lift span is not involved.</li> <li>Increased seismic resiliency in the event of a potential earthquake.</li> <li>The length of the Vancouver Upper Turning Basin would be reduced by 285 feet compared to No-Build, due to the placement of the proposed Columbia River bridges.</li> <li>Proposed changes in the location of the primary and alternate navigation channels. The new primary channel would require an S-curve maneuver</li> </ul>	<p>Same as the Modified LPA, except that the reduction in the Vancouver Upper Turning Basin would be increased to 293 feet (8 feet more than the Modified LPA).</p>



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
	<p>the closed position, the bridge provides 38 feet (primary channel), 58 feet (barge channel), and 72 feet (alternate barge channel) of vertical navigation clearance.</p> <ul style="list-style-type: none"> <li>Vessels requiring more than 72 feet of vertical navigation clearance must pass the Interstate Bridge via the opened lift spans. Interstate Bridge lift openings are currently restricted to avoid weekday peak highway traffic operations.</li> </ul>	<p>between the Columbia River bridges and the railroad bridge.</p>	
<p><b>Property Acquisitions and Displacements</b></p>	<p>No temporary or permanent easements, acquisitions, or encroachments.</p>	<p>Parcels that would require acquisition:</p> <ul style="list-style-type: none"> <li>Full – 45</li> <li>Partial/subsurface – 131</li> </ul> <p>Land uses that would be displaced:</p> <ul style="list-style-type: none"> <li>Single-family residences – 43</li> <li>Commercial businesses – 35</li> <li>Public facilities – 2</li> </ul>	<p>Same as the Modified LPA.</p>

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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
<p><b>Land Use</b></p>	<ul style="list-style-type: none"> <li>No building or land use displacements would occur.</li> <li>Existing land uses served by the structure, as well as interstate commerce and daily commute patterns, would remain vulnerable to high levels of congestion, unsafe conditions, and potential earthquake-induced failure.</li> <li>Traffic congestion related to bridge lifts would impair freight movement and reduce area productivity, which may have indirect impacts on land use plans and goals.</li> </ul>	<ul style="list-style-type: none"> <li>Up to 45 parcels would be fully converted from their current non-transportation uses to a transportation use. Up to 131 parcels would be partially acquired or subject to subsurface acquisitions.</li> <li>No change in underlying comprehensive plan or zoning designations on affected or adjacent parcels.</li> <li>No anticipated induced growth. Land use in Oregon and Washington is governed by comprehensive plans that anticipate future growth and planned transportation projects. Comprehensive plans are implemented through land use and zoning codes that govern the types and intensities of uses that can be established.</li> <li>Existing land uses served by I-5 would experience improved interstate commerce travel and increased safety from potential earthquake-induced failure.</li> </ul>	<p>All land use impacts would be the same as the Modified LPA, except that this option would require slightly more acquisition of property at Fort Vancouver; there would be no change in underlying land use designation or displacement of existing use (see the Acquisitions and Parks sections of this table).</p>
<p><b>Economic Activity</b></p>	<ul style="list-style-type: none"> <li>No short-term benefits or impacts, or changes associated with construction activities.</li> </ul>	<ul style="list-style-type: none"> <li>A total of 35 businesses would be displaced. Relocation services would be provided in compliance with the Uniform Act. Due to the make-up and geographical distribution of the</li> </ul>	<p>Same as the Modified LPA except that improved traffic operations on I-5 (shorter duration and length of congestion, reduced travel times, improved mobility options) are expected to result in improved mobility</p>



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
	<ul style="list-style-type: none"> <li>No businesses within Oregon or Washington would be displaced by right of way acquisition, and there would be no resulting decrease in property or sales tax revenues, or jobs lost.</li> <li>Existing bottlenecks and congestion would increase. Increasing congestion on I-5 could result in potentially significant economic effects. Economic development planned for this area may occur more slowly because business owners may be more reluctant to locate in an area with poor access and mobility for employees and customers.</li> <li>Freight reliability would decrease as congestion spreads beyond the peak hour</li> </ul>	<p>displaced businesses, a large adverse economic impact is not anticipated.</p> <ul style="list-style-type: none"> <li>Reduction of Portland and Vancouver property tax revenue from acquired properties would be small in relation to each city’s overall tax base.</li> <li>Benefit to marine commerce by increasing operational hours for taller vessels 72 to 116 feet in height to travel throughout the day, as vessels requiring vertical navigation clearances up to the 116 feet would be able to pass under the new Columbia River bridges at any time of day. (This is an improvement as compared to the No-Build Alternative because vessels 72 to 116 feet in height currently require a bridge lift and are restricted to hours outside of the weekday AM and PM peak periods on I-5.)</li> <li>Reduction in maximum vertical navigation clearance under the bridge could affect up to eight river users, but impacts would be mitigated.</li> <li>Benefits to the regional economy from reducing I-5 congestion and delay for the movement of goods and people via highway and transit. This would help maintain the regional competitiveness of the Ports of Portland and Vancouver, particularly for businesses that depend on moving freight by truck.</li> </ul>	<p>and access for freight and employment, resulting in increased competitiveness for the regional economy, reduced transportation costs for local businesses, and increased operational flexibility for businesses (e.g., deliveries, shipping, and business operations).</p>





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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
	<p>into times when trucks tend to travel.</p> <ul style="list-style-type: none"> <li>• Congestion at the Interstate Bridge would increase the cost of congestion delay to trucks.</li> <li>• Operation hours for taller marine vessels would continue to be restricted to off-peak hours. The estimated annual number of vessels/users requesting a bridge opening would be 270, based on past data.</li> </ul>	<ul style="list-style-type: none"> <li>• Temporary adverse economic impacts during construction include reduced business visibility, travel delays and congestion, and benefits from increased employment and spending in the construction industry.</li> </ul>	
<b>Neighborhoods</b>	<ul style="list-style-type: none"> <li>• Existing neighborhoods, community facilities, and social resources would not be impacted.</li> <li>• Neighborhoods would not benefit from reduced congestion, improved multimodal mobility, or potentially improved</li> </ul>	<ul style="list-style-type: none"> <li>• Business displacements are not anticipated to negatively impact neighborhood cohesion in the Bridgeton and Rockwood neighborhoods.</li> <li>• Business and residential displacements are not anticipated to negatively impact neighborhood cohesion in the Kenton and Esther Short neighborhoods.</li> <li>• Hayden Island would experience both positive and negative changes to neighborhood cohesion, which include adverse impacts from visual changes and</li> </ul>	Same as the Modified LPA.



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
	<p>access to employment opportunities.</p>	<p>residential and business displacements and benefits from improved access and circulation.</p> <ul style="list-style-type: none"> <li>• Travel conditions would not be expected to reduce neighborhood cohesion in the long-term. Most intersections would operate similar to or better than the No-Build Alternative, and reduced congestion on I-5 would result in less congestion on parallel roadways and at interchanges which would improve travel conditions.</li> <li>• Temporary construction impacts including travel delay and congestion, emissions that could reduce air quality, and increased noise could negatively impact neighborhood quality and cohesion in all neighborhoods adjacent to the corridor.</li> </ul>	
<p><b>Environmental Justice (EJ)</b></p>	<p>EJ populations would be impacted by increased congestion, safety issues related to congestion, lack of high-capacity transit options across the river, and lack of active transportation connections in the study area.</p>	<p><b>Transportation</b></p> <ul style="list-style-type: none"> <li>• Similar to the general population, EJ populations would benefit from reduced delay and congestion on the Columbia River bridges.</li> <li>• Some (but not all) segments of I-5 would be brought into conformance with WSDOT and ODOT mobility performance standards. Peak-hour bottlenecks would still occur. Given the diffuse nature of the traffic impacts, impacts to EJ populations</li> </ul>	<p><b>Transportation</b></p> <p>Same as the Modified LPA, except:</p> <ul style="list-style-type: none"> <li>• Reduced delay and congestion on the Columbia River bridges to a greater extent than the Modified LPA. EJ populations would benefit from this reduced congestion the same as the general population.</li> <li>• Reduced peak-hour bottlenecks compared to the Modified LPA.</li> </ul>



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
		<p>would be the same as to the general population.</p> <ul style="list-style-type: none"> <li>EJ populations would benefit from high-capacity transit operating in an exclusive right of way across the Columbia River, station area improvements, and improved multimodal connections to transit.</li> <li>EJ populations would benefit from the anticipated 15% to 30% reduction in the number of crashes forecast to occur and an improved bike level of traffic stress (BLTS) standing in Vancouver.</li> </ul> <p><b>Public Services</b></p> <ul style="list-style-type: none"> <li>Similar to the general population, EJ populations would benefit from improved response times for emergency vehicles using I-5 as a result of improvements in congestion, traffic flow, and transportation safety.</li> </ul> <p><b>Property Acquisitions and Displacements</b></p> <ul style="list-style-type: none"> <li>Property impacts would occur in areas that are meaningfully greater<sup>1</sup> and high-priority EJ areas.</li> </ul>	<p>Because the traffic impacts would be dispersed, impacts to EJ populations would be the same as to the general population.</p> <ul style="list-style-type: none"> <li>The benefits of light rail operations would be the same as the Modified LPA. EJ individuals on express bus transit service would have improved travel times compared to the Modified LPA.</li> <li>Crash reduction and BLTS benefits would be improved compared to the Modified LPA.</li> </ul> <p><b>Public Services</b></p> <p>Same as the Modified LPA, except:</p> <ul style="list-style-type: none"> <li>Emergency response times are expected to decrease slightly from additional improvements in congestion, traffic flow, and transportation safety.</li> </ul>

<sup>1</sup> “Meaningfully greater” refers to census block groups where levels of low-income or minority populations are meaningfully greater than corresponding county or regional averages—usually expressed in percentage ranges.



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
		<ul style="list-style-type: none"> <li>Impacts to EJ populations are expected to occur in downtown Vancouver, where 53 property impacts are anticipated. No residential displacements within meaningfully greater and high-priority EJ areas are identified.</li> </ul> <p><b>Economic Activity, Neighborhoods, Noise and Vibrations, Air Quality</b></p> <ul style="list-style-type: none"> <li>Environmental resource impacts to meaningfully greater and high-priority EJ populations under the Modified LPA would be similar to the No-Build Alternative.</li> </ul> <p><b>Preliminary Finding for EJ Impacts</b></p> <ul style="list-style-type: none"> <li>No disproportionately high and adverse effects on EJ populations have been identified.</li> </ul>	<p><b>Property Acquisitions and Displacements</b></p> <ul style="list-style-type: none"> <li>Same as the Modified LPA.</li> </ul> <p><b>Economic Activity, Neighborhoods, Noise and Vibrations, Air Quality</b></p> <ul style="list-style-type: none"> <li>Same as the Modified LPA.</li> </ul> <p><b>Preliminary Finding for EJ Impacts</b></p> <ul style="list-style-type: none"> <li>Same as the Modified LPA.</li> </ul>
<p><b>Public Services</b></p>	<ul style="list-style-type: none"> <li>Continued delay and disruption to emergency response times due to bridge lifts and substandard shoulders that limit the ability of emergency response vehicles to circumvent traffic.</li> <li>Congestion impacts limit the ability for</li> </ul>	<ul style="list-style-type: none"> <li>Six public service facility properties (one medical center, two school-related sites, and three non-categorized facilities) would require a full or partial acquisition, including right-of-way and temporary construction easement impacts.</li> <li>Only one facility (the ODOT Permit Facility on Hayden Island) would be permanently displaced. Mitigation for the remainder of the properties would minimize impacts such that the Modified</li> </ul>	<p>Same as the Modified LPA, except:</p> <ul style="list-style-type: none"> <li>Congestion would be further reduced and multimodal operations on I-5 would be improved.</li> <li>Response times for emergency vehicles using I-5 as an emergency route are expected to decrease because of the improvements in congestion, traffic flow, and transportation safety on I-5.</li> </ul>



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
	<p>emergency response to reach the bridge in both directions during both peak periods.</p> <ul style="list-style-type: none"> <li>Bicycle/pedestrian path located adjacent to highway provides emergency vehicles with direct access to bicycle and pedestrian incidents.</li> </ul>	<p>LPA would not have a long-term effect on the services provided by these facilities.</p> <ul style="list-style-type: none"> <li>The ODOT Permit Station and Field Office on Hayden Island would be displaced. The other five public facilities would not have building impacts or displacements.</li> <li>Improved congestion, transportation safety, and travel time predictability would improve emergency response times and mobility for public service providers.</li> <li>Provides adequate shoulder width for emergency response vehicles to bypass traffic through the corridor, which is not an option with the No-Build Alternative.</li> <li>Response times on other critical access routes are expected to stay the same or decrease (improve).</li> </ul>	
<p><b>Utilities</b></p>	<p>No impact to utilities or the levels of service provided, except in the event of a catastrophic earthquake, which could damage the Interstate Bridge and the utility lines that are located on the bridge.</p>	<p>Utilities in the study area that would need to be relocated due to construction of the new bridges:</p> <ul style="list-style-type: none"> <li>Water infrastructure.</li> <li>Sewer infrastructure.</li> <li>Natural gas infrastructure.</li> <li>Communication infrastructure and power cables.</li> <li>Electrical infrastructure.</li> <li>Cellular antenna array.</li> </ul>	<p>Same as the Modified LPA.</p>



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
<p><b>Parks and Recreation</b></p>	<p>No permanent or temporary acquisition of park land.</p>	<p><b>Permanent Acquisition of Park Land (square feet)</b></p> <ul style="list-style-type: none"> <li>• Old Apple Tree Park: 3,480.</li> <li>• Marshall Community Center, Luepke Senior Center, and Marshall Park: 25,190.</li> <li>• Kiggins Sports Fields/Stadium: 80.</li> <li>• East Delta Park: 9,300.</li> <li>• Fort Vancouver National Historic Reserve: 40,980.</li> <li>• Fort Vancouver National Historic Site: 18,260.</li> </ul> <p><b>Temporary Disturbance of Park Land (sq ft)</b></p> <ul style="list-style-type: none"> <li>• Old Apple Tree Park: 7,170.</li> <li>• Marshall Community Center, Luepke Senior Center, and Marshall Park: 19,060.</li> <li>• Kiggins Sports Fields/Stadium: 20.</li> <li>• East Delta Park: 8,170.</li> <li>• Fort Vancouver National Historic Reserve: 91,580.</li> <li>• Fort Vancouver National Historic Site: 43,380.</li> <li>• Fort Vancouver Waterfront Park: 850.</li> <li>• Vancouver Landing at Terminal One: 1,520.</li> <li>• Arnada Park: 2,830.</li> </ul>	<p><b>Permanent Acquisition of Park Land (sq ft)</b></p> <p>Same as the Modified LPA, except:</p> <ul style="list-style-type: none"> <li>• Fort Vancouver National Historic Reserve: 43,540 (0.06-acre increase).</li> <li>• Fort Vancouver National Historic Site: 19,780 (0.03-acre increase).</li> </ul> <p><b>Temporary Disturbance of Park Land (sq ft)</b></p> <p>Same as the Modified LPA, except:</p> <ul style="list-style-type: none"> <li>• Fort Vancouver National Historic Reserve: 89,030 (0.06-acre decrease).</li> <li>• Fort Vancouver National Historic Site: 41,860 (0.03-acre decrease).</li> </ul>



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
<p><b>Historic and Archaeological Resources</b></p>	<ul style="list-style-type: none"> <li>No impact to archaeological resources because there would be no ground disturbance.</li> <li>No impact to cultural and historic resources because there would be no demolition or construction activities.</li> <li>The original 1917 span of the bridge would be retained.</li> </ul>	<p>Conclusions regarding the effects of the Modified LPA on archaeology, cultural, and historic resources are pending.</p>	<p>Pending.</p>
<p><b>Visual Quality and Aesthetics</b></p>	<p>No changes to visual quality or aesthetics.</p>	<ul style="list-style-type: none"> <li>Adds new visual elements such as revised interchanges and on- and off-ramps, bridge structures over North Portland Harbor and the Columbia River, expanded roadways, retaining walls, sound walls, signage, and lighting.</li> <li>Overall, land cover and vegetation would block most views of the Modified LPA, but changes to natural harmony, cultural order, and project coherence may have beneficial impacts to the Columbia Slough, Columbia River, and downtown Vancouver landscape units.</li> <li>The new Columbia River bridge decks would be higher in elevation (116-foot</li> </ul>	<p>Similar visual impacts as the Modified LPA, except that the width of the Columbia River bridges would increase by 16 feet, which would add to the visual mass of the structure and move elements closer to viewers, particularly for viewers in close proximity or under the structures. From far away, the difference would be negligible.</p>



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
		<p>vertical clearance) and greater in visual mass because of the double deck and therefore more visible to some surrounding areas.</p> <ul style="list-style-type: none"> <li>Higher bridge decks and ramps, two-level design, additional transit structures, and other project environment elements would likely cause adverse visual impacts for some viewers in the Greater Central Park landscape unit.</li> </ul>	
<b>Noise and Vibration</b>	<p>As traffic congestion increases over time, noise-sensitive locations near the Interstate Bridge would experience highway noise impacts at one additional location.</p>	<ul style="list-style-type: none"> <li>An increase of 14 locations would experience highway noise that is over the noise abatement criteria or a substantial increase of 10 dBA or more over existing noise levels. With proposed highway noise mitigation, noise levels would be reduced at 60 locations.</li> <li>Transit operations result in moderate noise impacts at three locations and vibration impacts at two locations. Proposed transit mitigation would eliminate the transit noise impacts; however, vibration impacts would remain.</li> <li>Temporary and intermittent construction noise and vibration impacts.</li> </ul>	<p>Similar to the Modified LPA, except:</p> <ul style="list-style-type: none"> <li>Highway noise impacts, before and after mitigation, would be slightly different because traffic lanes would be slightly closer to noise-sensitive land uses.</li> <li>No change to peak-hour traffic volumes, posted speed limit, or vehicle mix.</li> </ul>
<b>Electric and Magnetic Fields (EMF)</b>	<p>No change to EMF levels as a result of the project.</p>	<p>The extension of the light-rail transit system would result in increased demand for electrical power sources. EMF would be generated from</p>	<p>Same as the Modified LPA.</p>





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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
		<p>these sources during operation, and the public would be exposed to EMF along the light-rail tracks, near substations, at station stops, and in the light-rail cars. EMF levels are expected to be below the general public exposure standards.</p>	
<p><b>Water Quality and Hydrology</b></p>	<ul style="list-style-type: none"> <li>Existing impervious surface area (175.6 acres) would remain untreated, which would allow for the continued release of stormwater with a degraded quality into study area receiving waters.</li> <li>No construction-related temporary impacts to water quality, such as the potential for increased erosion and sediment in stormwater runoff.</li> </ul>	<ul style="list-style-type: none"> <li>The Columbia River bridges would reduce the number of piers within the 100-year floodplain for the Columbia River. The expansion of the Ruby Junction Maintenance Facility would include improvements within the 100-year floodplain of Fairview Creek.</li> <li>Impervious surface areas would increase by approximately 36.1 acres (20.6%), which may reduce natural infiltration rates and increase stormwater pollutant loads of various constituents. However, stormwater runoff from all new and existing impervious surfaces that would be replaced would be managed and treated in accordance with current standards before being discharged to receiving waters, having an overall beneficial long-term effect on stormwater generation and treatment.</li> <li>Temporary effects on surface waters and groundwater during construction would be mitigated with best management practices to protect hydrological resources.</li> </ul>	<p>Similar to the Modified LPA, except for a 4.8-acre increase in contributing impervious area (CIA) with the wider I-5 roadway (2.3%). Since all generated stormwater runoff would be treated, the overall effect would be the same.</p>



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
<p><b>Wetland and Jurisdictional Wetlands</b></p>	<ul style="list-style-type: none"> <li>• Untreated stormwater would continue to discharge into wetlands and waters.</li> <li>• There would be no construction-related temporary impacts.</li> </ul>	<ul style="list-style-type: none"> <li>• Approximately 0.58 acres of permanent direct wetland impact and approximately 2.56 acres of temporary wetland impact in Oregon.</li> <li>• Approximately 7.39 acres of permanent wetland buffer impact and approximately 7.11 acres of temporary wetland buffer impact in Oregon.</li> <li>• Approximately 0.06 acres of permanent wetland buffer impact, and approximately 1.19 acres of temporary wetland buffer impact in Washington.</li> <li>• Approximately 0.89 acres of permanent in-water fill would be required to construct the Columbia River and North Portland Harbor bridge foundations, and approximately 1.04 acres of in-water fill removal from removing the existing Interstate Bridge and North Portland Harbor bridge foundations, for a net reduction of approximately 0.15 acres in-water fill.</li> </ul>	<p>Same as the Modified LPA.</p>
<p><b>Ecosystems</b></p>	<ul style="list-style-type: none"> <li>• Stormwater would enter surface water untreated, continuing to impair water quality and aquatic habitat.</li> </ul>	<p><b>Long-Term Impacts</b></p> <ul style="list-style-type: none"> <li>• Approximately 0.89 acres of benthic habitat displacement required to construct the proposed Columbia River and North Portland Harbor bridge foundations and approximately 1.04 acres of benthic habitat would be</li> </ul>	<p><b>Long-Term Impacts</b></p> <ul style="list-style-type: none"> <li>• Similar to the Modified LPA, except for a 4.8-acre increase in CIA (2.3%). Since treatment would be provided for all post-project CIA, including all new and existing and replaced CIA,</li> </ul>



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
	<ul style="list-style-type: none"> <li>Regular, intermittent maintenance activities would have the potential to disturb aquatic and terrestrial species and habitats, and nesting birds.</li> <li>Lack of seismic upgrades could result in the Interstate Bridge failing or collapsing during a catastrophic event such as a major earthquake, affecting fish and wildlife in the immediate vicinity of the bridge and aquatic habitats upstream and downstream.</li> <li>There would be no construction-related temporary impacts.</li> </ul>	<p>restored by removing the existing Interstate Bridge and North Portland Harbor bridge foundations, for a net restoration of approximately 0.15 acres of benthic habitat.</p> <ul style="list-style-type: none"> <li>Net increase of approximately 1.04 acres of shading at the Columbia River water surface from drilled shaft caps for the replacement bridges.</li> <li>Net increase of approximately 6.52 acres of elevated overwater shading from the elevated decks of the replacement bridges.</li> <li>Increase of approximately 36.1 acres of impervious surface area (20.6%). Treatment would be provided for all new, existing, and replaced CIA, most of which is currently untreated. This would result in a substantial net improvement in water quality and to aquatic habitat.</li> <li>Permanent loss of terrestrial habitats and vegetation, including approximately:                         <ul style="list-style-type: none"> <li>0.79 acres of riparian buffer in Washington.</li> <li>0.15 acres of Biodiversity Area in Washington.</li> <li>Less than 0.01 acres of mapped oak woodland in Washington.</li> <li>0.06 acres of wetland buffer in Washington.</li> </ul> </li> </ul>	<p>the net effect to water quality and aquatic habitat would be a substantial net improvement.</p> <p><b>Temporary Impacts</b> Same as the Modified LPA.</p>



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
		<ul style="list-style-type: none"> <li>➢ 0.58 acres of wetland in Oregon.</li> <li>➢ 7.39 acres of wetland buffer in Oregon.</li> <li>➢ 1.12 acres of area designated as "High" value riparian/wildlife habitat, and 6.20 acres of area designated as "Medium" value riparian/wildlife habitat in Oregon.</li> <li>• Removal of human-made structures (the existing bridges) that provide documented or potentially suitable habitat for nesting birds and roosting bats.</li> </ul> <p><b>Temporary Impacts</b> Temporary construction-related impacts would include:</p> <ul style="list-style-type: none"> <li>• Benthic habitat displacement and overwater coverage during construction (from temporary work bridges and platforms, temporary piles, barges, and cofferdams).</li> <li>• Handling and disturbance of fish during in-water work area isolation activities.</li> <li>• Temporarily elevated turbidity, and potential for accidental introduction of pollutants or debris.</li> <li>• Temporarily elevated underwater and terrestrial noise levels.</li> <li>• Overwater lighting.</li> </ul>	



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
		<ul style="list-style-type: none"> <li>• Changes in avian predation pressure on juvenile salmonids.</li> <li>• Temporary impacts to sensitive terrestrial habitats and vegetation, including temporary disturbance of approximately:                             <ul style="list-style-type: none"> <li>➢ 1.15 acres of riparian buffer in Washington.</li> <li>➢ 2.87 acres of Biodiversity Areas in Washington.</li> <li>➢ 0.03 acres of oak woodland in Washington.</li> <li>➢ 1.19 acres of wetland buffer in Washington.</li> <li>➢ 2.56 acres of wetland in Oregon.</li> <li>➢ 7.11 acres of wetland buffer in Oregon.</li> <li>➢ 4.60 acres of area designated as "High" value riparian/wildlife habitat, and 5.70 acres of area designated as "Medium" value riparian/wildlife habitat in Oregon.</li> </ul> </li> </ul>	
<p><b>Geology and Groundwater</b></p>	<ul style="list-style-type: none"> <li>• No structural improvements to address seismic resiliency.</li> <li>• No stormwater treatment for pollutants in roadway runoff could further</li> </ul>	<ul style="list-style-type: none"> <li>• Improved seismic resilience of the new Columbia River bridges and I-5 roadway and structures.</li> <li>• Improved effectiveness of surface water runoff handling and treatment, which could improve groundwater quality.</li> <li>• Potential for increased soil erosion in areas disturbed by construction.</li> </ul>	<p>Same as the Modified LPA.</p>



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
	degrade groundwater quality.		
<b>Hazardous Materials</b>	No impacts to hazardous materials as a result of project-related demolition or construction, including in-water excavation for bridge foundations.	Hazardous materials sites that would be disturbed: <ul style="list-style-type: none"> <li>Forty-two sites ranked Number 4.<sup>2</sup></li> <li>Five sites ranked Number 5.<sup>3</sup></li> </ul>	Same as the Modified LPA, except that the Fort Vancouver Property, a Number 4-ranked hazardous materials site, would require slightly more property acquisition. The site has a No Further Action determination for the possible presence of unexploded ordinance; a remedial investigation found no unexploded ordinance, and it is therefore not expected to impact human health and safety.
<b>Cumulative Effects</b>	When combined with past, present, and reasonably foreseeable future actions, retaining the existing Interstate Bridge would not have a solely beneficial	For the following resources, when combined with past, present, and reasonably foreseeable future actions, the beneficial and adverse cumulative effects would be: <p><b>Beneficial</b></p> <ul style="list-style-type: none"> <li>Air quality</li> </ul>	Same as the Modified LPA, except that there would be differences in the direct effects to specific resources (as identified above), which would alter the extent to which the replacement bridges would contribute to cumulative effects. However, none of the differences would

<sup>2</sup> The Number 4 sites are within the main project footprint and have a known or suspected release of a hazardous substance or petroleum product. However, these sites are inactive, or have received a No Further Action determination for the federal or state agency. In general, releases at these sites typically stemmed from a leaking underground storage tank or spill.

<sup>3</sup> The Number 5 sites are within the main project footprint and have a known or suspected release of a hazardous substance or petroleum product. These sites are in an active phase of investigation; require further investigation, cleanup, or long-term action; or have a Conditional No Further Action restricting use due to residual contamination on site. Therefore, these sites have a higher likelihood of encountering hazardous materials.

sq ft = square feet



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
	<p>cumulative effect on a resource.</p> <p>Retaining the existing Interstate Bridge would contribute to adverse cumulative effects for the following resources:</p> <ul style="list-style-type: none"> <li>• Air quality</li> <li>• Climate</li> <li>• Economics</li> <li>• Ecosystems</li> <li>• Energy and greenhouse gas (GHG) emissions</li> <li>• Geology and groundwater</li> <li>• Hazardous materials</li> <li>• Navigation</li> <li>• Transportation</li> <li>• Water quality and hydrology</li> </ul> <p>Retaining the existing Interstate Bridge would contribute to both adverse and beneficial cumulative effects for the following resources:</p> <ul style="list-style-type: none"> <li>• Noise and vibration</li> </ul>	<ul style="list-style-type: none"> <li>• Climate</li> <li>• Economy</li> <li>• Ecosystem resources</li> <li>• Energy demand and GHG emissions</li> <li>• Geology and groundwater</li> <li>• Hazardous materials</li> <li>• Land use</li> <li>• Navigation</li> <li>• Neighborhoods</li> <li>• Parks and recreation</li> <li>• Public services (and little to no effect on utilities)</li> <li>• Transportation</li> <li>• Water quality and hydrology</li> </ul> <p><b>Adverse</b></p> <ul style="list-style-type: none"> <li>• Acquisitions</li> <li>• EMF exposure (negligible)</li> <li>• Noise and vibration</li> </ul> <p><b>Both Adverse and Beneficial</b></p> <ul style="list-style-type: none"> <li>• Visual and aesthetic resources</li> <li>• Wetlands</li> </ul> <p>Note: Conclusions regarding the cumulative effects of the Modified LPA on archaeology, cultural and historic resources are pending.</p>	<p>change the cumulative effects conclusions.</p>

## 4. EQUITY IMPACTS AND BENEFITS FOR AUXILIARY LANE OPTIONS

For the equity resource area, Table 4-1 summarizes the impacts and benefits of the Modified LPA and the Modified LPA Two Auxiliary Lane Design Option compared to the No-Build Alternative. The Modified LPA Two Auxiliary Lane Design Option is compared to the Modified LPA for simplicity. These impacts are based on conceptual design and are subject to change. For the purposes of this analysis, both the Modified LPA and the Modified LPA Two Auxiliary Lane Design Option assume double-deck fixed-span bridges, the C Street ramps, and a centered I-5 alignment in downtown Vancouver. These impacts are based on conceptual design and are subject to change. The analysis year for all alternatives and design options is 2045.

Table 4-1. Comparison of Equity Impacts and Benefits for Auxiliary Lane Scenarios (2045)

Equity	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
<b>High-Capacity Transit Analysis 1 Findings (Jobs Access Improvements)</b>	Equity priority communities would not benefit from reduced congestion or the extension and improvement of high-capacity transit.	Job access would be improved with the extension of high-capacity transit to downtown Vancouver. The degree of access improvements differs between equity priority communities and their counterparts based on where people in these communities currently live: <ul style="list-style-type: none"> <li>For study area residents, three demographic groups—people with disabilities, persons with lower incomes, and older adults—are estimated to see greater increases than other demographic groups during both the peak and midday hours.</li> </ul>	Similar findings as the Modified LPA, with a slightly greater increase in jobs access for all demographic groups.





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Equity	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
		<ul style="list-style-type: none"> <li>Black, Indigenous, and People of Color (BIPOC) communities, those with limited English proficiency, immigrants and refugees, and young people are estimated to see less of an increase in access compared to their demographic counterparts. Addressing this disparity will require a joint effort between the IBR program, transit providers, local jurisdictions, and community partners.</li> </ul>	
<p><b>High-Capacity Transit Analysis 2 Findings (Station Area Demographics)</b></p>	<p>No extension and improvements to high-capacity transit or improved active transportation accessibility. Equity priority communities would not benefit from these improvements.</p>	<p>Increased access to high-capacity transit and the broader transit system. Based on where members of equity priority communities currently live, station area demographics compare to the larger study area:</p> <ul style="list-style-type: none"> <li><b>BIPOC population</b> percentages are similar between the metropolitan area, study area, and residents within the station area walksheds (31%, 30%, and 28%, respectively).</li> </ul>	<p>Same findings as the Modified LPA; this design option would not affect station area walksheds.</p>



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Equity	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
		<ul style="list-style-type: none"> <li>• <b>People with disabilities</b> comprise a high proportion of the study area population compared to the metropolitan area (16% vs. 12%, respectively), and station area walksheds have particularly high concentrations of people with disabilities (an estimated 22% of the population across all stations).</li> <li>• <b>Limited English proficiency population</b> percentages are relatively low across all station areas (except for the Expo Center station area) compared to the study area.</li> <li>• <b>Low-income residents</b> comprise a high percentage of station walksheds on the Washington side of the Columbia River—higher than the study area and the Portland-Vancouver metropolitan area.</li> <li>• <b>Immigrants and refugees</b> (identified as “foreign born populations” in the</li> </ul>	



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Equity	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
		<p>American Community Survey) comprise an estimated 6% of the population in station area walksheds compared to 9% of the study area. Both are lower than the 13% average across the metropolitan area.</p> <ul style="list-style-type: none"> <li>• <b>Age.</b> The station area walksheds have relatively high percentages of older adults and low percentages of young people compared to both the study area and the metropolitan area.</li> </ul> <p>In station areas where equity priority communities have lower representation as compared to the study area or metropolitan area, the IBR program could work with partners to improve access.</p>	
<p><b>Active Transportation Analysis Findings</b></p>	<p>Equity priority communities would not benefit from improved active transportation accessibility. Existing conditions force community members to walk and bike on substandard facilities (which carries safety risks) and/or depend largely</p>	<p>Active transportation components of the Modified LPA are consistent with community and Equity Advisory Group feedback: they are high quality and ubiquitous in the study area, improving transportation options for those relying on modes</p>	<p>Same findings as the Modified LPA.</p>



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Equity	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
	on driving (which carries significantly greater cost burdens).	besides driving. The improvements strongly support the equity objective to improve mobility for communities with transportation barriers.	
<b>Driving Access Analysis Findings</b>	Equity priority communities would not benefit from reduced congestion.	<ul style="list-style-type: none"> <li>Estimated access improvements are similar between study area residents from equity priority communities and their demographic counterparts (approximately 20% more jobs accessible within a 45-minute midday drive).</li> <li>Estimated access improvements are similar when comparing equity priority communities and other demographic groups at the regional level (approximately 4% more jobs accessible within a 45-minute midday drive).</li> </ul>	Similar findings as the Modified LPA, with a slightly greater increase in jobs access for all demographic groups due to faster driving times within the corridor resulting from less congestion.
<b>Short- and Long-Term Impacts</b>	Equity priority communities would not benefit from reduced congestion, the extension and improvement of high-capacity transit, or improved active transportation accessibility. Property and construction-related impacts would be avoided.	Each subarea analyzed (Oregon Mainland, Hayden Island, Downtown Vancouver, Upper Vancouver, and Ruby Junction) has above-average concentrations of more than one equity priority community. See the following technical reports for details on impacts:	Same findings as the Modified LPA.



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Equity	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
		<ul style="list-style-type: none"><li>• Acquisitions</li><li>• Air Quality</li><li>• EJ</li><li>• Neighborhoods and Populations</li></ul>	

1

1 **5. AIR QUALITY, ENERGY, AND CLIMATE IMPACTS AND BENEFITS FOR**  
 2 **AUXILIARY LANE OPTIONS**

3 For the air quality, energy, and climate resource areas, Table 5-1 summarizes the impacts and benefits of the Modified LPA and the Modified  
 4 LPA Two Auxiliary Lane Design Option compared to the No-Build Alternative. The Modified LPA Two Auxiliary Lane Design Option is compared  
 5 to the Modified LPA for simplicity. These impacts are based on conceptual design and are subject to change. For the purposes of this analysis,  
 6 both the Modified LPA and the Modified LPA Two Auxiliary Lane Design Option assume double-deck fixed-span bridges, the C Street ramps,  
 7 and a centered I-5 alignment in downtown Vancouver. These impacts are based on conceptual design and are subject to change. The analysis  
 8 year for all alternatives and design options is 2045.

9 Table 5-1. Comparison of Air Quality, Energy, and Climate Impacts and Benefits for Auxiliary Lane Scenarios (2045)

Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
<b>Air Quality</b>	<ul style="list-style-type: none"> <li>• The frequency and duration of bridge lifts is expected to be similar to existing conditions, resulting in similar levels of air quality pollutants due to vehicular idling during bridge openings.</li> <li>• No additional air pollutant emissions related to construction activities (e.g., from the manufacture and transport of construction materials and fuel use during construction activities).</li> </ul>	<ul style="list-style-type: none"> <li>• Reduction in air quality pollutants due to the elimination of bridge openings, which reduces the amount of vehicular idling.</li> <li>• Lower air pollutant emissions during operations associated with improved traffic flow and reduced vehicle miles traveled (VMT). Emission reductions vary by pollutant, ranging from a decrease of 1% to 17% as compared to the No-Build Alternative (see Table 5-2).</li> <li>• Construction would result in air pollutant emissions; these were not quantified with the analysis.</li> </ul>	Same as the Modified LPA.



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Resource Area	No-Build Alternative	Modified LPA	Modified LPA Two Auxiliary Lane Design Option
<b>Energy and Greenhouse Gas (GHG)</b>	No additional energy consumption or GHG emissions related to construction activities (e.g., GHGs from the manufacture and transport of construction materials and fuel use during construction activities).	<ul style="list-style-type: none"> <li>• Lower total energy consumption and GHG emissions from traffic operations, associated with improved traffic flow and reduced VMT. Regional energy consumption and GHG emissions would decrease by just over 1% using data from the regional travel demand model and just over 3% using traffic data with refined assumptions for vehicle speeds.</li> <li>• Construction would result in unavoidable GHG emissions and energy consumption of approximately 355,741 MT CO<sub>2</sub>e and 2,595,850 mmBtu.</li> </ul>	Same as the Modified LPA. Differences in total energy consumption and GHG emissions as compared to the Modified LPA are not statistically significant (see Table 5-3 and Table 5-4).
<b>Climate</b>	No additional GHG emissions related to construction activities (e.g., GHGs from the manufacture and transport of construction materials).	<ul style="list-style-type: none"> <li>• Lower GHG emissions from traffic operations associated with improved traffic flow and reduced VMT. Regional GHG emissions would decrease by just over 1% using data from the regional travel demand model and just over 3% using traffic data with refined assumptions for vehicle speeds.</li> <li>• Construction would result in unavoidable GHG emissions of approximately 355,741 MT CO<sub>2</sub>e.</li> </ul>	Same as the Modified LPA. Differences in GHG emissions as compared to the Modified LPA are not statistically significant (see Table 5-3 and Table 5-4).

- 1 CO<sub>2</sub>e = carbon dioxide equivalent; mmBtu = million British thermal units; MT = metric tons
- 2 Analysis of the long-term effects of the Modified LPA Two Auxiliary Lane Design Option using the regional travel demand model shows no
- 3 statistical difference in GHG emissions compared to the Modified LPA, as shown in Table 5-3.

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An additional analysis using operational model outputs for changes in speed and congestion on the I-5 corridor between No-Build, the Modified LPA, and the Modified LPA Two Auxiliary Lane Design Option show that reductions in GHG could be over 3% in the study area, as shown in

- 1 Table 5-4. This additional analysis was used to better characterize congestion improvements on the I-5 corridor.
- 2 Table 5-2. IBR Emissions Analysis (tons per day)

Pollutant	Existing (2015)	No-Build (2045)	MLPA (2045)	MLPA – 2 Auxiliary Lane Option (2045)	MLPA Difference from No-Build	MLPA – 2AUX Difference from No-Build
Daily Vehicle Miles Traveled	2,762,725	3,775,944	3,679,627	3,694,221	-2.6%	-2.2%
1,3-Butadiene	0.94	0.00	0.00	0.00	0.0%	0.0%
Acetaldehyde	3.25	0.49	0.42	0.42	-13.0%	-13.6%
Acrolein	0.32	0.03	0.03	0.03	-11.0%	-11.3%
Benzene	15.88	4.39	4.33	4.33	-1.4%	-1.3%
Diesel Particulate Matter	16.10	1.79	1.57	1.56	-12.7%	-13.3%
Ethylbenzene	19.95	13.55	13.47	13.47	-0.6%	-0.6%
Formaldehyde	4.99	0.57	0.51	0.50	-11.5%	-11.9%
Naphthalene	4.47E-04	6.36E-05	6.11E-05	6.13E-05	-4.0%	-3.7%
Polycyclic Organic Matter	0.27	0.01	0.01	0.01	-28.6%	-28.6%





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Pollutant	Existing (2015)	No-Build (2045)	MLPA (2045)	MLPA – 2 Auxiliary Lane Option (2045)	MLPA Difference from No-Build	MLPA – 2AUX Difference from No-Build
CO	5,676.9	1,822.3	1,725.6	1,731.5	-5.3%	-5.0%
NOX	1,213.3	269.4	225.7	223.4	-16.2%	-17.1%
SO2	3.2	3.0	2.8	2.8	-5.7%	-5.5%
VOC	714.3	835.4	830.4	830.4	-0.6%	-0.6%
Total PM <sub>10</sub>	63.8	74.4	63.2	62.7	-15.1%	-15.7%
Total PM <sub>2.5</sub>	26.2	12.5	10.8	10.7	-13.6%	-13.8%



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1 Table 5-3. Comparison of Energy Consumption and CO<sub>2</sub>e Emissions Based on Regional Travel Demand Model

Pollutant	Existing (2015)	No-Build (2045)	Modified LPA (2045)	Modified LPA – 2 Auxiliary Lane Option (2045)	MLPA Difference from No Build	MLPA – 2 AUX Difference from No Build	2 AUX Difference from MLPA
Daily Vehicle Miles Traveled	11,267,296	14,278,275	14,199,184	14,207,389	-0.55%	-0.50%	0.06%
Total Energy Consumption (mmBtu/day)	76,557	67,170	66,403	66,384	-1.14%	-1.17%	-0.03%
Total CO <sub>2</sub> e Emissions (MT CO <sub>2</sub> e/day)	7,447	4,723	4,676	4,673	-1.01%	-1.06%	-0.05%

CO<sub>2</sub>e = carbon dioxide equivalent; mmBtu = million British thermal units; MT = metric tons

Note: Values in this table represent emissions and energy consumption within the traffic assignment area. CO<sub>2</sub>e emissions are calculated assuming an electric vehicle adoption rate, consistent with Oregon and Washington state goals.

2 Table 5-4. Comparison of Energy Consumption and CO<sub>2</sub>e Emissions Based on Refined Travel Modeling Data

Pollutant	Existing (2015)	No-Build (2045)	Modified LPA (2045)	Modified LPA – 2 Auxiliary Lane Option (2045)	MLPA Difference from No Build	MLPA – 2 AUX Difference from No Build	2 AUX Difference from MLPA
Daily Vehicle Miles Traveled	11,267,296	14,278,275	14,199,184	14,207,389	-0.55%	-0.50%	0.06%
Total Energy Consumption (mmBtu/day)	76,557	68,944	67,047	66,756	-2.75%	-3.17%	-0.43%
Total CO <sub>2</sub> e Emissions (MT CO <sub>2</sub> e/day)	7,447	4,098	3,974	3,954	-3.02%	-3.50%	-0.50%

Note: Values in this table represent emissions and energy consumption within the traffic assignment area. CO<sub>2</sub>e emissions are calculated assuming an electric vehicle adoption rate, consistent with Oregon and Washington state goals.