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6 October 2025

Commander Brendan J. Harris
Chief, Waterways Management Branch
U.S. Coast Guard District Thirteen
915 Second Avenue
Seattle, WA 98174-1067

Dear Commander Harris:

This letter transmits an updated Interstate Bridge Replacement (IBR) Program Navigation Impact Report (NIR) to precede a Bridge Permit application for new bridges to replace the current Interstate Bridge spanning the Columbia River between Portland, Oregon, and Vancouver, Washington. The attached Revised NIR contains analysis regarding current and future navigational use of the Columbia River at the bridge location. The Revised NIR has been updated since it was initially submitted to the U.S. Coast Guard (USCG) in 2021 to include the most recent information, studies, and USCG guidance, as described below.

In November 2021, the IBR Program submitted an initial NIR to the USCG. The USCG responded by issuing Navigation Only Public Notice (NOPN) No. 02-22 in March 2022 and a Preliminary Navigation Clearance Determination (PNCD) in June 2022. The PNCD concluded that the proposed replacement bridge with a 116-foot vertical navigation clearance (VNC) would not accommodate reasonable needs of navigation and summarized 13 comments received in response to the NOPN. The IBR Program considered the USCG's PNCD and carefully analyzed each of its five primary topics: present governing structure, waterway characteristics, emergency services, commercial navigation trends, and unique maritime manufacturing/service facilities. IBR Program analysis included obtaining feedback from river users (defined herein as all vessels that transit the Columbia River under the Interstate Bridge and businesses that rely on such vessels), other businesses, local governments, and the community to better understand the implications of a 116-foot fixed-span bridge. This analysis is documented in the enclosed Revised NIR, and responses to six issues (the five identified in the PNCD listed above, as well as potential impacts to recreational vessels, raised by the USCG since issuance of the 2022 PNCD) are summarized within the enclosed IBR Program white paper (NIR Appendix A).

The IBR Program acknowledges the critical importance of selecting an Interstate Bridge design option that meets navigational needs of river users within the larger context of water, air, and land uses; existing conditions and trends; availability of facilities to accommodate navigation; and local, state, and national development goals. Furthermore, the IBR Program understands the importance of the Columbia River system and its role in local, national, and global economics and that the USCG has been directed by Congress to provide reasonable navigation on all U.S. navigable waters. The Interstate Bridge is the present governing structure on the Columbia River west of the Glenn Jackson Interstate 205 Bridge and must have a compelling navigational reason to reduce its VNC. Ultimately, the analysis described in the Revised NIR found that the 116-foot fixed-span bridge, as the governing structure, is the best design option for the Interstate Bridge with regard to the needs of all transportation modes. Construction of a 116-foot fixed-span bridge would, however,

result in impacts to four river users. The IBR Program communicated directly with impacted river users and engaged independent experts to assess the potential impacts to them. For the four impacted river users, the IBR Program worked directly with them to reach agreements that resulted in no adverse impacts from the proposed 116-foot VNC to their current and known future operations.

The compelling navigational reason for the proposed 116-foot fixed-span bridge design is a need to balance marine, air, and land navigation in this key economic corridor. A 116-foot VNC is the highest clearance that accomplishes the following:

- Meets both river and land navigation needs while allowing reasonable landside connections.
- Results in a safe gradient to highway traffic.
- Reduces intrusion into protected airspace.
- Avoids the significant initial and ongoing investment of public money for a movable span that would serve the interests of a few river users.

With this transmittal, the IBR Program submits the Revised NIR, which has been updated to include the following information, studies, and guidance since 2021:

- Reorganization to the Bridge Permit Application Guide's Section 2, Appendix A: Waterway Data Requirements March 2025 guidance.
- Analysis of January 2007 through December 2024 Interstate Bridge lift data recorded by the Oregon Department of Transportation and appended with Interstate Bridge lift logs from January 2007 through July 2025 (n.b., no newly impacted vessels were recorded in Interstate Bridge lift logs from January 2025 through July 2025).
- Results of communications with vessel owners and fabricators whose businesses would be affected by a change in bridge height.
- Deep-draft ship and shallow-draft vessel simulations conducted in fall 2023.
- A focused analysis of a proposed 116-foot fixed-span bridge and associated construction.

The IBR Program understands that the USCG will use the information and findings in the enclosed Revised NIR to evaluate whether the proposed 116-foot bridge VNC meets the reasonable needs of navigation and is a reasonable alternative to be analyzed in the environmental document. As detailed in the NIR, the IBR Program believes that the 116-foot fixed-span bridge design is the best design option that meets the existing and potential reasonable needs of navigation on the Columbia River. The IBR Program is providing this updated NIR to inform the USCG's subsequent process for issuing a new PNCD. Please see the enclosed Revised NIR and white paper for additional details.

Sincerely,

Greg Johnson
IBR Program Administrator

Attachment: Interstate Bridge Replacement Program Revised Navigation Impact Report

Appendix A. IBR Program Research Since USCG Issuance of 2022 PNCD

Interstate Bridge Replacement Program

Navigation Impact Report

Revised October 2025

Prior Versions Submitted to U.S. Coast Guard November 2021, May 2022, September 2024

Interstate Bridge Replacement Program

Navigation Impact Report

Prepared for:

Oregon Department of Transportation

Washington State Department of Transportation

Prepared by:

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TABLE OF CONTENTS

A. MEANS OF DATA COLLECTION A-1
A.1 Methodology A-1
A.2 River User Data A-2
A.3 Bridge Opening Data A-7

B. PRESENT GOVERNING STRUCTURES B-1
B.1 Bridges Upstream and Downstream B-1
B.2 Change in Clearance B-2
B.3 Restrictive Horizontal Clearance B-5
B.4 Restrictive Vertical Clearance B-5
B.5 Restrictions Due to Proposed Bridge(s) B-5

C. WATERWAY CHARACTERISTICS C-1
C.1 Waterway Stages C-1
C.2 Natural Flow of the Waterway C-1
C.3 Width of the Waterway C-4
C.4 Depth of the Waterway C-6
C.5 Waterway Layout and Geometry C-6
C.6 Channel and Waterway Alignment C-7
C.7 Other Limiting Factors C-11

D. FEDERAL NAVIGATION PROJECT D-1
D.1 Project Name D-1
D.2 Design Vessel Information D-2
D.3 Design Vessel Specifications D-4
D.4 Safe and Efficient Vessel Passage D-4
D.5 Can Vessels Be Modified? D-4
D.6 Modification Information D-4
D.7 Changes to Waterway Usage D-5
D.8 Impacts to Federal Channel D-6

E. EMERGENCY AND GOVERNMENT VESSEL USE E-1
E.1 Waterway Maintenance Activities E-1
E.2 Coast Guard and/or Other Government Vessel Activities E-1

E.3 Vessels Utilizing the Waterway E-1
E.4 Allow Passage of Largest Vessels E-4
E.5 Vessels Restricted by Proposed Bridge E-4
E.6 Can Restricted Vessels Be Modified? E-4
E.7 Identify Vessels Which Can Be Modified E-4
E.8 Impacted and Burdened Users E-4

F. PRESENT AND PROSPECTIVE RECREATIONAL NAVIGATION F-1
F.1 Vessel Information F-1
F.2 Percentage of Recreation Fleet Impacted F-2
F.3 Impacts to Facilities F-3
F.4 Can Segments of the Fleet Be Modified? F-3
F.5 Additional Information on Impacted/Burdened Waterway Users F-3

G. PRESENT AND WATERWAY AND PROSPECTIVE COMMERCIAL NAVIGATION AND THE CARGOES MOVED ON THE WATERWAY G-1
G.1 Present and Prospective Commercial Fleet G-1
G.1.1 Marine Contractors G-1
G.1.2 Frequency and Characteristics of Vessel Transits G-9
G.1.3 Bridge Openings as a Share of Total Navigation Activity G-11
G.2 Additional Information for Present and Prospective Commercial Navigation G-12
G.2.1 Impacts to Cruise Ship Ports-of-Call/Terminals G-12
G.2.2 Impacts to Ports Supporting Post-Panamax Vessels G-14
G.2.3 Impacts to Unique Regional Product Shipments G-15
G.2.4 Impacts to Helper Boats/Tugs G-20
G.2.5 Annual Cargo Movements G-23
G.2.6 Impacts to Commercial Fleet G-26
G.2.7 Impacts to Upstream Commercial Activity G-26
G.2.8 Impacts to Upstream Commercial/Industrial Development G-27
G.2.9 Future Navigational Needs G-28
G.2.10 Existing and Historical Waterway Use and Conditions G-28
G.2.11 Input from Waterway Dependent Facilities Concerning Future Uses G-28
G.2.12 Land-use Zoning along the Waterway G-30
G.2.13 Future Vessel Size and Traffic Trends G-38
G.2.14 Input from States Based on State Development Plans G-40

G.2.15 Input from Facilities Based on Business Plans G-41
G.2.16 Commercial Shipping and Other Affected Businesses G-41
G.2.17 Can Restricted Vessels Be Modified? G-43
G.2.18 Additional Information Concerning Impacted/Burdened Users G-43

H. MARINE FACILITIES H-1

I. LOCAL SERVICE FACILITIES I-1
I.1 Facility Impacts I-1
I.2 Impacts to Critical Infrastructure, Key Resources, Important/Unique Capabilities I-3
I.3 Alternate Service Locations I-3
I.4 Impacts from Use of Alternate Facilities I-4
I.5 Feasibility to Modify Affected Vessels I-4
I.6 Describe Modifications I-4

J. ALTERNATE ROUTES J-1

K. HARBOR OF REFUGE K-1

L. NEAR BEND IN WATERWAY L-1
L.1 Impacts from Bend on Safe Passage L-1
L.2 Consideration for Alternate Location L-1

M. OTHER FACTORS M-1
M.1 Describe the Factors. M-1
M.2 Recommended Mitigative Measures M-1

N. HYDRAULIC CONDITIONS N-1
N.1 Vessel Transit at Lower or Higher Water Stages N-1
N.2 Describe the Conditions: N-1
N.3 Recommended Mitigative Measures N-2

O. ATMOSPHERIC CONDITIONS O-1
O.1 Describe the Conditions O-1
O.2 Recommended Mitigative Measures O-4

P. GUIDE CLEARANCES P-1
P.1 Horizontal Guide Clearance P-1
P.2 Vertical Guide Clearance P-1
P.3 Deviation from Guide Clearance P-1

P.4 Justify Deviation from Guide Clearance P-1

Q. OTHER MAN-MADE CONDITIONS Q-1

R. ADDITIONAL FACTORS R-1

R.1 Additional Operational Factors R-1

R.1.1 Temporary Impacts R-3

S. MITIGATION S-1

S.1 Can Vessel and Cargo Arrangements Be Modified? S-1

S.1.1 Mitigation for Unavoidable Short-term Impacts S-1

S.1.2 Mitigation for Unavoidable Long-Term Impacts S-1

S.1.3 Emergency Operation, National Defense and Channel Maintenance Vessels S-2

S.1.4 Commercial Vessels S-2

S.1.5 Marine Contractors S-3

S.1.6 Mitigation Options by Impacted Vessels S-4

S.1.7 Marine Industries and Fabricators S-5

T. REFERENCES T-1

FIGURES

Figure A.2-1. Vertical Reference Diagram A-3
Figure B.2-1. Columbia-Snake River System Map B-4
Figure B.5-1. Vertical and Horizontal Navigation Clearance Diagram B-6
Figure C.2-1. Columbia River Water Elevation at the Interstate Bridge (1972–2020) C-3
Figure C.3-1. Maintained Federal Navigation Channel Widths for the Interstate Bridge C-5
Figure C.6-1. Columbia River Navigation Clearances for the Interstate Bridge C-8
Figure C.6-2. Existing and Proposed Columbia River Navigation Channels C-10
Figure D.1-1 Oregon Slough Federal Project Limits D-3
Figure E.3-1. Emergency Operation, National Defense, and Channel Maintenance Vessels Air Draft and Air Gap Results E-3
Figure G.1-1. Marine Contractors Air Drafts and Air Gaps G-6
Figure G.1-2. Bridge Openings by Vessel Type 2007 to 2024 ..... G-11
Figure G.2-1. Cruise Vessels Air Draft and Air Gap Results G-14
Figure G.2-2. Typical Shipment Diagram G-17
Figure G.2-3. Commercial Tugs, Tows, and Barges G-22
Figure G.2-4. Cargo Volume by Vessel Traffic Type, Columbia River System (2017–2022) G-24
Figure G.2-5. Cargo Volume by Vessel Traffic Type, Columbia River between Vancouver, WA and The Dalles, OR (2017–2022) G-25
Figure G.2-6. Vacant/Underutilized Parcels Upriver of the Interstate Bridge Within 0.25 Miles of Navigable Columbia and Willamette Rivers G-29
Figure G.2-7. Vacant/Underutilized Parcels Downriver of the Interstate Bridge Within 0.25 Miles of Navigable Columbia and Willamette Rivers G-30
Figure G.2-8. Existing and Potential Commercial and Industrial Sites G-32
Figure G.2-9. Existing and Potential Commercial and Industrial Sites G-33
Figure G.2-10. Existing and Potential Commercial and Industrial Sites G-34
Figure H.1-1. Marine Facilities within 3 Miles of the Interstate Bridge H-1
Figure O.1-1. Portland Airport Windrose Plot O-2

TABLES

Table A.2-1. Commercial, Marine Contractor, Passenger Cruise, and Federal River Users Contacted A-4
Table B.1-1. Existing Columbia Navigation Clearances B-1
Table B.1-2. Existing Structures on the Oregon Slough B-2
Table C.2-1. Columbia River Currents C-2
Table D.1-1. Federal Navigation Projects D-1
Table D.3-1. Tug and Barge Details D-4
Table G.1-1. Known Affected Marine Contractor Vessels G-9
Table G.1.2. Bridge Opening by Vessel Type by Year: 2007 to 2024 ..... G-10
Table G.2-1. Port of Portland Oregon Slough Vessel Call Data by Berth and Year G-26
Table G.2-2. Upstream Facilities G-26
Table G.2-3. Impacted Commercial Shipping and Businesses G-42

Table H.1-1. Marine Facilities within 3 Miles of the Interstate Bridge H-1
Table I.1-1. Ships Produced at Vancouver Kaiser Shipyard for the U.S. Navy, 1942-1946 ..... I-2
Table N.1-1. Columbia River Currents N-1
Table R.1-1. Construction Components and Duration R-3
Table S.1-1. Adjustments and Mitigation for Height-Affected Vessels S-4

APPENDICES

Appendix A: Interstate Bridge Replacement Program Research Since U.S. Coast Guard Issuance of 2022 Preliminary Navigation Clearance Determination
Appendix B: All Users and Vessels Data
Appendix C: Future Land Use Analysis Details
Appendix D: Impacted Users and Vessels Data
Appendix E: Interstate Drawbridge Operations Data
Appendix F: Columbia and Snake River Navigation Clearances
Appendix G: Columbia Water Level
Appendix H: Research Completed for Vessels That Requested an Interstate Bridge Lift (January 2012 through July 2025)
Appendix I: Draft Permanent and Temporary Alterations to Federal Navigation Projects
Appendix J: Kaiser Shipyard Memorandum

ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
Advanced American	Advanced American Construction
AIS	Automatic Identification System
ATB	articulated tug barge
BPAG	Bridge Permit Application Guide
CalPortland	CalPortland Company
CBC	Columbia Business Center
Celilo Bridge	BNSF railroad bridge at Celilo
CFR	Code of Federal Regulations
COLRIP	Columbia River Pilots
CRC	Columbia River Crossing
CRC report	CRC River User Data Report
CRD	Columbia River Datum
CRGNSA	Columbia River Gorge National Scenic Area
Diversified Marine	Diversified Marine, Inc.
EM	Engineering Manual
ER	Engineer Regulation
FHWA	Federal Highway Administration
FNC	federal navigation channel
Foss	Foss Maritime Company
FTA	Federal Transit Administration
Greenberry	Greenberry Industrial LLC

Acronym/Abbreviation	Definition
HDB	Heavy-lift deck barge
HME	Hickey Marine Enterprises
HNC	horizontal navigation clearance
I-205	Interstate 205
I-5	Interstate 5
I-84	Interstate 84
IBR	Interstate Bridge Replacement
JT Marine	JT Marine, Inc.
Kiewit	Kiewit Corporation
Knife River	Knife River Corporation
LPA	Locally Preferred Alternative
MARAD	U.S. Maritime Administration
MT	metric ton
M/V	Motor Vessel
NEPA	National Environmental Policy Act
NIR	Navigation Impact Report
NOAA	National Oceanic and Atmospheric Administration
ODOT	Oregon Department of Transportation
OHWM	ordinary high water mark
PDX	Portland International Airport
PF&R	Portland Fire & Rescue
PNCD	Preliminary navigation clearance determination

Acronym/Abbreviation	Definition
PORTS	Physical Oceanographic Real-Time System
PSNS	Puget Sound Naval Shipyard
RM	river mile
ROD	Record of Decision
Ross Island	Ross Island Sand and Gravel
Schooner Creek	Schooner Creek Boat Works
SDS	SDS Lumber Company and SDS Tug & Barge
Section 408	Section 14 of the Rivers and Harbors Act of 1899, codified at 33 U.S. Code 408
SEIS	Supplemental Environmental Impact Statement
SR	State Route
Tidewater	Tidewater Barge Lines
Tongue Point	Tongue Point Job Corps Maritime Training Program
UKC	under keel clearance
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USGS	U.S. Geological Survey
UVTB	Upper Vancouver Turning Basin
Vigor	Vigor Works, LLC
VNC	vertical navigation clearance
WSDOT	Washington State Department of Transportation

INTRODUCTION

Proposed Project

The Interstate Bridge Replacement (IBR) Program is a multimodal transportation project to improve Interstate 5 (I-5) corridor mobility by addressing present and future travel demand and mobility needs in the Program area. The IBR Program would implement new river crossings over the Columbia River and the Oregon Slough, with associated improvements to I-5. This report provides detailed consideration of a fixed-span bridge over the Columbia River with a vertical navigation clearance (VNC) of 116 feet above 0 feet Columbia River Datum (CRD). The IBR Program is also studying a movable-span bridge option over the Columbia River in the Draft Supplemental Environmental Impact Statement (SEIS); this bridge configuration would provide the same VNC (178 feet) as the existing Interstate Bridge. For the Oregon Slough crossing(s), the replacement or supplemental bridges would meet or exceed the vertical and horizontal navigation clearances (HNCs) provided by the existing I-5 Oregon Slough bridge (35 feet).

The existing Interstate Bridge has a maximum vertical clearance of 178 feet provided by the lift span, with varying fixed clearances at the existing Barge Channel and existing Alternative Barge Channel. The existing I-5 Oregon Slough bridge provides for a vertical clearance of 35 feet. The vertical clearance design evaluated in this report is the same as that considered during the National Environmental Policy Act (NEPA) process for the Columbia River Crossing (CRC) Project. The analysis in this report provides updated vessel and river use data and user impact analysis.

Purpose of this Report

This report is provided to meet the requirements for a Navigation Impact Report (NIR) as defined in Appendix A of the U.S. Coast Guard (USCG) Bridge Permit Application Guide (BPAG) (USCG 2025a). The purpose of the NIR is to accurately determine the current and prospective navigation on the waterway and to analyze the navigational impacts of bridge design alternatives. This report describes the physical features of the Columbia/Snake River system, the area's current and prospective navigation needs, the proposed replacement bridges, potential impacts to navigation as result of the proposed replacement bridges, and potential mitigation strategies to address identified impacts to navigation. The report follows the order of information consistent with the BPAG beginning at the BPAG's Section 2, Appendix A: Waterway Data Requirements. This introductory section provides background and contextual information regarding the IBR Program.

The USCG will use the information and findings in this report to issue a preliminary navigation clearance determination (PNCD) and help inform the IBR Program's application for a bridge permit. The PNCD is the USCG's evaluation of whether the proposed bridge clearances meet the reasonable needs of navigation and are a reasonable alternative to be analyzed in the environmental documentation. As outlined in the BPAG and in the 2014 Memorandum of Understanding between the USCG, Federal Highway Administration (FHWA), Federal Transit Administration (FTA), and Federal Railroad Administration, this preliminary determination is normally completed prior to or concurrent

with the NEPA scoping process (USCG 2014). Since a Record of Decision (ROD) was already issued for the CRC project, the process for the IBR Program will vary from that described in the BPAG. The IBR Program prepared a Draft SEIS to reflect changes from the CRC project to the IBR Program and update existing conditions. An initial PNCD was issued for this project in 2022, and the IBR Program carefully investigated each of the points in the PNCD raised by the USCG since its issuance (Appendix A). The PNCD is expected to be issued prior to the identification of a preferred alternative in the Final SEIS so that its findings can be used in the NEPA decision-making process.

Project Description

The IBR Program would replace the mainline Interstate Bridge over the Columbia River with associated improvements to I-5 and local street networks, and the I-5 Oregon Slough bridge. This report provides details regarding replacing the current bridges over the main Columbia River channel with fixed-span bridges with a VNC of 116 feet. The I-5 Oregon Slough bridge would also be replaced and would provide horizontal and vertical navigation clearance that meets or exceeds what is currently provided by the existing bridge. Other Program elements could include the following:

1. Improvements to the existing I-5 mainline and interchanges within Washington and Oregon.
2. A variety of active transportation improvements throughout the Program corridor, including a multiuse path connecting to the existing system. The path would allow users to travel from North Portland to and across Hayden Island and over the Columbia River, into downtown Vancouver.
3. An extension of high-capacity transit, both light-rail transit and express buses operating on the shoulder of I-5, across the replacement bridges.
4. Transportation demand and system management measures to be implemented with the Program, including the use of tolls, subject to the authority of the Washington and Oregon transportation commissions.
5. A potential option for a lift-span section of the replacement bridges over the main stem of the Columbia River.

The IBR Program is also evaluating a movable-span bridge configuration option in the IBR Program SEIS. This would provide for 178 feet of VNC over the proposed relocated Primary Channel, which is the same VNC as the existing bridge.

Elements of the bridge replacement project have been proposed and studied since the early 1990s. In 2002, the I-5 Transportation and Trade Partnership produced an evaluation of multiple highway, transit, and river crossing improvements in this corridor and other parts of I-5 (Portland-Vancouver 2002). This process gathered public and agency input on issues and potential solutions for transportation problems in the I-5 corridor, and the partnership recommended that the region move forward with several specific projects, including the CRC project in 2012, and now the IBR Program.

In 2006, a long list of project components including multiple transit modes, various bridge heights, various highway configurations, and other options—were evaluated to determine which should advance into further alternatives analysis. The low-level, movable-span bridge components were removed from consideration because of the negative impacts they would have on highway mobility,

highway safety, freight movement, and maintenance costs, and the lack of a significant difference in community impacts when compared to a higher mid-level fixed-span bridge.

While the IBR Program will use past work to inform the current effort, the details of a bridge replacement solution have not been finalized. Given the variety of changes that have occurred since the CRC project, the IBR Program needs to consider design refinements, including the design of the bridges. Upcoming efforts to identify a multimodal solution that meets community needs and priorities include working with local agencies and the community to look at such design options as high-capacity transit options, interchange improvements, urban design, interchanges, travel lanes, bridge height and type, and multiuse path facilities and connections. The bridge design for the main channel that is used in evaluating impacts to navigation is a fixed-span bridge, as reflected in the details below. The advanced design of the bridges to be permitted may differ somewhat from the design described herein, but vertical and horizontal navigation clearances are expected to be maintained.

Columbia River Bridges

The parallel bridges that form the existing Interstate Bridge between Hayden Island and the State Route (SR) 14 interchange would be replaced by two new parallel bridges with a single-level fixed-span configuration. The eastern (upstream) structure would accommodate northbound highway traffic on the bridge deck, with a bicycle and pedestrian path on the upstream side of traffic. The western structure would carry southbound traffic on the bridge deck, with transit provisions on the downstream side of traffic. Whereas the existing Interstate Bridge has only three lanes each way, with virtually no shoulders, each of the replacement bridges would be designed to be wide enough to accommodate three through lanes and up to two auxiliary lanes. Lanes and shoulders would be built to Washington State Department of Transportation (WSDOT) and Oregon Department of Transportation (ODOT) design standards. The existing bridges would be completely removed following construction of the replacement bridges.

The I-5 Oregon Slough bridge would be replaced with six new bridges:

- One bridge carrying light-rail transit
- Two bridges carrying I-5 through traffic (northbound and southbound)
- Two bridges carrying the I-5 southbound off-ramp to N Marine Drive and I-5 northbound on-ramp from N Marine Drive
- One arterial bridge for local traffic between N Marine Drive and Hayden Island.

Oregon Slough Bridges

The Oregon Slough is a side channel of the Columbia River that separates Hayden Island and the Oregon shore. This waterway is also known as North Portland Harbor, and this name is used on many maps, charts, and in other documents. This report uses “Oregon Slough” for consistency with the name used on the bridge permit issued for the construction of the existing Interstate Bridge and for the federal navigation project that is on portions of the waterway. However, “North Portland Harbor” is

used in many prior documents, including other IBR Program documents, and may be shown in figures and maps. The names should be considered interchangeable.

The existing I-5 Oregon Slough bridge would be replaced for seismic resiliency. The design of the replacement bridges and supplemental bridges required to accommodate local access, active transportation, and high-capacity transit has not been developed, but the IBR Program has committed to providing vertical and horizontal clearances that would be the same as or greater than the clearances of the existing I-5 Oregon Slough bridge. This would result in a minimum VNC of 35 feet and a minimum HNC of 215 feet. The replacement I-5 bridges would be located just west of the existing bridge, mostly outside the existing bridge footprint to accommodate maintenance of I-5 traffic during construction. Bridges to accommodate local access, active transportation, and high-capacity transit would be located outside of the existing bridge footprint to the east and west of the replacement bridges. The balance of the existing bridge retained for maintenance of traffic during construction of the replacement bridges would be removed once I-5 traffic is switched over to the replacement bridges.

IBR Program Purpose and Need

The purpose and need statements below are based on the 2012 Final Environmental Impact Statement and ROD, which was developed by the lead agencies, project sponsors, and CRC Task Force. The IBR Program is using the ROD as the basis of the Program and will not change the purpose and need.

Project Purpose

The purpose of the proposed action is to improve I-5 corridor mobility by addressing present and future travel demand and mobility needs in the IBR Program area. The Program area extends from approximately Columbia Boulevard in the south to SR 500 in the north. Relative to the No-Build Alternative, the proposed action is intended to achieve the following objectives: a) improve travel safety and traffic operations on the Interstate Bridge and associated interchanges; b) improve connectivity, reliability, travel times, and operations of public transportation modal alternatives in the Program area; c) improve highway freight mobility and address interstate travel and commerce needs in the Program area; and d) improve the Interstate Bridge's structural integrity (seismic stability).

Project Need

The specific needs to be addressed by the proposed action are:

1. **Growing travel demand and congestion**: Existing travel demand exceeds capacity of the Interstate Bridge and associated interchanges. This corridor experiences heavy congestion and delays lasting 4 to 6 hours daily during the morning and afternoon peak travel periods and when traffic accidents, vehicle breakdowns, or bridge lifts occur. Due to excess travel demand and congestion in the Interstate Bridge corridor, many motorists take the longer, alternative Interstate 205 (I-205) route across the river. Spillover traffic from I-5 onto parallel arterials such as Martin Luther King Jr. Boulevard and Interstate Avenue increases local congestion. In 2005, the two

crossings carried 280,000 vehicle trips across the Columbia River daily. Daily traffic demand over the I-5 crossing is projected to increase by more than 35% during the next 20 years, with stop-and-go conditions increasing to approximately 15 hours daily if no improvements are made.

2. **Impaired freight movement**: I-5 is part of the National Truck Network and is the most important freight highway on the West Coast, linking international, national, and regional markets in Canada, Mexico, and the Pacific Rim with destinations throughout the western United States. In the center of the Program area, I-5 intersects with the Columbia River's deepwater shipping and barging, as well as two river-level transcontinental rail lines. The I-5 crossing provides direct and important highway connections to the Port of Vancouver and Port of Portland facilities located on the Columbia River, as well as the majority of the area's freight consolidation facilities and distribution terminals. Freight volumes moved by truck to and from the area are projected to more than double over the next 25 years. Vehicle-hours of delay on truck routes in the Portland-Vancouver area are projected to increase by more than 90% over the next 20 years. Growing demand and congestion will result in increased delay, costs, and uncertainty for all businesses that rely on this corridor for freight movement.
3. **Limited public transportation operation, connectivity, and reliability:** Due to limited public transportation options, a number of transportation markets are not well served. The key transit markets include trips between the Portland Central City and the city of Vancouver and Clark County; trips between north/northeast Portland and the city of Vancouver and Clark County; and trips connecting the city of Vancouver and Clark County with the regional transit system in Oregon. Current congestion in the corridor adversely impacts public transportation service reliability and travel speed. Southbound bus travel times across the bridge are currently up to three times longer during parts of the a.m. peak compared to off-peak. Travel times for public transit using general purpose lanes on I-5 in the Program area are expected to increase substantially by 2030.
4. **Safety and vulnerability to incidents**: The Interstate Bridge and its approach sections experience crash rates more than twice the statewide averages for comparable facilities. Incident evaluations generally attribute these crashes to traffic congestion and weaving movements associated with closely spaced interchanges and short merge distances. Without breakdown lanes or shoulders, even minor traffic accidents or stalls cause severe delay or more serious accidents.
5. **Substandard bicycle and pedestrian facilities**: The bike/pedestrian facilities on the Interstate Bridge are about 3.5 to 4 feet wide, narrower than the 10-foot standard and are located extremely close to traffic lanes, thus impacting safety for pedestrians and bicyclists. Direct pedestrian and bicycle connectivity are poor in the Program area.
6. **Seismic vulnerability**: The existing Interstate Bridge is in a seismically active zone. They do not meet current seismic standards and are vulnerable to failure in an earthquake.

A. MEANS OF DATA COLLECTION

This section describes the methods used to obtain navigation data for the Program area.

A.1 Methodology

To obtain information on the current and potential future navigation needs and characteristics of the vessels that transit the bridge location, the Program team conducted the following activities:

1. Identified known river users. The CRC River User Data Report (CRC report) was the initial source for known river users, including commercial, recreational, passenger cruise, and federal users, as well as marine contractors and fabricators. Additional and updated information was obtained from the Hood River-White Salmon Bridge Replacement Project NIR (completed in September 2019) (WSP 2019). Contact information for known river users was also updated and/or verified through internet research and consultation with industry groups and organizations. Known recreational users were identified through contact with area marinas and other recreational vessel service providers within an approximately 3-mile radius of the project location.
2. Prepared and distributed (via email as the preferred method) a letter and river user data sheet to known river users to request vessel navigation and dimensional characteristics.
3. Prepared an online survey to collect river user data from the general public (unknown users) and distributed via public notices (described below) and through the IBR Program website.
4. Collected U.S. Army Corps of Engineers (USACE) data on lock usage at Bonneville Dam and BNSF data on bridge openings on the Columbia River and Oregon Slough.
5. Collected ODOT Interstate Bridge lift data to determine if vessels required a lift that were not otherwise captured in the outreach to known river users. ODOT bridge tenders manually record the lift height of the Interstate Bridge each time it is opened. When vessels transit under the bridge, they often request a bridge lift. The height of the lift is driven by the vertical height of the vessel from the surface of the water combined with a safety buffer, as described below. The IBR Program team subtracted the water level from the recorded lift elevation to determine the available clearance. Bridge lifts below a clearance that would indicate use for a height-constrained vessel were eliminated for further analysis. For the vessels or river users that were not included in the known river user data and did not provide information through the river user survey, attempts were made to locate the vessels through internet research and/or by contacting the vessel owners through email and/or telephone.
6. Held discussions with specific users such as fabricators and shipyard operators to discuss unique user needs.
7. Prepared a public notice for distribution and publication in the USCG Local Notice to Mariners, in local newspapers and specialty publications as identified in Appendix B, and on the Program website and social media accounts.
8. Conducted presentations about the Program to the Pacific Northwest Waterways Association and the Lower Columbia River Harbor Safety Committee and indicated the need to obtain river user

data. The Program team encouraged attendees to complete the river user data survey and/or update or verify the information on the known river user data sheets.

9. Sent an email notice and request for information for distribution by the Pacific Northwest Waterways Association to its members.
10. Reviewed land use and zoning along the waterway and public port authority plans to identify future business/industrial property plans that could influence the types and characteristics of vessels that would require transit under the proposed bridge.
11. Followed up with specific river users via telephone or email after they had received the river user data sheet to answer any questions and facilitate a timely response.
12. Prepared and distributed (via email as the preferred method) an additional river user data sheet to yacht clubs and marinas that moor recreational vessels frequently transiting under the bridge to provide specifications of potentially impacted sailboats.

A.2 River User Data

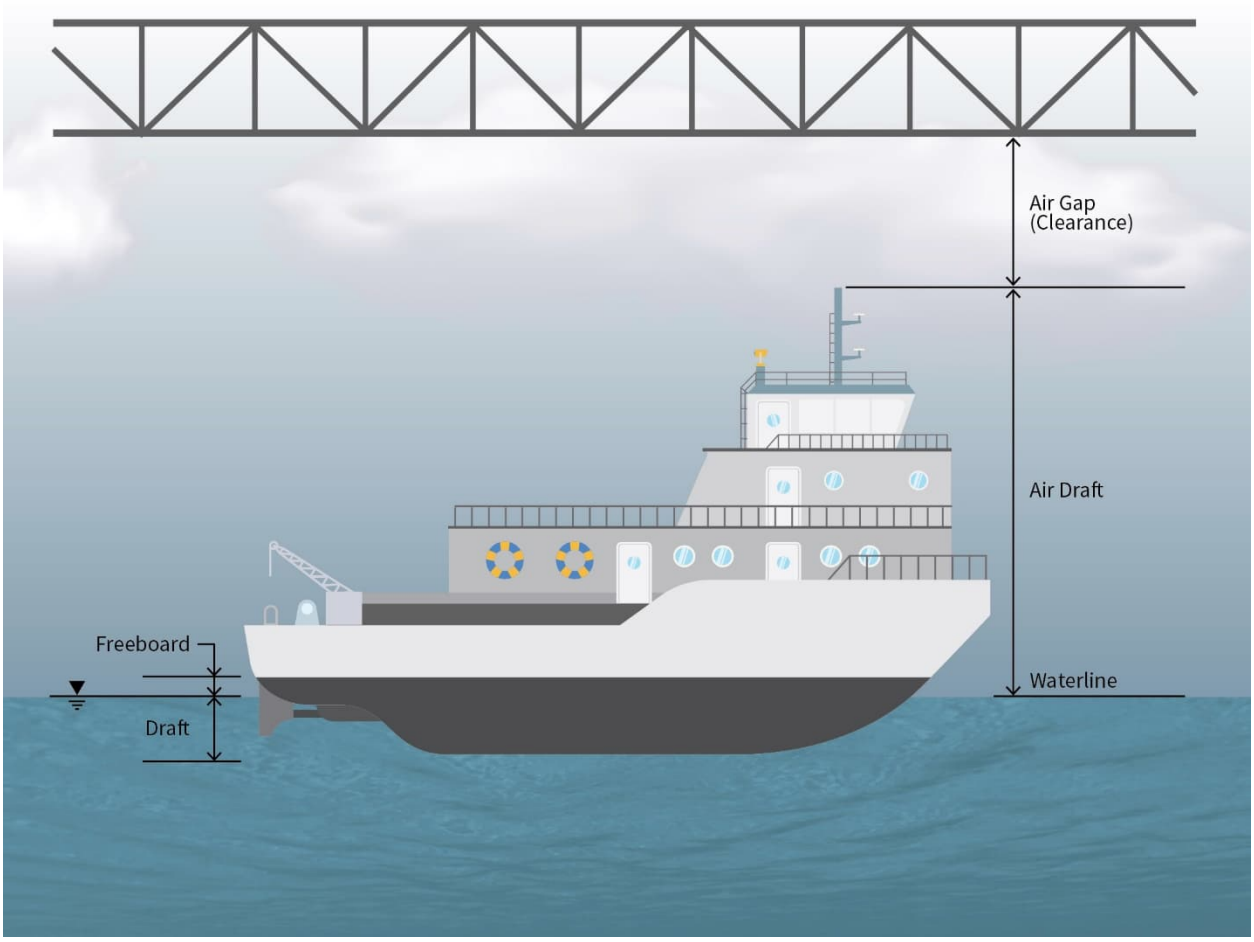
The following information was collected through the river user outreach efforts. A copy of all correspondence and a full reporting of the outreach efforts are included in Appendices B and D. Known Columbia River river users were identified using the methodology identified above. Known river users who transit under the existing bridges were contacted and surveyed regarding the navigation and dimensional features of their vessels and equipment. Vessel data sheets were provided, requesting the following information:

1. Company and/or owner of the vessel and contact information
2. Vessel name
3. Vessel type
4. Specialized vessel (e.g., limited maneuverability due to design or mode of operation)
5. Vessel category
6. USCG document number
7. Primary mooring location
8. Type and quantity of cargo, if applicable
9. Length (overall) in feet
10. Beam (width) in feet
11. Draft (depth of hull below waterline, unladen) in feet
12. Air draft (height of the highest fixed point above the waterline, unladen) in feet
13. Air gap for vessel (desired clearance from the highest fixed point on the vessel to lowest part of the bridge) in feet
14. Safety margin (horizontal clearance required by vessel to navigate through the bridge) in feet
15. Transit speed under Interstate Bridge and load configuration
16. Time of year of passage

17. Tug assistance requirement
18. Frequency of passage under the Interstate Bridge existing Primary Channel (typical per month)
19. Frequency of passage under the Oregon Slough (North Portland Harbor) bridge (typical per month)

Information on recreational vessels was obtained through the online surveys, communications with marina contacts, and individual direct communications with vessel owners if needed. All information gathered during river user surveys was self-reported. However, some information was verified by field surveys for the CRC project. Figure A.2-1 is a diagram of vertical reference descriptions as listed on the river user data sheet, using a tug as the example vessel.

Figure A.2-1. Vertical Reference Diagram



A bridge's VNC is the distance from the water surface to the lowest member of the bridge structure. The air gap is the additional height above the highest point on a vessel necessary to allow for a safety factor when transiting under a bridge due to wave- and wind-induced movements in the vertical plane. This is especially applicable for sailboats and other low-weight vessels since they have greater responses to wave conditions. Vessel responses are unique to a given ship's geometry and weight distribution and

vary with the ship's forward speed, the channel bathymetry, and environmental conditions such as wind and wave direction, height, and length. The amount of air gap is also influenced by visibility. For a project with a long design life, the long-term impacts caused by changing river runoff characteristics, sea level rise, and land subsidence are potential considerations as well. Generally, vessel captains determine and request the desired air gap for their vessels when transiting under the Interstate Bridge, but the requested air gap may be adjusted if it seems unreasonable to the Interstate Bridge lift operator.

Because the river level fluctuates, a river level that is exceeded only 1.2% or less of the time during the life of a project is a conservative design criterion for determining the near maximum surface for a heavily used channel. At the I-5 bridges, this design river level is 16 feet CRD, so this is the measurement used to determine whether a vessel is height restricted.

Users Contacted

Known river users were initially identified from the CRC report and the Hood River-White Salmon Bridge Replacement NIR (WSP 2019). Users were contacted by email and telephone. They were divided into the following categories: commercial tugs, tows, and barges; marine contractors; federal/ emergency/maintenance; passenger cruise; and recreation.

Commercial, Marine Contractor, Passenger Cruise, and Federal Users

Multiple commercial, marine contractor, fabricator, shipyard owner, federal, and passenger cruise users were contacted. Approximately half responded, confirming the vessel data obtained from prior reports and/or providing updated vessel information. Table A.2-1 lists the commercial, marine contractor, passenger cruise, and federal river users contacted; the vessel category; and whether a response was received. Many responders in these categories operate multiple vessels.

Table A.2-1. Commercial, Marine Contractor, Passenger Cruise, and Federal River Users Contacted

Company Name	Category	Response
Advanced American Construction	Marine Contractor	Yes
American Cruise Lines	Passenger Cruise	Yes
American Queen Steamboat Company	Passenger Cruise	No
American Waterways, Inc.	Passenger Cruise	Yes
Bergerson Construction	Marine Contractor	No
Bernert Barge Lines	Commercial Tugs/Tows/Barges	Yes
Brusco Tug and Barge	Commercial Tugs/Tows/Barges	No
Cadman	Industrial	Yes
Cal Portland	Marine Contractor	No

Table A.2-1. Commercial, Marine Contractor, Passenger Cruise, and Federal River Users Contacted

Company Name	Category	Response
Centerline Logistics (previously Olympic Tug & Barge)	Commercial Tugs/Tows/Barges	No
Combined Forestry and Marine	Commercial Tugs/Tows/Barges	Yes
Diversified Marine	Marine Contractor	Yes
The Dutra Group	Marine Contractor	No
Foss	Commercial Tugs/Tows/Barges	No
General Construction (subsidiary of Kiewit Corporation)	Marine Contractor	Yes
Greenberry Industrial LLC	Fabricator	Yes
Grays Harbor Historical Seaport	Passenger Cruise	No
Hickey Marine	Marine Contractor	No
JE McAmis	Marine Contractor	No
JT Marine	Marine Contractor	Yes
Knife River	Marine Contractor	No
Legendary Yachts	Shipyard	Yes
Lindblad/National Geographic Expeditions	Passenger Cruise	Yes
Manson Construction	Marine Contractor	No
Mark Marine Service	Marine Contractor	No
NorthBank Civil and Marine	Marine Contractor	Yes
Olson Marine	Commercial Tugs/Tows/Barges	Yes
Puget Sound Naval Shipyard	Federal	Yes
Ross Island	Marine Contractor	Yes
Sause Bros.	Commercial Tugs/Tows/Barges	Yes
SDS Tug & Barge	Commercial Tugs/Tows/Barges	No
Schnitzer Steel Industries	Fabricator	Yes
Schooner Creek Boat Works	Shipyard	Yes
Shaver	Commercial Tugs/Tows/Barges	Yes
Thompson Metal Fab	Fabricator	Yes

Table A.2-1. Commercial, Marine Contractor, Passenger Cruise, and Federal River Users Contacted

Company Name	Category	Response
Tidewater	Commercial Tugs/Tows/Barges	Yes
Tongue Point Job Corps (Maritime Training Program)	Federal	No
UnCruise	Passenger Cruise	No
USACE	Federal	Yes
USCG, Marine Safety Unit (Portland)	Federal	Yes
Vigor Works, LLC	Fabricator	Yes

Recreational Users

Recreational users were not generally contacted individually, and information was obtained from recreational marinas in the Program vicinity, as well as through responses to an online river user survey in 2021, and another river user survey distributed in 2025 to marinas known to moor vessels that frequently transit under the bridge. Additionally, in 2025, outreach included phone calls to marina and yacht clubs that were contacted in 2021; the marinas contacted in 2021 and 2025 are listed below. Of these, Hood River and St. Helens provided a response in 2021. Hayden Island Yacht Club, Columbia Way West, Tidewater Cove, NOTS Boating Club, and Rose City Yacht Club provided responses in 2025. All marinas and yacht clubs that responded indicated that they do not have boats that exceed 80 feet in height.

The marinas and yacht clubs that did not respond may have distributed the online survey link to their tenants, as several respondents to the online survey indicated a mooring location at one of the marinas listed below. The online survey in 2021 received 39 responses. Five surveys were received for commercial vessels, three for cruise vessels (one large passenger cruise vessel and two smaller vessels that self-reported as cruise vessels), seven for recreational motor vessels, 23 for sailboats, and one for a kayak.

Appendix B further details the research and findings specific to recreational users.

Marinas and Yacht Clubs Contacted

1. Astoria Yacht Club
2. Big Eddy Marina
3. Camas-Washougal Marina
4. Columbia River Yacht Club
5. Columbia Way West
6. Dolphin Yacht Club

7. Grand Banks Yacht Club
8. Hayden Bay Marina
9. Hayden Island Yacht Club
10. Hood River Marina
11. Jantzen Bay Marina
12. Longview Yacht Club
13. McCuddy's Marina
14. Multnomah Channel Yacht Club
15. NOTS Boating Club
16. Portland Yacht Club
17. Riverside Yacht Club
18. Rose City Yacht Club
19. Sauvie Island Yacht Club
20. St. Helens Marina
21. The Dalles Marina
22. Tidewater Cove
23. Tomahawk Bay Marina
24. Tomahawk Bay Yacht Club
25. Tyee Yacht Club

A.3 Bridge Opening Data

The Primary Channel under the existing Interstate Bridge provides a VNC of 39 feet when the lift span is in the lowered position. Navigation lights below the structure reduce the clearance to 38 feet in the lowered position. The existing Barge Channel and Alternative Barge Channel provide VNC of 58 feet and 72 feet, respectively. Vessels that require greater clearance or that cannot safely navigate the alternate channels require the lift span to be raised.

Vessels that require the lift span to be raised indicate that these vessels could be impacted by the replacement bridge height. However, the lift spans are also raised because of maneuverability limitations, and thus not all vessels that require a lift span are constrained by the height of the existing fixed spans; this must be considered in reviewing bridge opening trends.

To identify vessels that have historically and currently required bridge lift-span openings, the Program team reviewed Interstate Bridge lift data provided by ODOT. The bridge tenders operating the lift spans of the existing bridges record details of each lift in a logbook. Information recorded in the log includes the date and time of the opening, the name of the vessel or vessels transiting, the type of vessel, the lift elevation, the current water level, and weather conditions, among other data. Anecdotally, operators

typically provided 20 to 30 feet more than the height requested to not rely on the available VNC between the pile gap and water level.

The lift elevation recorded on the operator's report is the height of the lift above the pile cap and not the height above the water. The pile cap is located 38 feet above 0 CRD. To determine the bridge lift height above 0 CRD, 38 feet were added to the lift height. For consistency with the NIR methodology, which used the ordinary high-water mark (OHWM) to account for a high water elevation and a worst case scenario, 16 feet was subtracted from the lift height to indicate available clearance for vessels. A vessel was determined to be "impacted" if it could not pass under the replacement bridges with a 10-foot air gap while the river water level is at 16 feet CRD or higher. This combination of air gap and 16-foot river stage is called the "assumed condition." The Columbia River level fluctuates in this area but is lower than 16 feet CRD more than 98% of the time. Because the river level fluctuates daily as well as seasonally, there can be months during the course of a year when a vessel that would be impacted at 16 feet CRD is not impacted at all. In addition, the inclusion of a 10-foot air gap in the analysis is a worst-case assumption of impacts because many vessels can safely pass with less air gap.

The 2012 CRC NIR reported Interstate Bridge lift data from January 1, 1987, to December 17, 2011, and this was supplemented for the IBR Program NIR with Interstate Bridge lift data from January 1, 2012 to December 31, 2024. Interstate Bridge lift data from January 1, 2007 to December 31, 2024, are analyzed in detail in this report, and the trends described herein reflect that date range. Additionally, the IBR Program has monitored, and will continue to monitor, Interstate Bridge lift data to identify any potentially impacted vessels during coordination for the proposed replacement bridges. No newly impacted vessels have been identified from 2004 through July 31, 2025, that are not addressed elsewhere in this report. The reported Interstate Bridge lift data with the assumed vessel air drafts from January 2007 through July 2025, are included in Appendix E.

If a vessel was identified as being impacted based on the assumed conditions, further analysis was done to determine the percentage of time it was impacted based on water levels or whether particular conditions influenced its ability to transit under the bridge height.

While extensive work was performed to identify vessels that could be impacted by the bridge heights studied, there may be other vessels that have not yet been identified, for the following reasons:

- Some local vessel owners may not have responded to the IBR Program's outreach efforts.
- Some vessels listed in the Interstate Bridge lift logs from ODOT, which requested bridge openings, did not have enough identifying information to be verified and could not be verified after further research.
- Vessels from out of the area that have transited in the past may not be aware of the IBR Program.
- Marine contractors from out of the area may come into the area if they are awarded a contract.

Many vessels that transit under the existing bridges do not require an opening of the lift span. These vessels either are low enough to pass through the lift span in the lowered position or use one of the two alternate channels to the south of the lift span.

B. PRESENT GOVERNING STRUCTURES

B.1 Bridges Upstream and Downstream

Along the Columbia River, existing minimum horizontal and vertical clearances were determined by identifying governing structures between the Chinook and Richland Port Districts along the Columbia River and between the Pasco and Lewiston Port Districts along the Snake River. Between the Chinook and Richland Port Districts along the Columbia River, there are 22 structures that restrict vertical clearance over the river (Table B.1-1), seven of which are moveable -span structures (including the Interstate Bridge) and 15 of which are fixed-span structures. Existing structure clearances indicate that the fixed-span Glenn L. Jackson Memorial Bridge (I-205) at RM 112.7 is a governing structure for the movable Hood River-White Salmon Bridge (RM 168). Additional information on governing structures is outlined in Section 1 of Appendix A.

Table B.1-1 contains details of the existing structures crossing the Columbia River between the mouth of the Columbia River and the BNSF railroad bridge at Celilo (the Celilo Bridge).

Table B.1-1. Existing Columbia Navigation Clearances

Bridge	River Mile	Horizontal Clearance (feet)	Vertical Clearance (feet)	Vertical Clearance with Span Open (feet)
Astoria-Megler Bridge	13.5	1,070	193	N/A
Power Cable	40.0	N/A	230	N/A
Power Cable	62.4	N/A	216	N/A
Lewis and Clark Bridge	66.0	1,120	187	N/A
Power Cable	104.2	N/A	220	NA
BNSF Railway Bridge	105.6	200	39	Unlimited
Existing Interstate Bridge	106.5	263	39	178
Glenn L. Jackson Memorial Bridge (I-205)	112.7	469	136	N/A
Power Cable (directly west of Bonneville Lock and Dam)	145.1	N/A	210	N/A
Bonneville Lock and Dam (navigation lock)	145.3	86	Unlimited	N/A
Power Cable	146.6	N/A	190	N/A
Bridge of the Gods	148.3	655	135	N/A

Bridge	River Mile	Horizontal Clearance (feet)	Vertical Clearance (feet)	Vertical Clearance with Span Open (feet)
Hood River-White Salmon Bridge	169.8	246	57	146 [a]
Power Cable	171.1	N/A	155	N/A
Power Cable	173.8	N/A	159	N/A
Power Cable	186.2	N/A	155	N/A
The Dalles Bridge (navigation lock approach)	191.6	250	100	N/A
The Dalles Bridge (main span)	191.6	551	81	N/A
The Dalles Lock and Dam	191.8	86	N/A	100
Power Cable	191.9	N/A	125	N/A
Power Cable	201	N/A	123	N/A
Celilo Bridge	201.2	300	20	79

Note:
a. In 2021, the USCG issued a Preliminary Navigation Clearance Determination for a fixed-span bridge with a maximum 90-foot VNC for the Hood River-White Salmon replacement bridge, which is anticipated to be constructed by 2029, dependent on funding.
Key:
Celilo Bridge = BNSF railroad bridge at Celilo
N/A = not applicable
I-205 = Interstate 205

Table B.1-2 contains details of the existing structures on the Oregon Slough.

Table B.1-2. Existing Structures on the Oregon Slough

Bridge	River Mile[a]	Horizontal Clearance (feet)	Vertical Clearance (feet)	Vertical Clearance with Span Open (feet)
Power Cables	104.2	N/A	160	N/A
BNSF Railway Bridge	105.6	200	39	Unlimited
I-5	106.5	215	35	N/A
Power Cable	106.7	N/A	54	N/A

Note:
a. River mile reference is to the Columbia River since Oregon Slough is not numbered separately
Key:
I-5 = Interstate 5
N/A = not applicable

B.2 Change in Clearance

The existing Interstate Bridge is a governing structure as all bridges downstream currently provide greater vertical clearance. The existing Interstate Bridge has a maximum lift elevation of 178 feet above

0 CRD. Based on the assumed conditions identified in the Introduction, this clearance can accommodate a vessel with an air draft of up to 152 feet. Greater air drafts could be accommodated at lower water levels or by accepting a lesser air gap.

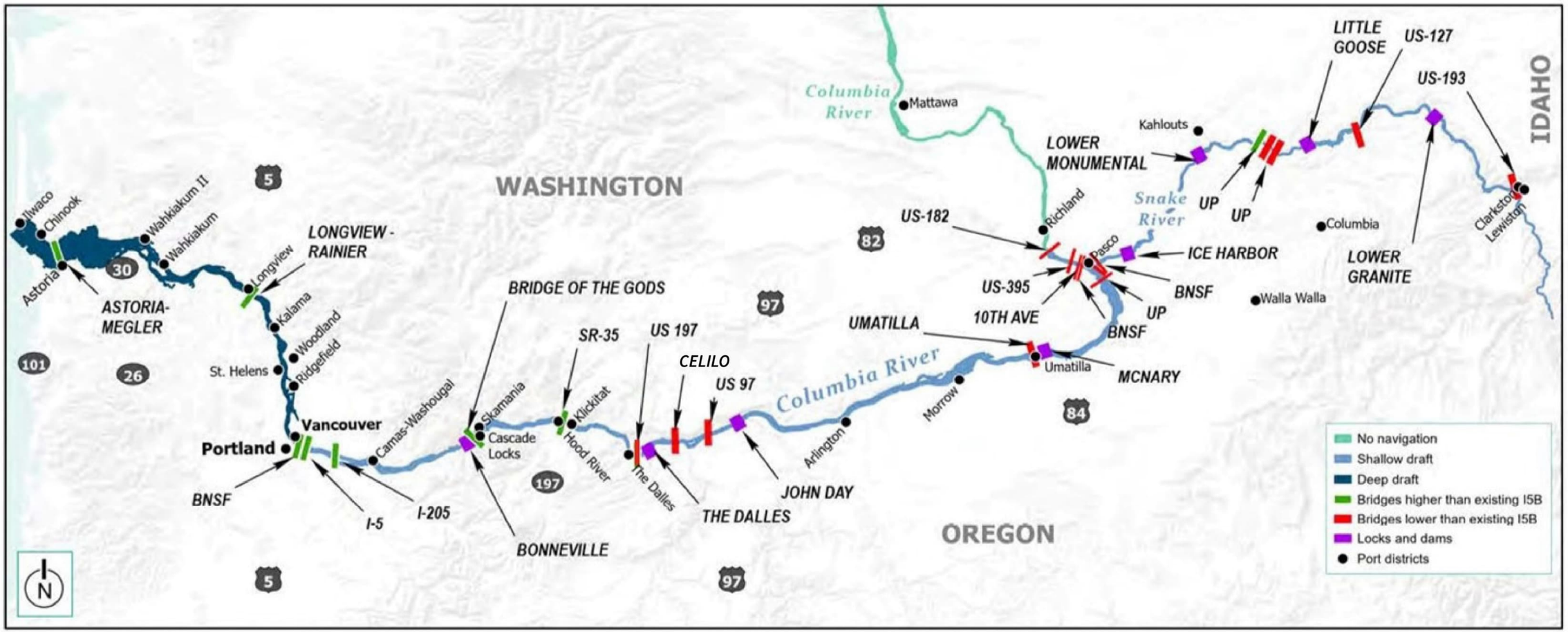
The next governing structure upriver of the Interstate Bridge is the Dalles Lock and Dam at river mile (RM) 191.5, which has a lock VNC of 100 feet and bridge VNC of 81 feet. Approximately 10 miles upriver from the Dalles Lock and Dam is the Celilo Bridge at RM 201.2. The Celilo Bridge lift span provides a maximum VNC of 79 feet above the normal pool elevation behind The Dalles Dam when open, making it a controlling factor for vertical clearance because all of the bridges between the Interstate Bridge and Celilo Bridge provide greater VNC than the Celilo Bridge. This means that the height constraint imposed by a VNC of 116 feet potentially affects river traffic VNC for approximately 95 miles, or 20% of the river system. Vessels originating upstream of this location, or downstream and traveling to an upstream destination upriver beyond this location, are limited to a VNC of 79 feet, including an air gap, in order to transit past the bridge. Upstream of the Celilo Bridge, there are other bridges with navigation clearances that are lower or similar. These include the Interstate 82 Bridge (71 feet) and the Union Pacific Railroad Bridge upriver of McNary Dam (72 feet).

The bridges between the Interstate Bridge and the Celilo Bridge also result in the establishment of governing structures. These bridges and their VNCs are as follows:

- I-205 (Glenn L. Jackson Memorial Bridge), 136 feet (or 144 feet at the center of the bridge)
- The Bridge of the Gods, 135 feet
- Hood River-White Salmon, 148 feet
- The Dalles Bridge (navigation lock), 100 feet
- The Dalles Bridge (highway), 81 feet

Figure B.2-1 shows the location of the governing structures on the Columbia-Snake River System and identifies whether they provide greater or lesser clearance than 116 feet for the IBR Program's proposed fixed-span bridge configurations. Appendix F includes details on the navigation clearances for all bridges, cables, and locks across the Columbia River (from the mouth to Richland, Washington) and across the Snake River (from the mouth to Lewiston, Idaho).

Figure B.2-1. Columbia-Snake River System Map



B.3 Restrictive Horizontal Clearance

The Bonneville Lock and Dam at the navigation lock approach (RM 145.3) is currently the location of the most restrictive horizontal clearance, at 86 feet. This is not representative of the horizontal clearance at bridges as vessels approach and depart the locks at low speeds, but it does represent the limiting factor for vessels navigating above the Bonneville Dam.

The most restrictive horizontal clearance on the Oregon Slough is the BNSF Railway Bridge at RM 105.6, which provides 200 feet of horizontal clearance. As detailed in Section M.1, factors such as dockages, lightering areas, and existing bridges within 0.5 miles of the proposed replacement bridge may create hazardous passage through the proposed structure. This railroad bridge is approximately 1 mile downstream of the Interstate Bridge, a distance that minimizes potential restrictive horizontal clearance.

B.4 Restrictive Vertical Clearance

The most restrictive vertical clearance is the Celilo Bridge at RM 201.2, which provides 20 feet of vertical clearance with the lift span closed and 79 feet of vertical clearance with the lift span open.

The most restrictive vertical clearance on the Oregon Slough is the existing I-5 bridge at RM 106.5, which provides 35 feet of vertical clearance.

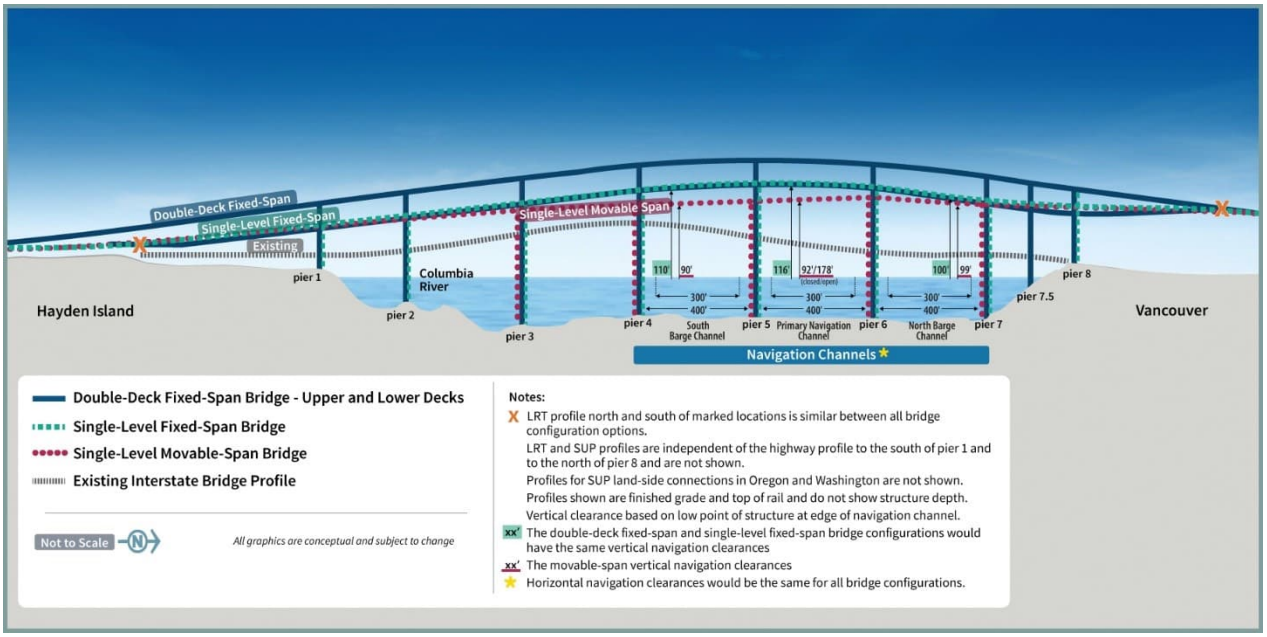
B.5 Restrictions Due to Proposed Bridge(s)

A reduction in VNC from 178 to 116 feet would result in the Interstate Bridge becoming the most restrictive/obstructive structure for the 6 miles of waterway from the Interstate Bridge to the I-205 bridge, or approximately 1% of the total Columbia-Snake River navigation system. Beyond that, the I-205 bridge and others restrict vessels to those that can navigate a VNC of 136 feet (or 144 feet at center of the bridge).

The existing Hood River-White Salmon bridge has a lift span with a VNC of 67 feet in the closed position and 148 feet in the open position above the normal pool elevation behind Bonneville Dam. Plans are currently underway for a fixed-height bridge to replace the existing Hood River-White Salmon bridge (RM 106.5), as identified in Table B.1-1. The USCG has issued a PNCD for the replacement bridges, which determined that the 90 feet of VNC would meet the reasonable needs of navigation. The replacement bridges are expected to open in late 2029, pending available funding. This NIR does not consider the Hood River-White Salmon replacement bridge, but were this bridge to be completed, it would change the governing structures and reduce the area potentially impacted by height restrictions from the IBR Program.

Changes in clearances due to the proposed bridges are shown in Figure B.5-1.

Figure B.5-1. Vertical and Horizontal Navigation Clearance Diagram



Key:
LRT = light-rail transit
SUP = shared-use path

C. WATERWAY CHARACTERISTICS

C.1 Waterway Stages

According to records maintained by the National Weather Service, the flood categories and river stages for the Columbia River downstream of the Interstate Bridge are as follows:

- Action Stage – 15 feet above CRD
- Flood Stage – 16 feet above CRD
- Moderate Flood Stage – 20 feet above CRD
- Major Flood Stage – 25 feet above CRD

According to the Federal Emergency Management Agency National Flood Insurance Study for Clark County, Washington, the 100-year flood level is 26.12 above CRD (FEMA 2018). The top five historical river crests (feet above CRD) for the Columbia River downstream of the Interstate Bridge are:

- 31.0 feet on June 13, 1948
- 30.8 feet on June 1, 1948
- 27.7 feet on December 25, 1964
- 27.6 feet on June 4, 1956
- 27.2 feet on February 9, 1996

The top four low water records for the Columbia River downstream of the Interstate Bridge are:

- -1.20 feet on January 7, 1937
- -1.10 feet on November 8, 1936
- -0.80 feet on July 30, 1978, and July 24, 1989
- -0.74 feet on July 14, 2001

While many vessels will not transit during very high water stages, self-reported observations from marine contractors included reports of being very busy during the February 1996 flood event, when they had to perform many rescues and temporary repairs of vessels, docks, and moorings and had frequent transits under the lift span of the Interstate Bridge.

C.2 Natural Flow of the Waterway

Currents at the Interstate Bridge location are generated by flows released at Bonneville Dam. According to the Federal Emergency Management Agency Flood Insurance Study for Portland, Multnomah County, Oregon, dated November 26, 2010, the average cross-sectional velocity for the 100-year flood near the Interstate Bridge is 3.8 feet per second (2.25 knots) (FEMA 2018). Note that this velocity is the average of the entire cross section; localized velocities, especially near the center of the channel, could be greater. During low-flow periods, the current is affected by tides, such that slack tide

can result in very little to no current. Currents used in the simulation effort are shown in Table C.2-1. No current information was found for the Oregon Slough.

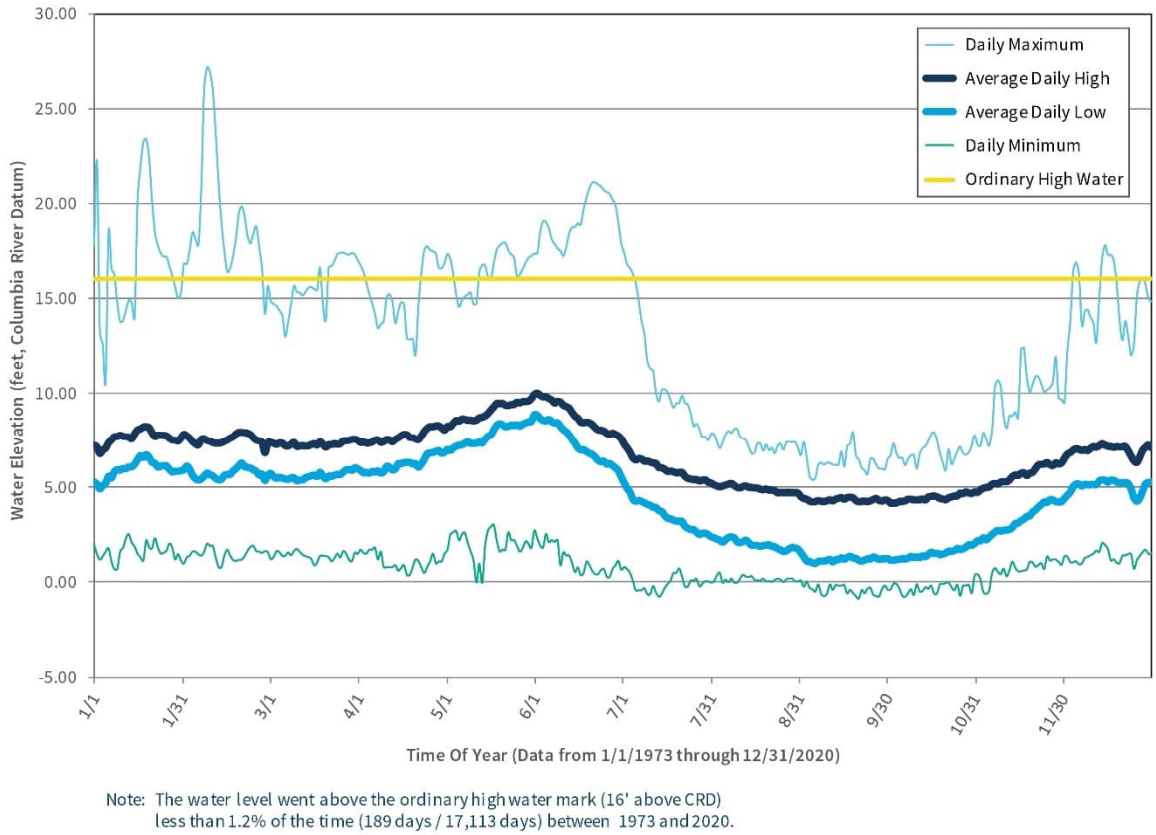
Table C.2-1. Columbia River Currents

Designation	Discharge at The Dalles (kcfs)	River Gage at I-5 Bridges (CRD)	Current Magnitude (fps/knots)
Normal	140	2.94	1.84/1.09
Transition	397	11.84	3.65/2.16
10-Year	539	16.44	4.35/2.58

Key:
CRD = Columbia River Datum
fps = feet per second
I-5 = Interstate 5
kcfs = 1,000 cubic feet per second

One of the critical factors influencing vertical clearance is river water level, which fluctuates daily and over the course of the year. Figure C.2-1 summarizes the variability in water levels for the Columbia River at the Interstate Bridge from 1972 through 2020. The figure shows daily maximum, daily minimum, average daily high, and average daily low water levels. Appendix G contains the data used to develop this chart.

Figure C.2-1. Columbia River Water Elevation at the Interstate Bridge (1972–2020)



Note: Water elevation data for 2021 through 2024 are not available for this illustration; thus, data are presented through 2020.

The Columbia River generally follows a seasonal trend of lowest water levels in late summer, moderately higher than average water levels in the winter (except for occasional storm-induced high water), and highest average water levels in May and June, coinciding with peaks in spring snowmelt and rainfall. In general, the following river water level trends can be observed from the data collected over the past 50 years:

- The highest average daily high is approximately 10 feet above CRD and occurs in late May/early June. The lowest average daily low is approximately 2 feet above CRD and occurs in early September.
- The OHWM of 16 feet above CRD was exceeded less than 1.2% of the time over the past 50 years. This is used as the “analysis level” for identifying vessels that would be impacted by a different VNC, as discussed in Section A.3.

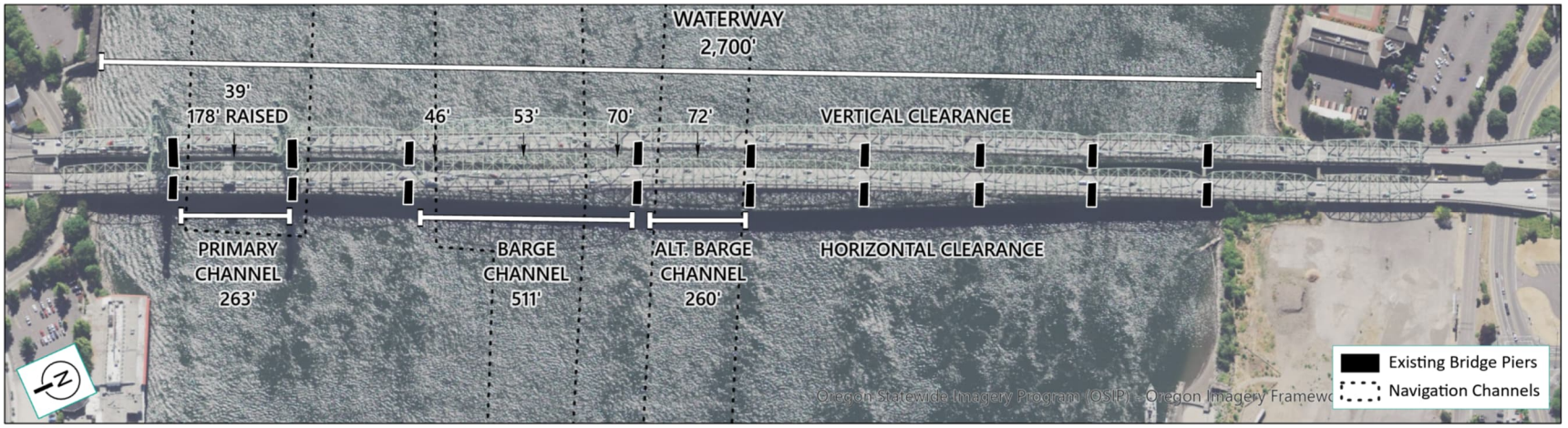
River levels at the Interstate Bridge are influenced primarily by variations in runoff. However, the river level is tidally influenced between its mouth at the Pacific Ocean and Bonneville Dam. The tidal influence is less at high river flow conditions and greater during low-flow conditions. According to National Oceanic and Atmospheric Administration (NOAA) Chart 18526, the diurnal range of the tide

during low river stages is 1.8 feet at Vancouver. The range becomes progressively smaller with higher stages of the river.

C.3 Width of the Waterway

The main Columbia River at the location of the Interstate Bridge has a width of approximately 2,700 feet. The river is constrained by urban development with hardened banks. The width is relatively consistent up- and downstream of the bridge for a considerable distance. The maintained federal channel widths and the overall river width are shown in Figure C.3-1.

Figure C.3-1. Maintained Federal Navigation Channel Widths for the Interstate Bridge



The Oregon Slough at the location of the I-5 bridge has a width of approximately 950 feet. The waterway is constrained by a federal levee on the south bank and urban development and infrastructure on both shorelines. The river widens just upstream but is relatively consistent in width downstream to its confluence with the main Columbia River channel. The Oregon Slough is the site of numerous floating homes and recreational and commercial moorage facilities that constrain the channel both up- and downstream of the I-5 bridge. This restricts the available width of the waterway for navigation to approximately 350 feet just upstream with even narrow widths available further east. These constraints are not generally present downstream of the BNSF Railway Bridge.

C.4 Depth of the Waterway

As noted previously, the channel depths currently maintained at the bridge by the USACE are either 15 or 17 feet. The most recent channel surveys completed by the USACE show water depths of 30 feet in the Primary Channel, 21 to 25 feet in the barge channels, and up to 48 feet outside the channels. Water shallower than 20 feet is limited to within 50 feet of the Washington shoreline and 300 feet of the Oregon shoreline (USACE 2021a).

Water depths in the Upper Vancouver Turning Basin (UVTB) and the Lower Columbia and Willamette project downstream of the bridge are currently less than the authorized depth of 35 feet. The most recent channel survey from the USACE in August of 2021 shows water depths of 20 to 30 feet downstream of the bridge for approximately 3,300 feet (USACE 2021b). Additional dredging east of the bridge to the authorized depth is unlikely to occur due to economic and time-prohibitive constraints and the lack of market need, as detailed in Section 2.2 in Appendix A.

Water depths at the Oregon Slough are shown as approximately 8 to 10 feet at the I-5 bridge on NOAA charts (NOAA 2020). Water depths vary considerably up- and downstream of the bridge, with depths of 40 feet or more downstream near the Port of Portland berths and shoaling at the upstream confluence with the Columbia, with depths as shallow as 3 to 4 feet. There are no available USACE surveys of the waterway at the existing bridge as it is not a federal project.

C.5 Waterway Layout and Geometry

The river is navigable for deep-draft vessels from its mouth to Portland, Oregon, and Vancouver, Washington, and for shallow-draft vessels to Lewiston, Idaho, via the Snake River. The Columbia River's deep-draft navigation system provides for a 43-foot-deep by 600-foot-wide channel from inside the Columbia River Bar upriver to ports on both the Washington and Oregon sides of the river at RM 106. The upriver end of this section of the channel, known as the Columbia and Lower Willamette Channels, is just downriver from the existing Interstate Bridge.

From just downstream of the Interstate Bridge to the head of navigation in Lewiston, Idaho (Snake River RM 139), the Columbia River is maintained as a shallow-draft system predominantly supporting tug and tow vessel traffic. The shallow-draft system has a controlling depth of approximately 15 feet (as noted in Section B). Just east of The Dalles at RM 201.2 is the Celilo Bridge with a VNC of 79 feet, which is notably less than the bridge heights under consideration for the IBR Program.

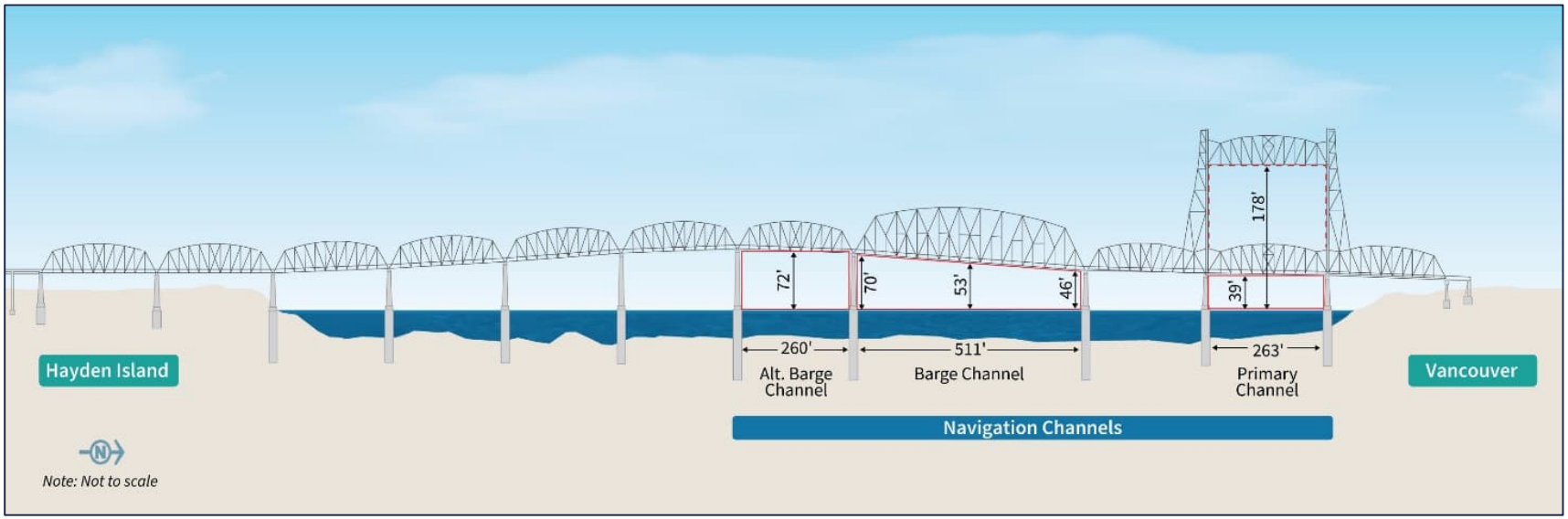
C.6 Channel and Waterway Alignment

Three bridges cross the main channel of the Columbia River in the Program area: the northbound and southbound structures of the Interstate Bridge, and the BNSF Railway Bridge.

Under the Interstate Bridge, vessels that are restricted to the navigation channel (the majority of commercial vessel traffic) pass through one of three designated federal navigation channels (FNCs): the Primary Channel, the Barge Channel, and the Alternative Barge Channel (see Figure C.6-1).

- The Primary Channel corresponds with the bridge's lift span and has a horizontal clearance of 263 feet and a vertical clearance of 39 feet in the closed position and 178 feet in the raised position.
- The Barge Channel lies under the wide spans of the bridge and has a horizontal clearance of 511 feet and a vertical clearance ranging from 46 feet to 70 feet.
- The Alternative Barge Channel occupies the span directly to the south of the wide span and has a horizontal clearance of 260 feet and a vertical clearance of 72 feet.

Figure C.6-1. Columbia River Navigation Clearances for the Interstate Bridge

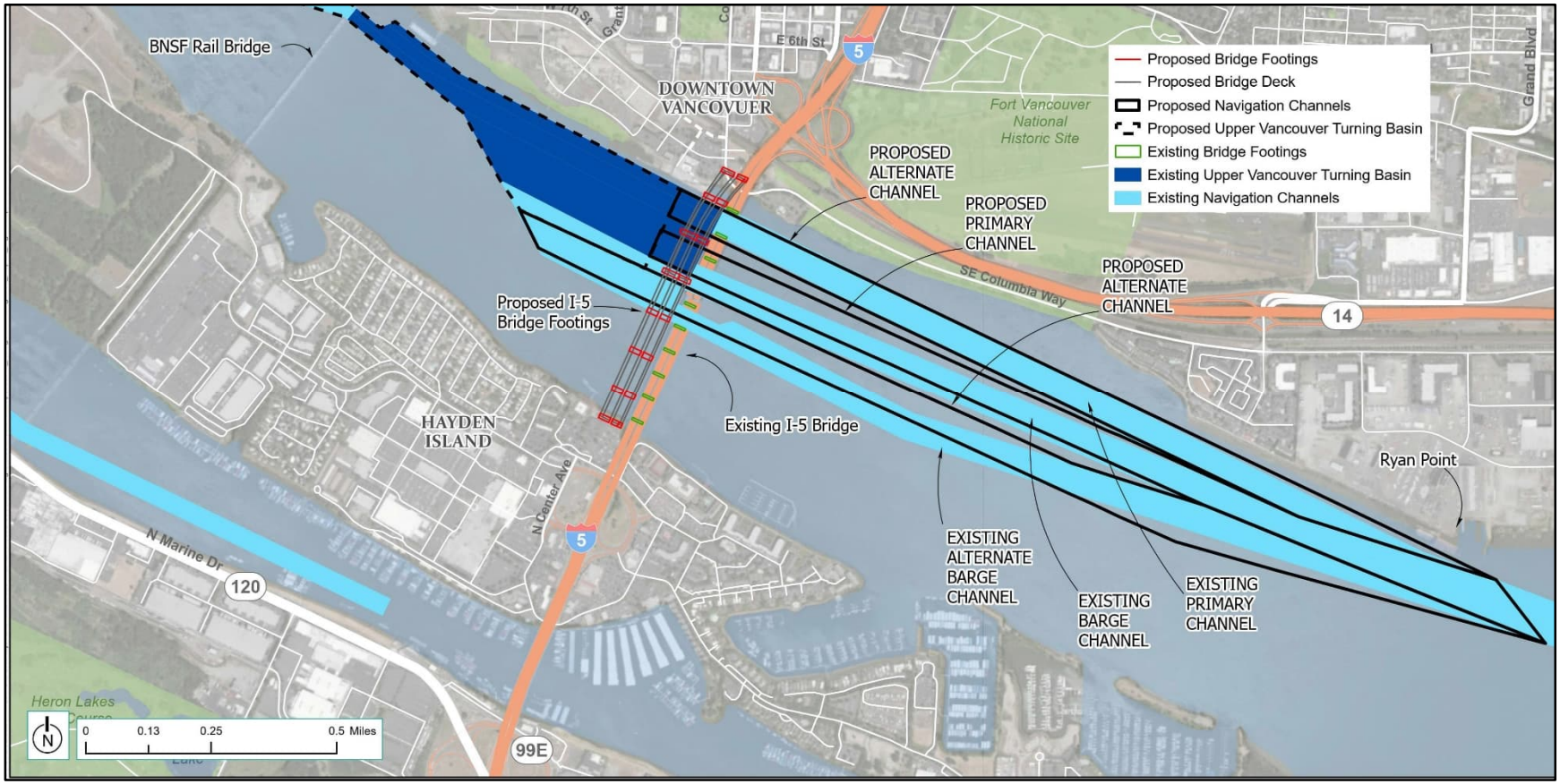


The third bridge in the Program area—the BNSF Railway Bridge—is located approximately 1 mile downstream (west) from the Interstate Bridge and provides unlimited VNC through a 200-foot-wide movable swing span. It provides a VNC of 39 feet in the closed position. There is a single federal channel corresponding with the swing span. The VNC of 39 feet is generally available on the fixed spans across the width of the bridge outside the FNC.

The most direct vessel route through this river section is through the Interstate Bridge's Primary Channel lift spans and the BNSF Railway Bridge's swing span. This route is relatively straight and is preferred during times of high-velocity river flow and for vessels with limited maneuverability when traveling downstream, regardless of vessel height. Vessels that require a VNC above 39 feet necessitate the lift spans and swing span to open to complete the transit. The Code of Federal Regulations (CFR) stipulates that the I-5 draw shall not be opened Monday through Friday from 6:30 a.m. to 9:00 a.m. or from 2:30 p.m. to 6:00 p.m., with the exception of allowing openings for vessels responding to an emergency situation (CFR Title 33 Chapter I Subchapter J, Part 117 § 117.869).

Vessel operators can avoid the need for a bridge lift by using the Interstate Bridge's Barge or Alternative Barge Channel as VNC and vessel maneuverability allow. Vessels are generally prohibited from requesting a lift span when they can pass without a lift (CFR Title 33 Section 117.11). The use of these channels requires a more complex maneuver than does the route through the Primary Channel and requires vessels to navigate a relatively complex "S" curve path between the Interstate Bridge and the BNSF Railway Bridge to pass through the BNSF swing span. The Alternative Barge Channel (the southernmost channel) requires a more pronounced maneuver than the Barge Channel. These routes are generally shown in Figure C.6-2 and are designated as the "existing Barge Channel" and the "existing Alternative Barge Channel." The channel locations would be modified to accommodate the proposed vertical clearance locations and location of the bridge piers. Proposed navigation channels are also shown in Figure C.6-2.

Figure C.6-2. Existing and Proposed Columbia River Navigation Channels



C.7 Other Limiting Factors

The IBR Program considered the implications of projected variances in regional weather patterns, their interaction with other geological and hydrological conditions, and how they could impact the Columbia River as it relates to navigation and the proposed replacement bridge design. Information from the Washington Coastal Resilience Project (Miller et al. 2018), Hydrologic Engineering Center – River Analysis System model developed by USACE (USACE 2022a), Levee Ready Columbia (Wherry et al. 2019), and other sources were reviewed, and potential impacts to the Columbia River's surface water elevation, flow cycles, and tidal influence were identified as follows.

- ***Higher surface water elevation during precipitation/melt events.*** By the year 2100, forecast regional weather pattern shifts project a Columbia River surface water elevation rise at the Interstate Bridge of almost 8-inches during atmospheric river or snowmelt flows. Relative changes in surface water elevation in the ocean in the Pacific Northwest could vary based on uplift and subsistence of continental plates, with some regions experiencing less surface water elevation rise because tectonic forces are causing the ground to rise. Findings from a study by Levee Ready Columbia indicate that rising ocean surface water elevation levels may impact the Columbia as far inland as Rainier, Oregon (Wherry et al. 2019).
- ***Higher wintertime flows and lower spring/summer flows with flood events.*** Seasonal shifts in temperature and precipitation could impact base and peak flows and river water levels. Average annual precipitation is likely to stay within the range of 20th-century variability; however, the amount and timing of precipitation may shift, with a trend toward more winter precipitation. Warmer, wetter winters are likely to lead to higher winter base flows and river stages, while lower base flows and river stages are likely to occur in spring and summer months. Per the Levee Ready Columbia study, a regional forecast for increased precipitation in the Cascades and the Willamette Valley would create higher wintertime flows in the general area of the Interstate Bridge (Wherry et al. 2019). Earlier snowmelt and more wintertime rain-on-snow, quickly melting the snowpack, would cause this change. Also contributing to winter flow variances, warmer winter temperatures in the Columbia River Basin could result in lower snowpack and higher winter base flows. Lower base flows are expected in the spring and summer months, and a higher likelihood of intense storms may increase flooding. While the river could have higher peak flows, according to the Columbia River Pilot's Vessel Movement Guidelines, river flow is less of a navigation challenge on the Columbia River as compared to river height (Columbia River Pilots 2023).
- ***Tidal influence to vary at the Interstate Bridge.*** Increased thermal expansion, melting of glaciers and land-based ice, and melting of Greenland and Antarctic ice sheets are expected to impact the surface water level of the ocean (Miller et al. 2018) and, thus, the tides that influence the Columbia River. Historically, high tides (associated with the lunar cycle) and high river flows (associated with precipitation events) occur at the same time between November and March. The U.S. Geological Survey (USGS) and USACE have conducted studies of sea-level rise from the mouth of the Columbia River at Astoria, Oregon (NOAA Tide Guage 9439040) to the Bonneville Dam. The USGS and USACE concluded that rise at RM 106 would be lower than that at the mouth of the river at Astoria, and the amount of rise would be impacted by the flow of the river.

Tides in the late spring and summer months are associated with lower river flows in the Columbia River. Looking forward, the tides in the spring and summer months would not be higher than the tides in the fall and winter. The USGS and USACE studied high-river-flow scenarios for the Columbia River due to historic snowmelt and winter atmospheric rivers to examine water surface elevations relative to managing flood-control structures, and they were used to inform the IBR Program's understanding of changes in water surface elevations around the Program area.

While the best available science does not provide specific projections for how shifts in regional weather patterns and their interactions with other hydrologic and geologic conditions impact the daily average high and low water levels at the Interstate Bridge, future higher winter base flows will affect water depth and river speed. It is possible that, during future high-flow events, navigation of certain vessels could be affected due to increased river flow regardless of the navigation clearances. Furthermore, it is possible that navigation for some of the largest vessels, depending on the final design and approved navigation clearances, could be affected by high river levels if there are days when the Columbia River may be too high to accommodate them underneath a fixed-span bridge. Ultimately, however, the risk to navigation clearance from forecast changes in Columbia River surface water elevation changes, flow cycles, and tidal influence is expected to be very low.

D. FEDERAL NAVIGATION PROJECT

D.1 Project Name

The Columbia River and the Oregon Slough include several federal navigation projects that are relevant to navigation within the Program area, shown in Table D.1-1 (USACE n.d.). There are numerous other federal navigation projects on the river, including side channels, turning basins, small boat harbors, and anchorages that are not detailed here.

Of the projects listed in Table D.1-1, the Columbia and Lower Willamette Rivers, UVTB, Vancouver to The Dalles (main or primary channel) project, Barge Channel, and Alternative Barge Channel correspond with or are located near the proposed replacement bridges. Figure C.6-2 in Section C, above, shows the existing channel configuration in the vicinity of the existing Interstate Bridge. "Authorized depth" refers to the depth of the channel authorized by the U.S. Congress to be constructed and maintained by the USACE.

Table D.1-1. Federal Navigation Projects

Project Name	Limits (RM)	Authorized Depth (feet)	Maintained Depth (feet)	Type of Project	Status
Mouth of the Columbia River	Offshore to RM 3	55 (north reach) 48 (south reach)	55	Channel	Operational
Columbia and Lower Willamette	RM 3 to RM 105.5	43 (to RM 105.5 and Oregon Slough RM 1.5) 35 (RM 105.5 to 106.5)	43	Channel	Operational Oregon Slough not maintained to 35 feet for entire length
Upper Vancouver Turning Basin	RM 106.5	35	N/A	Turning Basin	Operational Used infrequently and not maintained to authorized depth
Vancouver to The Dalles	RM 106.5 to RM 189.7	27	17	Channel	Maintained for barge traffic
Barge Channel	RM 106.5 to 107.5	15	15	Channel	Operational
Alternate Barge Channel	RM 106.5 to 108	17	17	Channel	Operational
Oregon Slough – Upstream Entrance	Oregon Slough RM 5.8 to RM 109	10	10	Channel	Last maintained in 2001

Key:
N/A = not applicable
RM = river mile

D.2 Design Vessel Information

A design vessel was identified for the UVTB for the 2023 IBR Program Navigation Simulation Study, the specifications of which are described in Section D.3. The IBR Program coordinated with USACE and USCG through monthly meetings to provide input on the ship simulation methodology and design vessel, including joint meetings in April 2023 and September 2023. The results from the simulation study were shared with the USCG during a regular coordination meeting with the IBR Program in February 2024. This design vessel was used for the: Columbia and Lower Willamette channel between the BNSF Railway Bridge and the Interstate Bridge; the Vancouver to The Dalles project; and, the Vancouver to The Dalles channel and secondary channels. The vessel designed by the USACE for each of these three projects could not be determined. Design vessels for the Columbia and Lower Willamette below the Interstate Bridge and for the Columbia and Lower Willamette FN on the Oregon Slough are not addressed in this NIR as they do not pertain to this project as detailed below.

Columbia and Lower Willamette channel between the BNSF Railway Bridge and the Interstate Bridge. The portion of the Columbia and Lower Willamette channel between the BNSF Railway Bridge and Interstate Bridge and the UVTB is located just downstream of the Interstate Bridge. Because the proposed replacement bridges would be located downstream (west) of the existing bridge, they would be situated over the federal navigation projects. The channel was originally authorized in 1878 and the turning basin in 1962. The design vessel used by the USACE for these projects could not be determined. A design vessel was selected for the UVTB in the 2023 IBR Program Navigation Simulation Study, including future operations at the Lafarge facility near the BNSF Railway Bridge (Moffat & Nichol 2023).

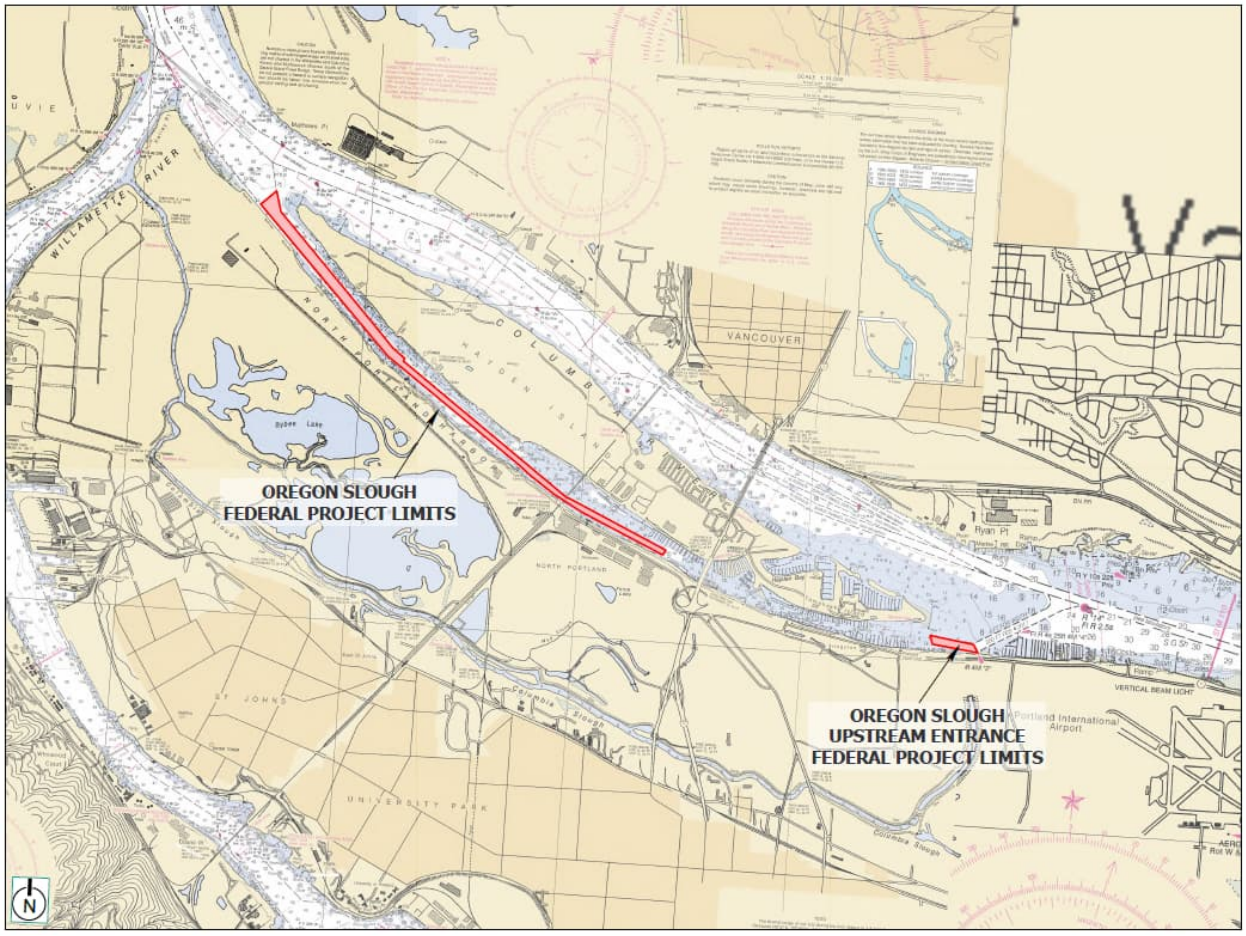
Vancouver to The Dalles project. The Vancouver to The Dalles project begins just downstream of the Interstate Bridge and was originally authorized by the Rivers and Harbors Act of 1937 with a depth of 27 feet for deep-draft vessels. The design vessel used by the USACE for this project could not be determined. No deep-draft vessel traffic currently uses this channel. However, a design vessel was selected for this federal navigation project based on criteria discussed in the 2023 IBR Program Draft Navigation Simulation Study (Moffat & Nichol 2023).

Vancouver to The Dalles channel and secondary channels. The Vancouver to The Dalles channel and the secondary channels located at the Interstate Bridge are primarily used for shallow-draft barges being pushed by tugs or towboats. The specific design vessel used by the USACE for the Vancouver to The Dalles project could not be determined. However, a design vessel was selected for this federal navigation project in the 2023 Draft Navigation Simulation Study based on information on present vessels using the navigation channel through contacts with commercial shipping interests and operators (Moffat & Nichol 2023). Navigation continues on the Columbia-Snake system beyond The Dalles. Vessels using that project are assumed to be the same as those using the Vancouver to The Dalles project.

Columbia and Lower Willamette below Interstate Bridge. The Columbia and Lower Willamette project ends just below the existing Interstate Bridge. Deep-draft vessels that pass through the channel below the BNSF Railway Bridge do not typically use the channel between the two bridges, as there are no suitable berths and the waterway depths are not authorized or maintained to an adequate depth. Therefore, design vessels for the Columbia and Lower Willamette project are not addressed in this NIR.

Columbia and Lower Willamette FNC on the Oregon Slough. On the Oregon Slough, the Columbia and Lower Willamette FNC does not extend to the I-5 Oregon Slough bridge. Project limits extend for 1.5 miles, approximately 1,500 feet downstream from the I-5 Oregon Slough bridge. The Oregon Slough – Upstream Entrance project begins approximately 1.5 miles upstream of the existing bridge. Figure D.1-1 shows the extent of the federal projects on the Oregon Slough. Design vessels for this project are not considered in this analysis as the channel does not correspond to the bridge location. The USACE recently completed updated environmental documentation for maintaining the Oregon Slough – Upstream Entrance to its authorized depth, but the timing of this work is not currently known. Since that effort is primarily to support existing navigation, it is not anticipated to result in changes to vessel use or characteristics.

Figure D.1-1 Oregon Slough Federal Project Limits



D.3 Design Vessel Specifications

The design vessel selected for the UVTB was a small tanker with dimensions of 580 feet in overall length, a 101-foot beam in overall width, and drafts of 20 and 33 feet for ballasted and loaded conditions, respectively.

The design vessel selected for the Vancouver to The Dalles project was a bulk carrier with dimensions of 508.2 feet in overall length, an 85.3-foot beam in overall width, and a draft of 25 feet.

For the Vancouver to the Dalles channel and secondary channels, the primary limitation on vessels is dictated by the lock dimensions at Bonneville Dam. Many tugs and barges of various sizes use the river. For the simulation effort, the design vessels used in this shallow-draft simulation testing were four configurations of tow barges in both light and loaded conditions and with the towboat position based on the operator's typical existing procedure. Table D.3-1 lists the tug and barge details used.

Table D.3-1. Tug and Barge Details

Vessel	Length Overall	Beam	Depth[a]
2x2 Barge + Twin Screw Pushboat (2 wide x 2 long)	737 feet	85.3 feet	14 feet
2x1 Barge + Twin Screw Pushboat (2 wide x 1 long)	438.5 feet	85.3 feet	14 feet
Specialty Barge + Z-drive Pushboat	505.8 feet	100 feet	10.5 feet
Specialty Barge + Twin Screw Pushboat	478.5 feet	100 feet	10.5 feet

Note:
a. Depth is from top of deck to bottom of keel

D.4 Safe and Efficient Vessel Passage

The replacement bridges would provide the horizontal and vertical navigational clearances necessary for the safe, efficient passage of the design vessels.

D.5 Can Vessels Be Modified?

Not applicable.

D.6 Modification Information

The USACE maintains the channel depth to 17 feet based on current uses, and there are no deep-draft vessel facilities in operation upriver of the Interstate Bridge. If a river user submits a request to deepen the channel, the USACE could conduct capital dredging, removing sediment/riverbed materials to return the channel to its authorized depth of 27 feet. The budget to accomplish and perform the dredging work would ultimately need to be approved by the U.S. Congress as part of the budget bills before that capital dredging work would begin. Further deepening of the channel to match the authorized depth of Columbia and Lower Willamette project would require additional Congressional

authorization. Furthermore, a feasibility study and a cost benefit analysis, as well as an extensive environmental analysis, would need to be prepared demonstrating that the economic benefits to navigation exceed the costs of conducting the work.

As detailed in Appendix A, additional dredging is unlikely to occur due the economic infeasibility and the extensive time and effort required for planning and authorizations. For example, dredging the Columbia River by an additional 3 feet in 2010 took approximately 20 years to design, permit, and complete, and cost $190 million to complete (Oregonian 2010).

D.7 Changes to Waterway Usage

The replacement bridge design would require modification of the federal project channel locations and the upstream extent of the UVTB. These channel modifications would be subject to review and authorization by the USACE under a separate process established in Section 14 of the Rivers and Harbors Act of 1899, codified at 33 U.S. Code 408 (Section 408). An authorization under Section 408 will be completed prior to the issuance of a Bridge Permit by the USCG. The IBR Program will coordinate with the USCG to keep the agency informed throughout the review process. While the channel modifications would not be subject to USCG authority, they would have the potential to affect navigation and thus are considered in this NIR. This section describes the proposed modifications, shown in Figure C.6-2, above.

To maintain the current bridge in an operational condition during construction, the replacement bridges would be constructed downstream of the existing bridges. The area where the replacement bridges would be constructed would overlap with the UVTB, which would be shifted 230 feet downstream to locate the upstream limit at RM 106.4, compared to the existing location at RM 106.5. The UVTB would remain oriented toward the northwest and would maintain current dimensions. Drawings of the navigation project hydrographic surveys show the dimension to be approximately 800 by 2,000 feet.

As with the existing bridges, the replacement bridges would continue to provide three navigation channels. The existing primary navigation channel is the northernmost channel and traverses the Interstate Bridge where the existing lift spans are located. Tows requiring air draft that is not available in the wide and high spans must use the lift span within the existing Primary Channel. For the proposed 116-foot fixed-span bridge (evaluated as part of the Modified Locally Preferred Alternative [LPA] presented in the IBR Program SEIS), the primary navigation channel would be shifted south approximately 500 feet to align with the highest VNC and to clear the span of the new bridges. The centrally located existing Barge Channel would then shift to the northernmost position and would be renamed as the “North Barge Channel.” Slight centerline adjustments would be made to the southernmost existing Alternative Barge Channel to clear the span of the new bridges, which would be renamed as the “South Barge Channel.” Each of the three proposed altered navigation channels would have HNCs greater than or equal to the existing HNCs. Under the Modified LPA, the HNC width includes a 300-foot navigation channel plus a 50-foot maintenance buffer on each side (400 feet total).

The existing Alternative Barge Channel is currently the southernmost channel. It is also sometimes referred to as the “high span” and is almost exclusively used by upbound tows (which are mostly

empty) and tows with construction equipment that require the higher clearance but do not require using the lift span. These tows are generally more controllable than downbound tows and can make the “S” turn needed to transition from the location of the BNSF Railway Bridge opening to the Alternative Barge Channel alignment. The existing Alternative Barge Channel would be renamed as the South Barge Channel. The alignment of this channel would increase from 200 to 300 feet HNC between the piers and would increase the existing VNC of 72 feet to 110 feet.

The existing Barge Channel, the middle of the three channels, is primarily reserved for downbound tows since they have less control. Therefore, these tows need the barge navigation channel (also referred to in the industry as the “wide span”). This is because use of this channel requires less maneuvering than the Alternative Barge Channel to move toward the Washington shore to align with the BNSF Railway Bridge. The existing Barge Channel would be redesignated as the Primary Channel, and the Barge Channel would be shifted to the north and renamed the North barge Channel at the request of the USACE. The proposed Primary Channel would maintain the authorized 300 feet between the piers and would increase VNC to 116 feet. The proposed North Barge Channel would also maintain the authorized 300 feet between piers and would increase VNC to 100 feet.

Appendix I details the proposed changes to the navigation channels designed to meet USACE guidelines.

D.8 Impacts to Federal Channel

The proposed replacement bridges would not impact the USACE’s ability to transit the bridge in the federal project channel.

E. EMERGENCY AND GOVERNMENT VESSEL USE

E.1 Waterway Maintenance Activities

Vessels on the river include those operated by the USACE, USCG, and U.S. Navy, as well as training vessels from the Tongue Point Job Corps Maritime Training Program and a dredge operated by the Port of Portland. Vessels using the waterway during the proposed replacement bridges' lifespan are identified in Section E.3.

E.2 Coast Guard and/or Other Government Vessel Activities

The proposed replacement bridges would not impact USCG or other government vessels' ability to transit the bridges to conduct mission-essential functions, as described below.

E.3 Vessels Utilizing the Waterway

Vessels operated by USACE, USCG, and the U.S. Navy, as well as training vessels, are described below, and air drafts and air gaps from the river user survey are shown on Figure E.3-1. User and survey data on these vessels are included in Appendices B and D.

- The Port of Portland provided vessel characteristics for the *Dredge Oregon*. The Port indicated that this vessel has an air draft of 63 feet, with a desired air gap of 5 feet. They noted that the dredge utilizes "spuds" to hold itself on position and navigate within the channel. When in the stowed position for transit, the spuds are the highest point on the dredge, at approximately 75 feet above the waterline. However, the Port indicated that if the dredge were required to transit upriver from the Interstate Bridge, it would be reasonable to hire a derrick barge and crane to remove the spuds at the Port's facility in the Swan Island harbor and place them on a barge, then reinstall them after the dredge has been towed upriver from the bridge. The Port did not provide typical frequency of transit under the Interstate Bridge by month. They noted that the dredge has transited under the Interstate Bridge six times in the last 42 years.
- The U.S. Navy Puget Sound Naval Shipyard (PSNS) in Bremerton, Washington, dismantles nuclear reactor compartments from deactivated nuclear submarines and cruisers. These compartments are then shipped via barge from Bremerton to the Port of Benton, where they are transferred to a large trailer for permanent disposal at the U.S. Department of Energy Hanford Reservation, approximately 7 miles from the Port of Benton, Washington. The U.S. Navy PSNS provided information on six freight barges, including two future barges (*Barge 40, Barge 60, Beluga, Edgecumbe, Future Barge 1*, and *Future Barge* 2), with air drafts ranging from 43 to 59 feet and desired air gaps of 15 feet. The vessels typically transit the bridge location during mid-March through mid-April and September through October. Shipment time and frequency will vary but could average two trips per year per vessel. The U.S. Navy PSNS indicated that they use contract tugboats with the above vessels, and Tidewater Barge Lines holds the current contract for the river portion of the trip.

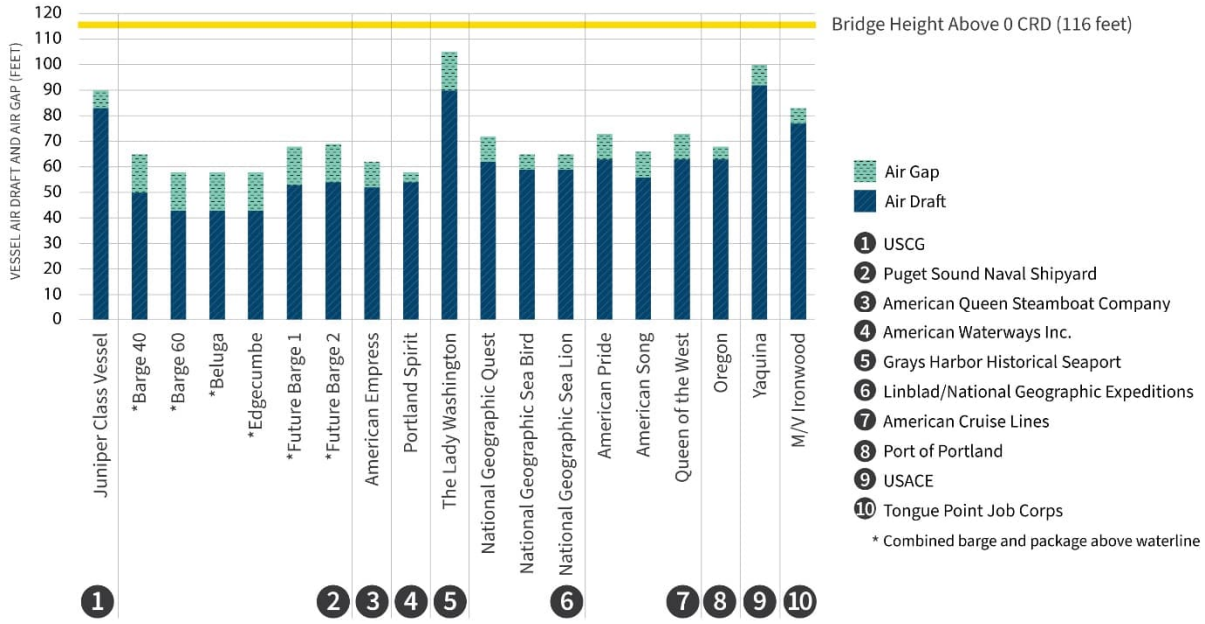
- The USACE Portland District confirmed that its hopper dredge (*Yaquina*) is the tallest USACE vessel that is expected to transit the bridge location. The *Yaquina* was surveyed as part of the CRC NIR, which noted a 92-foot air draft and an 8-foot desired air gap for the dredge. The USACE confirmed that the dredge typically works during the in-water work window of August 1 to September 30, but it needs to be able to transit under the bridge at any time of year to address shoals.
- The Tongue Point Job Corps Maritime Training Program (Tongue Point) did not respond to the IBR Program's request for information. They also did not respond to the request that was issued as part of the Hood River-White Salmon Bridge Replacement NIR. The CRC NIR indicated that Tongue Point uses the retired USCG Motor Vessel (M/V) *Ironwood* buoy tender as a training vessel for students. The vessel was surveyed as part of the CRC NIR, which indicated an air draft of 77 feet and required air gap of 6 feet. Tongue Point reported one trip per month for this vessel, from May to August.
- The City of Vancouver, City of Portland, Clark County, and Multnomah County operate firefighting, rescue, and law enforcement vessels in the area. These vessels are small and would not be restricted by the IBR Program's proposed fixed-span configuration.

Other vessels operating in the area that are not known to transit under the Interstate Bridge are described below.

- MSC Military Sea Lift Command U.S. Maritime Administration (MARAD) indicated that the *USNS Mercy* and T-AKE and T-AO vessels routinely travel to the Vigor Works LLC (Vigor) shipyard on Swan Island in Portland for service and have not ventured near the Interstate Bridge. MARAD manages services for the exclusive long-term safe layberthing for the T-AVB class Ready Reserve Fleet vessel *SS Curtiss* on the U.S. West Coast, including navigable waterways that can support the safe berthing and navigation of the size of vessel identified. MARAD requires specific minimum standards of accommodating their vessels. These include drafts that must be at least 4 feet deeper than the maintained river depth, a minimum 142-foot air draft, and piers that are accessible to trucks. There are no suitable locations for berthing and navigation of these vessels upriver of I-5, and there is insufficient depth upriver of the BNSF Railway Bridge. No MARAD vessels are included in the Interstate Bridge lift logs from January 2007 through July 2025.
- MARAD responded to the USCG public notice with information on vessels that use the Columbia and Willamette system. MARAD is responsible for a number of programs, such as the National Defense Reserve Fleet and the Ready Reserve Fleet, that operate vessels in support of the country's maritime interests. These programs have more than 140 vessels, including active vessels and those that could be rapidly deployed as needed (MARAD 2022). In response to a request from the IBR Program team on May 15, 2024, MARAD stated that the MARAD vessels that use the Columbia waterway would not be impacted by the proposed fixed-span bridge, noting that all of the home ported vessels in the region are downriver of I-5.
- The USCG Marine Safety Unit (Portland) indicated that the information they provided in response to the Hood River-White Salmon Bridge Replacement river user survey was still accurate. For that project, the USCG provided information on a Juniper-class buoy tender. The

vessel's primary mission is as a buoy tender; however, all USCG buoy tenders can perform other USCG missions, including search and rescue, maritime law enforcement, and marine environmental protection. The USCG indicated that an air draft of 83 feet and air gap of 7 feet are needed for the vessel. The vessel is all-weather capable, and its frequency of passage depends on specific operations and situations.

Figure E.3-1. Emergency Operation, National Defense, and Channel Maintenance Vessels Air Draft and Air Gap Results



Interstate Bridge lift data, as documented in Appendix H, indicate that dredges accounted for an average of 2% of bridge opening events between 2007 to 2024, ranging from a low of 1% for several years to a high of 6% in 2019 and 2024. Bridge opening events for dredges averaged three to four per year between 2012 and 2020. In 2021, 2022, 2023, and 2024, the *Yaquina* performed one upbound and one downbound transit each year; no other dredges were recorded during this timeframe.

Other government vessels accounted for an average of 1% of bridge opening events, ranging from a low of 0% (there were several years when a government vessel did not request an opening, including 2012 to 2014 and 2018 to 2024, to a high of 3% in 2007. Government vessels that required bridge openings include PSNS nuclear transporters, the USCG *Cutter Henry Blake*, the USCG Cutter *Barracuda,* and the M/V *Ironwood*.

E.4 Allow Passage of Largest Vessels

The USACE dredge *Yaquina* may be impacted by the proposed replacement bridges without modifications. However, the proposed replacement bridges would provide the horizontal and vertical clearances for the safe, efficient passage of the other vessels listed above.

E.5 Vessels Restricted by Proposed Bridge

Under the assumed conditions, the USACE dredge *Yaquina* would be able to pass under a bridge height of 116 feet in the vessel's current configuration more than 90% of the days of each month of the year. Because the dredge needs to be able to transit at any time of the year to address potential dredging needs, it is considered impacted by the proposed fixed-span replacement bridges. The USACE requested a minimum 8-foot air gap for the *Yaquina*. If that were changed to 5 feet, the dredge would essentially be unaffected (it could pass between 98% and 100% of the days in each month). With an 8-foot air gap, it could pass under the 116-foot bridge on more than 98% of the days each month of the year. The height of the vessel exceeds 116 feet under the assumed conditions during the flood stage at 16 feet above CRD. Mitigation options are provided to modify the antenna and mast to reduce the air draft, described in detail in Section T. Accordingly, for the purposes of this analysis, the proposed fixed-span bridge would not have a substantial impact on the dredge *Yaquina*.

E.6 Can Restricted Vessels Be Modified?

Mitigation options for the dredge *Yaquina* are provided in detail in Section T.

E.7 Identify Vessels Which Can Be Modified

Mitigation options for the dredge *Yaquina* comprise modifying the antenna and mast to reduce the air draft. These modifications would include removing the radar and its foundation down to 6 inches off the crow's nest platform, the flag halyard and gaff pipe, and all electronics. Additionally, cabling from the mast on structures higher than the crow's nest platform could be detached, and the masthead and maneuvering lights, as well as handrails down to the crow's nest deck, should be removed. The mast itself could be cut and removed down to 6 inches above the crow's nest platform, and the height of the vertical ladder and associated safety cable should be adjusted to 6 inches above the crow's nest platform. The ladder would need to be moved off-center to starboard to accommodate the modified mast.

E.8 Impacted and Burdened Users

The USACE maintains the Columbia River navigation channel through dredging. Equipment used for dredging downstream of the Interstate Bridge would not be constrained by the replacement bridges as it is located or based downstream of the Interstate Bridge and does not need to navigate the bridge for other purposes such as maintenance or refueling.

Navigation on the Columbia-Snake system extends nearly 230 miles along the Columbia River to Richland/Pasco/Kennewick, Washington, and also runs along 140 miles of the Snake River from the confluence at Pasco to Lewiston, Idaho. Along this channel, there are also numerous facilities such as docks, boat launches, marinas, intakes, outfalls, dams, and locks that may require regular or infrequent maintenance dredging, which would need equipment in the future to transit through the proposed replacement bridges. Equipment needed for dredging upriver of the Celilo Bridge is constrained by the bridge's height and does not require further consideration.

The USACE typically conducts maintenance dredging yearly on the Vancouver to The Dalles project during the summer season. For 2020, the USACE reported an amount of 132,936 cubic yards of dredging (USACE 2021c), which the USACE indicated that the *Yaquina* typically completes. There is no indication that the type and frequency of dredging will change in the future under current conditions. The Vancouver to The Dalles project is authorized to a depth of 27 feet but is only maintained to 17 feet. Should conditions change and the USACE undertake dredging of the channel to 27 feet, the capital dredging needs and ongoing maintenance needs would likely require different equipment than presently used, and additional permits would be needed to dredge to the 27-foot depth. There is no need for the channel to be dredged to its authorized depth, considering the current channel use, existing facilities, available properties, and future development identified in city, port, state, and federal land use and other management plans, which typically have planning horizons of 10 to 20 years.

The USACE has indicated that there are no current plans for replacement of the *Yaquina*, but, based on the age of the vessel, it would likely require replacement during the life span of the replacement bridges. If the USACE were to replace the *Yaquina*, the new dredge could be designed reasonably to meet the height limitations of the new bridge, similar to the construction of the USACE's new dredge *Donnelly*, which is undergoing construction and slated for service by late 2027 (USACE 2025a). The USACE's Marine Design Center integrates navigational clearance requirements, such as air gaps and VNC, into vessel design (USACE 2025b).

Dredging at berths and for other facilities is typically done by mechanical dredging or by small cutter section dredges due to the small volume of dredging needed. Mechanical dredging is most typically done by clamshell bucket operated by a crane from a barge, both of which are widely available. Future efforts are expected to be similar and conducted by equipment that would not be constrained by the proposed replacement bridges.

There is no evidence that the amount of dredging that occurs upriver of the proposed replacement bridges is likely to be substantially different than in past years. No dredge equipment that would be constrained by the Celilo Bridge would be constrained by the proposed replacement bridges; therefore, only dredge work between the existing Interstate Bridge and the Celilo Bridge is potentially impacted.

Additionally, the Columbia River may be used by a variety of other vessels as part of emergency response and national defense activities. These could include responses to incidents at Portland International Airport (PDX), emergency response to large-scale natural disasters such as earthquakes, or military support activities.

The IBR Program team contacted the Port of Portland to discuss emergency operations related to PDX. Port emergency and planning staff indicated that there are no standards or protocols related to aircraft in the Columbia River, such as specific sites for emergency landings in the river (Port of Portland 2024a). Because PDX is located near the Columbia River, emergency response plans and training include responding to an incident in the water. Initial emergency response activities would include small water and land craft operated by local law enforcement and emergency response agencies (DLBA 2021).

Portland Fire & Rescue (PF&R) provides firefighting, emergency medical services, technical rescue, and support to shoreline emergencies from the waterside of an incident and could provide emergency services for an aircraft-related water incident. PF&R has three stations along the Willamette and Columbia Rivers that deploy fireboats and smaller rescue boats (PF&R 2022). Similarly, the Port of Portland has a fleet of water rescue vessels that would respond to aircraft water incidents (Port of Portland 2024b). None of these vessels have heights that would be constrained by the proposed replacement bridges. If an aircraft ended up in the Columbia River, it could be upstream or downstream of the bridge. Removal or other efforts involving an aircraft in the water would be the responsibility of the aircraft owner/operator in coordination with federal transportation officials. Floating cranes or construction equipment would have to be selected based on availability and characteristics that could be accommodated by the waterway. Equipment is available to respond to this potential emergency that is not height constrained.

Considering the current channel use, existing facilities, available properties, and future development identified in city, port, state, and federal land use and other management plans, there is no known reason to project an increase or change in the type of government vessels transiting upstream of the replacement bridges to change in the next 10 to 20 years.

F. PRESENT AND PROSPECTIVE RECREATIONAL NAVIGATION

F.1 Vessel Information

The Columbia River is an active recreational waterway supported by marinas, maintenance facilities, and other vessel support services present along its shoreline. The proposed 116-foot fixed-span bridge would not block access to these facilities; therefore, it would not impact services that support recreational activities on the waterway. Detailed information about marine facilities along the Columbia River that support recreational vessels can be found in Section H.

Recreational vessels that use the river are described below. User and survey data on these vessels are included in Appendices B and D. The majority of recreational vessels are small power and sailboats that would not be impacted by bridge heights and widths. Only vessels with the potential to be impacted by the replacement bridges are addressed in this section. The frequency of travel identified for individual vessels below is based on self-reported data from vessel owners:

- Schooner Creek Boat Works (Schooner Creek) provided information on one sailboat, *Rage*. The vessel has a reported air draft of 90 feet and a desired air gap of 10 feet. In 2021, Schooner Creek reported that the *Rage* typically passes under the Interstate Bridge typically one time per month in January, February, October, November, and December; five times per month in March and September; seven times per month in April and August; and 10 times per month May through July. The Interstate Bridge lift logs recorded just two bridge lifts for the *Rage* between January 2012 to July 2025.
- The 2012 CRC NIR identified a sailboat being constructed by Schooner Creek with a 139-foot air draft that would not be able to pass under the proposed replacement bridges at any time without mitigation (CRC 2012a). Schooner Creek was contacted in 2021 and did not provide any information on this potential vessel. Because no additional information was provided, it is assumed that this vessel was moved from the area and, thus, would not be impacted by the proposed bridge height.
- A private individual provided information on their sailboat, *Make It So*. The boat has a reported air draft of 87 feet and a desired air gap of 10 feet. It transits under the Interstate Bridge typically once per month in March through May and in September, and two times per month in June through August. The CRC NIR indicated that the *Make It So* was surveyed and has a surveyed air draft of 90 feet.
- The CRC NIR included information from Legendary Yachts Inc. and their sailboat, *Radiance*. The company confirmed that the information provided for the CRC report remained accurate, which indicated a surveyed air draft of 85 feet with a desired air gap of 3 feet. The boat transits under the Interstate Bridge approximately two times per month from July through September. It is moored on the Columbia River in Vancouver. The company also indicated that its operation has been moved to a Vancouver location and that there are no vessels in or planned for

production. It would utilize existing facilities (such as other vessel service locations) for any in-water needs.

- The CRC NIR provided information on 14 vessels surveyed at the Portland Yacht Club. The tallest of these vessels had an air draft of 74 feet. The report also provided information on vessels from the Rose City Yacht Club, where the tallest vessel had an air draft of 63 feet. See the CRC NIR pages 6-18 and 6-19 for additional information (CRC 2012a).

Interstate Bridge lift data for the sailboat *Tristan* show one transit in 2017 and one in 2018. This vessel is a 117-foot sailing yacht that was shown to be in the river in 2017 and 2018 and moored at Salpare Bay on Hayden Island with an estimated air draft of 130 feet. Recent Automatic Identification System (AIS) data show the vessel on the west coast of Canada. The ODOT lift log incorrectly recorded one 136-foot lift for the *Dulcinea* in December 2024, and Interstate Bridge lift data recorded the vessel height as 115 feet. However, outreach to the vessel owner confirmed that the vessel's air draft is 96.5 feet, and therefore, it would not be restricted by a 116-foot VNC. No recreational power vessels were found to be impacted under the assumed condition. Two sailboats (*Make It So* and *Rage*) were measured with an air draft of 90 feet. Under the assumed condition, the vessels would not be height restricted, but both are included in this discussion because of the small margin of error.

Larger recreational sailboats with an air draft exceeding 90 or 95 feet would not be able to pass under the replacement bridges. See Appendix H for details regarding sailboats that traveled upriver of the Interstate Bridge that were determined to have unknown impacts.

Recreational sailboats and powerboats typically use the river more frequently during the peak recreational boating season, between April and October. Sailboats affected by the existing bridges generally have an air draft ranging from 50 to 90 feet, with an average of approximately 70 feet. The majority of the sailboats documented in the Interstate Bridge lift data would be able to transit the proposed fixed-span bridge height.

Powerboat air drafts ranged from 20 to 25 feet and almost never required a bridge opening. There was at least one large private vessel (M/V *Meduse*) that required a bridge lift of 90 feet identified in the Interstate Bridge lift data.

F.2 Percentage of Recreation Fleet Impacted

There are no sources of information that directly compare the number of bridge opening events for recreational vessels with all recreational river activity because the only recorded transits of the bridge are those that require a bridge opening. However, sailboats accounted for an average of 35% of bridge opening events, ranging from a low of 27% (2012) to a high of 51% (2023). Additionally, sailboats accounted for 30 lifts, or approximately 4%, of the 826 total requested lifts identified as at or above a 116-foot VNC.

Overall, the data show that sailboats account for a greater percentage of bridge openings in more recent years than in the past. A 116-foot VNC would not impede any recreational vessels transiting the Columbia River, as evidenced by the data presented in this section. Detailed information about bridge opening events based on vessel type can be found in Section G.1.2.

F.3 Impacts to Facilities

The facilities listed below in Section H primarily serve small recreational craft. Except as noted below, access to the facilities would not be directly or indirectly impacted by the replacement bridges.

F.4 Can Segments of the Fleet Be Modified?

Not applicable.

F.5 Additional Information on Impacted/Burdened Waterway Users

Most of the sailboat activity involving transits under the Interstate Bridge is generated by residents living in or near the greater Portland-Vancouver area, which includes the Portland Metro Area (Clackamas, Columbia, and Multnomah Counties in Oregon and Clark and Skamania Counties in Washington); adjacent Oregon counties surrounding the Portland Metro Area (Washington, Yamhill, Polk, Marion, Linn, Wasco, Hood River, and Sherman Counties); and adjacent Washington counties surrounding the Portland Metro Area (Cowlitz, Lewis, Yakima, and Klickitat Counties). Sailboats surveyed in 2021 had an average air draft of 44 feet, compared to 66 feet in 2012. Sailboat activity and sizing are not likely to change significantly in the next 10 to 20 years, based on current channel use, existing facilities, available properties, and future development identified in city, port, state, and federal land use and other management plans. Support facilities for recreational waterway users, such as marinas, yacht clubs, and maintenance facilities, would not be impacted by the proposed replacement bridges. Detailed information about marine facilities that support recreational vessels on the Columbia River can be found in Section H.

G. PRESENT AND WATERWAY AND PROSPECTIVE COMMERCIAL NAVIGATION AND THE CARGOES MOVED ON THE WATERWAY

G.1 Present and Prospective Commercial Fleet

Commercial vessels on the Columbia River include cruise vessels, tugs, tows, barges, and marine contractors. Each of these vessels and services requires a combination of specialized technology, infrastructure, and trained crews to safely and efficiently navigate through locks, understand river currents and conditions, and utilize navigation systems. Detailed information on each type of vessel is provided in the sections that follow. River user survey responses with data on specific vessels that navigate the Columbia River are included in Appendices B and D.

The vertical and horizontal clearances of the new and replacement bridges over the Oregon Slough would be the same as or greater than those of the existing bridge. Limited information was provided by river users on their use of this waterway through the data-gathering phase. Because users of the Oregon Slough are already constrained by the existing bridge, and the Columbia River will provide an alternative route, no additional impacts to users would occur and a vessel-specific analysis of impacts was not conducted.

G.1.1 Marine Contractors

The marine contractor category includes vessels such as crane barges, dredges, and other construction equipment transported by construction contractors on the Columbia River. Transits made by these vessels are not limited to a particular time of year or frequency, as construction work is typically performed on an as-needed or contract basis. Crane barges can conduct a wide range of water-related construction activities and are typically used by marine contractors. Crane barges are not motorized and are moved with tugs or tows. Spuds or anchors are used to keep barges stationary. During travel, the spuds are either raised to a level high enough to prevent the barge spuds from grounding, or they are removed and lashed to the deck. Most crane barges in the Columbia River travel with their spuds raised (as this requires the least amount of work), and when raised, the spuds are typically the highest points of the vessel.

Air drafts and air gaps for marine contractor vessels are shown below by company, and information obtained through the river user survey is presented in Figure G.1-1 and Table G.1-1.

- Information on five crane barges operated by Advanced American Construction (*DB 125*, *DB 4000*, *DB 4041*, *DB 4100*, and *Paul Bunyan*) and one tugboat (*Lindy Marie*) was collected during the CRC project. According to the data, the barges have an air draft ranging from 78 to 92 feet (with spuds raised) and a 2-foot desired air gap. The *DB 4100* is the tallest crane, with a reported height of 92 feet with the spuds raised. The minimum crane gantry height for the *DB 125* is 51 feet, and for the *DB 4000*, *DB 4041*, and *DB 4100*, the minimum height is 35 feet. The

Paul Bunyan is a spud barge, and the other barges are portable cranes on spud barges. The tugboat has a 35-foot air draft and a desired air gap of 5 feet. The vessels travel up and down the Columbia River a couple of times per month, all year. A review of the Advanced American Construction (Advanced American) website confirmed the vessel characteristics identified above (AAC n.d.). The *Paul Bunyan* is not listed on the company's website. Therefore, it is unknown whether the *Paul Bunyan* is still part of their fleet. The website also includes descriptions of additional barges and tugs, but it is unknown whether those vessels transit the bridge location. In November 2024, Advanced American shared information about three additional vessels, the *MCR 8 Barge*, *Tug Schweiger*, and *DB Millennium*. Vessel information gathered through the USCG Maritime Information Exchange identifies the *MCR 8* as an active freight barge with a length of 236.8 feet and a beam that reaches a height of approximately 65.6 feet (USCG 2025b). The *Tug Schweiger* is a 60.4-foot towing vessel that was listed in the Interstate Bridge lift logs. This vessel is listed on the Advanced American website, but no vessel details are provided. The Advanced American website reported (in August 2025) that the *DB Millennium* is 155 feet tall with the crane and boom in place and 50 feet tall with the crane and boom lowered (AAC n.d.). The IBR Program and Advanced American reached an agreement to address potential impacts associated with the vessels described above. The specific actions in this agreement are confidential.

- Bergerson Construction did not respond to the IBR Program's request for information. They also did not respond to the request that was issued as part of the Hood River-White Salmon Bridge Replacement NIR. Previously collected information on two barges (*Carr Barge* and *Sectional Barge*) and two tugboats (*Darryl B* and *Olaf J*) indicated that the two barges have air drafts ranging from 40 to 150 feet with the spuds raised. The air draft on the largest vessel with the spuds lowered is 78 feet and with the crane lowered is 52 feet. The two tugboats have air drafts of 20 and 35 feet. All four vessels require at least a 10-foot air gap. The vessels transit the Columbia River as contracts require. The Bergerson Construction website does not provide information on their vessels.
- The CalPortland Company (CalPortland) did not respond to the IBR Program's request for information. Research indicates that Northwest Aggregates, Inc. operates a tugboat (*Johnny Peterson*) and a dredge (*Sanderling*) (US Maritime Intelligence 2025a). Northwest Aggregates, Inc. falls under Glacier Northwest, Inc., which is a subsidiary of CalPortland (CalPortland 2025). The *Johnny Peterson* and *Sanderling* each have an air draft of 32 feet and a preferred air gap of at least 4 feet. The tugboat and dredge transit under the existing Interstate Bridge approximately eight times a month all year.
- Diversified Marine, Inc. (Diversified Marine) provided information on three derrick barges (*DB Freedom, DB Lucy,* and *DB Vulcan*), two spud barges (*BMC44* and *BRG22*), two barges (*DMI 100* and *DMI 60*), and three tugboats (*Cougar*, *Mariner*, and *Tiger*). The *DB Freedom* is the largest of the derrick barges, with an air draft of 90 feet with the crane lowered. The *DB Lucy* has a reported air draft of 85 feet (the CRC NIR noted an air draft of 73 feet with the crane lowered), and the *DB Vulcan* has an air draft of 89 feet; (the CRC NIR noted that this height was with the crane lowered). The derrick barges have a desired air gap of 10 feet. The two spud barges (*BMC44* and *BRG22*) have air drafts of 78 and 85 feet, respectively, with spuds raised. The two

barges (*DMI 100* and *DMI 60*) both have air drafts of 60 feet. Diversified Marine's three tugboats (*Cougar*, *Mariner*, and *Tiger*) have air drafts of 50, 45, and 38 feet, respectively. Diversified Marine did not provide any information related to frequency of transit; however, during the CRC project they indicated that their vessels travel on the Columbia River as contracts are awarded and that one trip a month all year is estimated for each vessel.

- The Dutra Group did not respond to the IBR Program's river user survey. They also did not respond to the request that was issued as part of the Hood River-White Salmon Bridge Replacement NIR. The CRC NIR included information on two crane barges (*Derrick Barge #24* and *Paula Lee*) , both of which were still listed as part of the Dutra Group's fleet on the company website in 2025 (Dutra 2025). The CRC NIR indicated that the *Derrick Barge #24* and *Paula Lee* have the potential to work on the Columbia River. The highest point on the cranes during transit is the A-frame. The *Derrick Barge #24* has an A-frame height of 67 feet 4 inches, and the *Paula Lee* has an A-frame height of 77 feet 6 inches. The height of the A-frame above the waterline assumes the freeboard is half the hull height (halfway between the light- and full-loaded draft).
- Hickey Marine Enterprises (HME) did not respond to the IBR Program's request for information. As part of the river user outreach for the Hood River-White Salmon Bridge Replacement NIR, HME provided information on four derrick barges (*Sea Hawk*, *Sea Horse*, *Sea Lion*, and *Sea Vulture*). HME indicated on the vessel data sheets that the *Sea Hawk*, *Sea Lion*, and *Sea Vulture* all have an air draft of 75 feet and a desired air gap of 10 feet, and the *Sea Horse* has a spud height of 90 feet and a desired air gap of 10 feet. The *Sea Horse* has a gantry height of 75 feet. Information on the gantry heights for *Sea Hawk*, *Sea Lion*, and *Sea Vulture* was not provided in the Hood River-White Salmon Bridge Replacement NIR river user survey. The CRC NIR indicated that the vessels' gantry heights are 28 feet, 34 feet, and 43 feet, respectively, and that trips primarily occur between October and March during the in-water work window. The company estimated that their barges go upriver approximately six times per year.
- JE McAmis did not respond to the IBR Program's request for information. As part of the river user outreach effort for the Hood River-White Salmon Bridge Replacement NIR, JE McAmis provided information on one derrick barge (*Heidi Renee*). They indicated that the *Heidi Renee* is primarily used for dredging and marine construction and has an air draft of 90 feet (spuds up) and a desired air gap of 10 feet. The spuds can be lowered or removed (the data sheet for the Hood River-White Salmon Bridge Replacement NIR indicated that this is not ideal) for transit. The CRC NIR indicated a height of 12 feet with the spuds removed and that the company transits the river as required when contracts are awarded.
- JT Marine, Inc. (JT Marine) provided information on two tugboats (*Christy T* and *Irene T*), two crane barges, (*DB Astoria* and *DB Taylor*), and one towboat (*LeAnne T*). The *Christy T* has an air draft of 55 feet, and the *Irene T* has an air draft of 50 with a desired air gap of 10 feet. The *DB Astoria* has a height of 80 feet with spuds up and 30 feet with spuds removed. The *DB Taylor* can operate with two different booms—one with a length of 160 feet and one with a length of 220 feet. The longer boom cannot be lowered to the cradle and has an air draft of 131 feet. A desired air gap of 10 feet was reported for both vessels. An air draft was not reported for the *LeAnne T.* According to the USCG Maritime Information Exchange, the *LeAnne T* was laid up as of

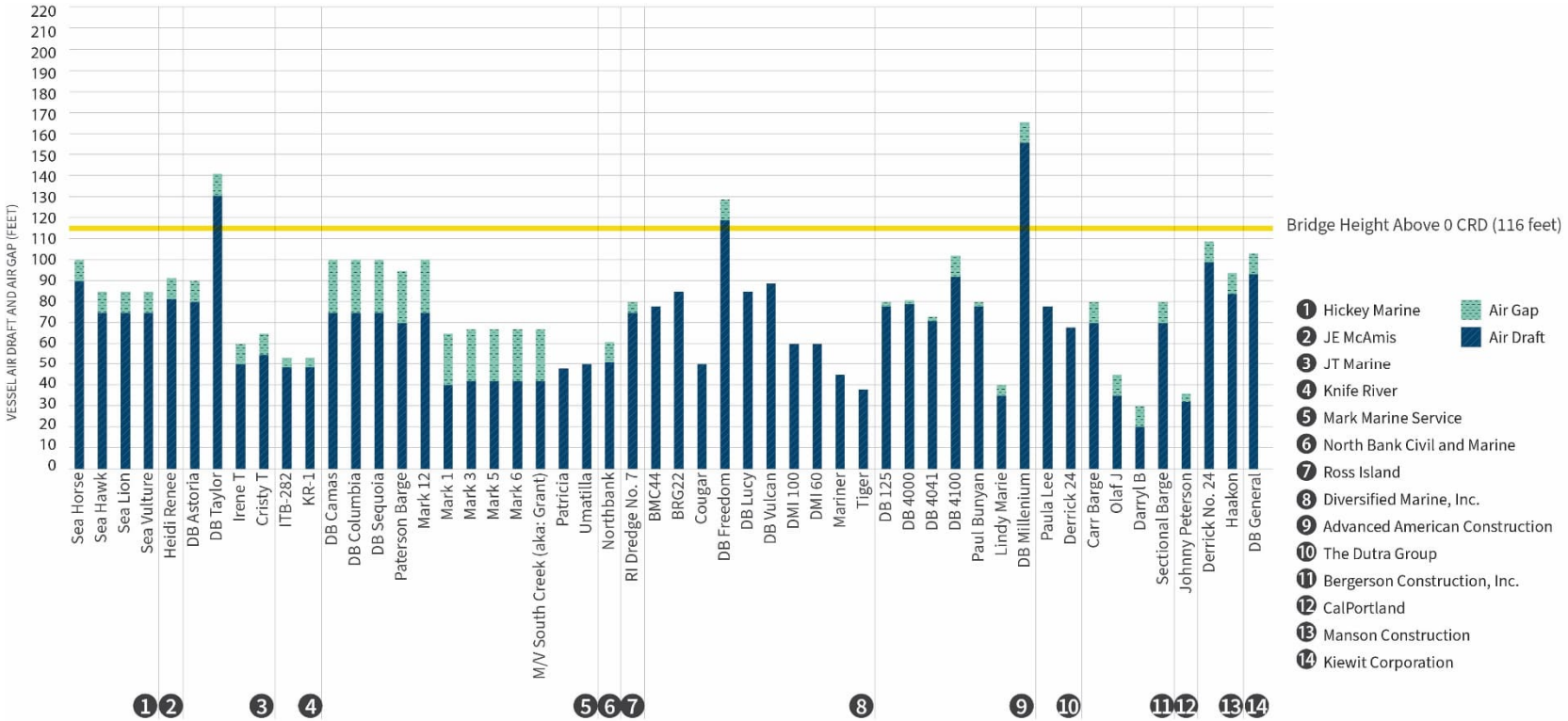
July 2025 (USCG 2025b). JT Marine indicated that the vessels transit under the Interstate Bridge approximately 10 times per month, all year and one time per month all year under the I-5 Oregon Slough bridge. However, as documented in Appendix E, bridge lift logs for the Interstate Bridge provided by ODOT have recorded bridge lifts for these vessels less frequently than 10 times per month. One lift was recorded for the *DB Astoria*, and no lifts were recorded for the *DB Taylor* or *LeAnne T* in the years studied. Three bridge lifts for the *Irene T* were recorded in the years studied. Between 0 and 25 bridge lifts were recorded annually for the *Christy T* from 2012 to 2024. Based on the self-reported data from JT Marine and findings from the Interstate Bridge lift data (Appendix E), the IBR Program found that the only vessel operated by JT Marine that would be impacted by the proposed fixed-span replacement bridges is the *DB Taylor*. However, the *DB Taylor* is currently height-restricted for travel by the existing bridge, and the replacement bridges would, therefore, not adversely impact this vessel.

- Kiewit Corporation (Kiewit) provided information on six crane barges (*DB General, DB Alameda*, *DB Oakland*, *DB Olympia*, *DB Pacific*, and *DB Seattle*) that were identified as having been upriver in the past. Air drafts for these barges range from 70 to 93 feet, with the *DB General* being the tallest vessel. Desired air gaps are 5 to 10 feet. There is an optimal angle for the crane boom to be positioned while being towed. If the height is too tall to transit under a bridge, the vessel is moored near the bridge, the crane is lowered to pass under the bridge, and then the vessel is moored again, and the crane raised to the proper tow height. Considering the seasonal variations in the river stages and the ability to use a smaller air gap, the *DB General* would be able to pass under a 116-foot bridge during much of the year. As documented in Appendix B, Kiewit confirmed that, if needed upriver, the *DB General* could pass under the replacement bridges with minimal or no impact and would not be financially impacted by the proposed bridge.
- Knife River Corporation (Knife River) did not respond to the IBR Program's request for information. As part of the river user outreach for the Hood River-White Salmon Bridge Replacement NIR, Knife River provided information on two deck barges (*KR-1* and *ITB-282*), both with an air draft of 48.5 feet and a desired air gap of 5 feet. Knife River previously provided information on the *KR-1* and indicated that the deck barge transits the area approximately 4 to 19 times per month all year.
- Manson Construction Company did not respond to the IBR Program's request for information. The CRC NIR included information on two crane barges (*Derrick No. 24* and *Haakon*). The *Derrick No. 24 is* a crane barge with an air draft of approximately 99 feet and a desired air gap of 6 feet. The *Haakon* has an 84-foot air draft and a desired air gap of 5 to 10 feet. The height provided is for the gantry, and no information was provided regarding the ability to modify for lower clearances. The CRC NIR indicated that the *Derrick No. 24* had not been in the Columbia River system for 10 years but would enter the system if contracted to do so. In 2025, the IBR Program communicated directly with Manson Construction Company, which provided details on three additional derrick barges (*DB Viking, DB Valhalla*, and *DB Wotan*). The *DB Viking* has a height of 78.5 feet with booms lowered, allowing it to transit under a 116-foot bridge without impacts. The *DB Valhalla* and *DB Wotan* are 123.5 feet and 97 feet respectively. No bridge lifts were

recorded for these vessels between 2007 and 2024, indicating that the vessels do not transit under the Interstate Bridge and therefore would not be impacted. Additionally, the Program confirmed with Manson Construction Company that the *Derrick No. 24* would not be impacted because the vessel is not certified by the American Bureau of Shipping.

- Mark Marine Services did not respond to the IBR Program's request for information. The company did, however, respond to the requests that were issued for the Hood River-White Salmon Bridge Replacement and the CRC projects. They provided information on different vessels for the two prior reports. It is not known whether the reported vessels differed due to the different locations of the projects on the Columbia River or because of changes in their fleet. Vessel characteristics as reported in both prior reports are included here. For the Hood River-White Salmon Bridge Replacement NIR, Mark Marine Services provided information on nine barges (*DB Camas*, *DB Columbia*, *DB Sequoia*, *Paterson Barge*, *Mark 12*, *Mark 1*, *Mark 3*, *Mark 5*, and *Mark 6*) and one tugboat (M/V *South Creek*). Of these vessels, the highest air draft is 75 feet, and all desired air gaps are 25 feet. No information was provided in the Hood River-White Salmon Bridge Replacement river user survey regarding whether they can be modified for lower clearances. The CRC NIR indicated that the *DB Camas* spud height is 75 feet and can be lowered. Information was previously provided on four crane barges (*DB Camas* and *DB Columbia*, as reported above; the *Amazon*, indicated as retired; and *Barge #7*, indicated as under construction). No vessel characteristics were provided for *Barge #7* in the CRC NIR or the Hood River-White Salmon Bridge Replacement NIR. The CRC report also provided information on two towboats, *Patricia* and *Umatilla*, with heights of 48 and 50 feet, respectively, and indicated that the company's busiest season is November through February, corresponding with the in-water work window. The company reported that the three crane barges pass under the Interstate Bridge an average of one trip per month and make one round trip per year to the Oregon Slough, but they access the slough from downstream and do not cross under the Oregon Slough bridge.
- NorthBank Civil and Marine provided information on one crane barge (*Northbank*), and the vessel data sheet indicated an air draft of 51 feet with the crane boom down in the travel position and a desired air gap of 10 feet.
- Ross Island Sand and Gravel (Ross Island) provided information on one dredge (*Dredge #7*) and one tug (*Rossisle*). The company indicated that Dredge #7 requires a VNC of 75 feet with its positioning spuds raised. The vessels transit under the Interstate Bridge two to four times per year.

Figure G.1-1. Marine Contractors Air Drafts and Air Gaps



Construction equipment used by marine contractors accounted for an average of less than 1% of bridge opening events between 2007 and 2024. Bridge transits by marine contractors are dependent on their home locations and the location of their construction projects. Three marine contractors are located upriver of the Interstate Bridge (including JT Marine, Mark Marine Services and SDS Tug & Barge). These contractors transit under the Interstate Bridge for downriver construction projects or to pick up supplies from downriver locations. Contractors that are located downriver of the Interstate Bridge must transit the bridges for projects located upriver of the bridges.

Marine contractors reported they use the river on an as-needed basis all months of the year, depending on the timing of the construction project. Air drafts for construction equipment ranged from 40 to 131 feet.

Marine contractor derrick barges make up the majority of the identified vessels that are impacted by the bridge heights studied due to the height of the crane elements. Contractors typically operate crane barges that conduct a wide range of water-related construction activities. FHWA regulations for bridges specify that special navigation clearances shall normally not be provided for floating construction equipment unless required for navigation channel maintenance (23 CFR 650.807(g)). Derrick barges are often used for dredging and could be used for maintenance or repair of navigation locks. No information was available to determine the status of the specific equipment related to these activities, and no equipment was eliminated from consideration specifically because of these regulations. The following vessels (arranged by the contractor) were considered to be potentially impacted.

Advanced American Construction

Under the assumed conditions, the *DB 4100* would not be able to pass under a bridge height of 116 feet in the vessel's current configuration. The *DB 4100* could pass at least 90% of the days of each month of the year with a 10-foot air gap, and greater than 98% of days in all months of the year with a 5-foot air gap. Advanced American stated that the spuds can be temporarily lowered to allow clearance when constrained. Accordingly, for the purposes of this analysis, the proposed replacement bridges would have no substantial impact at either height. In addition, the *DB Millenium* would be constrained by the vessel's crane height, which requires a maximum air draft of 65 feet. The vessel would be able to traverse under the 116-foot bridge by lowering the crane. However, lowering the crane requires that the boom and mast also be lowered all the way. Due to the additional required effort and time associated with these adjustments, the vessel is considered impacted. The IBR Program and Advanced American reached an agreement to address the impacts described above. The specific actions in this agreement are confidential.

Kiewit Corporation

Under the assumed conditions, the *DB General* would not be able to pass under a bridge height of 116 feet in the vessel's current configuration. However, as confirmed by Kiewit Corporation, when considering the seasonal variations in the river stages and the ability to use a smaller air gap, the *DB General* would be able to pass under a 116-foot bridge during much of the year. Kiewit confirmed that,

if needed upriver, the *DB General* could pass under the replacement bridges with minimal or no impact.

JT Marine, Inc.

Under assumed conditions, the *DB Taylor,* which is currently impacted by the existing Interstate Bridge, would continue to not be able to pass under a bridge height of 116 feet in the vessel's current configuration when outfitted with a 220-foot crane boom. Because this vessel cannot travel under the current bridge configuration without modification, its operations would not change, and it would not be adversely impacted by a new 116-foot fixed-span bridge.

Comments received by JT Marine on the IBR Program's Draft SEIS in November 2024 referenced potential impacts to up to 13 vessels operated by their customers. The IBR Program reached out for additional information about those potentially impacted vessels in 2024 and no response. The IBR Program determined that a 116-foot fixed-span bridge would not create new impacts to JT Marine's existing operations as no newly impacted vessels were identified, as detailed in this report. However, future business operations by JT Marine may be impacted for loads that require greater than a 116-foot VNC. Specific details regarding these impacts are confidential. The IBR Program engaged independent experts to assess the potential impacts on JT Marine based on information provided by JT Marine and industry data, and the IBR Program and JT Marine reached a settlement agreement that addressed impacts to JT Marine's future business operations. The specific actions in this agreement are confidential.

Diversified Marine, Inc.

The *DB Freedom* has an air draft of 90 feet with the crane lowered and would be able to pass under a bridge height of 116 feet, with a 10-foot air gap. The company's normal setup for transporting the vessel is to place the crane boom over the top of the tug placed at the stern of the barge. In that position it requires an air draft of up to 119 feet (depending on the tug used for moving the barge). When needed for transiting under obstacles with limited clearance, the crane boom can be rotated to the side of the tug and lowered to the level needed to pass under the obstruction.

Manson Construction Company

The *Derrick No. 24* has an air draft of approximately 99 feet and a desired air gap of 6 feet and would be impacted under the assumed conditions for a bridge height of 116 feet. Based on water levels, the vessel could pass with a 5-foot air gap at least 90% of the days in all the months of the year except the highest-flow months of May and June, when it could pass at least 75% of the days. It could pass at least 80% of the days of the year, including at least 50% of the days during the high water months of May and June. The company indicates that it has no plans to bring the vessel to the Columbia River. Accordingly for the purpose of this analysis, there would no impact from a new 116-foot fixed-span bridge.

SDS Lumber Company

The *Dauby* has an air draft of 55 feet and a desired air gap of 10 feet. One reported possible future shipment made by SDS Tug & Barge (a subsidiary of SDS Lumber Company) would be obstructed at some point in the year by the proposed 116-foot bridge. SDS Tug & Barge indicated through a river user survey to the IBR Program that they haul equipment loads that could be as high as 100 feet (Appendix D). Under the assumed conditions, the 100 foot shipment could pass under a 116-foot bridge between 55% and 95% of days per month for 5 months of the year (July through November), between 25% and 37% of the days per month for 5 months of the year (December through April), and between 12% and 22% of the days in May and June. With a 5-foot air gap, it could pass more than 88% of the days each month except in May and June, when it could pass between 72% and 78% of the days per month. The future load is speculative and is not based on history or a specific future market, and updated information was not provided by SDS Lumber Company. Accordingly, for the purposes of this analysis, there would be no substantial impact from a new 116-foot fixed-span bridge.

Table G.1-1. Known Affected Marine Contractor Vessels

Vessel	Air Draft (feet)	Air Gap (feet)	Total VNC during OHWM[a] (feet CRD)	Impact from Fixed-Span Replacement Bridges (116 feet CRD)	Impacts Dependent on River Level
DB 4100[b]	92	10	118	Constrained by spuds height	Only within 2 feet or less of OHWM
DB Millennium[b]	155	10	181	Constrained by boom height	Impacts under all conditions with crane boom raised

Notes:
[a] OHWM is 16 feet above 0 CRD and occurs on average 1.2% percent of the year.
[b] Anderson 2024
Key:
CRD = Columbia River Datum
OHWM = ordinary high water mark
VNC = vertical navigation clearance

G.1.2 Frequency and Characteristics of Vessel Transits

Bridge opening trends from 2007 to 2024 are presented on Figure G.1-2. The number of bridge opening events (excluding openings for bridge maintenance, in which no vessel transited) ranged from a low of 65 events (2024) to a high of 309 events (2012), with an average of 94 events (2021) to a high of 309 events (2012), averaging 159 events per year. This compares with an average of 287 events per year from 1997 through 2012 reported during the CRC project. Documented bridge openings from January 2007 to July 2025 are included in Appendix E.

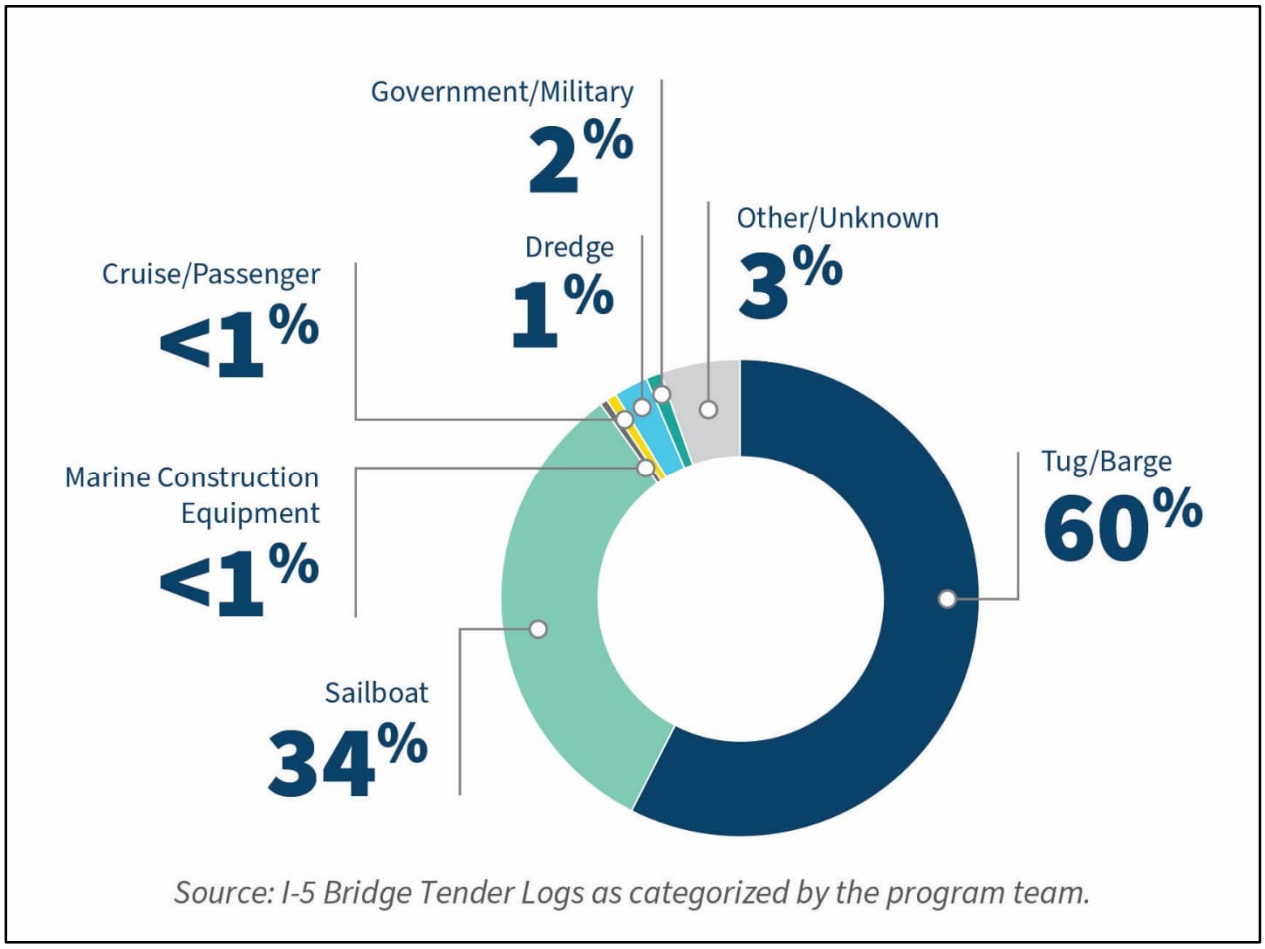
Table G.1.2. Bridge Opening by Vessel Type by Year: 2007 to 2024

Year	Tugs, Tows, and Barges	Sail-boats	Marine Construction	Dredge	Government/ Military	Cruise/ Pleasure	Other/ Unknown	Total
2007	64	45	0	0	10	0	5	124
2008	126	68	0	0	6	0	2	202
2009	102	63	0	0	11	0	9	185
2010	96	44	0	0	6	0	5	151
2011	251	111	0	0	7	0	6	375
2012	202	81	2	4	0	5	9	303
2013	60	39	0	2	0	2	0	103
2014	82	59	2	4	0	0	2	149
2015	49	41	1	3	2	0	6	102
2016	48	51	0	4	0	1	4	108
2017	174	79	0	4	5	5	3	270
2018	80	59	0	2	2	2	2	147
2019	69	25	0	6	0	0	4	104
2020	66	41	2	2	0	0	6	117
2021	66	25	0	0	0	0	0	91
2022	69	47	0	0	0	0	5	121
2023	43	51	0	0	0	0	2	96
2024	24	30	0	4	0	0	1	59
Total	**1,671**	**959**	**7**	**35**	**49**	**15**	**71**	**2,807**
Percentage	**60%**	**34%**	**0.25%**	**1%**	**2%**	**0.5%**	**3%**	

Table G.1.2 summarizes the share of bridge opening events by type of vessel over a 17-year period (2007 to 2024). Tugs and barges accounted for over half (60%) of all openings, followed by sailboats at 34%, then dredge vessels at 1%, and vessels where a type could not be determined at 3%. Each of the remaining vessel types accounted for 0.3% to 1% of the openings. There were 826 requested lifts identified as being at or above the 116-foot VNC.

Comparing this vessel data with the CRC project data from 1987 to 2007 shows little change in openings except for the reduction in lifts involving construction equipment. When looking at bridge opening events from 2007 to 2024, there is a clear downward trend of bridge lift requests, further underscoring lower demand for transit of vessels requiring a bridge height over 116 feet.

Figure G.1-2. Bridge Openings by Vessel Type 2007 to 2024



Source: I-5 Bridge Tender Logs as categorized by the program team.

G.1.3 Bridge Openings as a Share of Total Navigation Activity

There are no sources of information that directly compare the number of bridge opening events with all river activity because the only recorded transits of the bridge are those that require a bridge opening. However, data are available that characterize the annual vessel activity for commercial tugs and barges, as discussed below.

The number of commercial lockages at Bonneville Dam provides a useful estimate of the total transits (or events) that occur at the existing bridges because nearly all the traffic passing through the Bonneville lock was linked to terminals located downriver of the Interstate Bridge. Notably, the locks along the Columbia River are compatible with barge traffic but not deep-draft container ships, such as container vessels. These limitations impact transit of deep-draft cargo ships beyond the lower river system, regardless of bridge height. BNSF Railway Bridge opening data also provide information on vessel transits that may also occur at the Interstate Bridge, as most commercial vessels and sailboats pass under both bridges and require an opening of the BNSF Railway Bridge. Bonneville Dam lock data from the years 2000 through 2011 show an average of 2,596 commercial lockages per year at the dam.

The share of this traffic that required an opening at the bridges represented an average of 3.6% of estimated total trips. From 2012 through 2020, 22,584 passages of the dam were recorded, showing an average of 2,258 per year (USACE 2021d). The share of this traffic that required an opening at the bridges represented an average of 7% of estimated total trips. The data show that nearly all the vessel traffic passing through the Bonneville Dam is linked to terminals downriver of the Interstate Bridge. These cargo shipments are primarily for agricultural commodities that can navigate under a 116-foot VNC, constituting a majority of the river traffic.

The number of openings of the BNSF Railway Bridge can provide information on total commercial vessel traffic and most sailboats, as they require an opening to navigate the bridge, and there are limited origins/destinations between the BNSF Railway Bridge and the existing Interstate Bridge, and most vessels would have to pass both bridges. The BNSF Railway Bridge (BNSF Columbia Draw 9.6) underwent a total of 19,636 openings between the years 2015 and 2020; the share of this traffic that required an opening at the Interstate Bridge represented an average of 4% of estimated total trips.

The USACE also maintains data on waterborne commerce. For the Vancouver to The Dalles project, an average of 6,504 trips per year from 2017 to 2022 were reported. This does not capture recreational traffic (USACE 2022b).

G.2 Additional Information for Present and Prospective Commercial Navigation

G.2.1 Impacts to Cruise Ship Ports-of-Call/Terminals

Cruise and passenger vessels include vessels that operate only on the Columbia and Snake Rivers, as well as those that offer seasonal itineraries. This category includes sightseeing boats and overnight cruise vessels. Several passenger cruise lines host tours up and down the Columbia and Snake Rivers. These vessels require frequent passage under the Interstate Bridge during the cruise season. Therefore, the IBR Program contacted potentially impacted companies directly to inquire about potential impacts to their operations. Six passenger cruise lines were contacted as part of the river user survey conducted in 2021, and three responded. These companies confirmed that no impacts would result from a 116-foot fixed-span bridge. Ultimately, through IBR Program research confirming vessel dimensions, as well as contacting companies directly, it was confirmed that no cruise or passenger vessels operating on the Columbia River would be impacted by a 116-foot VNC. Vessel characteristics, by company, are summarized below, and height clearances from the river user survey are shown on Figure G.2-1, below.

- American Cruise Lines completed the online survey for three vessels: the *American Pride, Queen of the West,* and *American Song*. The *American Pride* and *Queen of the West* have a reported air draft of 63 feet. The *American Song* has a reported air draft of 56 feet. All three vessels have a desired air gap of 10 feet. The vessels transit under the Interstate Bridge approximately 16 times per month in April through November. Additionally, in 2024, American Cruise Lines acquired four vessels from American Queen Voyages (formerly the American Queen Steamboat Company) following the latter's bankruptcy. The vessels are the *American Queen, American Empress*, *American Countess,* and *American Duchess* (Diller 2024). The Hood River-White Salmon

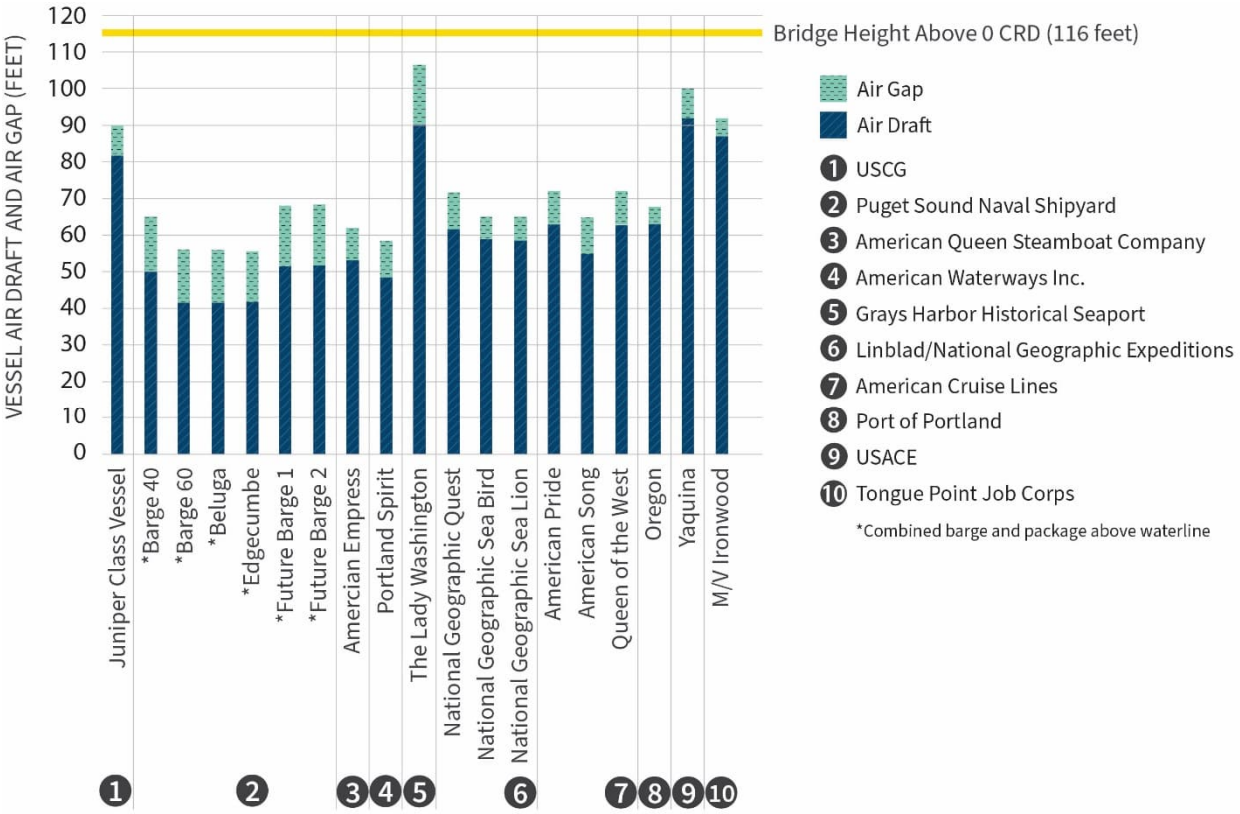
Bridge Replacement NIR indicated that the *American Empress* has an air draft of 52 feet and requires a 10-foot air gap (WSP 2019). While no additional specifications were reported about the acquired vessels, the American Cruise Lines company website indicates that the riverboats and paddlewheelers operating on the Columbia and Snake Rivers are of similar style and size (American Cruise Lines 2024).

- American Waterways, Inc., provides passenger service on the Columbia River. The company provided information for a cruise vessel (*Portland Spirit*) that has an air draft of 48 feet and requires at least a 10-foot air gap. The company also indicated that they operate the *Columbia Gorge Sternwheeler*, which is similar in size to the *Portland Spirit,* and the *Willamette Star*, *Crystal Dolphin*, and *Explorer*, which are much smaller. Frequency of transit was not provided. The CRC NIR indicated that the vessels average about 80 trips per month each on the Columbia River main channel and the Oregon Slough from June through October, with fewer trips the rest of the year.
- Lindblad/National Geographic Expeditions provided confirmation regarding their vessels that operate on the Columbia River (*National Geographic Quest*, *National Geographic Sea Lion,* and *National Geographic Sea Bird*). The *National Geographic Quest* has a 62-foot air draft and requires an air gap of at least 10 feet. The *National Geographic Sea Lion* and *Sea Bird* both have air drafts of 59 feet with a 6-foot desired air gap. The *National Geographic Quest* transits under the Interstate Bridge approximately once per month in September and three times per month in October. The *National Geographic Sea Lion* transits under the Interstate Bridge approximately three times per month in September and once per month in October. The *National Geographic Sea Bird* transits under the Interstate Bridge approximately three times per month in September, four times per month in October, and once per month in November.
- The Grays Harbor Historical Seaport Authority did not respond to the IBR Program's request for information. They did provide information on two sailing ships (*Lady Washington* and *Hawaiian Chieftain*) for the Hood River-White Salmon Bridge Replacement NIR. Since that time, the *Hawaiian Chieftain* has been sold and is no longer in the area (Segall 2024). The *Lady Washington* has a raised-mast air draft of 90 feet and a stepped-down mast height of 65 feet with a required 15-foot air gap. The maneuverability of these vessels is limited because of their height and auxiliary sails. It is assumed that future transits to upriver destinations could occur and would require transit under the Interstate Bridge. Vessel information for the *Lady Washington* was also included in the CRC NIR, but frequency of transit under the Interstate Bridge was not provided.
- UnCruise Adventures has operated one passenger cruise vessel (*SS Legacy*) on the Columbia/Snake River system. The Program team was not able to reach UnCruise to obtain vessel characteristics. According to its website, the company no longer offers the Columbia/Snake River as one of their destinations (UnCruise Adventures 2025).

In addition to identifying no impacts to current passenger cruise vessels (as all current operations are able to pass under the assumed conditions for the proposed bridge height), no impacts to future passenger vessels are anticipated. Future passenger vessels are expected to remain at the heights of existing passenger vessels that transit the area. The cruise and passenger vessels that regularly operate in this area are constrained by other bridges, and it is in the best interest of the operators to use vessels

that can clear all of the bridges in the region. For example, the Sellwood Bridge, which spans the Willamette River in Portland approximately 22 miles south of the Interstate Bridge, has a VNC lower than that proposed for the IBR Program. To operate upriver of the Sellwood Bridge, vessels would be able to clear the replacement bridges. The Celilo Bridge, which is 95 miles upstream of the Interstate Bridge, has a VNC significantly lower than the replacement bridges, and bridges on the Snake River are even lower. Any cruise vessel operating up to Lewiston would be able to clear the proposed replacement bridges.

Figure G.2-1. Cruise Vessels Air Draft and Air Gap Results



G.2.2 Impacts to Ports Supporting Post-Panamax Vessels

Based on interviews and a literature review, most of the industrial-zoned sites along the Columbia River that are owned by ports are being planned as industrial campuses that support light industrial and commercial uses and that will not generate marine traffic or include marine facilities (e.g., docks). This includes properties at the Columbia Business Center (CBC), Port of Camas-Washougal, Port of Cascade Locks, Port of Hood River, Troutdale Reynolds Industrial Park, The Dalles, and Stevenson.

Ports upriver of the Celilo Bridge would not be expected to generate vessels or cargoes that would be impacted by the replacement bridges due to existing height (79 feet when raised) and width restrictions imposed by the Celilo Bridge and others located upstream. Areas downstream of the replacement bridges and the BNSF Railway would also not be expected to generate vessels or cargo

that would be impacted by the replacement bridges because most vessel transit is generated from upstream of the replacement bridges. Furthermore, there is minimal cargo generation or transit from downstream locations that are not already limited by upstream height or width restrictions.

G.2.3 Impacts to Unique Regional Product Shipments

General Information Pertaining to Fabricators at the CBC

Since its establishment in 1942, the CBC, which is located upstream of the Interstate Bridge in Vancouver, has historically supported fabricators that can construct large-scale specialty items like naval warships, oil rigs, and bridge and dam components. This historical fabrication work (naval warships) ended in 1945; for additional information, refer to Section I.1 detailing historical Kaiser Shipyard vessel production. Current fabricator tenants at the CBC include Greenberry Industrial LLC (Greenberry) and Thompson Metal Fab. In a 2024 article in the *Portland Business Journal*, it was stated that Vigor, also a CBC tenant, would be changing its business model and ceasing the fabrication of steel girders and other large complex components formerly fabricated at the CBC (Stevens 2024); therefore, Vigor future shipments are not discussed in detail within this section.

Due to the limits on recorded information in the Interstate Bridge lift logs, it was difficult to associate specific bridge lifts with the metal fabricators, Greenberry and Thompson Metal Fab. To better understand their navigational requirements and needs, the IBR Program contacted Greenberry and Thompson Metal Fab directly. Discussions with the fabricators indicated that there is a shipment to the CBC transiting under the Interstate Bridge every year or two for each company, on an as-needed basis during all months of the year. Such shipments consist of, for example, structures for the oil industry (oil rig modules), local Pacific Northwest industries (structures for forest products plants and other local firms), USACE (lock gates, fish weirs, and other structures), and state departments of transportation (mainly bridge structures). Greenberry and Thompson Metal Fab also indicated that they are currently fabricating structures that support offshore energy programs (wind and tidal power). Not all of these shipments require bridge lift openings or transits under the bridge. The fabricators did not provide information on specific shipments that would be impacted but rather focused on past shipments and potential future shipments. The tallest projected future shipments from Greenberry and Thompson Metal Fab would not be able to pass unrestricted under a bridge height of 116 feet. The reported shipments, which were lower, could pass under all of the studied bridges during at least part of the year.

Greenberry and Thompson Metal Fab were also contacted individually by the IBR Program team to discuss how their unique navigational needs, future business plans, and future size and/or type of vessels that transit the Interstate Bridge location might be impacted by the replacement bridges and negotiate how to address any such impacts. Negotiations with individual fabricators were vitally important in determining how to address or remove impacts. These negotiations resulted in agreements between Greenberry and Thompson Metal Fab and the IBR Program that address impacts and allow unimpeded fabrication and manufacturing to support the local economy and job centers in the region.

Additional Details and Cargo Analysis

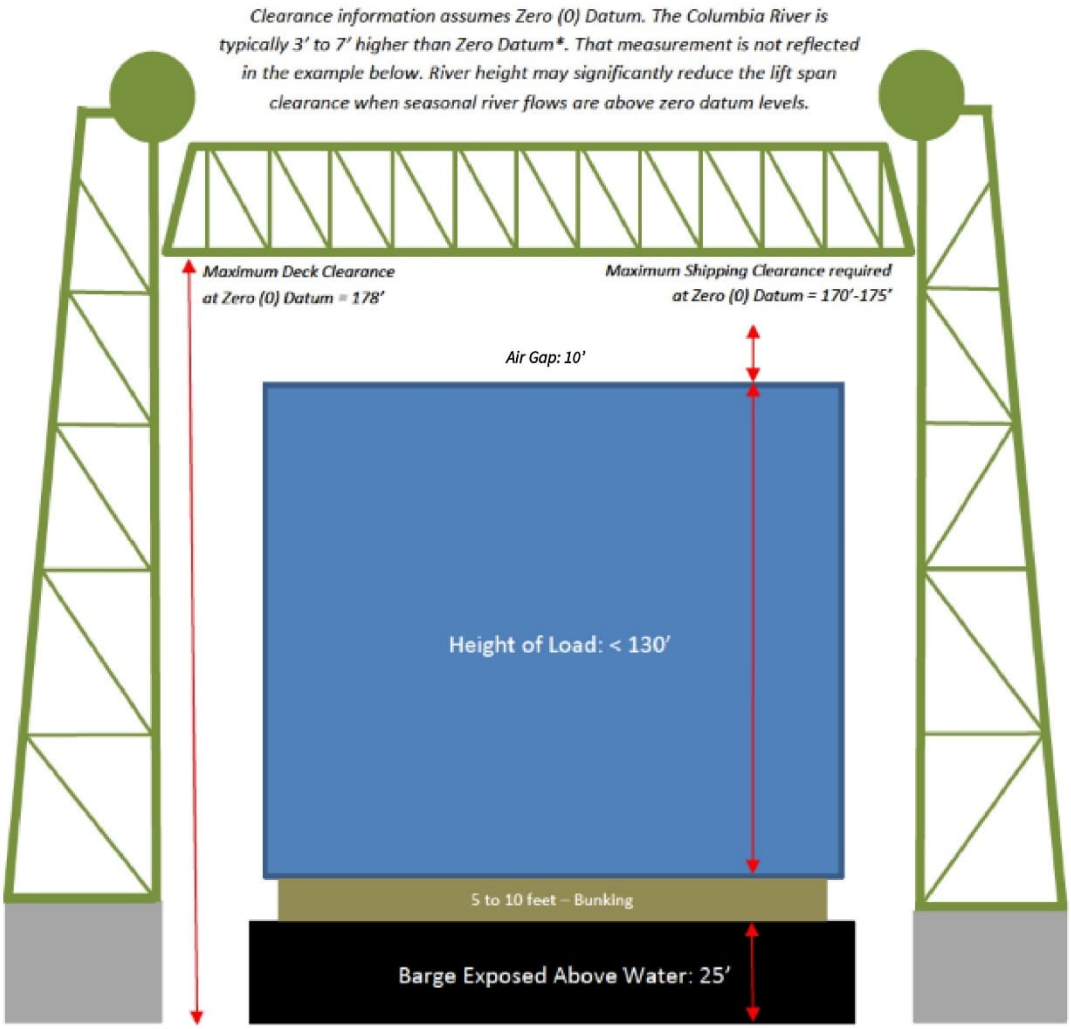
Additional information provided by each company, when they were contacted to better understand their navigational requirements and needs is summarized below and is included in Appendix D. Also included within this section is a graphic and accompanying analysis provided by Thompson Metal Fab that illustrates impacts to shipments transiting under a fixed span bridge.

- Greenberry is a general industrial fabricator and contractor. The company website indicates that their Vancouver, Washington, location fabricates and ships large tanks, pressure vessels, modules, bridge steel, and large structural components (Greenberry 2024). Greenberry responded to the IBR Program's request for information and completed a vessel data sheet that provides additional information on the type of fabricated materials they produce. They indicated that the vessels transporting their cargo have a maximum air draft of 136 feet, with a desired 1-foot air gap. Greenberry indicated that third-party vessels pass under the main channel typically once per month, year-round.
- Thompson Metal Fab is a heavy structural steel and plate fabrication company located in Vancouver, Washington. Thompson Metal Fab responded to the request for information and provided an extensive summary of their current and potential future operations, as well as information on the height and other characteristics of their past projects that have required a bridge lift. The company indicated that they need the same clearance currently provided by the bridge lift span (178 feet) to accommodate their operations. Examples of previous shipments made by Thompson Metal Fab include drilling rigs and drilling equipment, support towers and stations for tram projects, steel bridge components, and tub girders. An example of a drilling rig shipment that required a bridge lift greater than 116 feet is the *Nordic-Calista Rig 3*, which was shipped from the Thompson Metal Fab facility to the North Slope, Alaska. This specific transit occurred in July 1997 and requested a 123-foot bridge lift. The rig included 850 metric tons (MT) of fabricated steel and measured 45 feet wide by 78 feet high by 110 feet long. The 1997 *Nordic-Calista Rig 3*'s transit is provided as an example in the cargo analysis below. The total height (vessel, cargo, and air gap) of the example projects they provided that previously required a bridge lift ranged from 54 feet to 161 feet. Thompson Metal Fab reported 40 projects from 1973 to 2020 that required bridge lifts, and they provided the height of the shipment and air gap provided for each lift. These projects involved the shipment of drilling rigs. Of the 40 projects reported, 18 would have been height restricted by the replacement bridges during high water events (+16 feet CRD). However, as previously noted, this condition occurs less than 1.2% of the year. Seven of the reported projects had heights of 116 feet or higher and would have been restricted by the replacement bridges in the assumed condition. The most recent projects with a height above 116 feet reported by Thompson Metal Fab were in 2010, 2011, and 2014 (Appendix D).

Thompson Metal Feb Cargo Analysis

Figure G.2.-2 was provided by Thompson Metal Fab to the IBR Program on May 26, 2021, to show the typical vertical clearance requirements for the company's shipments.

Figure G.2-2. Typical Shipment Diagram



* https://water.weather.gov/ahps2/hydrograph.php?wfo=pqr&gage=vapw1

Draft and Freeboard

Figure G.2-2 depicts 25 feet of freeboard with a hypothetical shipment measuring 130 feet in height. Although the weight of the shipment is unknown, the freeboard of the theoretical barge in the figure would be less than the 25 feet. Thompson Metal Fab typically uses heavy-lift deck barges (HDBs), such as *HDB 401* or *HDB 402* owned by Crowley. These barges have a depth of 25 feet, measured from the keel to the top of deck.

With the example of the *Nordic-Calista Rig 3*'s 1997 transit (provided above), a shipment of 850 MT would result in a draft of 1 meter, or roughly 3.6 feet, meaning that the barge exposed above water (freeboard) shown in Figure G.2-2 would be 18.4 feet, according to the specifications available for this barge example (the Crowley *HDB 401/402*). A fully loaded barge would result in a draft of roughly 15 feet, or a freeboard of 10 feet.

Air Gap

Another variable depicted in Figure G.2-2 that determines height restriction is air gap. The air gap shown in Figure G.2-2 is 10 feet. However, the USCG does not require a specific shipping clearance or air gap for vessels transiting underneath a bridge. Instead, air gap is a variable distance that is selected by a vessel owner.

For barges, there are often guidelines from the owner that stipulate the preferred or required air gap. The Columbia River Pilots (COLRIP) association, like the USCG, does not require a minimum clearance and instead defers to vessel owners. Data collected from Columbia Waterway users indicate that air gap tolerance can range from 1 foot to greater than 10 feet.

River Level

Although not depicted in Figure G.2-2, another variable that determines height restriction is river level. River levels fluctuate daily and over the course of the year. Figure C.3-1 in Section C summarizes the variability in river levels for the Columbia River at the Interstate Bridge from 1972 through 2020. The figure shows daily maximum, daily minimum, average daily high, and average daily low water levels, and the ordinary high water level datum of +16 feet CRD, which occurs less than 1.2% of the time.

It is not a USCG requirement to assume a specific river level when determining which vessels would be impacted by a reduced VNC. This NIR assumes a conservative scenario of a +16 foot CRD when analyzing Interstate Bridge lift data, as a +16-foot CRD occurs less than 1.2% of the year.

Variability in river levels has historically determined the timing of commercial shipments. The LOADMAX and the Physical Oceanographic Real-Time System (PORTS) on the Columbia River provide predictive information on river levels. These systems are operated by NOAA and the Port of Portland and consist of six river gages measuring water level and a river forecast system operated by the National Weather Service Northwest River Forecast Center. The LOADMAX/PORTS data are primarily used by the commercial shipping community, which maximizes the loading of ships to take advantage of true river water levels. This system is especially important when transiting the Interstate Bridge, where river levels regularly drop or rise roughly 8 feet over the course of the year, as described in Section C.

Modeling of projected changes to regional weather patterns at the Interstate Bridge indicates a negligible effect on river levels. These levels are discussed in Section C.7.

Under Keel Clearance

River levels also impact under keel clearance (UKC), or the distance between the keel of the barge and the bottom of the channel. COLRIP requires a UKC of no less than 2 feet.

The navigation channel for the Columbia River is maintained at 17 feet deep at the Interstate Bridge (CRD = 0). However, the height of the river is frequently between +5 and +10 feet CRD from January to June of a given year and between 0 and +5 feet from July to December of a given year.

Continuing this analysis using the HDB initially introduced in this section shows that a fully loaded barge has a draft of roughly 15 feet. The channel is maintained at 17 feet deep, and COLRIP requires 2 feet UKC. Thus, a fully loaded barge transiting the bridge during the second half of the year, when water levels more regularly hit 0 CRD, would just barely meet this requirement (15 feet of draft still allows for a 2-foot UKC in a 17-foot-deep channel at 0 CRD).

However, in this scenario, LOADMAX would be used to predict the best day and time when water levels are optimized to allow the cargo to pass through the channel while meeting the UKC. This can still occur during the second half of the year because water levels fluctuate daily.

Fully loaded ships transiting the bridge during the first half of the year when the river is frequently between +5 and +10 feet CRD will pass without UKC concerns. Water depth in the channel during the later months ranges from 22 to 27 feet (a 17-foot-deep channel plus 5 to 10 feet of additional water level in the first half of the year equals +22 to +27 feet).

Regardless of load size, LOADMAX predictions can regularly assist tug and barge operators with determining favorable water conditions so that shipments meet the COLRIP UKC requirement. Another option for barges is to ballast the vessel by adding water to the ballast tanks to increase draft, thereby reducing VNC.

Revisiting the *Nordic-Calista Rig 3* Example

The elements of draft/freeboard, air gap, river levels, and UKC can be applied to *the Nordic-Calista Rig 3* example referenced on Figure G.2-2. The tallest portion of the cargo in that example measured 78 feet tall with a weight of 850 MT, resulting in a barge freeboard height of roughly 22 feet. The cargo height of 78 feet, plus 5 feet of bunking, plus a 10-foot air gap, plus 22 feet of freeboard results in a total VNC of 115 feet at 0 CRD, allowing it to clear a 116-foot fixed span bridge.

The draft resulting from this example is only 6.6 feet. Additional ballasting could be used to further reduce VNC if more than 5 feet of bunking were needed or to account for river water levels greater than 0 CRD.

Of the seven bridge lifts requested in the past 50 years by Thompson Metal Fab that equaled 116 feet or greater, this analysis shows that three of those lifts would be impacted by a 116-foot fixed-span bridge. If specifics on cargo size and weight are known, this analysis could be used to determine the maximum cargo height on a given shipment that could safely clear a 116-foot fixed-span bridge.

G.2.4 Impacts to Helper Boats/Tugs

This vessel group includes tugboats (sometimes referred to as tugs) and towboats (sometimes referred to as tows) and commercial barges.. Tugsand tows transiting this region fall into one of two categories: oceangoing vessels that serve the metal fabricators at the CBC, and shallow-draft system vessels on the river system between Portland/Vancouver and Lewiston. Crane barges associated with marine construction are included in the marine contractor category (see Section G.1).

River barges are sized to transit the locks and bridges in the Columbia-Snake River System. Columbia River lock dimensions limit tugs and tows to 84 feet in width and 650 feet in length (up to four barges). River barges are typically 150 to 273 feet long with a beam of up to 42 feet. A standard tow consists of a towboat with four barges lashed two abreast (side by side), though towboats can move without barges or with one or more barges. Tugs are usually higher than barges and are the more height-constrained component of this group. Tugs operating in the river system typically have a highest fixed point of less than 55 feet and are constrained by numerous bridges on the Columbia and Snake River system that have lower VNCs than the proposed replacement bridges.

Crane barges associated with marine construction are included in the marine contractor category. Barges requiring tug or tow move up- and downriver with a variety of bulk (e.g., grain and petroleum) and container cargoes. Most cargo moves from upriver origins to downriver destinations. Some specialty barge transport occurs where the cargo may exceed the tug VNC.

From 2007 to 2024, tugs and barges accounted for over half (59%) of all openings. Tugs and barges also accounted for over half of all openings between 1987 and 2007. Their usage share ranged from a low of 40% (2023 and 2024) to a high of 70% (2021). Tugs and barges generally range from 28 to 61 feet, and they are usually able to use the barge channel or alternative barge channel to transit under the Interstate Bridge. Tugs and barges will request an opening of the Interstate Bridge to provide sufficient vertical clearance or to make a straight course between the Interstate Bridge and the BNSF Railway Bridge downstream. The largest share of these bridge lifts for tugs and barges occurs during the spring, when high rainfall and mountain snowmelt combine to increase the current and raise the river level at the Interstate Bridge. Between 24% and 42% of bridge lifts for tugs and barges occurred in April, May, and June.

Air drafts and air gaps for commercial tugs, tows, and specialty barges are described below by company, and heights provided in the river user survey are presented on Figure G.2-3.

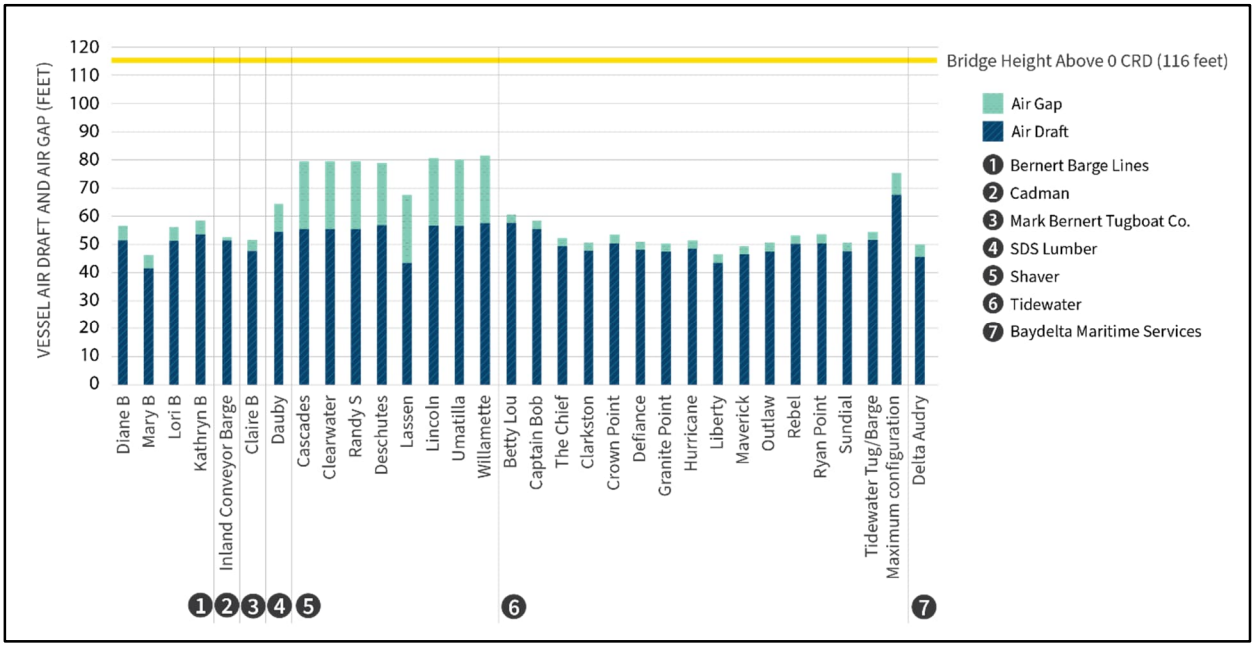
- Bernert Barge Lines provided information on four towing vessels (*Kathryn B, Lori B, Diane B*, and *Mary B*) that transit the bridge location. The largest air draft for these vessels is approximately 54 feet (*Kathryn B*). The vessels pass under the Interstate Bridge up to eight times per month throughout the year. For each of these vessels, a 5-foot air gap is desired.
- Cadman, Inc., an affiliate of Lehigh Hanson (Heidelberg Group), operates one self-unloading aggregate hopper barge that transits the Interstate Bridge three times per month in January, four times per month in February through June, five times per month in July through September, four times per month in October, and three times per month in November and December. Its air draft is approximately 49 feet, with a desired air gap of 1 foot. The barge has

no mechanical propulsion and requires a tug, which is provided by contract. The company indicated that the tug air draft is typically 52 feet.

- The Mark Bernert Tugboat Company provided information via the online survey for one tugboat (*Claire B*). This vessel has a reported air draft of 48 feet with a desired air gap of 4 feet. The vessel transits under the Interstate Bridge four times per month in March through October.
- Pacific Pile & Marine provided information on a derrick barge (*DB Pacific Lifter*) that is 135 feet above the water line, a height that exceeds the maximum air draft by 45 feet. The owner stated they would not be impacted by the replacement bridges, and no lifts were identified for the *DB Pacific Lifter* in the Interstate Bridge lift logs.
- SDS Lumber Company and SDS Tug & Barge (SDS) manufacture lumber, plywood, power, and pulp, as well as offering tug and barge services through the marine subsidiary. The company is located in Bingen, Washington. It did not respond to requests to verify or update vessel information. Information for three tugboats (*Dauby*, *Wallace E*, and *Bruce M*) was provided by SDS as part of the Hood River-White Salmon Bridge Replacement NIR. Based on those prior data, the greatest air draft of these vessels is 56 feet, with a desired air gap between 10 and 20 feet, depending on the water level and conditions. SDS also transports vessels with spuds that can be lowered to a maximum height of 65 feet with a desired air draft of 15 feet. About 10 trips per month (all year) were recorded for 2007 to 2011 for these vessels. While the CRC NIR noted the potential for shipments of loads on SDS barges as tall as 100 feet, this information was not provided for the more recent Hood River-White Salmon Bridge Replacement Bridge NIR and is therefore not considered in this impact analysis.
- Shaver Transportation provided information on eight tugboats (*Cascades* [push knee], *Clearwater* [push knee], *Deschutes* [tractor tug], *Lassen* [push knee], *Lincoln* [push knee], *Willamette* [tractor tug], *Randy S* [type not specified], and *Capt. Steve* [type not specified]). These vessels were noted as requiring a total clearance (air draft and air gap) of 80 feet. Air drafts range from 44 feet to 58 feet. The vessel data sheets indicated that tug assistance would be required during construction of the replacement bridges until the existing Interstate Bridge is removed. The tugs transit under the Interstate Bridge at all times throughout the year. In a letter dated November 2024, Shaver Transportation indicated that they have a fleet of 15 tugboats and 22 grain barges. Additional tugboats that operate on the Columbia River, as identified through their website, include *Samantha S* (tractor tug), *Sommer S* (tractor tug), *Shaver* (tractor tug), *Portland* (tractor tug), *Washington* (tractor tug), *Vancouver* (tractor tug), *Columbia* (conventional tug), *Lincoln* (conventional tug), *Dispatcher* (conventional tug), and *Beaver* (line handling) (Shaver n.d.). All vessels are similar in size and perform similar tasks to the eight tugboats initially reported.
- Tidewater Barge Lines (Tidewater) provided vessel data sheets for 14 tugboats (*Betty Lou*, *Captain Bob, Chief, Clarkston, Crown Point, Defiance, Granite Point, Hurricane, Liberty, Maverick, Outlaw, Rebel, Ryan Point*, and *Sundial*). The maximum configuration of these vessels is a tug and four barges. On average, Tidewater vessels pass under the Interstate Bridge 70 times per month. The greatest air draft of these tugboats is 58 feet, with an air gap of 3 feet.
- Baydelta Maritime Services Incorporated, a privately owned company servicing the San Francisco Bay Area, operates the *Delta Audrey* tugboat (Baydelta Maritime n.d.). One lift was

recorded in the Interstate Bridge lift logs for the *Delta Audrey* in November 2024, with a lift elevation of 130 feet. Information available through the USCG Maritime Information Exchange indicates that this vessel has a depth of 22.2 feet and a length of 93 feet (USCG 2025b), though other online sources document the vessel as having a length of 100 to 103 feet. Technical specifications for the *Delta Audrey* available on the Nichols Bros. Boat Builders website indicate that the vessel is 100 feet long and has a draft of 17 feet, but the vessel height has not been documented here or elsewhere (Nichols Bros. Boat Builders 2016).

Figure G.2-3. Commercial Tugs, Tows, and Barges



The following companies did not respond to the IBR Program's river user survey, and vessel information was not provided in prior reports. To the extent possible, information was obtained from publicly available sources. As the information was not verified through direct contact, vessel characteristics for this group are not included on Figure G.2-3, and impacts are not assessed.

- The Brusco Tug and Barge Company website indicates that its Columbia River fleet provides towboat service on the Columbia, Snake, and Willamette Rivers for private customers and for the USACE to tow government-owned tank barges (Brusco Tug and Barge 2022).
- Centerline Logistics (previously Olympic Tug and Barge and Harley Marine Services), according to their website (Centerline Logistics Corporation 2024), provides marine petroleum transportation services on the West, East, and Gulf Coasts of the United States. The company website provides vessel specifications and indicates that two vessels operate in Oregon (the *Investigator* [barge] and *Lizzy Too* [tug]). The *Lizzy Too* has an air draft of 48 feet. The Hood River-White Salmon Bridge Replacement NIR noted that the *Investigator* has an air draft of 26 feet (WSP 2019). The company website does not currently list an air draft for this vessel. The Hood River-White Salmon Bridge Replacement NIR also listed the *Willamette Champion* as a

vessel that operates in the Portland area, but the current website does not include this vessel (WSP 2019).

- Foss Maritime Company (Foss) provides a variety of tug services, including escort and ship assist, oceangoing cargo, and contractor support. For the Columbia/Snake River system, the company website indicates that they provide regional towing service (Foss Maritime n.d.). Although they did not respond to the river user survey, tug masters from Foss performed ship handling for the shallow-draft and deep-draft vessel simulations. As part of the simulations, Foss provided information about five tugs that service the Columbia River (*Carolyn Dorothy, Peter J Brix, P J Brix, Earl W. Redd,* and *Daniel Foss*). Information collected during the CRC project indicated that Foss performs harbor-assist work and does not typically transit upriver of the Interstate Bridge. Special projects in the past have required transit to the upper Columbia and Snake Rivers. Foss was reported as selling its Columbia River operations in 2013 (Oregonian 2013). Based on this information, transit by Foss vessels would be infrequent.
- Kirby Marine owns the *Adriatic Sea,* which is an articulated tug barge (ATB). Recorded Interstate Bridge lift data show this vessel transiting downstream once in 2012 with a bridge lift of 90 feet providing for 128 feet of vertical clearance, and it was tugging a barge. Information from US Maritime Intelligence indicates that the vessel is 80 feet high (US Maritime Intelligence 2025b). Assuming a 10-foot air gap, this vessel would be able to transit under the proposed replacement bridges. Vessels of this type do not regularly transit above the Interstate Bridge.
- Crowley Maritime operates the ATB vessel *Aurora*. The Interstate Bridge lift data for the *Aurora* show four transits in 2021, with bridge lift elevations between 85 and 100 feet. Vessel specifications from Crowley Maritime indicate that the barge pilothouse reaches an air draft of 51 feet with an additional roughly 20 feet of mast, for a total VNC of roughly 71 feet. Available information indicates that the *Aurora* primarily provides service in Alaska (Professional Mariner 2021). Based on this information and vessel specifications, transit by the *Aurora* would not be impacted under the assumed conditions.

G.2.5 Annual Cargo Movements

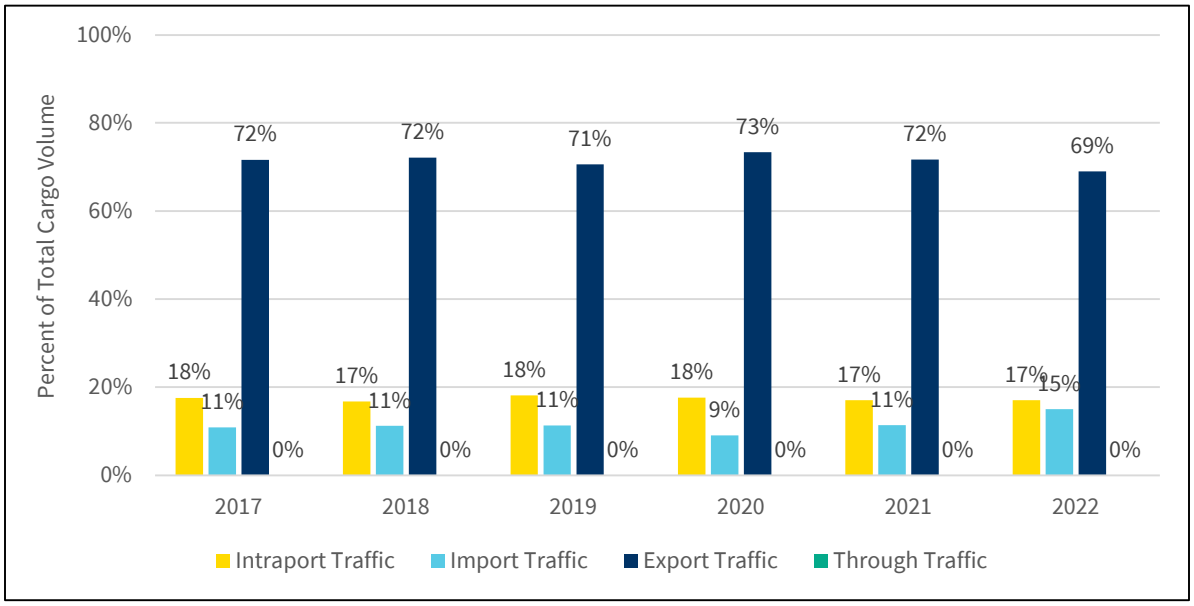
Columbia/Snake River System

The Columbia River originates in British Columbia, Canada, and flows for 1,175 miles to its mouth on the Pacific Ocean between Oregon and Washington. The Snake River is one of the main tributaries to the Columbia River and originates in Wyoming. It flows approximately 868 miles to the confluence with the Columbia River at Columbia RM 283. The navigable portion of the Columbia/Snake River System begins at the mouth of the Columbia River and extends to the head of navigation in Lewiston, Idaho, at the confluence of the Snake and Clearwater Rivers, approximately 465 miles upriver from Astoria, Oregon, as shown in Figure B.2-1. The navigable sections include a portion that supports deep-draft oceangoing vessels and a shallow-draft system supporting primarily shallow-draft barges being pushed by towboats or tugs.

The deep-draft navigation system provides for a 43-foot-deep by 600-foot-wide channel from inside the Columbia Bar to Portland, Oregon, and Vancouver, Washington, on the Columbia River—a distance of

approximately 105 miles. This section of the channel, known as the Columbia and Lower Willamette, provides deepwater access to facilities at the Washington ports of Longview, Kalama, Woodland, and Vancouver and to the Oregon ports of Astoria, St. Helens, and Portland, as well as to industrial facilities and private facilities located in this area. Data from the USACE show that 59,725,531 tons of cargo were transported on the river in 2022 (USACE 2022b). Figure G.2-4 shows the cargo volumes from 2017 to 2022 on the Columbia River system, which includes the main channels and all navigable tributaries of the Columbia, Willamette, and Snake Rivers. As shown, the majority of cargo volume was exported.

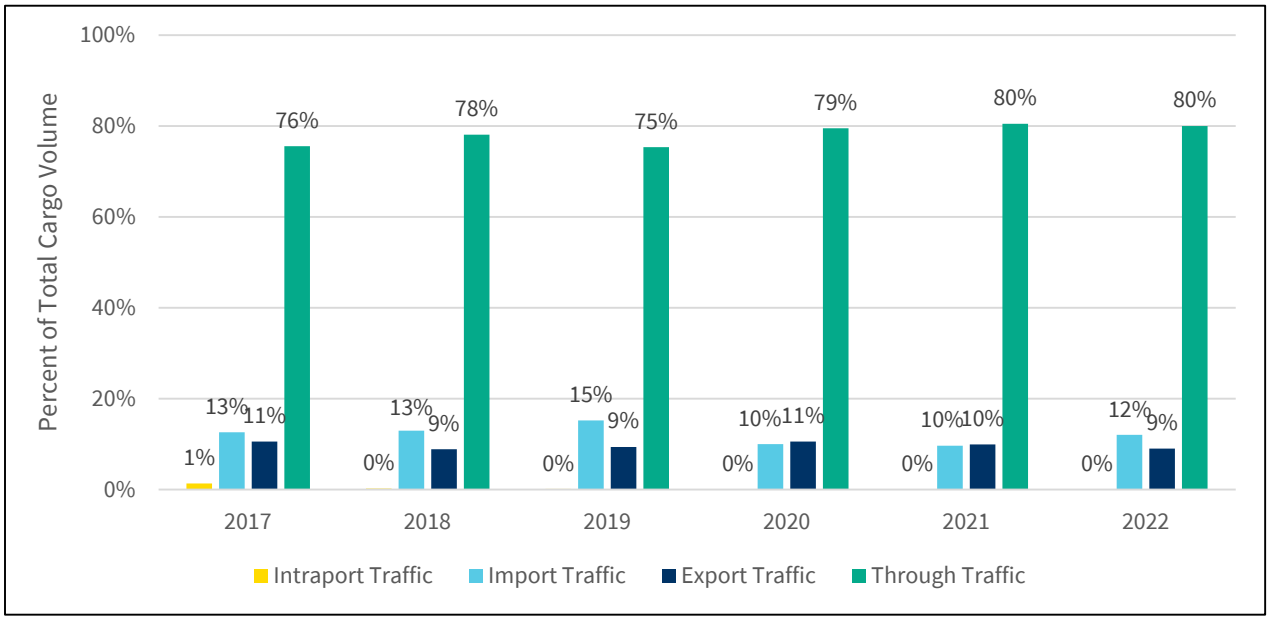
Figure G.2-4. Cargo Volume by Vessel Traffic Type, Columbia River System (2017–2022)



Source: USACE 2022c.

The shallow-draft navigation system begins just downstream of the Interstate Bridge (at RM 106.5). The Vancouver to The Dalles portion of this section was authorized as a deep-draft system (27 feet authorized depth) to serve oceangoing vessels that were common at the time. However, the USACE currently maintains the channel to 17 feet based on usage. The controlling depth for the rest of the shallow-draft system (from The Dalles to Lewiston, Idaho) is 14 feet. The section of the river from Vancouver to The Dalles handled approximately 8.5 million tons of cargo annually over a 5-year average from 2017 to 2022 (USACE 2022b). Figure G.2-5 shows the cargo volumes by vessel traffic type from 2017 to 2022 transiting on the Columbia River upriver of the Interstate Bridge from Vancouver, Washington to The Dalles, Oregon. On average, 78% of the cargo carried on this segment had an origin or destination outside of the area. These through-traffic cargo shipments are constrained by the existing structures detailed in Section B.1. Less than 1% was intraport (i.e., cargo transported between origins and destinations within the segment), 12% was devoted to imports, and 10% was to exports.

Figure G.2-5. Cargo Volume by Vessel Traffic Type, Columbia River between Vancouver, WA and The Dalles, OR (2017–2022)



Source: USACE 2022b

Wheat made up the largest volume of cargo transported (56%). Nearly 98% of the wheat originated outside this stretch of the Columbia River. Logs made up the next largest (34%), followed by sand and gravel (16%). USACE data on vessel draft during the same period indicate drafts from 2 to 19 feet. There was an average of five trips per year with drafts greater than 17 feet.

Oregon Slough

The lower entrance to the Oregon Slough is at Columbia RM 102.5, and the upper entrance (east) is at Columbia RM 108.8. The lower end is the location of several berths operated by the Port of Portland for deep-draft cargo vessels. These include auto berths (601 and 607) and container berths (603, 604, and 605). As reported by the USACE, cargo volumes in 2020 were 685,432 tons (USACE 2020). The Port of Portland uses this lower section for storage and staging of equipment associated with the *Dredge Oregon*.

The Port of Portland provided data on vessel calls for their existing berths on the Oregon Slough, as shown in Table G.2-1. Small ocean-going vessels can transit upstream of Terminal 6. However, these berths are all deepwater facilities that serve vessels using the deep-draft system downstream to the mouth of the river and do not transit upriver to the Interstate Bridge location.

Table G.2-1. Port of Portland Oregon Slough Vessel Call Data by Berth and Year

Berth	2016	2017	2018	2019	2020
601	64	60	57	68	66
603	0	2	1	3	1
604	0	1	5	4	0
605	0	5	23	10	49
607	71	45	71	39	12

Upriver of the BNSF Railway Bridge, the waterway is dominated by floating homes and recreational vessel moorage, with some commercial traffic associated with an existing marine contractor and shipyard located just downstream of the existing Interstate Bridge. The BNSF Railway Bridge on the waterway saw a total of 644 openings from January 2015 to July 2021, with an average of 92 openings per year (BNSF 2021). There are relatively few vessels moored between the two bridges, and the openings are likely associated with the marine contractor and shipyard.

G.2.6 Impacts to Commercial Fleet

There are no sources of information that directly compare the number of bridge opening events for commercial vessels with all commercial river activity because the only recorded transits of the bridge are those that require a bridge opening.

G.2.7 Impacts to Upstream Commercial Activity

In addition to the facilities within 3 miles of the Interstate Bridge (identified in Section H), an assessment of additional facilities upstream to the Bonneville Dam was completed to determine whether these facilities could support existing or future cargo that could be height-constrained by the replacement bridges. This information was collected from aerial photographs, data from county assessors, Coast Pilot, and other published sources. Table G.2-2 provides details about these facilities.

Table G.2-2. Upstream Facilities

Name	Location	Type of Facility	Contact Information	Conclusion
Georgia-Pacific Camas	Camas, WA (Lady Island)	This facility produces paper towel products. The site is height-constrained by bridges on US 14, an upstream span with a 37-foot fixed VNC, and a downstream span with a 69-foot VNC.	(360) 834-3021	Already height-constrained by the bridges that connect US-14 to Lady Island; not height-constrained by replacement bridges.

Name	Location	Type of Facility	Contact Information	Conclusion
City of Camas Ramp	Camas, WA	Docks and barges use this ramp to moor tugs and tows.	(360) 834-6864	Not height-constrained by replacement bridges.
Washougal Waterfront	Washougal, WA	This facility consists of the Port of Camas-Washougal's Marina, with moorage for powerboats and sailboats.	(360) 835-2196	Potential for sailboats to be height-constrained by replacement bridges.
CalPortland Blue Lake Aggregate Yard	Fairview, OR	This is a distribution facility that stocks crushed rock, washed rock, concrete sand, and dredged sand.	(503) 535-7740	Not height-constrained by replacement bridges.
Chinook Fairview – Sundial Chip Reload	Fairview, OR	This facility was formerly used as a ship and barge facility; only the spud barge facility is in operation.	Not available	Not height-constrained by replacement bridges.
Knife River Aggregates Terminal	Troutdale, OR	This facility consists of a ready-mix concrete plant with a dock and conveyor for sand and gravel delivery by barge and unloading-related facilities.	(503) 944-3500	Not height-constrained by replacement bridges.

US-14 = US Highway 14; VNC = vertical navigation clearance

G.2.8 Impacts to Upstream Commercial/Industrial Development

The replacement bridges would likely be in place for 100 years or more, and the NIR considers potential impacts from prospective upstream commercial development that could result in different navigation on the waterway. Development in the nearby area is limited by various land use restrictions, including the 85-mile-long Columbia River Gorge National Scenic Area (CRGNSA) located roughly 14 miles east of the Interstate Bridge, land use and economic considerations outlined in local policies and plans, topography, transportation access parallel to shorelines (SR 14, Interstate 84 [I-84], and BNSF Railway and Union Pacific Railroad), levees in North Portland, Camas, Washougal, and Troutdale, vacant buildable lands constrained by environmentally sensitive resources, and other areas limited for future water-dependent land uses. Ultimately, the proposed 116-foot fixed-span bridge does not impact upriver development as growth for large vessels is not anticipated, and development downriver of the Interstate Bridge is expected to continue where there is access to a robust workforce.

Appendix C of this report assesses land uses along the Columbia River upstream of the Interstate Bridge to evaluate the potential for development that could result in prospective navigation different than that currently using the waterway. Appendix C also includes an analysis of existing commercial

and industrial development and land uses suitable for this type of development to identify their likelihood of creating additional navigation activities that could be impacted by the proposed replacement bridges. See also Appendix A, Section 5 for details regarding land use constraints and uses.

G.2.9 Future Navigational Needs

There are no additional future navigational needs that are not discussed elsewhere in this report.

G.2.10 Existing and Historical Waterway Use and Conditions

Between the Interstate Bridge and the Celilo Bridge 95 miles to the east, many of the surrounding shoreline land uses are dependent on the varying navigation uses of the Columbia River, including for passive recreation and commercial purposes. While the Columbia River is designated by MARAD as Marine Highway route M-84, its shoreline is identified by local jurisdictions as a resource to be leveraged for river-dependent uses that are more in line with recreational, environmental, habitat, or economical purposes than with industrial marine, water-dependent uses.

As discussed in Section G.1.11 and Appendix A, Section 5, development in the areas near the Interstate Bridge is limited by various land use restrictions, including local land use and economic considerations, topography, transportation access parallel to shorelines, and vacant buildable lands constrained by environmentally sensitive resources.

The intrinsic value of the Columbia River is largely in its natural beauty, especially within the CRGNSA, which protects the natural scenic resources of the gorge and severely limits industrial development outside of existing incorporated communities. The CSGNSA is divided into three broad categories of land areas, each with different requirements for land use regulations: Urban Areas, General Management Area, and Special Management Areas. The U.S. Forest Service reviews standards for all development within the National Scenic Area to ensure they follow the allowable uses outlined in the CRGNSA Management Plan (Columbia River Gorge Commission 2025). All the industrial uses between the BNSF Railway Bridge and the Celilo Bridge are in urban areas and established industrial parks (e.g., CBC, Port of Cascade Locks Industrial Park) located outside of the designated CRGNSA boundary.

The analysis provided in Appendix C concluded that both political and geographic constraints were the primary factors affecting commercial/industrial development along the waterway.

G.2.11 Input from Waterway Dependent Facilities Concerning Future Uses

There are no planned developments within the Program area that would be served by marine transport that could be impacted by the proposed replacement bridges.

The IBR Program notes that new, future marine commerce development of manufacturing and service facilities upriver of the Interstate Bridge is unlikely for several reasons. There is little viable industrial land east of the Interstate Bridge, and land downriver of the Interstate Bridge is more likely to experience development because viable industrial land is available with access to a workforce and a

deeper draft (43 feet) as shown in Figure G.2-7. The IBR Program reviewed the vacant buildable industrial lands within 0.25 miles (or 1,320 feet) of the Columbia River near the Interstate Bridge from available data in the adjacent Washington and Oregon areas. Washington State's Vacant Buildable Lands Model (VBLM) analyzes its counties and project housing and job growth within incorporated cities by analyzing the capacity of vacant and underutilized parcels. Using this model, it was found that there are 663 acres of land upriver of the Interstate Bridge that are vacant or underutilized, of which 8% (or about 51 acres) are not constrained by local critical areas regulations or in environmentally sensitive areas that restrict development. These upriver industrial lands include the CBC, Port of Camas-Washougal, and Columbia Vista Corporation properties as shown in Figure G.2-6. Of the downriver industrial lands, 883 acres are vacant and underutilized, of which 19% (or about 221 acres) are not constrained by critical or sensitive areas. See Appendix A, Section 5 for additional details about the VBLM analysis.

Figure G.2-6. Vacant/Underutilized Parcels Upriver of the Interstate Bridge Within 0.25 Miles of Navigable Columbia and Willamette Rivers

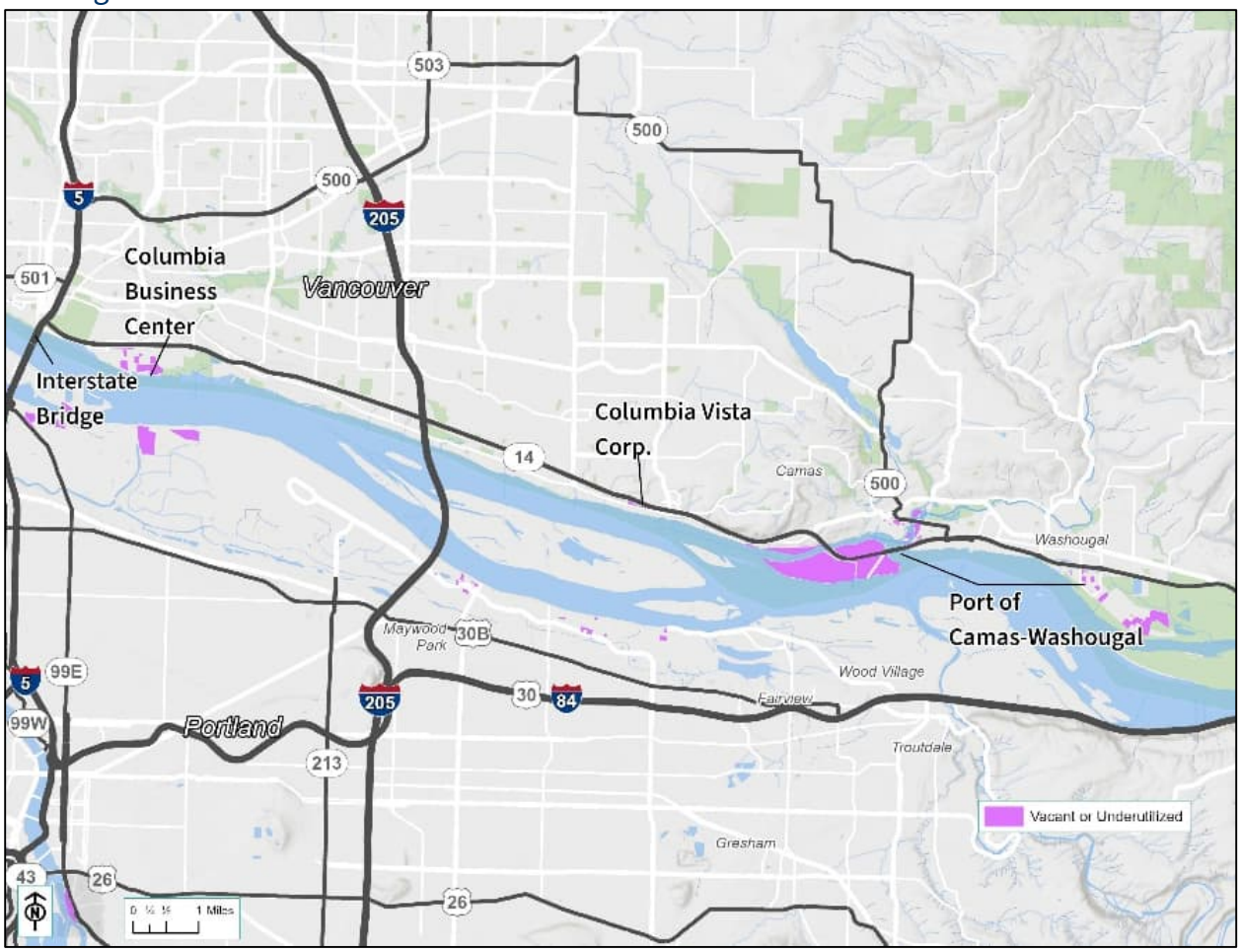
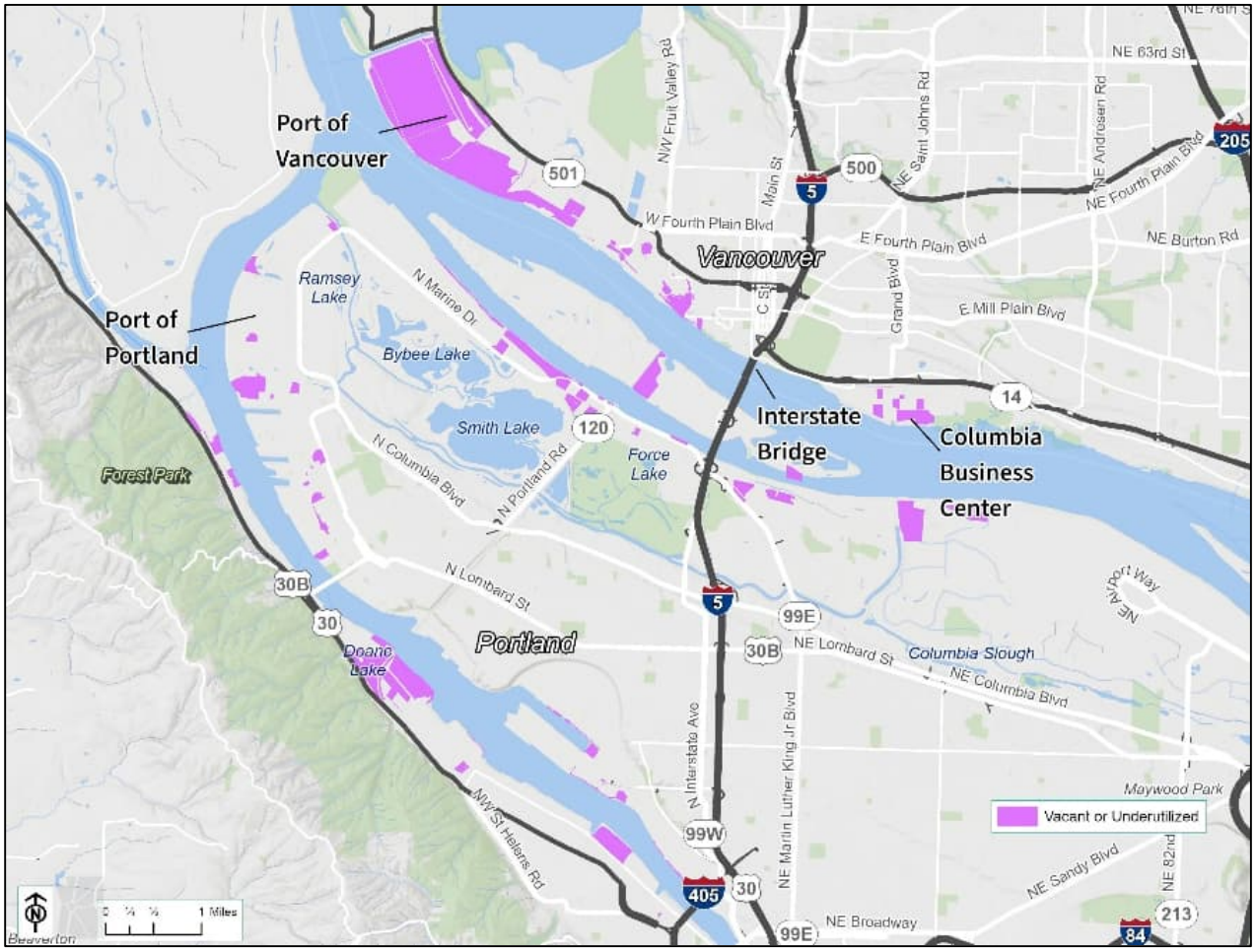


Figure G.2-7. Vacant/Underutilized Parcels Downriver of the Interstate Bridge Within 0.25 Miles of Navigable Columbia and Willamette Rivers



G.2.12 Land-use Zoning along the Waterway

In many cases, the linear rights of way for SR 14, I-84, and the BNSF Railway and Union Pacific Railroad on both sides of the river can restrict lot depth, making the area less conducive to certain types of development. Given the steep topography and limited area for placement of these rights of way, they often run along the shoreline, precluding industrial development.

Riverfront Trails

Many jurisdictions (such as Hood River, The Dalles, and Vancouver) have existing or planned recreational trails and trail expansions along the river. Such trails can create a barrier to other marine-dependent uses of the Columbia River shoreline.

Redevelopment Potential of Industrial Sites with Existing Marine Structures

There are undeveloped, potentially re-developable sites along the Columbia River within the Program area. These sites are zoned for industrial and other uses that could generate marine traffic that would require various navigational clearances. There are also sites with existing marine infrastructure, such as lumber mills, that could be redeveloped with different water-dependent uses in the future and that could use the existing marine infrastructure. These sites are primarily located within incorporated jurisdictions. Redevelopment of sites on the Columbia River that have existing marine traffic docking structures could be significantly easier and less expensive than developing new sites. Redevelopment could bypass, or involve less arduous, land use and environmental permitting requirements. In addition, many sites that could be redeveloped are downstream of the proposed replacement bridges, making them not subject to potential impacts of future bridge heights.

Summary of Findings by Subarea

This section illustrates key constraints to the Columbia River and other land uses by subarea in the sites shown in Figures G.2-8, G.2-9, and G.2-10. Please refer to Figure B.2-1 in Section B.2 to see the navigation clearances of existing bridges along the river.

Figure G.2-8. Existing and Potential Commercial and Industrial Sites

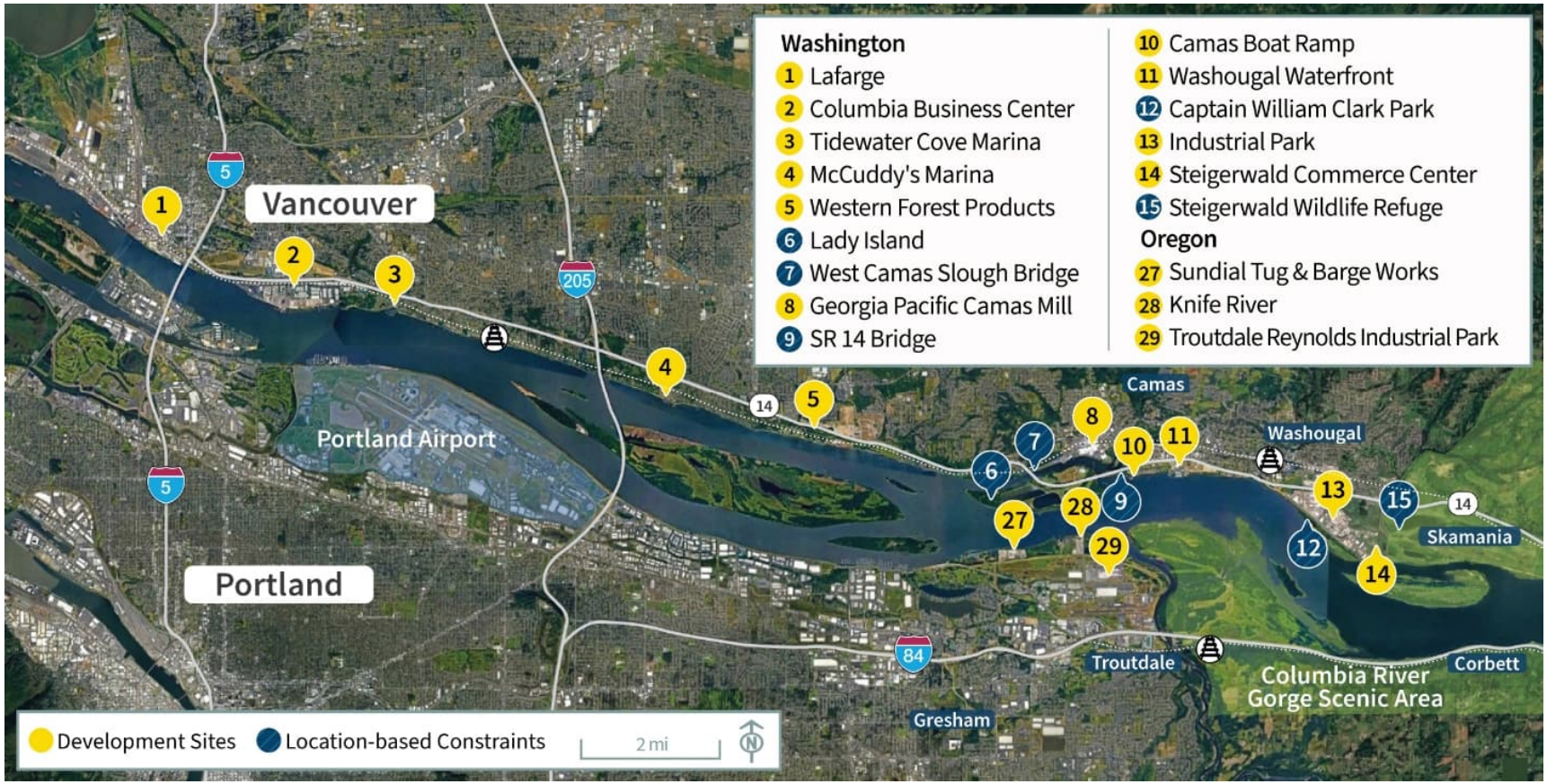


Figure G.2-9. Existing and Potential Commercial and Industrial Sites

Figure G.2-10. Existing and Potential Commercial and Industrial Sites

Clark County, Washington (Vancouver)

The water-dependent industrial sites within the jurisdiction of the City of Vancouver include industrial uses at the CBC (metal fabricators include Thompson Metal Fab and Greenberry; and JT Marine, a marine contractor), Western Forest Products property, and Lafarge property. Recreational water-dependent uses occur at the recreational moorage at Steamboat Landing Marina, Tidewater Cove Marina, and several docks associated with private residences.

It is uncertain whether all of the parcels in the CBC will remain in industrial use over the long run. Some of the main fabrication buildings were built in the 1940s. If these areas are redeveloped, it is likely to be for mixed use (residential, commercial, and retail uses) like the area immediately to the west. CBC owner Killian Pacific submitted a formal request to the City of Vancouver in May 2025 to change the CBC's comprehensive plan designation of "light and heavy industrial" to "Regional Activity Center (RAC)." This request would promote long-term mixed use on the site and enable it to "transition to a new mix of economic activities" (Slick and Kilian Pacific 2025). See Section I.2 for details. A portion of the eastern shoreline of the CBC is owned by Vigor, which has indicated that it will continue long-term industrial use of this area.

Within the portion of the Program area in Vancouver, the only current uses that would be height-constrained by the replacement bridges are the two fabricators and marine contractor located at the CBC. The height-constrained uses include fabricated structures such as oil rig modules and fish weirs, among others, and future business operations for JT Marine. Based on existing land use regulations, there are no vacant waterfront parcels that could be placed in industrial use.

The Steamboat Landing Marina and private moorages typically serve smaller powerboats and sailboats (up to 40 feet) and are not known to be height-constrained. The Tidewater Cove Marina has slips available for vessels ranging from 40 to 110 feet in length, which likely could serve vessels up to 148 feet tall. There are no known recreational sailboats that would experience height constraints with the replacement bridges. See Section F for details regarding recreational vessels.

Clark County, Washington (Camas)

There are two existing water-dependent sites within the jurisdiction of the City of Camas: the Georgia-Pacific Camas Mill and the City of Camas Boat Ramp. The Georgia-Pacific Camas Mill has ceased operations of its marine facilities, but the facilities remain in place. It is possible that both sites could serve as areas for future marine uses.

The Georgia-Pacific mill site would not be constrained because it already has a height constraint imposed by the bridges that connect SR-14 to Lady Island.

The City of Camas owns a boat ramp that is leased to Mark Marine Service. The City is in the process of renewing the property lease for an additional 5 years beyond the current lease. Future use of this parcel could remain in industrial use or change to public access. Mark Marine vessels are addressed in Section G.1.1.

Clark County, Washington (Washougal)

The waterfront industrial property in Washougal has been rezoned to highway commercial zoning and is undergoing a process of waterfront revitalization, focusing on mixed-use development (residential and commercial). This development encompasses the Port of Camas-Washougal marina, the site of the former Hambleton Lumber Mill, and the Port of Camas-Washougal's 6th Street property. These three properties are collectively referred to as the Washougal Waterfront.

Most of the moorage slips at the Port of Camas-Washougal marina are covered and are only usable by power boats, which would not be height-constrained. The marina has an uncovered maximum slip length of 55 feet; however, most of the sailboats are 50 feet or less in length, and sailboats of this size would not be height-constrained by the replacement bridges' height.

Industrial development in Washougal is centered in the Port of Camas-Washougal's industrial properties at the eastern edge of the city. Heavy industrial zoning at this site accommodates uses such as bulk petroleum product terminals, plants, and storage facilities, which could generate marine traffic. However, a levee and recreation areas/trails parallel the river and separate the industrial site from the water, which inhibits marine industrial uses along the riverfront in Washougal.

Skamania County, Washington

The industrial waterfront properties in Skamania County have traditionally been used by the forest products industry, including the mill sites at Stevenson, Home Valley, and Underwood. As the forest product sector has declined, properties have been held by forest product firms for potential future reuse as a mill site or have been planned for redevelopment to resort or mixed-use development. The proposed replacement bridges would not impose a height constraint on shipping activities because log rafts or barges could easily pass under the bridges.

The Port of Skamania owns a business park, cruise terminal, and boat launch at Stevenson. The port's property at Stevenson Landing is on the waterfront and has a cruise ship dock but does not offer waterfront access for water-dependent firms requiring barge service. Within the city of Stevenson, there is community interest in enhancing recreational waterfront with public access.

Other land holdings in Skamania County provide space for commercial and industrial tenants but do not have direct access to the Columbia River (e.g., the Port of Skamania County's Cascades Business Park, Lewis and Clark Business Park, and Wind River Business Park).

Klickitat County, Washington

Most of the occupied industrial lots along the riverfront in Klickitat County are used by the timber industry, which generates cargoes (logs, wood chips, and aggregates, etc.) that are not height-constrained. It is expected that the bridge would not have any impacts to shipping related to the timber industry. SDS operates a marine subsidiary from its location in Bingen. Vessels operated by SDS are addressed in Section G.1.1.

There are undeveloped industrial lots along the Columbia River in Klickitat County. The county's Industrial Park zoning allows for boat building, assembly and fabrication of metal products, and additional manufacturing activities as uses permitted outright. However, many of the industrially designated lots are constrained by the railroad right of way, which creates shallow lots from the river and potentially limits large industrial structures on the site.

There are also vacant developable industrial lands at Dallesport Industrial Park. However, the BNSF Railway right of way cuts through the property near the river, leaving a narrow band of land adjacent to the river that is currently used by a barge terminal. It is unlikely that future uses would be height-constrained at this location.

Multnomah County, Oregon (Portland)

There are many recreational marinas in the area between Hayden Island and Government Island that are used by both powerboats and sailboats. There are no known plans to change land uses in this section of the riverfront.

Multnomah County, Oregon (Fairview and Troutdale)

The industrially zoned sites in the Fairview and Troutdale area generate marine traffic that primarily consists of tugs and barges, which are not height-constrained.

The Knife River aggregates terminal in Troutdale is not expected to change uses in the near future. Tugs and barges serving this facility are not height-constrained.

In early 2011, Tidewater closed the Sundial Tug & Barge Works shipyard because the vessel repair and construction business was cyclical and not a core business function. The facility is currently idle, many of the marine facilities have been removed, and the site could be sold or redeveloped (Oregonian 2011).

The recently developed Troutdale Reynolds Industrial Park is located on the former 700-acre brownfield previously used by Troutdale Aluminum. The site's main tenants are Amazon and FedEx. The development does not include marine facilities. The Port of Portland has no plans to develop marine facilities, and shallow water would make marine facilities development difficult.

See Section G.1.1 for details about marine contractor tug uses in the Program area.

Hood River County, Oregon (Cascade Locks)

There are undeveloped industrial lots along the Columbia River in the city of Cascade Locks. Some of these lots are zoned as light or heavy industrial and could be developed for marine uses. Other available lots in Cascade Locks have been identified for types of development that would not generate marine traffic, such as a business park serving non-water-dependent firms, or entertainment and recreational uses, potentially including a casino.

Cascade Locks is positioning itself as a sailboat racing destination. The Port of Cascade Locks maintains Marine Park, a large public park with a marina, and boat launch. The marina includes a dock

primarily used for the Sternwheeler, a river cruise paddle boat. The marina has 36 slips accommodating boat lengths up to 40 feet, which would not accommodate height-constrained sailboats. In general, there is a desire to attract the international sailing community, but the sailboats using this area are smaller and would not be height-constrained by the replacement bridges.

Hood River County, Oregon (Hood River)

Activities that generate marine cargo are limited along Hood River's riverfront, due to the railroad tracks that abut the river for a large portion of the shoreline. In the Port of Hood River area, the emphasis is on recreational development and business park development rather than marine-based industrial uses.

Cruise ships that call at Hood River are addressed in Section F. The sailboats homeported in Hood River or calling on a transient basis at Hood River are typically less than 40 feet long and, as a result, would not be constrained by the proposed height of the replacement bridges.

There are no known existing or future activities that would be height-constrained in Hood River.

Wasco County, Oregon

Bernert Barge Lines and Mid Columbia Producers have barge terminals at the Port of The Dalles. The tugs and barges calling at these terminals would not be constrained by the height of the proposed replacement bridges. The Dalles Marina provides slips accommodating boat lengths up to 60 feet, but most are designed for 40-foot boat lengths. The sailboats homeported at or visiting the port's marina are typically smaller and would not be height-constrained by the replacement bridges.

A new cruise dock was opened in The Dalles in September 2012 that provides a float to serve transient recreational boats, as well as a fixed pier for cruise ships.

Other industrial developments are focused on redevelopment of the Northwest Aluminum site, which offers approximately 120 acres for commercial and industrial development. This site does not provide riverfront access.

G.2.13 Future Vessel Size and Traffic Trends

Bridge transits by marine contractors are dependent on their home locations and the locations of the construction project. Three businesses that provide marine contracting services or operate crane barges are located upriver of the Interstate Bridge (JT Marine, Mark Marine Services, and SDS). These contractors transit beneath the Interstate Bridge for downriver construction projects or to pick up supplies from downriver locations. Contractors that are located downriver of the Interstate Bridge must transit under the bridges for projects located upriver of the bridges.

As discussed previously in this report, the Celilo Bridge, located 95 miles upstream of the Interstate Bridge, has a lower VNC than that proposed for the replacement bridges, and any marine construction project used upstream of the Celilo Bridge would not be height constrained by the proposed replacement bridges. Therefore, the only marine construction projects that would be constrained by

the proposed replacement bridges are 1) those that are located between the current Interstate Bridge and the Celilo Bridge and that are performed by firms based downstream of the Interstate Bridge, and 2) those located downstream of the proposed replacement bridges that are performed by firms based upstream of the Interstate Bridge.

The volume of marine construction occurring between the Interstate Bridge and Celilo Bridge in the future will be limited by the amount of property available for development and future construction activity. As discussed in Appendix C, most of this area is in the CRGNSA, which strictly limits the types of development that may occur. As described in Section G.2.8, downstream of the CRGNSA, there are a limited number of sites available for water-dependent development.

Future infrastructure projects between the replacement bridge location and the Celilo Bridge that may require water-based construction equipment could include bridge replacements, construction of docks or other in-water construction, dredging, or work on The Dalles or Bonneville Dams or locks. There are known projects, such as the planned replacement of the Hood River-White Salmon bridge over the Columbia River, and unplanned projects, such as dam maintenance and repair, that will likely require floating construction equipment. Since these projects are still in the planning phases or are not currently anticipated, the type and size of the equipment needed cannot be determined. However, past projects can provide an indication of potential needs.

In 2019, emergency repairs were conducted on the Bonneville Dam navigation lock by Advanced American. Information published by the company noted that crane barge *DB 125* was needed for the repair (Advanced American n.d.). Another recent project was The Dalles Dam Upstream Navigation Lock Gate project in 2016. The gate was fabricated by Greenberry at the CBC and was transported by barge upstream, where shore-based cranes installed the gate. Photographs show the equipment in transit as being lower than the tug *Dauby* transporting it and thus would not have been height-constrained, as shown in Section G.2.4 (Greenberry 2021).

Many, but not all, of the marine construction vessels that are currently able to transit the Interstate Bridge, as discussed in Section G.1, would continue to be able to do so under the proposed replacement bridges, given the current figuration of the equipment. Notably, 23 CFR 650.807(g) specifies that special navigation clearances are not normally provided for floating construction equipment unless required for navigation channel maintenance. Based on past trends and future land use, future marine construction is not expected to exceed past averages and would not be expected to be height-constrained by the replacement bridges. Equipment that, as currently configured, would not be able to pass under the proposed replacement bridges would not be precluded from working on projects past the replacement bridges but may require a modification to transit under the bridge. The specific modifications are in development with vessel owners.

As previously discussed, tugs typically have a highest fixed point of less than 55 feet and are constrained by numerous bridges on the Columbia and Snake River system. The highest fixed point of future river tugs is expected to remain below 55 feet. An example of this is three new tugs with a maximum air draft of 52 feet—the *Crown Point*, *Granite Point*, and *Ryan Point*—that were constructed for Tidewater in 2015 and 2016.

Similarly, the length of future river barges is expected to remain within the current range of 150 to 273 feet long with a beam of up to 42 feet due to lock restrictions.

The frequency and type of future shipments that could be impacted are unknown, but it is possible that some shipments could be affected by a bridge height of 116 feet. It is also not known whether it is feasible to modify the way that future shipments are constructed, assembled, or shipped such that they would be able to transit under the replacement bridges. Therefore, these users would potentially be impacted by the replacement bridges. It is difficult to predict maritime transportation system demands and associated needs for bridge openings for the 100+ year service life since vessel traffic and river-level conditions vary from year to year, and economic trends for maritime commerce may change over time.

Based on information provided by fabricators and a review of literature, some of the fabricated structures manufactured at the CBC in the future could be taller than the tallest shipments in the past. The size of oil rigs is increasing in response to new technologies such as directional drilling of oil fields, and the newer rigs may require transiting heights in excess of 125 feet. However, the primary market for these rigs is Alaska, which has seen a significant reduction in crude oil production, and changing conditions may affect the future demand for the type of drill rigs shipped in the past. Other structures, such as fish weirs and bridge trusses, are unlikely to change significantly in the future and would not be height restricted.

Most of the fabricated metal structures are transported by ocean barges bound for destinations located outside of the Columbia River in Alaska, California, and elsewhere. Ocean barges are larger than river barges, with lengths of 400 or more feet and beams of 100 feet or more. Ocean barges cannot transit through the Bonneville lock because their beams exceed the width of the lock chamber. As a result, future fabricated meta operations in the affected region of the river are limited to the area downstream of the Bonneville Dam.

Grain shipping is another type of marine commerce identified along the Columbia River. The most common methods for shipping grain on the Columbia River can be accommodated by a fixed-span bridge. Grain is typically shipped on the river by hopper barge or tug and barge systems, rather than ocean-going container vessels, as it is more cost effective and better supported by existing facilities east of the Interstate Bridge. The grain is transferred to grain elevators, then loaded onto bulk carriers (not container ships) before being shipped to international markets. There is no indication that this method of using bulk carrier shipments of grain is shifting along the Columbia River. If there was a shift to shipping grain via containers on a barge, the shipments would still be accommodated by a fixed-span bridge as barge containers that carry grain have an air draft no more than 70 feet VNC. Additional information about potential impacts on grain shipments and marine commerce can be found in Sections 4 and 5 of Appendix A.

G.2.14 Input from States Based on State Development Plans

Neither Washington nor Oregon has a specific state development plan, aside from the joint understanding that the IBR Program is vital for interstate commerce.

G.2.15 Input from Facilities Based on Business Plans

Based on the analysis in Appendix C, there are no known planned developments that would significantly increase navigation or require the use of vessels that would be height-constrained by the proposed replacement bridges. Efforts are underway in upriver counties to reuse vacant or underutilized industrial waterfront parcels in forest product manufacturing (which is not height-constrained) or in non-water-dependent uses, including commercial business parks, mixed-use residential/commercial developments, and tourist centers.

G.2.16 Commercial Shipping and Other Affected Businesses

The 116-foot fixed-span bridge is the best bridge configuration option to improve the Interstate Bridge when impacts to affected river users can be mitigated. The 116-foot fixed-span bridge design was originally identified in the 2012 CRC NIR after the effects of 95- to 125-foot-high bridge heights were analyzed in increments of 5 feet. This analysis remains applicable for the IBR Program replacement bridges as it is a similar bridge design that is considering similar impacts to vessels and their cargo, as well as landside impacts. Ultimately, the 116-foot fixed-span bridge design would avoid or minimize impacts to nearly all river users, and it would be the best design option for the IBR Program when impacts to the remaining limited number of affected river users are mitigated.

Through extensive research, including review of Interstate Bridge lift data spanning 17 years and comments from river users and the Columbia River adjacent community, the IBR Program found that a 116-foot VNC would impact a total of four river users, as described below:

- One river user owns vessels that would be directly impacted. These vessels are the Advanced American marine contracting company's *DB 4100* and *DB Millenium*. The *DB 4100* would only be restricted when river levels are within 2 feet of the OHWM at 16 feet above 0 feet CRD, which is projected to occur only 1.2% of the time over the course of one year. This vessel has accommodations to lower crane booms/gantries and could implement them to transit during OHWM conditions of 16 feet CRD. The *DB Millenium* would be restricted at all times of the year and has accommodations to lower the crane boom and mast for transit.
- A second river user, the JT Marine shipyard services company, has potential future business operations that would be impacted by a bridge with a 116-foot VNC. Specific details regarding these impacts are confidential. As described in Section G.1.1, JT Marine's known existing operations would not be adversely impacted by a 116-foot VNC.
- The two remaining river users, Greenberry and Thompson Metal Fab, fabricate large structures that would be impacted by a 116-foot VNC.

Separately, the *Yaquina* dredge, owned by the USACE, would temporarily be impacted during construction only.

Notably, the IBR Program conducted extensive research, outreach, and coordination to determine that JT Marine's future business operations would be impacted by a 116-foot VNC bridge and that its current operations would not be adversely impacted. One vessel operated by JT Marine, the *DB Taylor*, is currently height-restricted for travel under the existing Interstate Bridge. Present conditions require

the vessel to be disassembled, be modified, or use mobile cranes mounted on barges upriver of the bridge for travel under the existing bridge. These conditions would not change with a replacement 116-foot VNC bridge, and the vessel would still require modifications for transit. Therefore, the IBR Program found that a 116-foot VNC bridge would not impose new adverse impacts on business operations for this vessel. Furthermore, in response to the IBR Program's Draft SEIS, JT Marine stated that up to 13 vessels operated by their customers would be impacted by a 116-foot fixed-span bridge. The IBR Program coordinated directly with JT Marine and conducted additional research, as documented in Section G.1.1, to understand potential impacts to its business. This research identified no impacts to JT Marine's current business operations.

The local commercial shipping and other businesses that could be impacted by a 116-foot fixed-span bridge are listed below in Table G.2-3. Agreements were reached between the IBR Program and Greenberry, Thompson Metal Fab, and Advanced American, as described in Section S to address impacts. The IBR Program engaged independent experts to assess the potential impacts on JT Marine based on publicly available industry data and information provided by JT Marine confidentially to the IBR Program, and the IBR Program and JT Marine reached a settlement agreement that addressed impacts to JT Marine's future business operations. The specific actions in this agreement are confidential.

Table G.2-3. Impacted Commercial Shipping and Businesses

Owner	Vessel and/or Business Impacts	Vessel Type	Air Draft (feet)	Restricted Trips	Trip Frequency
Greenberry Industrial	**TBD** (fabricator's tallest future shipment)	Barge with fabricated materials	136	Any trips requiring clearance over 116 feet	Less than 1 trip per year, any time of year
Thompson Metal Fab	**TBD** (fabricator's tallest future shipment)	Barge with fabricated materials	165	Any trips requiring clearance over 116 feet	Less than 1 trip per year, any time of year
JT Marine	**TBD** (future business operations requiring greater than 116 feet VNC)	Marine contractor services	TBD	Any trips requiring clearance over 116 feet	Not identified
Advanced American Construction	*DB 4100*	Marine contractor vessel	92	All trips	1 to 2 times per month, any time of year
Advanced American Construction	*DB Millenium*	Marine contractor vessel	155	Trips when river levels are at OHWM	Not identified

OHWM = ordinary high-water mark; TBD = to be determined; VNC = vertical navigation clearance

These impacts are based on reasonable assumptions regarding river level and vessel air gap. While the impacted vessels would not have unrestricted, year-round access under the bridge height analyzed, some of those vessels would be able to pass under that height, and lower bridge heights, for most or at least part of the year.

The identified navigation impacts relate to restricting the frequency of passage; they would not adversely affect navigation safety, and they would impact the passage of a very small portion of marine traffic. Some of the impacted vessels would not be able to pass for some days of the year, and a smaller portion could not pass at any time, without mitigation. With regard to permitting considerations, as described above, the USCG Bridge Administration Manual states that "the safety of navigation is a paramount consideration that cannot be compromised when addressing bridge program issues" (USCG 2004, Chapter 2 E.1).

Navigation safety was an important factor when developing and screening design alternatives for the IBR Program. The primary criteria for the success of each run completed in the navigation simulation study were the mariners' assessment of safety and opinion of whether maneuvers could realistically be conducted (Moffat & Nichol 2023). The navigation simulation study found that the higher average VNCs for the proposed bridges are an improvement over the existing conditions, from a navigation perspective. The horizontal clearance for the replacement bridges would be increased to 400 feet in each of the three navigation channels for safety and, therefore, would not result in any impacts to vessels or river users. While navigation safety is not part of the basic purpose and need for the Program, navigation safety would benefit from the Program, as detailed in the navigation simulation study (Moffat & Nichol 2023).

G.2.17 Can Restricted Vessels Be Modified?

As described in Section G.1, several potentially impacted vessels could lower booms to reduce air draft and therefore avoid impacts.

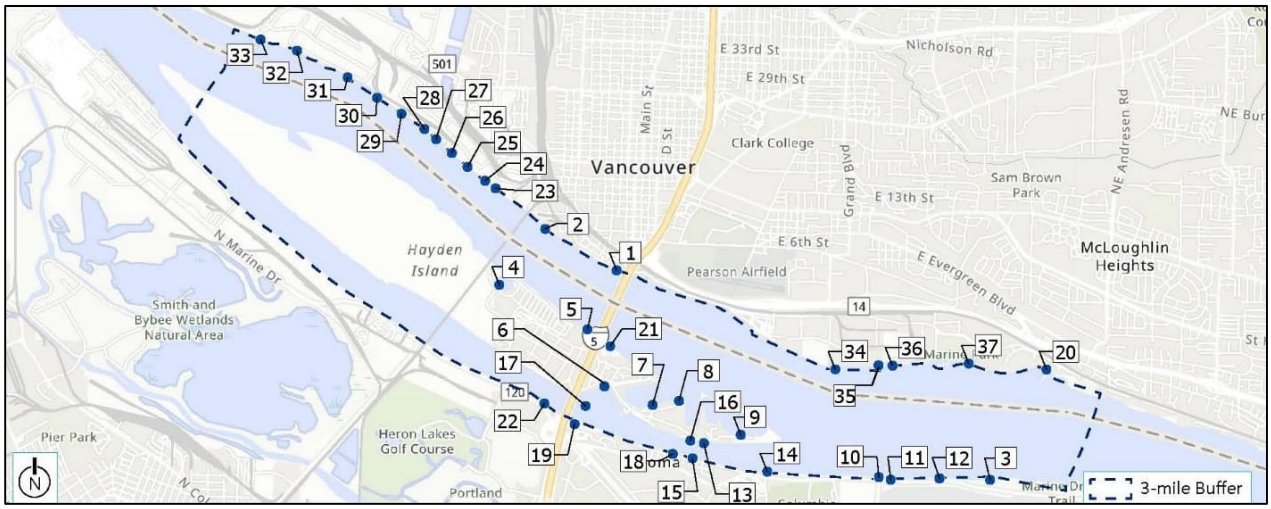
G.2.18 Additional Information Concerning Impacted/Burdened Users

Not applicable.

H. MARINE FACILITIES

The section of the Columbia River near the Program area has a high concentration of marine facilities. These include several marinas and services for recreational vessels, as well as a number of vessel maintenance facilities. There is a higher concentration on the Oregon Slough than on the main Columbia River. Recreational facilities are concentrated upstream of the Interstate Bridge, while many cargo terminals are concentrated downstream. Figure H.1-1 shows the location of the facilities within 3 miles, and Table H.1-1 contains details regarding the name, contact information, and type of facility.

Figure H.1-1. Marine Facilities within 3 Miles of the Interstate Bridge



Of the 37 facilities identified, 33 were found to predominantly serve small recreational craft (power and sail). The four additional facilities include three shipyards or vessel repair facilities (JT Marine, Schooner Creek, and Diversified Marine), and one multimodal industrial park (the CBC).
Except as noted below, access to the facilities would not be directly or indirectly impacted by the replacement bridges. Additional information about potential impacts on river users and facilities that primarily serve small recreational crafts is provided in Section A.2, Section F, and Appendix B.

Table H.1-1. Marine Facilities within 3 Miles of the Interstate Bridge

Map ID	Name	Type of Facility	Contact Information
1	Terminal 1	Public dock, cruise vessels and small craft	info@portvanusa.com, 360-693-3611
2	Lafarge Terminal	Private cement terminal	nicholas.stevens@lafargeholcim.com, 360-695-9208
3	James M Gleeson Boat Ramp	Boat launch (small craft)	parksguestservices@oregonmetro.gov, 503-665-4995

Table H.1-1. Marine Facilities within 3 Miles of the Interstate Bridge

Map ID	Name	Type of Facility	Contact Information
4	Schooner Creek Boat Works	Vessel services	Info@schoonercreek.com, 503-735-0569
5	Old Red Lion Dock	Abandoned recreation dock	N/A
6	Jantzen Bay Marina	Marina	leasing@columbiacrossings.com, 503-283-2444
7	Hayden Bay Marina	Marina	leasing@columbiacrossings.com, 503-283-2444
8	Columbia River Yacht Club	Yacht club	503-289-6561
9	Tomahawk Bay Marina	Marina	leasing@columbiacrossings.com, 503-283-2444
10	McCuddy's Marina	Marina	mark@mccuddysmarina.com, 503-289-7879
11	Tyee Yacht Club	Yacht club	https://www.tyeeyc.com/contact, 503-284-4771
12	Rose City Yacht Club	Yacht club	https://rosecityyachtclub.org/about, 503-652-1549
13	Tomahawk Island Marina	Marina	info@tomahawkislandmarina.com, 503-289-5511
14	Portland Yacht Club	Yacht club	admin@portlandyc.com, 503-285-1922
15	Columbia Way West Marina	Marina	503-839-4459
16	McCuddy's Marina	Marina	mark@mccuddysmarina.com, 503-808-9992
17	Jantzen Beach Fuel Dock	Fueling station	503-863-9641
18	Captain's Moorage	Floating home moorage	503-908-5995
19	Marineland at Pier 99	Marina	503-286-8221
20	Tidewater Cove Marina	Marina	360-977-2015
21	Red Lion Hotel on the River Jantzen Beach	General dock (cruise vessel use)	503-283-4466
22	Diversified Marine	Vessel services, marine contractor	kurt@dmipdx.com, 503-289-2669
23	Grain Elevator	Grains (includes barge offloading)	info@portvanusa.com, 360-693-3611

Table H.1-1. Marine Facilities within 3 Miles of the Interstate Bridge

Map ID	Name	Type of Facility	Contact Information
24	Berth 1	Break bulk	
25	Berth 2	Heavy lift and bulk export	
26	Berth 3	Heavy lift	
27	Berth 4	Roll on roll off	
28	Berth 5	Liquid bulk	
29	Berth 7	Dry bulk	
30	Berth 8	Multi use	
31	Berth 9	Multi use	
32	Berth 10	Auto & roll on roll off	
33	Berth 13 and 14	Lay berth	
34	JT Marine	Vessels services, marine contractor	timo@jtmarineinc.com, 360-750-1300
35	Columbia Business Center	Barge dock	lance@killianpacific.com, 503-334-1534
36	Marine Park Boat Launch	Boat launch (small craft)	parksrecculture@cityofvancouver.us, 360-487-8311
37	City Boat Basin	Fire boat moorage, vessel launch and outfitting	Chad.eiken@cityofvancouver.us, 360-487-7882

N/A = not applicable

I. LOCAL SERVICE FACILITIES

I.1 Facility Impacts

The proposed replacement bridges would not block access to any of the facilities noted in Section H.

There are three existing shipyards or vessel repair facilities within 3 miles of the Program area: JT Marine, Schooner Creek, and Diversified Marine.

JT Marine is located approximately 1.5 miles upstream of I-5 in the CBC in Vancouver. JT Marine offers a full range of shipyard services, including dry dock, vessel repair, new vessel construction, and vessel deconstruction. Facilities include a 1,200-ton dry dock, 1,000 feet of dock space, and overhead cranes (JT Marine 2023). Vessels that are not able to transit under a bridge height of 116 feet would not be able to access the facility.

Schooner Creek is located approximately 0.75 miles downstream of the Program area on Hayden Island between the BNSF Railway Bridge and the Interstate Bridge. Schooner Creek provides full-service boat repair and manufacturing of small recreational and commercial vessels. Facilities include in-water docks, an upland yard, and 35-ton and 70-ton travel lifts (Schooner Creek 2021).

Diversified Marine is located on the Oregon Slough just downstream of the Interstate Bridge. This yard offers repair, retrofit, and construction of tugs, barges, and commercial steel vessels. It can accommodate vessels up to 100 feet wide and 300 feet long. Facilities include 100-ton and 700-ton dry docks (Diversified Marine 2021).

The Port of Vancouver's Terminal 1 facility is located on the north bank of the river just downstream of the Interstate Bridge. Because the facility was recently updated with portions of its dock and building removed, it is not within the replacement bridges' footprint. In addition, the Port of Vancouver has removed many of the existing buildings on the dock and made significant progress in redeveloping the Terminal 1 properties (Port of Vancouver 2021). The IBR Program continues to coordinate with the Port of Vancouver regarding anticipated changes to its wharf and dock to avoid impacting the use of these facilities for their intended purposes.

The CBC, owned by Killian Pacific since 2006, is an industrial park consisting of 220 acres of waterfront property upriver of the Interstate Bridge in Vancouver, with variable use buildings, outside storage, and access to multimodal transportation, including rail, ground, and water access. As a landowner, CBC may have a right of access to the Columbia River as it relates to their ownership of "riparian" lands on the Columbia River. However, the IBR Program would not affect any right that the CBC or Killian Pacific has to access the river. Furthermore, the Washington Constitution vests sole ownership in the beds and shores of all navigable waters to the state, up to and including the line of ordinary high tide. The right of access to and use of the navigable channel is a public right. According to a letter submitted by the CBC to the USCG in 2022, the company's barge slips accommodate river and oceangoing vessels up to 400 feet in length and with air drafts up to 178 feet tall (USCG 2022). The CBC facilities have allowed, and will continue to allow, for heavy manufacturing uses related to national security, changing regional

weather patterns, energy, and critical infrastructure. A second barge slip is located near the JT Marine site, but is not currently maintained.

The CBC is the location of the former Kaiser Shipyard, established in 1942, which launched more than 140 ships constructed for the U.S. Navy during World War II. This shipyard closed shortly after the end of the war and was never reopened. Only remnants of the maritime infrastructure remain, and much of the area of the former shipyard is devoted to other uses, including commercial, industrial, and residential activities. Based on documented ship production in the 1940s, five of the six vessel types produced would be able to transit a 116-foot VNC (Table I.1-1). The S4-S2-BB3 ship type is the only vessel type that would be height constrained. However, the current CBC site is unlikely to be a primary location for future naval ship construction, as discussed in Section G.2.12, as there are other nearby locations that are more suitable for shipyard redevelopment.

Table I.1-1. Ships Produced at Vancouver Kaiser Shipyard for the U.S. Navy, 1942-1946

Ship Type	Common Name	Total Produced	General Dimensions
EC2-S-C1	Liberty ship	10	*Draft:* approx. 27 feet 7 to 9 inches *Air Draft: approx.* 74 feet 3 inches *Total Height:* approx. 102 feet
LST	Landing ship	30	*Draft:* 12 feet 4 inches *Air Draft:* 75 feet 2 inches *Total Height:* 87 feet 10 inches
S4-S2-BB3	Casablanca-class escort aircraft carriers	50	*Draft:* up to 22 feet *Air Draft:* 103 feet *Total Height:* 125 feet
VC2-S-AP5	Victory ship type; Attack transport	31	*Draft:* up to 28 feet *Air Draft:* approx. 81 feet *Total Height:* 109 feet
C4-S-A3	Troop transport	12	*Draft:* up to 33 feet *Air Draft:* approx. 46 feet 6 inches *Total Height:* 79 feet 6 inches
C4-S-A4	Cargo transport	8	

Source: Appendix J, Kaiser Shipyard Memorandum

Just downstream of the Interstate Bridge on the Oregon side of the river is a facility that used to serve as a dock for a hotel that has since been demolished. This facility would likely be removed to accommodate the replacement bridges. Since it does not provide any marine services, the removal would not impact navigation or services.

The I-5 Oregon Slough bridge is flanked by private moorage facilities for floating homes and recreational vessels. Portions of these facilities would be removed or relocated for the replacement

bridges and connecting on- and off-ramps over the Oregon Slough (IBR 2024). They do not provide any critical marine services such as fuel or repair activities and would not reduce available marine services on the waterway.

I.2 Impacts to Critical Infrastructure, Key Resources, Important/Unique Capabilities

The IBR Program has considered impacts to the CBC, owned by Killian Pacific, an approximately 80-year-old, 220-acre waterfront industrial park upriver of the Interstate Bridge with buildings, outside storage, and access to multimodal transportation (rail, ground, and water). Killian Pacific has stated in correspondence with the USCG that it would lose significant revenue from its inability to lease the CBC to major industrial companies because those companies would not have access to the Columbia River without a vertical bridge clearance of at least 178 feet. The IBR Program has conducted additional research and outreach to understand this concern.

The CBC does not directly own or operate vessels on the Columbia River; as such, the CBC uses the area as a landlord rather than as a river user. As a landowner, the CBC has a right of access to the Columbia River as it relates to its riparian lands on the river. However, the IBR Program would not take or damage any right by the CBC or Killian Pacific with regard to accessing the river, and the proposed bridge design would not physically take or damage CBC's property. The IBR Program disputes the assertion that the CBC would lose lease revenue for this reason.

Notably, Killian Pacific has documented that the long-term vision of the site is to transition its use from industrial to mixed commercial land use. On May 10, 2025, Killian Pacific submitted a formal request to the City of Vancouver to change the comprehensive plan designation for the properties collectively known as the CBC from its current designations of light and heavy industrial to Regional Activity Center (RAC). With the adoption of the RAC designation, Killian Pacific intends to transition the CBC from, as noted by Killian Pacific in the request to the City of Vancouver, "…an underdeveloped legacy of industrial uses to a new vibrant waterfront district…" with mixed uses that will "…transition to a new mix of economic activities" (Slick and Kilian Pacific 2025). This request indicates that Killian Pacific's intention to shift its business model to pursue mixed commercial development rather than focus on industrial use that would require the movement of large goods on the Columbia River. Killian Pacific's intention to shift its business model to pursue mixed commercial development rather than focus on industrial use that would require the movement of large goods on the Columbia River.

I.3 Alternate Service Locations

Based on the size of the JT Marine shipyard facility and information on past projects provided on the company's website, the shipyard primarily serves smaller vessels such as tugs, fishing vessels, and barges. Vessels within these categories would not be impacted by the proposed replacement bridges. Larger shipyards such as Vigor on Swan Island, which is located approximately 4.98 miles, or 4.33 nautical miles, downstream of I-5, are available to serve larger vessels.

In addition, the ship building and repair services provided at the CBC are not unique to the region. The following facilities along the U.S. Pacific Coast, for example, provide shipbuilding and repair services for medium to large vessels:

- *Vigor Industrial, located in Seattle, Washington, approximately 170 miles north of the Interstate Bridge*, is a 27-acre Harbor Island shipyard with three drydocks, providing ship repair, modernization, and new construction for mid- to large-sized vessels. Such vessels include ferries, fishing vessels, barges, offshore vessels, and U.S. Navy and Coast Guard ships.
- *Dakota Creek Industries, located in Anacortes, Washington, approximately 250 miles north of the Interstate Bridges*, is a full-service shipbuilding and repair facility on the Guemes Channel with a Syncrolift shiplift and drydock, specializing in steel and aluminum vessels up to 400 feet, including tugboats, ferries, research vessels, and offshore support ships.
- *Vigor Industrial, located in Ketchikan, Alaska, about 950 miles north of the Interstate Bridge*, is a 20-acre, ice-free facility with two drydocks and a 70,000-square-foot assembly hall. It provides year-round shipbuilding, repair, and fabrication services that are ideal for vessels operating in Alaska waters.
- *General Dynamics NASSCO and Vigor Industrial/Continental Maritime of San Diego located in San Diego, California, approximately 1,100 miles south of the Interstate Bridges*, are described below:
    - The General Dynamics NASSCO shipyard has 86 acres of land and 47 acres of water. It is equipped with extensive facilities, including drydocks, building ways, berths, and cranes, capable of constructing and servicing ships up to 1,000 feet in length.
    - The Continental Maritime of San Diego facility, owned by Vigor, is a certified U.S. Navy Master Ship Repair Contractor that provides repairs and alterations to all major Navy surface vessels and amphibious ships, with in-house capabilities for electrical, machinery, coatings, fabrication, and rigging systems.

I.4 Impacts from Use of Alternate Facilities

Use of these alternate facilities would not substantially increase operation of affected vessels.

I.5 Feasibility to Modify Affected Vessels

Vessels that would not be able to clear the proposed bridges have been identified. For some of these vessels, modifications are feasible. For vessels that cannot undergo modification, alternate forms of mitigation have been identified and agreed to with vessel owners such that the replacement bridges would have no economic impact to the vessel owner.

I.6 Describe Modifications

Modifications to impacted vessels, including modification details, cost of modification, and who would pay for modification, are details included in the finalized river user agreements, which are confidential and cannot be distributed publicly.

J. ALTERNATE ROUTES

The main Columbia River does not have an alternate route available. Vessels that could be restricted by the proposed bridges over the Oregon Slough would be able to use the main Columbia River as an alternate route, as it has greater horizontal and vertical clearances. Because the replacement bridges over the Oregon Slough would provide the same VNC as the existing clearances, there would be no change in the number of vessels that would need to use this alternate route.

K. HARBOR OF REFUGE

The Columbia River is not an open ocean or a coastal area and is therefore not subject to the same type of conditions that require harbors of refuge. Wind and wave conditions on the river do not affect vessels the same way as the conditions would in coastal areas near the mouth of the Columbia River.

Nearby marinas and the Oregon Slough can provide refuge for small craft during extreme weather events. There are several boating facilities located upriver from the Interstate Bridge, such as Donaldson Marina, Steamboat Landing, and the M. James Gleason Ramp, which can provide small craft refuge (OSMB 2007). The project would not block access to these sites, and small craft are not likely to be affected by changes to vertical or horizonal navigation clearances. Commercial vessels on the Columbia River and Oregon Slough are not generally impacted by weather conditions and are too large to find refuge outside the channel. These larger vessels would either seek dock space or anchor as needed should weather conditions require it.

L. NEAR BEND IN WATERWAY

L.1 Impacts from Bend on Safe Passage

NOAA Chart 18526 shows the nature of the waterway and navigation channel within the Program vicinity. This chart indicates that there are no bends in the waterway within 0.5 miles of the Interstate Bridge.

L.2 Consideration for Alternate Location

Not applicable.

M. OTHER FACTORS

M.1 Describe the Factors.

Factors such as dockages, lightering areas, and existing bridges located within 0.5 miles of the proposed replacement bridges may create hazardous passage through the proposed structure. There are no other bridges within 0.5 miles of the Interstate Bridge over the main Columbia River or the I-5 Oregon Slough bridge. However, the BNSF Railway Bridge is located approximately 1 mile downstream of the bridges that carry I-5.

The Port of Vancouver's Terminal 1 is located just downstream of the Interstate Bridge. With the realignment of the main navigation channel under the replacement bridges, cruise or other vessels can continue to moor at the facility without infringing on vessels transiting the primary channel.

According to USACE navigation project information and NOAA charts, there are no designated anchorages or lightering areas within the vicinity of either the Interstate Bridge or the I-5 Oregon Slough bridge. USCG regulations do not establish any regulated navigation areas near the replacement bridge locations. The Oregon Slough is subject to the State of Oregon's "Slow-No Wake" requirements, which limit vessel speed within 200 feet of marinas and/or floating home moorages and establishes a 5-mile-per-hour speed limit from west of the BNSF Railway Bridge to the eastern entrance to the waterway from the Columbia River.

A number of floating homes are present along the Oregon Slough. The construction of the IBR Program features on this waterway would require relocation or removal of a number of these homes. The process of property acquisition and displacement would include moving the identified floating homes with the following assumptions:

- The maximum height of the 37 affected floating homes is 33 feet (single-story).
- These floating homes fit the Oregon Revised Statutes 830.700 building code definition of floating home as "a moored structure that is secured to a pier or pilings and is used primarily as a domicile and not as a boat." The homes are not considered vessels, do not feature propulsion, and would be relocated by use of a tugboat.

Based on the identified building heights of the floating homes to be moved, the movement of these floating structures would not be height-constrained by the replacement bridges. However, residents of floating homes in the vicinity of the Program improvements who use small vessels to travel to and from their homes, as well as vessels traveling to and from businesses and services near the North Portland Harbor bridges construction area may need to use detour navigation routes during construction.

M.2 Recommended Mitigative Measures

Navigation channel restrictions and closures during construction, along with detour navigation routes, would be communicated with residents of floating homes and other river users before and during construction.

N. HYDRAULIC CONDITIONS

N.1 Vessel Transit at Lower or Higher Water Stages

Section G.1.1 identifies potentially impacted vessels that could avoid impacts to navigation by transiting at lower water stages. In particular, the *DB 4100* would be impacted only within 2 feet or less of the OHWM and, therefore, could avoid impacts by transiting at lower water stages.

N.2 Describe the Conditions:

Existing hydraulic conditions would not increase the hazard of passage under the proposed bridges. Currents at the bridge location are generated by flows released at Bonneville Dam. According to the Federal Emergency Management Agency Flood Insurance Study for Portland, Multnomah County, Oregon dated November 26, 2010, the average cross-sectional velocity for the 100-year flood near the Interstate Bridge is 3.8 feet per second (2.25 knots) (FEMA 2018). Note that this velocity is the average of the entire cross section. Localized velocities, especially near the center of the channel, could be greater. Two-dimensional hydraulic modeling was conducted for the existing bridge piers, proposed pier configuration, and a temporary configuration for construction phasing. The model results provided water surface elevations, water depths, velocities, and shear stresses to inform the ship simulations conducted in 2023. The major changes in velocity differences occur at the Interstate Bridge piers. The pier increases range from 0 to 5 feet per second over a range of 2,450 feet for the proposed configuration and 0 to 5 feet per second over a range of 3,400 feet for the temporary configuration. The velocity comparison shows a decrease immediately downstream of the existing piers and an increase downstream of the proposed piers. Near the existing north channel under the Interstate Bridge, which is the existing primary navigation channel, the current velocity is approximately 3 knots (Moffat & Nichol 2023). During low-flow periods, the current is affected by tides, such that a slack tide can result in very little to no current. Currents used in the vessel simulation effort are shown in Table N.1-1. No current information was found for the Oregon Slough.

Table N.1-1. Columbia River Currents

Designation	Discharge at The Dalles (KCFS)	River Gage at I-5 Bridges (CRD)	Current Magnitude (fps/knots)
Normal	140	2.94	1.84/1.09
Transition	397	11.84	3.65/2.16
10-Year	539	16.44	4.35/2.58

Key:
CRD = Columbia River Datum
fps = feet per second
I-5 = Interstate 5
KCFS = 1,000 cubic feet per second

When traveling with a river current, vessels need to maintain a faster speed than the current to provide steerage. Consequently, at higher river velocities, speed over ground is increased and the required distance to negotiate turns becomes greater. Should the vessel need to stop for any reason, it must compensate for the river flow by moving backward. If the vessel is towing a non-self-propelled barge or other vessel, the tow can lose control and the only way to stop the tow would be to turn around. Barges being towed often have a tug alongside them while transiting under bridges and along other parts of the river to provide greater control.

N.3 Recommended Mitigative Measures

Not applicable.

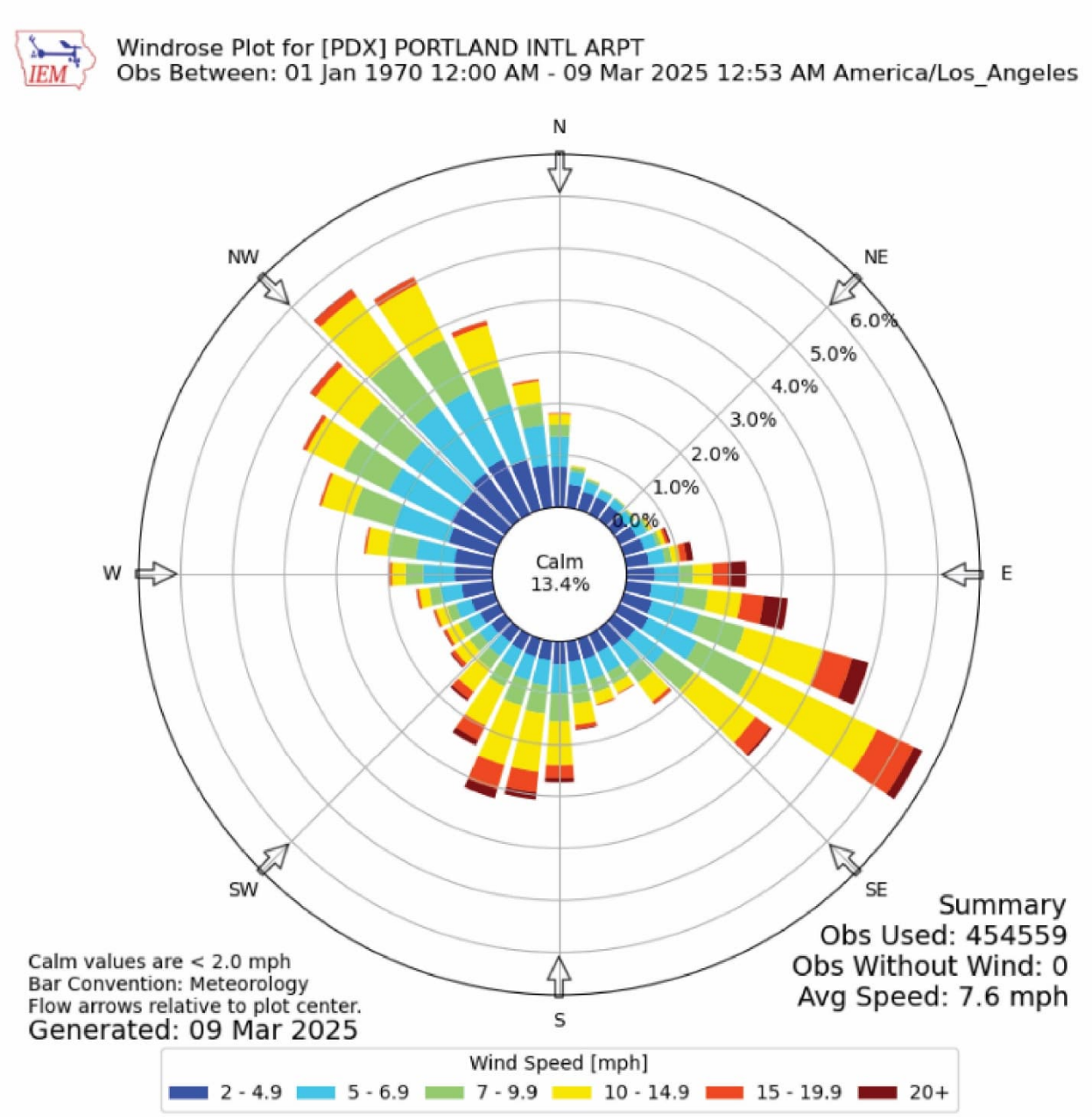
O. ATMOSPHERIC CONDITIONS

O.1 Describe the Conditions

Wind forces on a vessel produce two impacts: a sideways drift and a turning moment. The degree to which wind affects a vessel depends on the relative direction of the wind, the ratio of wind speed to vessel speed, the depth to draught ratio, the vessel profile, and whether the vessel is in a light or loaded condition. The impacts of waves and when they should be considered in navigation channel design are discussed at length in USACE Engineer Manual (EM) 1110-2-1613, Chapter 5-2 and 6-4 (USACE 1995). For large ships and tows, waves must have a length of approximately half the length of the vessel in order to be considered in the design. In the Columbia River, this would only occur in swell waves near the entrance of the river to the ocean. Waves in the Program area would be local wind-generated waves that have a much shorter wavelength than would be required to affect a vessel's behavior.

Winds from the bow are generally not a concern for wind speeds less than 10 times the vessel speed. However, winds become a greater concern as they increase or shift abeam. The maximum impact occurs when the wind direction is perpendicular to a ship's beam. Transiting in a strong wind or through a curve requires more skills and room for navigational tolerance than transiting in a light wind. Wind observations from the Portland airport weather station show that when strong winds occur, they are predominantly from the northwest and southeast, in general alignment with the river and channel. Winds can occur from the south, but that is not the predominant direction (see Figure O.1-1).

Figure O.1-1. Portland Airport Windrose Plot



Source: Iowa State University 2025
mph = miles per hour

Wind waves are not a hazard to navigation in rivers except during storms (USACE 1980). Studies completed in the Columbia River have evaluated wave conditions (Helaire et al. 2019). Waves in this stretch of the river are generated by passing ships and windstorm events. Waves of this size would not be expected to affect tugs, tows, or larger commercial vessels due to their weight and length at the

waterline, which serve to reduce the impacts of waves on the vessels. For smaller vessels, the specified air gap should provide adequate margins to accommodate vessel movements, based on the typical height of waves in the area.

No wave information was found for the Oregon Slough. Because of the narrowness of the waterbody, the limited fetch, and the many shoreline restrictions, only very small waves would be expected in the area of the proposed replacement bridges and would not be expected to impact available VNCs.

Fog, rain, and transiting at night reduce visibility. The net result is that under these conditions, there is less time to react should a vessel need to maneuver quickly. Even with radar, vessels will travel slower than during periods of good visibility. Reduced speed affects vessel steerage and maneuverability. In addition, knowing the bridge clearance and the vessel's height becomes extremely important in low-visibility conditions because it may not be possible to simply "eyeball" whether the vessel will clear a bridge height. Users may want a greater air gap while transiting during these conditions. Fog is most prevalent in the area during the fall and winter and when river flows are at their lower levels, when visibility can be reduced to 0.5 miles or less on 4 to 8 days per month (DOC et al. 2021).

O.2 Recommended Mitigative Measures

No mitigative measures are recommended because local atmospheric conditions are not expected to increase the hazard of passage under the proposed replacement bridges.

P. GUIDE CLEARANCES

The USCG publishes bridge guide clearances for certain navigable waters of the U.S., and compliance with these guide clearances will ordinarily receive favorable consideration under the bridge permitting process as providing for the reasonable needs of navigation. The USCG notes that guide clearances are not intended to be regulatory, and greater or lesser clearances may be required or approved as necessary to meet the navigation needs at a particular location (USCG Bridge Program 2012).

P.1 Horizontal Guide Clearance

According to the clearance guide for the Columbia River from the BNSF Railway Bridge at Vancouver (RM 105.6) to The Dalles, the HNC is indicated to be 450 feet, as measured from a river stage of 600,000 cubic feet per second (USCG n.d.). Upriver of The Dalles, the horizontal clearance is indicated as 400 feet, based on 2% flowline. No guide clearance is provided for the Oregon Slough.

P.2 Vertical Guide Clearance

According to the clearance guide for the Columbia River from the BNSF Railway Bridge at Vancouver (RM 105.6) to The Dalles, the VNC is indicated to be 135 feet, as measured from a river stage of 600,000 cubic feet per second (USCG n.d.). Upriver of The Dalles, the VNC is 60 feet, based on 2% flowline. No guide clearance is provided for the Oregon Slough.

P.3 Deviation from Guide Clearance

A bridge height of 116 feet and a horizontal clearance of 400 feet both will be less than the published USCG guide clearance.

P.4 Justify Deviation from Guide Clearance

A bridge height providing 135 feet of VNC would encroach on protected airspace for Pearson Field Airport and would provide only a minimum reduction in impacts while increasing costs and resulting in other landside impacts. While the replacement bridges would also deviate from USCG guide clearances, the altered navigation channels would have a greater or equal HNC compared to existing conditions.

Q. OTHER MAN-MADE CONDITIONS

There are no known natural or human-made conditions that would affect navigation that are not addressed elsewhere in this NIR.

R. ADDITIONAL FACTORS

R.1 Additional Operational Factors

VNC is just one of several factors that vessels transiting in a channel or under a bridge must consider when determining whether a passage can be accomplished safely. These factors are both operational and physical. This section discusses operational factors because changes in the physical surroundings may result in users having to address the operational factors differently, even though the factors themselves do not change. The major operational factors considered by the USACE that affect the vessel transits in channels include wind, wave, and current conditions; visibility (day, night, fog, and haze); water level (including possible use of tidal advantage for additional water depth); traffic conditions (one- or two-way, pushtows, cross traffic); speed restrictions; tug assistance and pilots; UKC; and ice (USACE 1984, 1995, 1999).

This navigation technical analysis does not include a discussion of operator skills or experience. Vessel operators are assumed to have sufficient training and qualifications to transit the Columbia River. This includes an understanding of the factors that affect their vessels, knowledge of the aids-to-navigation in the area, and knowledge of the presence of natural and human-made river obstacles.

From a navigation perspective, vessel operators consider the following when transiting between bridge piers:

- Vessel size and maneuverability
- Dredged channel width and distance to bridge piers
- Operational factors
- Risk of collisions
- Vessel operator's experience

Bridge piers should be placed outside the top of the dredged channel's slopes. Any width greater than that increases the safety margin of the transit. The USACE Engineer Manual for shallow-draft navigation projects indicates that the span should be somewhat wider than the designed width of the channel and depends on the alignment and velocity of currents; channel alignment approaching the bridge, particularly from the upstream direction; and impacts of the prevailing winds (USACE 1980).

To accommodate the proposed replacement bridges, the IBR Program proposes to modify the federal navigation projects that are authorized in the Program area. These changes will modify the way that vessels that are restricted to the channel navigate the area, and the potential impacts of those changes on navigation are discussed in this section. While the authority to modify these channels comes through the USACE, the changes are considered applicable to the PNCD to the extent that they affect navigation.

The analysis in this section is based primarily on a bridge navigation simulation study completed in 2023 by Moffatt & Nichol, and a vessel simulation effort completed in 2014 by Waterway Simulation

Technology, Inc. for the CRC project (Moffat & Nichol 2023). The 2014 simulation was completed for deep-draft vessel use of the UVTB and the primary channel, and for tug and tow use of the three navigation channels at the bridge location. Portions of this previous ship simulation were repeated in 2023 to incorporate changes to the project elements since 2014. A real-time vessel simulation was performed for both deep-draft and shallow-draft navigation based on characteristics of the existing navigation channels, modified channels and maneuvering areas during construction sequencing, and the proposed navigation channels following construction of the replacement bridges. In total, 109 simulations were performed, including 20 deep-draft and 89 shallow-draft. Simulations were observed by members of the USACE and USCG. Ship handling for the deep-draft vessel simulations was performed by a licensed pilot from the Columbia River Pilots Association. Ship handling for the shallow-draft vessel simulations was performed by a local tug master from Shaver Transportation Company, Foss Maritime, Tidewater, or Combined Forestry and Marine Services.

The simulations were completed in support of the Section 408 process with the USACE to determine the impacts on navigation of the proposed channel modifications in accordance with EM 1110-2-1643 and EM 1110-2-1611. These manuals require that all proposed modifications to a new or authorized FNC be modeled for the final design, with a physical model or ship and/or tow maneuvering model study, to ensure safe and efficient navigation. USACE Engineer Regulation (ER) 1110-2-1403 regulates this modeling. The ship simulation studies and reports will be reviewed and finalized prior to issuance of Section 408 authorization by the USACE, but the effort and reports completed to date provide a detailed analysis of navigation conditions suitable to support the IBR Program NIR and PNCD.

For the bridge navigation simulation study, two primary channels were evaluated for interim conditions (during construction): the Construction North Channel and the Construction South Channel. The mariners noted that there would be more obstacles to maneuver past in the Construction North Channel during construction, but overall, this is the preferred construction channel. The mariners found that transit through the Construction South Channel was feasible but challenging. Initial limitations to transit through the Construction South Channel until mariners are more familiar with the interim conditions could include the following:

- 2 x 2 barges should be broken into 2 x 1 barges, independent of flow conditions.
- Specialty barges' transit should be limited to daylight, an assist tug should be available, and the deckhand would need to be on the barge giving the tug master constant distances.
- Breaking up the tow into fewer barges may require fleeting areas (i.e., areas used to provide barge mooring) upstream of the Program area and downstream of the BNSF Railway Bridge.

The navigation simulations resulted in the following conclusions for the proposed North Barge Channel, Primary Channel, and South Barge Channels l post-construction:

- The average clearances for the proposed replacement bridges are greater than for the existing Interstate Bridge.
- There was no noticeable difference in the safety and difficulty ratings by pilots between the existing and proposed navigation channels.
- The mariners did not raise navigation concerns regarding the replacement bridges.

- The wider channels and higher bridge elevation in the proposed channel and bridge design allow for higher safety and visibility.
- The proposed navigation channels and proposed replacement bridges are an improvement over the existing conditions for navigation.
- The existing lift span on the Interstate Bridge is the only channel that can be transited during high water conditions. With the replacement bridges, 2 x 2 and 2 x 1 barges would be able to transit all three navigation channels during high-water conditions.
- The BNSF Railway Bridge will continue to be the most difficult location to transit on this reach of the river. However, the mariners stated that the proposed channel allows for natural transitions between the replacement bridges and the BNSF Railway Bridge.

Based on the results of the two ship simulation efforts in 2014 and 2023, the proposed channel modifications would increase navigation safety and would not impact the prospective navigation on the waterway.

R.1.1 Temporary Impacts

A Conceptual Staging Narrative was included in the Columbia River Bridges and Approaches Draft Permanent and Temporary Alterations to Federal Navigation Projects (Appendix I), a technical report submitted as part of the Section 408 Permit application. The Conceptual Staging Narrative provides an overview of the staging plans for the construction of the replacement bridges. The overview includes details of the construction phases of the new bridges and demolition phases of the existing bridge while maintaining navigation channels during construction.

Construction Components and Duration

Table R.1-1 provides the estimated construction durations for the components of the replacement bridges. The estimated durations are shown as ranges to reflect the potential for funding to be phased over time. In addition to funding, contractor schedules, regulatory restrictions on in-water work and river navigation considerations, permits and approvals, weather, materials, and equipment could all influence construction duration and overlap of construction of certain components.

Table R.1-1. Construction Components and Duration

Component	Estimated Duration	Notes
Columbia River bridges	4 to 7 years	• Construction is likely to begin with the main river bridges. • The general sequence would include initial preparation and installation of foundation piles, shaft caps, pier columns, superstructure, and deck.

Component	Estimated Duration	Notes
North Portland Harbor bridges	4 to 10 years	• Construction duration for the North Portland Harbor bridges is estimated to be similar to the duration for Hayden Island interchange construction. The existing North Portland Harbor bridge would be demolished in phases to accommodate traffic during construction of the new bridges.
Demolition of the existing Interstate Bridge	1.5 to 2 years	• Demolition of the existing Interstate Bridge could begin only after traffic is rerouted to the new Columbia River bridges.
Three interchanges north of SR 14	3 to 4 years for all three	• Construction of these interchanges could be independent from each other and from construction of the Program components to the south. • More aggressive and costly staging could shorten this timeframe.
Total construction timeline	9 to 15 years	• Funding, as well as contractor schedules, regulatory restrictions on in-water work and river navigation considerations, permits and approvals, weather, materials, and equipment, could all influence construction duration.

SR = State Route

Construction of the replacement bridges, associated improvements, and removal of the existing Interstate Bridge would temporarily affect navigation on the Columbia River. Temporary impacts would include temporary closures or changes to the three navigation channels, reduced height and width of the navigation envelope, and temporary restrictions due to construction activities, as described below.

For the estimated 4- to 7-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 the existing piers could be demolished. Construction of the replacement bridge pier sets would occur one by one, resulting in changes to the three navigation channels at different points in time. Construction would be staged so that at least one navigation channel would be open at a given time.

Over the existing navigation channels, the pier locations for the new bridges would be further apart than the existing bridges. Some of the new bridge piers, which would be located outside of the navigation channel, would not line up with the existing bridge piers. While the new crossing is under construction and the existing crossing is still operational, this would result in more obstacles in the river and more difficulty in navigation for vessels that may not utilize the main channel. The length of the navigation channel underneath structures would temporarily increase when the replacement bridges are under construction and the existing Interstate Bridge is still in use. Although vessels would temporarily navigate through a longer clearance envelope that would include the existing bridges and

the replacement bridges under construction, river pilots from the ship simulations did not express concerns regarding temporary navigation with the proposed channel design (Moffat & Nichol, 2023).

Due to an anticipated length of construction (4 to 7 years), it is imperative to accommodate frequent users, such as tugs and tows, during construction. Most vessels that currently use the navigation channels would be able to continue to use at least one of the three channels throughout most of the construction period.

During construction, the height and width of the navigation envelope would be reduced due to construction equipment and pier placement prior to removal of the existing Interstate Bridge. A temporary construction navigation envelope (height and width of unobstructed clearance for navigation) would be maintained during construction with a minimum clearance of 72 to 75 feet (vertical) by 150 to 200 feet (horizontal). This envelope meets the vessel clearance needs of the majority of waterway users, including tugs and tows, passenger cruise vessels, and the majority of other vessels that use the waterway. Accommodations would be implemented to maintain safe passage through the construction area.

During construction, there could be some temporary restrictions due to blockages from barges and cranes used to construct piers and lift bridge segments into place. Anticipated closures for the bridge construction would be much shorter than what already occurs on the river, such as the yearly lock maintenance closures at the Bonneville Dam that typically occur over a two-week period (USACE 2022d).

Navigation Clearances during Construction – Columbia River

Horizontal clearances: As illustrated in the Draft Permanent and Temporary Alterations to Federal Navigation Projects (Appendix I), there will be times when the maximum horizontal clearance in the navigation channels available for passage may be limited to 150 feet. While that is less than the horizontal clearances in the existing channels, and also less than the 300 feet for each of the proposed new channels, it matches the available horizontal clearance at the BNSF Railway Bridge swing span approximately 1 mile downriver of the Interstate Bridge. With appropriate safety measures in place, it is not anticipated that the limited horizontal clearances in place during construction would restrict marine navigation.

Vertical clearances: There are multiple conditions under which construction staging would result in vertical clearances that are less than the proposed final clearance of 116 feet for the fixed-span bridge. Construction phases described in the Conceptual Staging Narrative as Condition 1 will provide a maximum vertical clearance of 72 feet above 0 CRD. There are three instances of Condition 1, ranging in duration from 7 to 9 months. Another construction phase, described as Condition 2, would limit vertical clearance to 100 feet above 0 CRD. There are three instances of Condition 2, ranging in duration from 2 to 20 months.

Navigation Clearances during Construction – Oregon Slough

The new and replacement bridges over the Oregon Slough would match or exceed the vertical clearance of the existing bridge. Short-duration in-water work windows and constructability issues suggest that the new structures over the Oregon Slough would most likely incorporate bridge elements

that use prefabricated superstructure elements such as steel girders or precast segmental girders. These types of construction would eliminate the need for extensive supports in the Oregon Slough. However, some temporary restrictions may be necessary due to barges and cranes used to lift bridge segments into place and during demolition of the existing bridge. Restrictions and temporary closures of the navigation channel and the availability of the alternate route would be communicated to marinas and moorages on the Oregon Slough, as these are the primary users. Since extensive temporary supports are not likely, the navigation clearance would not be significantly reduced from today's clearance envelope. In addition, as noted in section M, residents of floating homes in the vicinity, who use small vessels to travel to and from their homes, as well as vessels traveling to and from facilities near the North Portland Harbor bridges construction areas, may need to use detour navigation routes during construction.

Construction staging schemes will be devised that minimize adverse impacts to navigation in the Oregon Slough. Construction activities could temporarily reduce available clearances due to the need for work bridges and platforms or from floating construction equipment and barges. The main Columbia River channel provides an alternate navigation route that can be used by vessels impacted by the reduced clearances. This would create an inconvenience due to the longer transit but would not restrict travel. The timing of construction in the Oregon Slough in relation to the main channel construction has not been determined, but it is not expected to occur at the same time. Therefore, navigation on the Oregon Slough would not be adversely affected during construction.

It will be essential to communicate restrictions or temporary closures of the navigation channel and the availability of the alternate route to those who use the marinas and moorages on the waterway, as these are the primary users of the slough at this crossing. Standard and regulatory mitigation measures for navigation include developing a construction staging plan to help ensure that construction activities are planned to maintain a minimum channel for navigation. The construction staging plan will be reviewed and approved by the USCG Captain of the Port prior to construction. The IBR Program would coordinate with the USCG Captain of the Port to obtain approval before making any changes to the three navigation channels, for each bridge pier set construction effort. Closures or restrictions on river traffic would be communicated in advance, enabling river users, as needed, to modify their schedules, tug and barge configurations, requirements for assist tugs, shipping marine freight by other modes (e.g., truck, rail), use of different vessels with lower vertical clearance, and other options during construction activities that disrupt navigation and enable the USACE to fulfill its navigation missions.

S. MITIGATION

S.1 Can Vessel and Cargo Arrangements Be Modified?

S.1.1 Mitigation for Unavoidable Short-term Impacts

To protect and minimize temporary effects on navigation during construction, standard and regulatory mitigation measures such as best management practices would be implemented, including the following:

- Develop construction staging plans, described in Section S.1.3.
- Conduct outreach to inform the navigation community, recreational boaters, and other river users throughout construction about the IBR Program, construction statuses, and temporary effects.
- Provide information about the IBR Program, construction statuses, and temporary effects to the maritime community.
- Provide signage and notices at boat ramps, water access points, marinas, and other locations frequented by river users to inform them of construction activities.
- Notify individual vessel owners about the IBR Program, construction statuses, and temporary effects.
- Require all construction barges to have active AIS signals and construction channel lines to be updated on the published navigation charts.
- Modify the USACE dredge *Yaquina* to have a lowerable mast to enable passage under the bridge during construction.
- Provide obstruction marking and lighting to make the river crossing structures visible to river traffic. Design roadway or accent lighting on the bridges and surrounding interchanges to limit light or glare that could affect river navigation.
- Update navigation charts and other navigation publications to reflect changes to VNC and HNC for future river users.

S.1.2 Mitigation for Unavoidable Long-Term Impacts

This section identifies potential mitigation measures for the affected users. Mitigation can include modifications to vessels, modification to cargo or how cargo is handled, providing alternative routes, transiting at lower water levels, and other efforts. A prime consideration is the economic feasibility of the mitigation and whether users can adjust operations without economic loss. The avoidance, minimization, and mitigation measures identified herein summarize agreements that the IBR Program has reached with affected users and would be implemented prior to issuance of the USCG Bridge Permit and/or construction of the project.

The IBR Program provided agreements to and reached agreements with affected vessel owners and river users to avoid, minimize, or mitigate impacts associated with a fixed-span bridge of 116 feet of VNC. For each affected vessel owner or user, mitigation discussions and documentation included the following:

- Identified proposed clearance for mitigation
- Description of the proposed mitigation
- Evaluation of the viability of the mitigation
- Development of statements from both parties to document the status of mitigation discussions at key milestones
- Specific mitigation commitments and mitigation work plans

The mitigation described below is for impacts associated with vessel transit on the Columbia River under the proposed replacement bridges. No mitigation is identified for the proposed Oregon Slough bridges as no impacts were identified or raised as concerns by river users. The vertical and horizontal clearances for the proposed bridges over the Oregon Slough meet or exceed the clearance of the existing I-5 Oregon Slough bridge. In addition, users in the vicinity of the proposed Oregon Slough bridges are primarily recreational, with clearance requirements that would not be impacted, and it is also possible to avoid the I-5 Oregon Slough bridges by utilizing the Columbia River. The Oregon Slough bridges may be required to have navigation aids such as vertical clearance gages, lighting, or other navigation aids, as determined by the USCG through the bridge permit process.

S.1.3 Emergency Operation, National Defense and Channel Maintenance Vessels

The USACE hopper dredge *Yaquina* was the only federal vessel identified as being potentially impacted by the proposed replacement bridges. As discussed in Section D, the USACE has indicated that a bridge height of 116 feet is adequate to allow the *Yaquina* to pass; however, because this temporarily would not meet the assumed condition (minimum air gap of 10 feet), the following mitigation during construction is provided (see Table S.1-1).

- During construction, modify the *Yaquina*'s antenna and mast so that it could be lowered to reduce the air draft. Everything higher than the crow's nest would need to be removed; the mast would then need to be outfitted with a hinge, then reinstalled. Whenever the *Yaquina* transits under the bridge, the mast could be unhinged and lowered either manually or electrically.

S.1.4 Commercial Vessels

No commercial tugs and barges, for which information was available, would be adversely affected by the proposed replacement bridges; thus, no mitigation is necessary for these vessels.

S.1.5 Marine Contractors

The analysis identified two marine contractor vessels owned by Advanced American as not being able to transit year-round under the proposed replacement bridge height of 116 feet (see Table S.1-1 for the two impacted marine contractor vessels and proposed mitigation). Marine contractors transit under the bridge while traveling to and from work sites. Of the vessels identified as being potentially impacted, some may not transit under the bridge in a given year, whereas others may transit multiple times. The IBR Program has an agreement with Advanced American to address impacts to their business operations.

The following options were considered and applied to various contractor vessels:

- Remove the spuds. Some crane barges have height limitations caused by traveling with raised spuds. The spuds need to be raised high enough to prevent grounding during transit, not only in the navigational channel but also along the route to the desired destination. The spud heights are typically 70 to 90 feet. Removing the spuds prior to transit would reduce the vessel height to the next lowest point on the crane barge, typically a gantry or slightly elevated boom. A number of users indicated that it would take one-half to one day to remove the spuds and similar time to replace them. Removing spuds is an activity that is possible, though not always preferred by the operator, especially for users that cannot self-remove them or need to travel only short distances. For instance, if the barge's own crane cannot lift the spuds out and lay them on the deck, another crane would be needed to perform this work. If the barge is not tied to a dock or to shore when the spuds are removed, the barge would have to either anchor or have a tug assist it by holding the barge in place.
- Remove the boom. If the boom tip is the highest point of the vessel, the boom can be removed prior to transit. This requires a considerable amount of work because all of the rigging needs to be removed, and another crane needs to be used to lift off the boom. If the boom is especially long and the barge from which it is removed is too short, the boom may need to be transported on a separate barge.
- Remove the gantry. If the gantry is the highest point of the vessel, it can be removed prior to the transit. It can take up to a week to lower the gantry and another week to raise it. This is a labor- and equipment-intensive activity and cannot be done frequently. It is not feasible for crane barges that need to transit under the bridge several times a month or more.
- Reconfigure the crane. The crane gantry may be modified to reduce its height. The modification would require the services of a naval architect working with the crane barge owner to redesign the crane to ensure it can achieve the same lifting capacity and reach.
- Use mobile cranes mounted on barges upriver of the bridge. If crane barges cannot transit under the bridge, it may be possible to transport a deck barge upriver, then load a land-based mobile crane from shore once the deck barge is upriver of the bridge. This is not a solution to getting an existing floating crane barge under the bridge, but rather an alternate method of getting equipment to work locations. Depending on the size of the mobile crane needed, it may be difficult to transport the mobile crane over the highways and to the loading area.

S.1.6 Mitigation Options by Impacted Vessels

The IBR Program has reached agreement with vessel owners and users that would be impacted by a 116-foot VNC. The various options for adjustment or mitigation to apply to height-constrained vessels are shown in Table S.1-1.

Table S.1-1. Adjustments and Mitigation for Height-Affected Vessels

Vessel	Air Draft (feet)	Air Gap (feet)	Total VNC During OHWM[a] (feet CRD)	Impact from Fixed-Span Replacement Bridges (116 feet CRD)	Available Existing Adjustments
DB 4100	92	10	118	Constrained by spuds and boom height	Lower or remove spuds, lower booms, reduce air gap, or travel when river level is below OHWM
Dredge Yaquina	92	10	118	Temporarily constrained by antenna height	Reduce air gap, or travel when river level is below OHWM
DB Millenium	155	10	181	Constrained by height	Lower crane boom, and lower mast

Note:
[a] OHWM is 16 feet above 0 CRD and occurs on average 1.2% of the year.
Key:
ATB = articulated tug barge
CRD = Columbia River Datum
OHWM = ordinary high water mark
VNC = vertical navigation clearance

The *DB 4100* is constrained by the height of the spuds. It would be possible to lower or remove the spuds for this vessel, assuming that an air draft of less than 10 feet cannot be accommodated or water levels are within 2 feet of the OHWM. No mitigation for this vessel is anticipated because of the limited time in which the vessel is height-constrained, the ability to utilize a lesser air draft, and the ability to remove or lower the spuds a small amount to accommodate a transit.

The *DB Millenium* is constrained by the crane height, which requires a maximum air draft of 65 feet. Lowering the crane to traverse under a bridge requires that the boom and mast must also be lowered completely, requiring additional effort and time. The IBR Program and the owner of the *DB Millenium*, Advanced American, reached an agreement to address impacts to the *DB Millenium* in May 2025. See the following section S.1.7 for additional details regarding the process for valuating impacts and reaching the settlement agreement.

S.1.7 Marine Industries and Fabricators

Occasional historical and anticipated future shipments from the two major upriver fabricators (Thompson Metal Fab and Greenberry) and one marine shipyard services company (JT Marine) would not be able to pass under the fixed bridge height of 116 feet under the assumed conditions year-round.

The JT Marine shipyard services company anticipates future business operations that would be impacted by a bridge with a 116-foot VNC, the specifics of which are confidential to protect proprietary financial information.

Discussions were conducted with all impacted river users (Thompson Metal Fab, Greenberry, and JT Marine as well as Advanced American; Advanced American is discussed in detail in section G.1.1 and S.1.6) to identify and evaluate options to address potential impacts to their operations and to reach formal settlement agreements. The IBR Program worked with the impacted river users to identify appropriate strategies to allow them to continue to pursue current and future anticipated markets following construction of the replacement bridges. In addition, the IBR Program engaged independent experts to assess the potential impacts on these impacted river users based on industry data and information provided directly from them. Specifically, the two states leading the IBR Program, Oregon and Washington, in coordination with both state legal offices, conducted a comprehensive valuation process that engaged experts to evaluate the current and projected business conditions. This evaluation included a thorough review of operations, vessels characteristics, site capabilities, employment data, financial statements, and future revenue forecasts. It also considered potential business losses resulting from lost market opportunities and potential effects from relocating their operations. An additional independent assessment was conducted, which validated that the process supporting negotiations was appropriate and adequate. Negotiations occurred under confidentiality agreements for the purpose of preserving proprietary company financial information. The agreements were reached and would involve payments to the companies that can be used at their businesses' direction and control. The compensation provided through these agreements will allow these impacted river users to operate successfully after construction of the proposed replacement bridge and continue to advance the regional economic vitality.

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