3.2 Aviation and Navigation

Two important goals of the IBR Program are to meet the reasonable needs of navigation on the Columbia River and avoid or minimize hazards to aircraft navigation at nearby airports and associated airspaces. This section discusses existing river and aircraft navigation conditions within the study area and evaluates the associated beneficial and adverse effects of the Modified LPA and the No-Build Alternative.

The Columbia River and North Portland Harbor are designated as federal navigable waterways. This designation signifies that all construction or alteration of bridges crossing these waterways must first receive approval from the U.S. Coast Guard (USCG), pursuant to Section 9 of the Rivers and Harbors Act of 1899. Additionally, a Memorandum of Agreement (MOA) between USCG and FHWA and a Memorandum of Understanding (MOU) among the USCG, FHWA, FTA, and Federal Railroad Administration (FRA) state that environmental documentation must include a discussion of potential project impacts to navigation and a summary of ongoing coordination with USCG.

There are two airports near the study area: Pearson Field in Washington and Portland International Airport (PDX) in Oregon. Each of these airports has federally protected airspace regulated by the Federal Aviation Administration (FAA). Long-term effects to aviation were evaluated using federal aviation regulations, which are FAA rules that govern all U.S. aviation activities. Federal aviation regulations relevant to the IBR Program include regulating air navigation systems, lights or glare that may affect visibility, and management of wildlife hazards that may increase the probability of aircraft strikes.

The information presented in this section is based on analyses found in the Aviation Technical Report and Navigation Impact Report.

3.2.1 Changes or New Information Since 2013

The Columbia River Crossing (CRC) Final EIS and Record of Decision were completed in 2011, and design refinements were addressed in subsequent NEPA re-evaluations in 2012 and 2013. Since then, the following changes and new information have affected the potential impacts to aviation and navigation:

- Changes to aviation conditions and needs.
- Changes to federal, state, and local aviation regulations.
- Changes to existing and prospective navigation in both the main channel of the Columbia River and North Portland Harbor.
- Changes to USCG policy with 2016 updates to the USCG Bridge Permit Application Guide.
- 2014 MOU among the USCG, FHWA, FTA, and FRA to coordinate and improve bridge planning and permitting.
- 2014 MOA between USCG and FHWA to coordinate and improve bridge planning and permitting.
- Changes to design of the CRC project's LPA to develop a Modified LPA, including three bridge configuration options with varying heights with respect to proximity to protected airspace and vertical navigation clearance.

The replacement bridges over the Columbia River and North Portland Harbor are the main Program component relevant to aviation and navigation considerations. The CRC LPA and IBR Modified LPA would both include a pair of double-deck fixed-span replacement bridges with 116 feet of vertical navigation clearance, 400 feet of horizontal navigation clearance (a 300-foot channel plus 50 feet on either side for channel maintenance), and 193 feet maximum height of the bridge with signage and luminaires. The Modified LPA also includes two additional bridge configuration design options: a pair of single-level fixed-span bridges

and a pair of single-level movable-span bridges. Consideration of the three bridge configurations involves coordination with the U.S. Army Corps of Engineers (USACE) and USCG regarding multiple navigation-related items; see Section 2.6 for a discussion of current and future actions necessary to reach resolution on an acceptable bridge configuration for the IBR Program.

Table 3.2-1 compares the impacts and benefits between the CRC LPA identified in the Final EIS (2011) and the IBR Modified LPA from the changes listed above. Based on this analysis, the Modified LPA would have the same or similar effects as the CRC LPA on aviation and navigation with the exception of an additional bridge configuration design option. A detailed description of impacts and benefits to aviation and navigation from the Modified LPA and associated design options follows.

Table 3.2-1. Comparison of Effects

Technical Considerations	CRC LPA Effects as Identified in the 2011 Final EIS	Modified LPA Effects as Identified in the Draft SEIS	Explanation of Differences
Aviation Safety	Less intrusion into Pearson Field protected airspace compared to the existing Interstate Bridge Reduced potential for bird nesting or roosting	Same as CRC for all bridge configuration design options	N/A
River Navigation Clearance	Reduced vertical clearance in the primary navigation channel (from 178 feet (during a bridge lift) to 116 feet). Increased horizontal clearance in the primary navigation channel (from 263 feet to 400 feet [a 300-foot channel plus 50 feet on either side for channel maintenance])	Vertical and horizontal clearances are the same as CRC for the double-deck fixed-span bridges and single-level fixed-span bridges configurations Same horizontal clearance with an increased vertical navigation clearance to 178 feet with the single-level movable-span bridges configuration	A movable-span bridge configuration design option was added to the Modified LPA to meet the USCG Preliminary Navigation Clearance Determination (2022).
Federally Authorized Navigation Channel Location	Proposed changes to the location of the primary navigation and barge channels	Same as CRC	N/A

Note: The CRC LPA and Modified LPA effects are as compared to a No-Build Alternative, unless otherwise noted.
CRC = Columbia River Crossing; LPA = Locally Preferred Alternative; N/A = not applicable; SEIS = Supplemental Environmental Impact Statement; USCG = U.S. Coast Guard

3.2.2 Existing Conditions

River Navigation

I-5 crosses the Columbia River via the existing Interstate Bridge and the North Portland Harbor bridge. Within the vicinity of the Interstate Bridge, there are four federally authorized navigation projects on the Columbia River: three federally authorized navigation channels that pass beneath the Interstate Bridge (the primary navigation channel, barge channel, and alternate barge channel) and the federally authorized Vancouver Upper Turning Basin located immediately downstream of the Interstate Bridge. This turning basin has

historically provided a turning location for deep-draft ships navigating up to, but not beyond, the Interstate Bridge. There is no federally authorized navigation channel within North Portland Harbor in the vicinity of the Interstate Bridge. Table 3.2-2 summarizes the widths and depths of the federally authorized navigation projects within the study area.

Table 3.2-2. Widths and Depths of Federally Authorized Navigation Projects in the Study Area

Federally Authorized Navigation Channel	Authorized Width (feet)	Existing Horizontal Clearance (feet)	Authorized Depth (feet)	Maintained Depth (feet)	Current Waterway Depth (feet)
Primary Columbia River Navigation Channel (Vancouver to The Dalles)	300	263	27	17	30
Barge Channel	300	511	15	15	~21 to 25
Alternate Barge Channel	200	260	17	15	~21 to 25
Vancouver Upper Turning Basin	800	N/A[a]	35	35	~20 to 30

Source: IBR Navigation Impact Report 2022

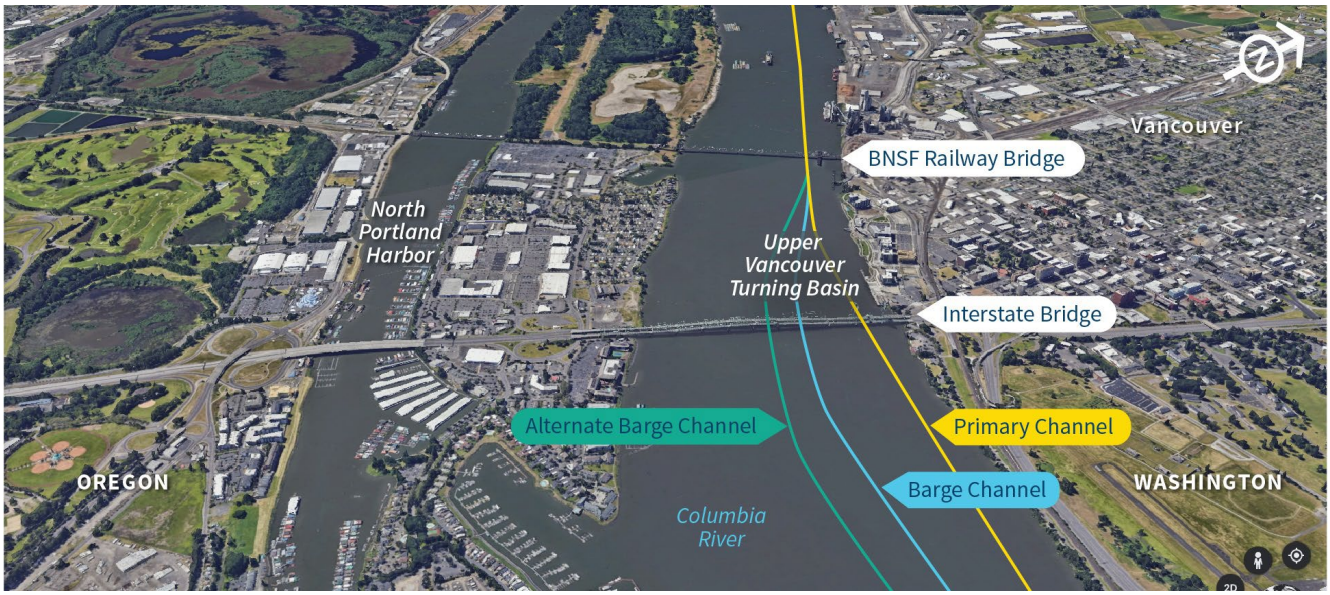
a The federal authorization for the Vancouver Upper Turning Basin includes dimensions of 2,000 feet long and 800 feet wide. Horizontal clearance as referenced for the other federally authorized projects in this table relates to distance between bridge piers for ships navigating beneath the bridge and therefore does not apply to the turning basin.

Vessels that currently operate near and/or navigate beneath the Interstate Bridge include tugs and barges, recreational sailboats and powerboats, marine contractor barges with construction cranes and materials, cruise and passenger boats, dredges, government vessels, vessels transporting manufactured and fabricated goods, and others. More than 232,000 boat use days[1] occurred in 2017 in the Columbia River from the Interstate Bridge to the Bonneville Dam (approximately 39.5 river miles upstream).

Columbia River navigation is limited by horizontal and vertical clearances associated with the Interstate Bridge and North Portland Harbor bridge, the BNSF Railway Bridge that crosses the Columbia River to the west (downstream) of the Interstate Bridge, and a second BNSF Railway Bridge that crosses North Portland Harbor (see Figure 3.2-1). The alignments of the navigation channels factor into vessel passage of both the Interstate Bridge and the BNSF Railway Bridge. Figure 3.2-1 illustrates these alignments with different magnitudes of curvature between the two bridges. A variety of navigation factors, such as downstream or upstream transit, vessel/cargo load, vessel size and draft, weather conditions, water flow velocities, wind/wave conditions, and more are all important considerations for vessel maneuverability and safety.

[1] Boat use days are calculated by multiplying the number of boats that use the river by the number of days of use. Therefore, one boat using the river 200 days would equal 200 boat use days, as would 200 boats each using the river for one day.

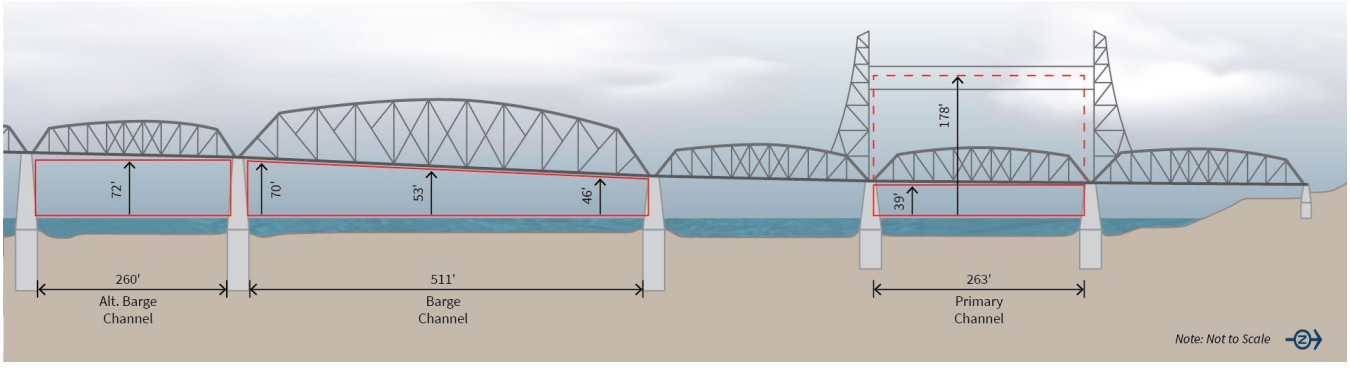
Figure 3.2-1. Existing Navigation Channels Under the Interstate Bridge and BNSF Railway Bridge



Due to the proximity of the Interstate Bridge and the BNSF Railway Bridge, vessel operators typically plan their route in consideration of navigation factors associated with both bridges. Vertical navigation clearance and vessel cargo play a role in route options because USCG regulations specify that movable-span bridge openings are only allowed for vessels that are otherwise unable to pass under the bridge via alternate channels. For example, vessels that need less than 33 feet vertical navigation clearance (including adjustments for weather, water level, and other conditions) to pass the BNSF Railway Bridge may take a route outside the primary navigation channel. Vessels needing additional vertical navigation clearance require the BNSF Railway Bridge swing span to be opened and must use the primary navigation channel. This route is near the Washington shore (shown in Figure 3.2-1).

Figure 3.2-2 shows that when the Interstate Bridge lift spans in the closed position, the vertical clearance within the primary navigation channel is 39 feet (as measured above 0 Columbia River Datum [CRD]). When the lift spans are raised, the maximum vertical clearance is 178 feet. The barge channel lies under the wide span of the bridge and has a horizontal clearance of 511 feet and a vertical clearance ranging from 46 to 70 feet; however, vessels tend to use the southern half of this channel where the vertical clearance is the highest. The alternate barge channel has a horizontal clearance of 260 feet and a vertical clearance of 72 feet. Water levels dictate the available clearance at a specific time. Water levels vary seasonally based on flows and daily based on tidal influence. The average daily high is approximately 10 feet CRD and typically occurs in late spring. The average daily low is approximately 2 feet CRD and typically occurs in early fall.

Figure 3.2-2. Existing Interstate Bridge Navigation Clearances



Note: all vertical navigation clearances shown are measured in feet above 0 CRD.

For passage through the Interstate Bridge, vessels requiring more than 72 feet vertical navigation clearance must use the primary navigation channel with the opened lift spans; vessels that can pass with less than 72 feet of vertical navigation clearance can use any of the three channels depending on vessel size and pilot choice. Interstate Bridge lift openings are currently restricted to avoid weekday peak highway traffic operations between 6:30 a.m. and 9:00 a.m. and between 2:30 a.m. and 6:00 p.m., excluding emergency bridge lifts. Thus, vessels that require a bridge lift must schedule their passage time outside these restricted time periods.

With the exception of some specialized vessels that use the Columbia River infrequently, most vessels require vertical clearances of less than 90 feet (see Table 3.2-3). As detailed in the IBR Program Navigation Impact Report issued in May of 2022, required openings of the Interstate Bridge declined by 45% from an average of 289 per year between 1997 and 2011 to 157 per year between 2012 and 2020. From 2012 to 2020, 58% of the bridge openings were for tugs, 17% for sailboats, and the remainder for other vessel types. These openings of the Interstate Bridge represent 5% to 7% of total river traffic based on openings of the downstream BNSF Railway Bridge and use of the locks at the upstream Bonneville Dam.

Table 3.2-3. Summary of Vertical Clearance Requirements and Frequency of Use

Vessel Type	Approximate Vertical Clearance Requirement	Approximate Annual Frequency
Tugs, Tows, and Barges	48 feet to 80 feet	> 500 trips
Sailboats/Recreation	63 feet to 90 feet	> 75 trips
Marine Contractors	40 feet to >175 feet	Varies
Dredges (U.S. Army Corps of Engineers dredge *Yaquina)*	102 feet	24
Marine Industrial	54 to >175 feet	Varies
Cruise/Passenger	50 feet to 80 feet	> 500 trips

Source: IBR Navigation Impact Report 2022
Note: Vertical clearance requirements are based on vessel air draft (distance from water surface to highest point on a vessel) plus a 10-foot additional air gap (extra height allowance beyond the upper limit of air draft to allow a safety factor for vessel movements due to wind and waves). For marine contractors and marine industrial vessels, required clearance can vary based on the height of the cargo and/or construction equipment contained on the vessel.

For the Interstate Bridge, USCG has stated future navigation conditions clearance should not be less than existing conditions. In a June 17, 2022, Preliminary Navigation Clearance Determination, USCG stated that "any proposed new bridge would need to meet or exceed the existing vertical navigation clearance (VNC) of the current I-5 twin bridges, 178 feet, and would preferably have unlimited VNC over the USACE-approved main navigation channel/project. Any side channels would require vertical clearances equal to or greater than 72 feet." Additionally, the Preliminary Navigation Clearance Determination states that any proposed bridge would have a horizontal navigation clearance requirement greater than or equal to that of the current or future permitted USACE federal navigation channel projects, and notes USACE may have additional requirements.

The federal navigation channels have various authorized widths. The authorized width of the Vancouver to The Dalles channel (i.e., the primary Columbia River navigation channel) is 300 feet. The authorized widths of the two side channels are 300 feet and 200 feet, respectively. The existing 263-foot horizontal clearance for the primary navigation channel beneath the Interstate Bridge, which is a function of bridge pier locations within the Columbia River, is less than the USACE-authorized channel width of 300 feet. This substandard horizontal

clearance exists because the original Interstate Bridge (current northbound span) was constructed prior to federal authorization of the primary navigation channel.

On the south side of Hayden Island, North Portland Harbor supports marinas of floating homes and primarily noncommercial boats. North Portland Harbor does not include a designated navigation channel. It is largely traveled by recreational boaters and those accessing the water-oriented uses along the harbor. The horizontal navigational clearance beneath the existing I-5 North Portland Harbor Bridge is approximately 215 feet and a vertical clearance is approximately 35 feet. Farther west (downstream), large ocean-going cargo ships use North Portland Harbor to reach Port of Portland Terminal 6. However, they cannot travel farther upstream due to the depth of the waterway.

Existing Aviation Safety

Two airports are located near the study area: Pearson Field and PDX. The PDX is located about 3 miles southeast of the Interstate Bridge on the Oregon side of the Columbia River. It is the major regional airport and serves large commercial passenger and freight service, private aircraft, and the Oregon Air National Guard. Potential future expansions include runway extensions and the addition of a new runway; however, the most recent Airport Master Plan update determined that these facilities would not be required through the 2035 planning horizon (Portland Bureau of Planning and Port of Portland 2008).

Pearson Field, on the Washington side of the Columbia River, serves primarily small piston-engine aircraft weighing 10,000 pounds or less. Because it is surrounded by developed urban uses and the Vancouver National Historic Reserve, there are no plans to expand facilities or operations at this airfield.

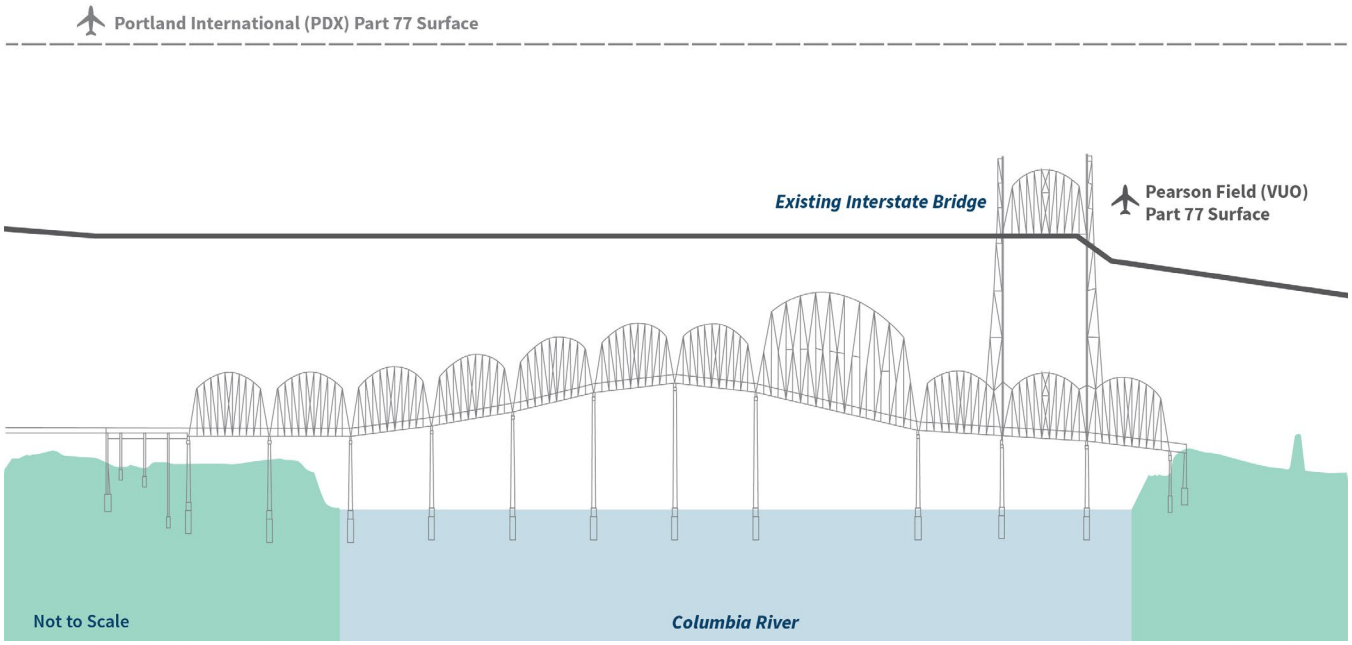
The existing Interstate Bridge and Pearson Field both predate federal aviation regulations. Currently, the Interstate Bridge lift-span towers intrude 98 vertical feet into protected airspace for Pearson Field (see Figure 3.2-3). To mitigate these conditions, the existing lift-span towers are marked with lights and the FAA issues special flight procedures for pilots using Pearson Field to avoid the towers.

Approach and departure surfaces represent imaginary lines extending upward and outward from the center of the runway that define the area for evaluation of potential obstructions to safe takeoffs and landings.

In addition to affecting Pearson Field's protected airspace, the existing Interstate Bridge's open-truss framing unintentionally provides bird roosting and nesting areas, which in turn can contribute to potential wildlife strike hazards for aircraft. Wildlife strikes can cause damage to aircraft and potential loss of life; thus, birds and their habitat are an important concern at Pearson Field. To date, ODOT has used deterrents such as sound cannons to discourage birds from using the existing bridges.

Protected airspace for PDX in the vicinity of the Interstate Bridge lift-span towers is approximately 130 feet above the top of the lift-span towers. As a result, the existing Interstate Bridge creates no intrusion or hazard for aircraft navigation at PDX.

Figure 3.2-3. Pearson Field and Portland International Airport Aviation Constraints



3.2.3 Long-Term Effects

No-Build Alternative

Navigation Effects

With the No-Build Alternative, navigation conditions would not change. Vessels requiring more than 72 feet of VNC would need to schedule passage through the Interstate Bridge around existing restrictions on lift-span operation. The primary navigation channel would remain in its current location and vessels would continue to use the same channels available today. Without the seismic upgrades to the Interstate Bridge, a major earthquake could collapse or seriously damage one or both bridges, temporarily restricting or preventing navigation.

Aviation Effects

Under the No-Build Alternative, the Interstate Bridge lift-span towers would continue to intrude on Pearson Field's protected airspace. Existing operating procedures for departures and arrivals would remain. The open-truss structure of the existing bridge would continue to provide bird roosting and nesting habitat, functioning as a potential source of aircraft wildlife strike hazards. Because the Interstate Bridge lift-span towers have historically been an aviation hazard, and aircraft wildlife strike hazards from birds using the structure are documented and subject to mitigation measures, hazards to aviation would remain.

Modified LPA

Table 3.2-4 compares the long-term effects of the Modified LPA to the No-Build Alternative. Under the Modified LPA, several changes would occur to navigation.

Table 3.2-4. Comparison of Long-Term Effects to Aviation and Navigation

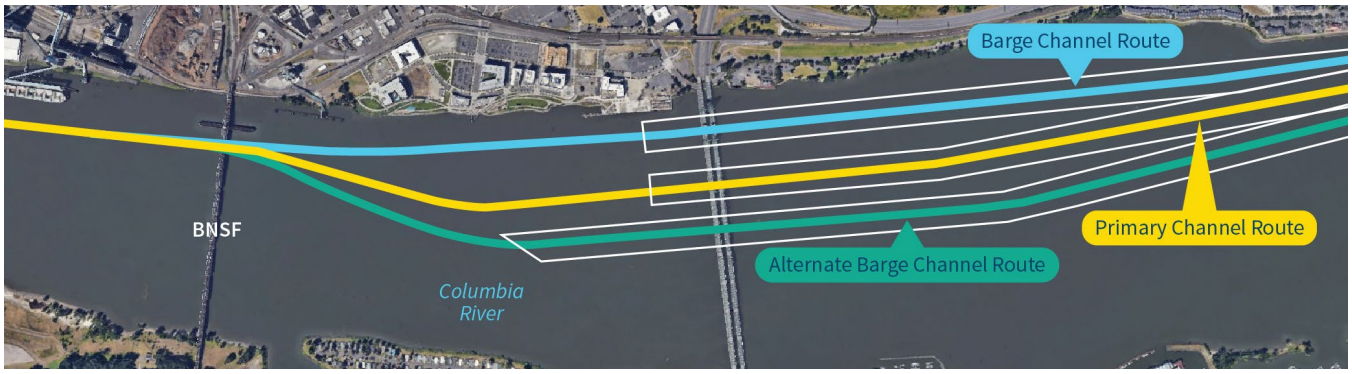
Environmental Metric	No-Build Long-Term Effects	Modified LPA Long-Term Effects
River Navigation	Primary navigation and barge channels remain in current locations.	Proposed changes in the location of the primary navigation and barge channels. Existing bridge foundation elements would be removed to a depth determined by the USACE to not pose a hazard to current or future dredging operations.
	Continued risks of impacts to navigation from potential earthquake events including the potential for the bridge failing and blocking or obstructing the navigation channels.	Improved through increased seismic resiliency in event of potential earthquake by reduction in the risk of bridge failure or collapse and blocking or obstructing the navigation channels.
Aviation Safety	Existing lift-span towers would continue to intrude into Pearson Field restricted airspace and require operating procedures that direct pilots away from the lift towers.	Less intrusion into Pearson Field protected airspace (includes lower-profile signs and lighting on the new Columbia River bridges).
	Existing open-truss framing continues to provide bird roosting and nesting areas, existing ODOT deterrence measures continue; aircraft wildlife strike risk continues at existing level.	Design bridge features to reduce potential for bird nesting and roosting combined with continued deterrence measures would reduce potential for aircraft wildlife strikes from existing level.

Note: The impacts for the Modified LPA are relative to No-Build Alternative.
ODOT; Oregon Department of Transportation; USACE = U.S. Army Corps of Engineers

Navigation Effects

For all bridge design options under consideration for the Modified LPA, the routes that vessels would be required to take to pass through both the new Columbia River bridges and BNSF Railway Bridge would change due to the proposed relocations of the primary navigation channel and barge channel (see Figure 3.2-4). All bridge configuration design options would modify the federally authorized navigation channels, switching the relative positions of the primary channel and the barge channel from those shown in Figure 3.2-1. The barge channel would be located closest to the Washington shore, while the primary channel would be located one bridge span south at the bridge's highest point of vertical clearance. The alternate barge channel would continue to be in approximately the same location.

Figure 3.2-4. Proposed Columbia River Navigation Channels under the Modified LPA



The navigation clearance would change for all channels:

- The barge channel dimensions would be 100 feet VNC (fixed-span configurations) or 89 feet VNC (movable-span configuration) with 400 feet horizontal navigation clearance (HNC). Most vessels and cargo would be able to pass under the new Columbia River bridges using this northern barge channel. Many mariners have indicated this is the preferred channel to use when navigation conditions are challenging for downbound vessels laden with cargo because this channel requires the least amount of maneuvering to pass through the BNSF Railway Bridge swing-span opening. This channel would improve navigation for most users compared to the existing Interstate Bridge, except for vessels or cargo loads that require greater than 100 feet of clearance with the fixed-span bridge configurations or 89 feet with the movable-span bridge configuration.
- The primary channel (center) dimensions would be 116 feet VNC (fixed-span configurations) or, for the movable-span bridge configuration, 89 feet VNC (closed position) to 178 feet VNC (open position) with 400 feet HNC. Vessels that require more than 100 feet VNC (fixed-span configurations) or 89 feet VNC (movable-span configuration) would use this channel.
- The alternate barge channel dimensions would be 110 feet VNC (fixed-span configurations) or 83 feet VNC (movable-span configuration) with 400 feet HNC.

Note to Reviewers: If available prior to publication of the Draft SEIS, the navigation impacts analysis will be supplemented when findings from ship and tug/tow simulations are completed in fall 2023. In addition, the naming convention for changes in the primary navigation channel and barge channel under the Modified LPA may change prior to publication of the Draft SEIS. Further coordination with USCG and USACE on these topics will continue.

The Modified LPA with the single-level movable-span bridge configuration would continue to provide 178 feet VNC. This configuration would meet the Preliminary Navigation Clearance Determination issued by the USCG in June 2022. Movable-span operations, and therefore river navigation, would potentially need to be restricted to weekday nighttime openings to minimize impacts to highway traffic and light-rail transit operations. This could be more restrictive than the No-Build Alternative because bridge openings are currently only restricted to peak commute hours Monday through Friday.

The Modified LPA with either the double-deck or single-level fixed-span bridge configurations would reduce the maximum VNC from 178 feet to 116 feet, requiring adjustments to some vessels or business operations. Under these bridge configuration design options, the VNC of the primary channel would be a maximum of 116 feet. The fixed VNC of 116 feet could adversely affect the operators of vessels that require a greater vertical clearance. The IBR Program collected information on vessels traveling this section of the Columbia River to assess the existing clearance needs; the results were discussed and verified with vessel operators and the USCG. Information on vessels that would be restricted by a 116-foot bridge under the Modified LPA is summarized in Table 3.2-5 below.

As Table 3.2-5 shows, only a small number of vessels or freight shipments may have vertical clearance requirements greater than the clearance that would be provided by the Modified LPA with either fixed-span configuration. With the proposed fixed VNC of 116 feet, a total of five vessels/users currently operating on the Columbia River (three marine contractor vessels and two fabricated materials barges) would be unable to navigate beneath the bridge. Eight vessels/users would be restricted when the river level is at the ordinary high water level of 16 feet above CRD, which is only 1% of days in a typical year.

Table 3.2-5. Vessels Restricted by a 116-foot Bridge under the Modified LPA Fixed-Span Bridge Configurations [a]

Vessel	Owner	Vessel Type	Air Draft (feet)	Required Clearance (feet) [b]	Approximate Trip Frequency
N/A (fabricator's tallest future shipment)	Greenberry Industrial	Barge with fabricated materials	136	146	Any time of the year.
N/A (fabricator's tallest future shipment)	Vigor	Barge with fabricated materials	130	140	Any time of the year.
N/A (fabricator's tallest reported shipment)	Thompson Metal Fab	Barge with fabricated materials	165	175	Any time of the year.
DB Taylor	JT Marine	Marine contractor vessel	131	141	Up to 10 trips per month at all times of the year.
DB Freedom	Diversified Marine	Marine contractor vessel	119	129	10 trips per year.
DB 4100	Advanced American Construction	Marine contractor vessel	92	102	One to two times per month, all months of the year.
DB General	General Construction	Marine contractor vessel	93	103	Varies; can be any month of the year.
Yaquina [c]	U.S. Army Corps of Engineers	Hopper dredge	92	102	Twice a month October through July; 4 times a month August and September.

Source: IBR Navigation Impact Report 2022

a Restrictions on vessel navigation beneath the new bridges were determined based on an ordinary high water level of 16 feet above CRD. This level was exceeded at the Interstate Bridge less than 1.2% of days over the data period between 1972 and 2020.

b Required clearance includes a 10-foot air gap above a vessel's highest point, which provides a safety factor due to wave- and wind-induced movements in the vertical plane when vessels are transiting under the bridges.

c Proposed 116-foot height was identified in part to allow the USACE vessel *Yaquina* to transit beneath the bridge. While potentially restricted in high water conditions, the Yaquina would be able to pass under the bridge more than 98% of days each month of the year.

Under the Modified LPA, the proposed Columbia River bridges would be constructed to the west of the existing Interstate Bridge. Consequently, the Modified LPA with the double-deck fixed-span configuration would reduce the 2,000-foot-long Vancouver Upper Turning Basin by 285 feet compared to the No-Build Alternative. Construction of the Modified LPA west of the existing Interstate Bridge would also reduce the distance between the proposed Columbia River bridges and the BNSF Railway Bridge, resulting in a shorter available distance for vessels to align with the openings of the two bridges. Compared to the double-deck bridge configuration, the increased width of the single-level configurations would reduce the length of the Vancouver Upper Turning Basin by approximately 44 feet, bringing the total reduction in the length of the

Vancouver Upper Turning Basin from the No-Build Alternative to approximately 329 feet. Consequently, the distance between the BNSF Railway Bridge and the Columbia River bridges would be further reduced, resulting in a shorter available distance for vessels to align with the openings of the two bridges. Vessels must maintain speed through the water for steerage, and when moving downstream with the current, this reduced length of the turning basin could reduce available time and space to change course.

The Modified LPA for all bridge configuration design options includes spans of 465 feet, which meets the federally authorized channel width. This would require fewer piers than the No-Build Alternative (six pairs of in-water piers versus nine sets for the No-Build Alternative). Wider spans would also provide for greater horizontal navigation clearance and create fewer obstacles to navigation for all river users than the No-Build Alternative.

The new North Portland Harbor bridges proposed under the Modified LPA would not reduce or increase vessel navigation clearance from current conditions. Therefore, no effects to navigation are expected to result from the North Portland Harbor bridges.

Aviation Effects

The Modified LPA would benefit aviation safety and efficiency. The new Columbia River bridges would be located slightly farther downstream and thus slightly farther from Pearson Field compared to the existing Interstate Bridge. The roadway deck, with an approximate maximum height of 160 feet, would remain outside of protected airspace and the bridges would also comply with additional FAA clearance requirements of 17 feet to account for vehicle traffic on the bridge. Where needed, lower-profile signs and luminaries would be used along the Columbia River bridges to minimize intrusions into protected airspace.

Although not eliminating intrusion into Pearson Field's airspace, the Modified LPA with either the double-deck or single-level fixed-span configuration would cause a lesser degree of intrusion into protected airspace than the existing bridge since the lift towers would be removed. The design option without the C Street ramps at the SR 14 interchange would further reduce the estimated climb gradient from 427 ft/NM to 401 ft/NM for departures from Pearson Field. The single-level fixed-span bridge configuration would potentially penetrate the Pearson Field Part 77 (i.e., protected) airspace. For the extradosed and finback bridge types,[2] Pier 7 would likely penetrate the Pearson Field protected airspace. The girder bridge type could have minor intrusions into the Pearson Field protected airspace. Any unavoidable intrusions would be mitigated using appropriate marking, lighting, and/or other approved methods identified through coordination with FAA. Although, a single-level bridge would not require special street lighting and signage to avoid Pearson Field protected airspace.

Aviation effects for the single-level movable-span bridge configuration would be similar to those described above for the single-level fixed-span option with the girder bridge type; however, the lift-span towers would penetrate the Pearson Field Part 77 airspace. The FAA has provided feedback to the IBR Program that a design that would maintain or improve the existing condition would not likely be a hazard to aviation. The current preliminary design for this option would place the new lift towers to the south of the existing tower locations, such that the new towers would not penetrate the Pearson Field approach surface and not exceed the existing tower heights. Therefore, although the single-level movable-span towers would penetrate Pearson Field protected airspace, they would not create a hazard to aviation.

The Modified LPA would be designed with consolidated structural elements that reduce the areas on which birds can land, roost, and potentially nest, which would improve aircraft safety. Fewer birds would be attracted to the new Columbia River bridges as a result, and continued incorporation of bird deterrent measures into the bridge maintenance program would further reduce the potential for wildlife strike hazards

[2] See Chapter 2, Description of Alternatives, for more information on the extradosed and finback bridge types.

at Pearson Field. Stormwater ponds constructed as part of the Modified LPA would include deterrent features commonly used at other airports, such as nets, to discourage birds from using the ponds.

No long-term effects on aviation activities at PDX would result from the Modified LPA because the new Columbia River bridges would remain outside its protected airspace. Protected airspace for PDX in the vicinity of the Interstate Bridge lift-span towers is approximately 130 feet above the top of the existing lift-span towers. Since the current preliminary design proposes new lift towers to an elevation slightly below the existing ones, even the single-level movable-span bridge option would not penetrate or create a hazard for aircraft navigation at PDX.

3.2.4 Temporary Benefits and Effects

No-Build Alternative

No project-related construction activities would take place under the No-Build Alternative that would have temporary benefits or effects to aviation or navigation.

Modified LPA

River Navigation Effects

Construction activities would result in temporary effects to navigation on the Columbia River. During construction of the Modified LPA, some of the new piers, which are located outside of the current navigation channel, would not line up with the existing piers. For the estimated four- to seven-year duration of construction, the existing Interstate Bridge would still be operational, and channels would be restricted by the presence of both the existing and constructed piers until demolition of the existing piers could occur. Horizontal navigation clearances could be further affected due to crane barges and other equipment present in the vicinity of the channel during pier construction. Smaller vessels and most recreational craft, which have limited horizontal clearance needs, would not be restricted from passing.

Construction would be staged so that at least one navigation channel would be open at a given time. A minimum unobstructed navigation clearance of 75 feet (vertical) by 200 feet (horizontal) would be maintained during construction. This clearance would meet most vessel clearance needs of most waterway users. Closures or restrictions on river traffic would be communicated in advance, enabling river users to accommodate their schedules without undue interruption. The majority of vessels currently using the navigation channel would be able to continue their use throughout most of the construction period. Larger vessels may require a tug to assist their navigation of the construction area, particularly if a vessel is traveling downriver with cargo.

While navigation within North Portland Harbor is more limited than in the Columbia River, construction staging schemes would be devised for the Modified LPA to minimize adverse impacts to navigation in North Portland Harbor. Construction in North Portland Harbor is not expected to occur at the same time as the Columbia River. Restrictions and temporary closures of the navigation channel and the availability of the alternate route(s) would be communicated to marinas and moorages on North Portland Harbor, as these are the primary users.

Temporary navigation effects under the single-level movable-span bridge configuration would be similar in character to those described above but would be more pronounced because of the larger footings and piers on either side of the primary navigation channel and the additional construction time, materials, and equipment needed to construct this option compared to the fixed-span configurations.

See Section 3.2.6, below for more discussion of staging and related construction-phase mitigation.

Aviation Effects

Tall cranes used during construction may be a hazard to aviation at Pearson Field. Equipment used to remove the existing lift-span towers would likely be the tallest construction equipment and therefore the most likely to present a hazard to aviation. The degree to which aviation would be affected depends on the construction methods employed. FAA would review construction plans to determine potential effects before construction could begin.

Construction activities are not anticipated to affect aircraft navigation to and from PDX because construction equipment is not anticipated to exceed a height of 375 feet, the point at which it would begin to penetrate PDX's protected airspace.

Construction of the SR 14 interchange would penetrate the restricted airspace for Pearson Field. Temporary storage of fill, cranes, or other construction-related materials and equipment could also temporarily intrude into the aviation surfaces. As with the Columbia River bridges construction, the actual intensity of effects would depend on the equipment and construction methods used.

Construction dust or emissions from construction equipment could pose a short-term hazard to aviation by reducing visibility. Dust could result when wind disturbs uncovered fill or open excavations. Trucks and equipment traveling on unimproved construction roads could also stir up dust, impairing visibility.

Activities at the staging and casting yards would not be expected to have temporary effects on aviation.

Temporary aviation effects under the single-level movable-span bridge configuration would be similar in character to those described above but would be longer in duration than for fixed-span configurations—potentially up to an additional two years. Effects would be prolonged because tall cranes would be required to construct the new lift towers associated with the movable span.

3.2.5 Indirect Effects

Under the Modified LPA, constraints on navigation for vessels that would be unable to transit beneath the proposed new bridges could have potential indirect effects on marine-dependent uses upstream of the bridges. The Navigation Impact Report (IBR 2022x) concluded that there would be a limited number of commercial and industrial developments located upstream of the proposed Columbia River bridges that would depend on height-constrained vessels to service them. Furthermore, the IBR Program would coordinate with the owners of these vessels that currently require more than 116 feet of VNC to avoid or minimize impacts to their business operations.

No new marine-dependent developments are currently known to be planned upstream of the Columbia River bridges. Constraints related to land use controls and business demand, rather than the new Columbia River bridges VNC, represent the primary factors that could potentially impact future commercial and industrial development upstream. Land use restrictions imposed by the Columbia River Gorge National Scenic Area, along with topography, transportation access parallel to shorelines (SR 14, I-84, the BNSF Railway, and the Union Pacific Railroad), and existing protected open spaces are the limiting factors for future water-dependent commercial and industrial development. Overall, the Modified LPA is not expected to result in indirect impacts to marine-dependent land uses.

No anticipated indirect effects to aviation have been identified for the Modified LPA.

3.2.6 Potential Avoidance, Minimization, and Mitigation Measures

Long-Term Effects

Standards and regulatory measures to avoid or minimize long-term effects on aviation and navigation have been evaluated and screened. These measures have been incorporated during the development of the Modified LPA to the extent possible and will continue to be refined as the design progresses. In addition to these measures, potential project-specific mitigation measures have been identified and will be developed with the Modified LPA design.

Specific mitigation for aviation and navigation includes:

- The Modified LPA would include obstruction marking and lighting to make the river crossing structures visible to aircraft. Proposed roadway or accent lighting on the bridges and surrounding interchanges would be designed to limit light or glare that could affect aviation at Pearson Field or PDX.
- As discussed in Section 3.2.3 above, the Modified LPA would have long-term effects for an estimated five vessels, serving three fabricators, that would be unable to transit beneath the new Columbia River bridges. The IBR Program would continue to coordinate with the affected vessel owners to reach mutually acceptable decisions and agreements to address these effects. Agreements between the IBR Program and vessel owners would be finalized prior to publication of the Final SEIS.

Temporary Effect

To protect and minimize temporary effects on aviation and navigation during construction, standard and regulatory mitigation measures such as best management practices (BMPs) would be implemented. Construction BMPs applicable to the Modified LPA are discussed in Section 3.14, Water Quality and Hydrology.

Standard and regulatory mitigation measures for aviation and navigation include:

- Construction phasing and staging would help ensure that construction activities would be planned and maintain a minimum channel for navigation. A Construction Staging Plan would be reviewed and approved prior to construction. Closures or restrictions on river traffic would be communicated in advance, enabling river users to accommodate their schedules without undue interruption.
- Temporary effects to aviation would result from demolition of the Interstate Bridge and construction activities for the Columbia River bridges and the SR 14 interchange. Mitigation of temporary hazardous effects to aviation would be required in these areas only. FAA would review proposed temporary effects that construction equipment and activities would have on aviation at Pearson Field and would ultimately approve proposed mitigation measures. In addition, FAA would identify requirements for marking equipment and all other obstructions during construction.
- Dust control measures, such as watering exposed soil and using gravel surfacing on temporary construction roads, could effectively mitigate dust impacts to aviation from construction activities in the SR 14 area. Section 3.10.6, Air Quality lists dust control requirements in both Oregon and Washington. Construction materials and activities would likewise be managed to minimize glare and smoke.
- Public involvement and education programs would be provided throughout construction to provide information to tug operators, pilots, and the public.