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APPENDIX I: DRAFT PERMANENT AND TEMPORARY ALTERATIONS TO  
FEDERAL NAVIGATION PROJECTS



Considering  
the importance  
of our natural  
environment



**U.S. Army Corps of Engineers  
Section 408 Permission  
2nd Review Package  
Columbia River Bridges and Approaches  
Permanent and Temporary Alterations to  
Federal Navigation Projects**

July 2025

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# **Columbia River Bridges and Approaches Permanent and Temporary Alterations to Federal Navigation Projects**

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## 1 ACRONYMS AND ABBREVIATIONS

2	ADA	Americans with Disabilities Act
3	CRBA	Columbia River Bridges and Approaches
4	CRD	Columbia River Datum
5	I-5	Interstate 5
6	IBR	Interstate Bridge Replacement
7	OECR	Office of Equity and Civil Rights
8	OHW	ordinary high water
9	proposed project	Columbia River Bridges and Approaches construction package
10	RC	river crossing
11	RM	river mile
12	SR	State Route
13	USACE	U.S. Army Corps of Engineers
14	USCG	U.S. Coast Guard

## 1. INTRODUCTION AND PROJECT DESCRIPTION

The Columbia River Bridges and Approaches (CRBA) construction package (proposed project) includes the construction of new Columbia River bridges and approaches; and the demolition of the existing Interstate Bridge crossing the main channel of the Columbia River. The proposed project is part of the Interstate Bridge Replacement (IBR) Program and would be the first of several independent construction packages that would be funded, designed, and constructed over time.

The proposed project would involve construction of a new pair of bridges over the Columbia River west of the existing Interstate Bridge. The new eastern (upstream) bridge would accommodate northbound highway traffic and a bicycle and pedestrian path. The new western (downstream) bridge would carry southbound traffic and space for future installation of two-way light-rail tracks. Whereas the existing bridges each have three lanes with no shoulders, each of the two new bridges would be wide enough to accommodate three through lanes, one auxiliary lane, and shoulders on both sides of the highway. Lanes and shoulders would be built to full design standards.

The existing Interstate Bridge has nine in-water pier sets, whereas the new Columbia River bridges would be built on six in-water pier sets, plus multiple piers on land. Each in-water pier set would be supported by a foundation of drilled shafts; each group of shafts would be tied together with a concrete shaft cap. Columns or pier walls would rise from the shaft caps and connect to the superstructures of the bridges.

As with the existing bridge, the new Columbia River bridges would provide three navigation channels: a primary channel and two barge channels. The current location of the Primary Navigation Channel is near the Vancouver shoreline where the existing lift spans are located. Under the IBR Program's Modified Locally Preferred Alternative, the Primary Navigation Channel would be shifted south approximately 500 feet (measured by channel centerlines), and the existing main (center) Barge Channel would shift north. Each of the three navigation channels would be 400 feet wide (this width includes a 300-foot channel plus a 50-foot channel maintenance buffer on each side of the authorized channel).

Two bridge configurations have been carried forward through the technical analyses; one is the single-level steel girder bridges with movable-span, and the other is the single-level steel girder bridges with fixed-span. The movable-span bridge configuration would have the greatest overall impact, or the largest footprint, and the steel girder fixed-span bridge configuration would have the greatest impact of the fixed-span bridge types that are currently under consideration. Both configurations would have the same in-water pier spacing and realigned navigation channels.

Both configurations would have two side-by-side, single-level steel girder bridges. The movable-span configuration would have movable lift spans between Piers 5 and 6. A lift span needs to be located on a straight and flat bridge section (i.e., without curvature and with minimal slope). To comply with these requirements, and in order for the bridge to maintain the highway, transit, and active transportation connections on Hayden Island and in Vancouver while minimizing property acquisitions and displacements, the lift span would need to be located farther south of the existing lift span, between Piers 5 and 6.

- 1 The single-level movable-span configuration would provide 89 feet of vertical navigation clearance
- 2 over the proposed Primary Navigation Channel when the lift spans are in the closed position. The 89-
- 3 foot vertical clearance is based on the requirement of a minimum of 72 feet of vertical clearance (the
- 4 existing maximum clearance of the Interstate Bridge when the lift span is in the closed position) to
- 5 achieve a straight, flat bridge span and maintain an acceptable grade for transit operations. In the
- 6 open position, the bridges would provide 178 feet of vertical navigation clearance over the proposed
- 7 relocated Primary Navigation Channel. This configuration would provide 400 feet of horizontal
- 8 navigation clearance at the Primary Navigation Channel and two barge channels (see Appendix A).
  
- 9 The single-level fixed-span configuration would provide 116 feet of vertical navigation clearance over
- 10 the proposed relocated Primary Navigation Channel. This configuration would provide 400 feet of
- 11 horizontal navigation clearance at the Primary Navigation Channel and two barge channels.

## 2. PROPOSED PERMANENT CHANGES TO THE NAVIGATION CHANNELS AND TURNING BASIN

The proposed changes to the navigation channels to align through the proposed Columbia River bridges were designed to meet the guidelines outlined in *Layout and Design of Shallow-Draft Waterways* (U.S. Army Corps of Engineers [USACE] Engineering Manual 1110-2-1611) and *Hydraulic Design of Deep-Draft Navigation Projects* (USACE Engineering Manual 1110-2-1613) (USACE 1980, 2006). The channels were designed to be a minimum width of 300 feet parallel to the proposed bridge piers with 50 feet of clearance from the bridge pier to the channel limit, making 400 feet of total horizontal navigation clearance between the bridge piers. Additionally, the proposed channels were designed to meet the criteria of a straight segment at least five times the design ship length (with an overall length of 700 feet) between successive turns.

### 2.1 Primary Navigation Channel

The existing Primary Navigation Channel is located on the north side of the Columbia River adjacent to the Washington shore. The channel has an authorized width of 300 feet but narrows to 263 feet as it passes through the pier walls of the existing Interstate Bridge lift span. At the existing Interstate Bridge, the channel has a vertical clearance of 39 feet with the lift span in place and a vertical clearance of 178 feet with the lift span raised and the river at elevation 0 Columbia River Datum (CRD). The use of bridge lifts for the Primary Navigation Channel is limited between 6:30 a.m. and 9 a.m. and from 2:30 p.m. to 6:00 p.m. on weekdays, per Code of Federal Regulations 33.117.869. The channel has an authorized depth of 27 feet, but is maintained to 17 feet based on need and does not require dredging to maintain an acceptable depth.

Construction of the new river crossing (RC) would require the middle channel to be designated as the primary channel to allow alignment with the lift span of the new bridge or maximum vertical clearance of the fixed-span bridge. The new alignment would allow passage with no reduction in channel width or vertical clearance with the movable-span configuration. The fixed-span configuration would provide a vertical clearance of 116 feet at 0 CRD. The channel depth would be similar to that of the existing Primary Navigation Channel. Deep-draft ship simulation modeling presented in the July 2025 CRBA *Full-Mission Bridge Deep-Draft and Shallow-Draft Simulation Report* did not identify any navigation problems associated with the new channel alignment (see Appendix B). Sedimentation in the channel is not anticipated to change as a result of construction of the new bridges. The July 2025 CRBA *Navigation Channel Dredging and Maintenance Analysis* contains analysis of soundings provided by the USACE. Dredging records used in the analysis support the conclusion that dredging would not be required in support of the proposed channel modifications.

### 2.2 Main Barge Channel

The existing main Barge Channel is located south of the Primary Navigation Channel (see Appendix B), has an authorized width of 300 feet, provides a channel width of 300 feet through the existing Interstate Bridge, and has approximately 58 feet of vertical clearance above CRD as it passes under

1 the existing bridge. The channel has an authorized depth of 15 feet, with a depth of 18 to 38 feet based  
2 on soundings taken in 2012 by the USACE.

3 The construction of the new RC and the conversion of the existing main Barge Channel (middle  
4 channel) to function as the proposed Primary Navigation Channel would require changing the  
5 designation of the northernmost channel to the North Barge Channel. This designation change was  
6 made at the USACE's request. The minor realignment of the channel does not appear to diminish the  
7 safety of the channels, as demonstrated by barge simulation studies. Appendix B shows the proposed  
8 channel configuration. This realignment would maintain the authorized 300-foot channel width  
9 through the new Columbia River bridges. The new bridges would increase vertical clearance to 99 feet  
10 above CRD for the movable-span configuration, and 100 feet above CRD for the fixed-span  
11 configuration. Channel depths would not vary significantly from the original alignment. It is not  
12 anticipated that sedimentation in the channel would change from construction of the new bridge. The  
13 July 2025 CRBA *Navigation Channel Dredging and Maintenance Analysis* contains analysis of soundings  
14 provided by the USACE. Dredging records used in the analysis support the conclusion that dredging  
15 would not be required to support the proposed channel modifications.

## 16 2.3 Vancouver Upper Turning Basin

17 The existing Vancouver Upper Turning Basin provides an 800-foot-wide, 2,000-foot-long turning basin  
18 just below the existing Interstate Bridge (see Appendix B). It has an authorized depth of 35 feet. The  
19 upstream limit of the existing Vancouver Upper Turning Basin is river mile (RM) 106.5, just below the  
20 Interstate Bridge. The 800-foot-wide turning basin continues downstream for 2,000 feet. The width  
21 appears to be based on the ability to turn a T-2 Jumbo Tanker under low to moderate flows in the  
22 Columbia River. The length of the Vancouver Upper Turning Basin appears to be based on the location  
23 of proposed terminals by the Port of Vancouver. Prior to April 8, 1959, the Port of Vancouver provided  
24 the basic plan to the USACE for submittal to Headquarters for approval. Soundings indicate that the  
25 depth of the channel in this reach exceeds 17 feet and averages a range of 26 to 48 feet.

26 The proposed modified Vancouver Upper Turning Basin would generally maintain the current  
27 orientation and shape, with the exception of an approximate 230-foot shift downstream. The  
28 upstream limit of the modified Vancouver Upper Turning Basin would be located at RM 106.4, just  
29 below the proposed new bridges. The turning basin would remain oriented toward northwest, and the  
30 length of the basin would be maintained. Ship simulations were conducted by Waterways Simulation  
31 Technology and the USACE Engineer Research and Development Center to verify the safety of the  
32 proposed turning basin for current vessel usage. The testing showed that the design vessel could be  
33 safely turned.

34 Based on depth soundings provided by the USACE, dredging has not been required in over 25 years in  
35 the proposed modified Vancouver Upper Turning Basin area. Additionally, no information was  
36 available for any past dredging operations showing any volume of material dredged from this area.

## 37 2.4 Alternative Barge Channel

38 The existing Alternative Barge Channel is located south of the existing Primary Navigation Channel  
39 and main Barge Channel (see Appendix B). It has an authorized channel width of 300 feet but reduces

1 to 200 feet in order to pass through the existing Interstate Bridge. As it passes under the existing  
2 bridge, the channel has a vertical clearance of approximately 72 feet above CRD. The channel has an  
3 authorized depth of 15 feet but ranges in depth from 17 to 40 feet. Historically, maintenance has not  
4 been required to preserve this depth.

5 Construction of the new RC would require realignment of the channel to pass through the piers of the  
6 new bridges and renamed the South Barge Channel, as requested by the USACE (see Appendix B). The  
7 alignment of this channel has sufficient width for a full 300 feet of channel width when passing  
8 between the piers of the new bridge, a vertical clearance of 90 feet for the movable-span  
9 configuration, and a vertical clearance of 114 feet for the fixed-span configuration, with the river at  
10 elevation 0 CRD. It is not anticipated that sedimentation of the channel would change due to  
11 construction of the new Columbia River bridges. The July 2025 CRBA *Navigation Channel Dredging and*  
12 *Maintenance Analysis* contains analysis of soundings provided by the USACE. Dredging records used in  
13 the analysis support the conclusion that dredging would not be required due to the proposed channel  
14 modifications.

## 3. CONCEPTUAL STAGING OVERVIEW

The conceptual staging plans for the construction of the IBR Program Columbia River single-level movable-span bridge configuration include 12 stages for bridge construction and five stages for demolition of the existing Interstate Bridge. The conceptual staging plans for the construction of the IBR Program Columbia River single-level fixed-span bridge configuration include 10 stages for bridge construction and five stages for demolition of the existing bridge. The details of each stage are described below.

### 3.1 Stages

The proposed staging concepts demonstrate one way the two proposed bridge configurations could be constructed while maintaining traffic operations on Interstate 5 (I-5) and the connecting interchanges. The proposed staging would progress as outlined in the following simplified description of the construction sequence:

- Start building the RC structures.
- Shift the I-5 traffic and ramps to the east on Hayden Island and at the State Route (SR) 14 interchange. This would include constructing temporary alignments for some of the movements at the SR-14 interchange.
- Start building the southbound approaches.
- When the southbound RC structure is completed, move southbound traffic from the existing structure onto the new southbound RC structure.
- After completing additional construction on the approaches, shift traffic from the existing northbound structure temporarily to the new southbound RC structure.
- Complete the northbound approaches and the northbound structure and shift the northbound traffic from the southbound RC structure onto the new northbound RC structure.
- Make final adjustments and complete the ramps and shoulders of the new I-5 Columbia River bridges and approaches.
- Demolish the existing RC structures.

In addition to vehicle traffic, bicycle and pedestrian traffic would also need to be staged during construction. Bicyclists and pedestrians would continue to use the existing Interstate Bridge to cross the Columbia River until all the northbound traffic is taken off the northbound structure. This is necessary because the Hayden Island to I-5 northbound traffic would continue to use the existing northbound bridge until the new northbound RC and approaches are completed.

Conflicts between the existing bridges and the proposed shared-use path prohibit completion of the shared-use path prior to relocation of the northbound traffic.

Another noteworthy item is the need to establish and maintain toll collection throughout construction. This work would consist of installing and maintaining all the necessary equipment for collecting tolls during construction. This means that temporary toll collection equipment may need to be relocated and re-installed several times as traffic is shifted between construction stages.

## 1 3.2 Columbia River Bridge Construction

2 The proposed construction stages depict one possible scenario for bridge construction and existing  
 3 bridge removal that may occur, and demonstrate how the navigation channels would be maintained  
 4 during those activities. One scenario is presented for the construction of each of the movable-span  
 5 and the fixed-span bridge configurations.

6 Once a construction contract is awarded, the contractor may sequence the construction differently  
 7 than described below to best use the materials, equipment, and personnel available to perform the  
 8 work. While the contractor would be allowed some flexibility, any proposed adjustments would need  
 9 to maintain vehicular, pedestrian, and bicycle traffic flow; minimize impacts to navigation; and be  
 10 approved (and permitted as may be warranted) by the owner and any prevailing jurisdictions or  
 11 agencies.

12 The amount of work that can be conducted at any given time depends on three factors:

- 13 • At least one channel for navigation must be maintained to minimize the impacts to navigation  
 14 during construction.
- 15 • The amount of equipment available to build the project is likely to be limited. Based on  
 16 equipment availability, it is estimated that only two drilled shaft operations would be likely to  
 17 occur at a given time.
- 18 • The physical space the equipment requires at each pier would be substantial. Appendix C and  
 19 Appendix D show the estimated sizes of the work platforms/bridges and associated barges.

20 It is assumed that the Columbia River bridges would be constructed concurrently, starting from the  
 21 south shore on Hayden Island and progressing across the river to the north shore in Vancouver.

22 Generally, there are three elements that would be constructed at a given pier location:

- 23 • Foundation – This element includes installing temporary in-water structures (work bridges/  
 24 platforms), installing large-diameter drilled shafts, and removing the temporary in-water  
 25 structures.
- 26 • Bent – This element includes installing the shaft cap on the previously installed drilled shafts;  
 27 columns and a bent cap would then be installed on the shaft cap.
- 28 • Superstructure – This element includes erecting the structure between piers and placing the  
 29 reinforced concrete deck.

30 Sequencing details within each stage are outlined in the following section.

## 1 4. MOVABLE-SPAN DETAILED STAGING DESCRIPTION

2 Appendix A shows how the navigational clearance would change horizontally and vertically over time  
 3 during construction. Appendix B provides a more detailed view of the relationship of the designated  
 4 channels to the existing and proposed bridge structures. As demonstrated in Appendix A, the existing  
 5 primary channel would be left unchanged until the beginning of 2029, when superstructure  
 6 construction begins for the new Columbia River bridges over the primary channel; after that point, the  
 7 primary channel would be restricted vertically to 100 feet. During this time, the channel would be  
 8 reduced horizontally to a width of 200 feet because of the space requirements for the construction  
 9 equipment around the piers. The vertical restriction would remain at 100 feet until the existing bridge  
 10 is removed in 2033, at which time the final vertical clearance of 178 feet and the new primary channel  
 11 would be established and put into operation.

12 The following sections describe the general progression of the overall construction stages of the  
 13 Columbia River bridges (see Appendix C).

### 14 4.1 Staging Descriptions

#### 15 4.1.1 Construction Stage 1

16 This stage consists of constructing Pier 1 on land and Pier 2 in the river for both northbound and  
 17 southbound spans. The work would be sequenced as follows:

- 18 • Construct drilled shafts and a shaft cap at Pier 1.
- 19 • Construct a temporary work bridge from the south shore to Pier 2.
- 20 • Construct a temporary work platform on the south side of Pier 2.
- 21 • Install a cofferdam around the perimeter of Pier 2.
- 22 • Construct drilled shafts for Pier 2.

23 Navigation channel availability during Stage 1 would include the following:

- 24 • The Alternative Barge Channel would be open without any height or width restrictions.
- 25 • The Barge Channel would be open without any height or width restrictions.
- 26 • The Primary Navigation Channel would be open without any height or width restrictions.

#### 27 4.1.2 Construction Stage 2

28 Stage 2 consists of completing Pier 2 and beginning Pier 3 construction for both northbound and  
 29 southbound spans. The work would be sequenced as follows:

- 30 • Construct a shaft cap at Pier 2.
- 31 • Remove the cofferdam and construct columns and a pier cap at Pier 2.
- 32 • Remove the work platform and work bridge from Pier 2.

- 1 • Install temporary works at Pier 3.
- 2 • Construct drilled shafts for Pier 3.

3 Navigation channel availability during Stage 2 would include the following:

- 4 • The Alternative Barge Channel would be open without any height or width restrictions.
- 5 • The Barge Channel would be open without any height or width restrictions.
- 6 • The Primary Navigation Channel would be open without any height or width restrictions.

### 7 4.1.3 Construction Stage 3

8 Stage 3 consists of completing Pier 3, beginning Pier 4, and placing the span 1 girders for both  
9 northbound and southbound spans. The work would be sequenced as follows:

- 10 • Install the suspended isolation system and construct a shaft cap at Pier 3.
- 11 • Construct columns and a pier cap and remove temporary works at Pier 3.
- 12 • Install temporary works and construct drilled shafts at Pier 4.
- 13 • Install a temporary bent on the north side of Pier 1 northbound and erect the south end of  
14 span 1 girders.
- 15 • Install temporary bents on each side of the Pier 2 northbound shaft cap and erect the pier  
16 table girders.
- 17 • Jack the span 1 northbound girders into place to close span 1.
- 18 • Remove the temporary bents and repeat to complete span 1 southbound.

19 Navigation channel availability during Stage 3 would include the following:

- 20 • The Alternative Barge Channel would be closed.
- 21 • The Barge Channel would be open without any height or width restrictions.
- 22 • The Primary Navigation Channel would be open without any height or width restrictions.

### 23 4.1.4 Construction Stage 4

24 Stage 4 consists of completing Pier 4, beginning Pier 5, and placing the span 2 girders for both  
25 northbound and southbound spans. The work would be sequenced as follows:

- 26 • Install the suspended isolation system and construct a shaft cap at Pier 4.
- 27 • Construct columns and a pier cap and remove temporary works at Pier 4.
- 28 • Install temporary works and construct drilled shafts at Pier 5.
- 29 • Install temporary bents on each side of the Pier 3 northbound shaft cap and erect the pier  
30 table girders.
- 31 • Jack the span 2 northbound girders into place to close span 2.
- 32 • Remove the temporary bents and repeat to complete span 2 southbound.

1 Navigation channel availability during Stage 4 would include the following:

- 2 • The Alternative Barge Channel would be closed.
- 3 • The Barge Channel would be closed.
- 4 • The Primary Navigation Channel would be open without any height or width restrictions.

#### 5 4.1.5 Construction Stage 5

6 Stage 5 consists of completing Pier 5, beginning Pier 6, and placing the span 3 girders for both  
7 northbound and southbound spans. Sequenced work includes the following:

- 8 • Install the suspended isolation system and construct a shaft cap at Pier 5.
- 9 • Construct the columns, pier cap, and vertical lift towers and remove the temporary works at  
10 Pier 5.
- 11 • Install the temporary works and construct drilled shafts at Pier 6.
- 12 • Install temporary bents on each side of the Pier 4 northbound shaft cap and erect the pier  
13 table girders.
- 14 • Jack the span 3 northbound girders into place to close span 3.
- 15 • Remove the temporary bents and repeat to complete span 3 southbound.

16 Navigation channel availability during Stage 5 would include the following:

- 17 • The Alternative Barge Channel would be closed.
- 18 • The Barge Channel would be closed.
- 19 • The Primary Navigation Channel would be open without any height or width restrictions.

#### 20 4.1.6 Construction Stage 6

21 Stage 6 consists of completing Pier 6 and placing the span 4 girders for both northbound and  
22 southbound spans. The work would be sequenced as follows:

- 23 • Install the suspended isolation system and construct a shaft cap at Pier 6.
- 24 • Construct the columns, pier cap, and vertical lift towers and remove the temporary works at  
25 Pier 6.
- 26 • Install the temporary bent on the south side of the Pier 5 northbound shaft cap and erect the  
27 north end of the span 4 girders.
- 28 • Jack the span 4 northbound girders into place to close span 4.
- 29 • Remove temporary bent and repeat to complete span 4 southbound.

30 Navigation channel availability during Stage 6 would include the following:

- 31 • The Alternative Barge Channel would be closed.
- 32 • The Barge Channel would be closed.

- 1       • The Primary Navigation Channel would be open without any height or width restrictions.

#### 2    4.1.7    Construction Stage 7

3    Stage 7 consists of constructing southbound Pier 8 on land and Pier 7 in the river for both northbound  
4    and southbound spans. The work would be sequenced as follows:

- 5       • Construct the drilled shafts and shaft cap at Pier 8 southbound.  
6       • Construct a temporary work bridge from the north shore to Pier 7.  
7       • Construct temporary work platform on the north side of Pier 7.  
8       • Install a cofferdam around the perimeter of Pier 7.  
9       • Construct the drilled shafts, shaft cap, columns, and pier cap for Pier 7.  
10      • Remove the cofferdam, work platform, and work bridge at Pier 7.  
11      • Install a temporary bent on the north side of the Pier 6 southbound shaft cap and erect the  
12      south end of the span 6 girders.

13    Navigation channel availability during Stage 7 would include the following:

- 14      • The Alternative Barge Channel would be open with 150 feet of horizontal clearance and 72 feet  
15      of vertical clearance.  
16      • The Barge Channel would be open with 200 feet of horizontal clearance and 43 feet of vertical  
17      clearance.  
18      • The Primary Navigation Channel would be closed.

#### 19   4.1.8    Construction Stage 8

20    Stage 8 consists of constructing southbound spans 6 and 7 and erecting girders. The work would be  
21    sequenced as follows:

- 22      • Install a temporary bent on the south side of Pier 8 southbound and erect the north end of the  
23      span 7 girders.  
24      • Install temporary bents on each side of the Pier 7 southbound shaft cap and erect the pier  
25      table girders.  
26      • Place the span 7 southbound girders from land to close span 7.  
27      • Jack the span 6 southbound girders into place to close span 6.

28    Navigation channel availability during Stage 8 would include the following:

- 29      • The Alternative Barge Channel would be open with 150 feet of horizontal clearance and 72 feet  
30      of vertical clearance.  
31      • The Barge Channel would be open with 200 feet of horizontal clearance and 43 feet of vertical  
32      clearance.  
33      • The Primary Navigation Channel would be closed.

1 **4.1.9 Construction Stage 9**

2 Stage 9 consists of installing the southbound lift span at span 5 and preparing the new southbound  
 3 bridge for temporary placement of all northbound and southbound travel lanes. The work would be  
 4 sequenced as follows:

- 5 • Preassemble the southbound lift span (on barges adjacent to bridge or offsite).
- 6 • Install the vertical lift span at span 5.
- 7 • Complete the installation of mechanical lift span equipment and test the span for lift  
 8 operations.
- 9 • Complete the southbound bridge deck and configure it for the temporary placement of all  
 10 northbound and southbound travel lanes.
- 11 • Complete the north and south approach structures for the new southbound bridge.
- 12 • Switch all traffic over to the new southbound bridge.
- 13 • Close the existing southbound bridge.
- 14 • Keep the existing northbound bridge in service for access to SR-14 eastbound. The sidewalk  
 15 would remain in service for bicycles and pedestrians.

16 Navigation channel availability during Stage 9 would include the following:

- 17 • The Alternative Barge Channel would be open with 150 feet of horizontal clearance and 72 feet  
 18 of vertical clearance.
- 19 • The Barge Channel would be closed.
- 20 • The Primary Navigation Channel would be open with 200 feet of horizontal clearance and 100  
 21 feet of vertical clearance.

22 **4.1.10 Construction Stage 10**

23 Stage 10 consists of the partial demolition of the existing southbound bridge to accommodate the  
 24 completion of the new northbound bridge. The work would be sequenced as follows:

- 25 • Remove span 1 from the existing southbound bridge.
- 26 • Construct the drilled shafts and shaft cap at Pier 8 northbound.
- 27 • Lower the existing southbound lift span, and lower and remove the counterweights.
- 28 • Remove the existing southbound lift span.
- 29 • Remove the lift tower and existing southbound span 2.

30 Navigation channel availability during Stage 10 would include the following:

- 31 • The Alternative Barge Channel would be open with 150 feet of horizontal clearance and 72 feet  
 32 of vertical clearance.
- 33 • The Barge Channel would be open with 200 feet of horizontal clearance and 43 feet of vertical  
 34 clearance.

- 1 • The Primary Navigation Channel would be closed.

#### 2 4.1.11 Construction Stage 11

3 Stage 11 consists of constructing northbound spans 6 and 7 and erecting girders. Sequenced work  
4 includes the following:

- 5 • Install a temporary bent on the south side of Pier 8 northbound, and erect the north end of the  
6 span 7 girders.
- 7 • Install temporary bents on each side of the Pier 7 northbound shaft cap, and erect the pier  
8 table girders.
- 9 • Install a temporary bent on the north side of the Pier 6 northbound shaft cap, and erect the  
10 south end of the span 6 girders.
- 11 • Place the span 7 northbound girders from land to close span 7.
- 12 • Jack the span 6 northbound girders into place to close span 6.

13 Navigation channel availability during Stage 11 would include the following:

- 14 • The Alternative Barge Channel would be open with 150 feet of horizontal clearance and 72 feet  
15 of vertical clearance.
- 16 • The Barge Channel would be open with 200 feet of horizontal clearance and 43 feet of vertical  
17 clearance.
- 18 • The Primary Navigation Channel would be closed.

#### 19 4.1.12 Construction Stage 12

20 Stage 12 consists of installing the northbound lift span at span 5 and preparing the new northbound  
21 bridge for northbound traffic. Sequenced work includes the following:

- 22 • Preassemble the northbound lift span (on barges adjacent to bridge or off site).
- 23 • Install the vertical lift span at span 5.
- 24 • Complete the installation of the mechanical lift span equipment and test the span for lift  
25 operations.
- 26 • Complete the northbound bridge deck and configure it for the permanent placement of all  
27 northbound traffic.
- 28 • Complete the north and south approach structures for the new northbound bridge.
- 29 • Switch northbound traffic from the new southbound bridge to the new northbound bridge.
- 30 • Close the existing northbound bridge.

31 Navigation channel availability during Stage 12 would include the following:

- 32 • The Alternative Barge Channel would be open with 150 feet of horizontal clearance and 72 feet  
33 of vertical clearance.
- 34 • The Barge Channel would be closed.

- 1
  - 2
- The Primary Navigation Channel would be open with 200 feet of horizontal clearance and 100 feet of vertical clearance.

## 5. FIXED-SPAN DETAILED STAGING DESCRIPTION

Appendix A shows how the navigational clearance would change horizontally and vertically over time during construction. Appendix B provides a more detailed view of the relationship of the designated channels to the existing and proposed bridge structures. As demonstrated in Appendix A, the existing primary channel would be left unchanged until the superstructure for the new Columbia River bridges is constructed over the channel at the end of 2029; after that point, the existing primary channel would be restricted vertically to 100 feet. During this time, the channel would be reduced horizontally to a width of 200 feet because of the space requirements for the construction equipment around the piers. The vertical restriction would remain at 100 feet until the existing Interstate Bridge is removed in 2033, at which time the final vertical clearance of 116 feet and the new primary channel would be established and put into operation.

The following sections describe the general progression of the overall construction stages of the Columbia River bridges (see Appendix D).

### 5.1 Staging Descriptions

#### 5.1.1 Construction Stage 1

This stage consists of constructing Pier 1 on land and Pier 2 in the river for both northbound and southbound spans. The work would be sequenced as follows:

- Construct drilled shafts and a shaft cap at Pier 1.
- Construct a temporary work bridge from the south shore to Pier 2.
- Construct a temporary work platform on the south side of Pier 2.
- Install a cofferdam around the perimeter of Pier 2.
- Construct drilled shafts for Pier 2.

Navigation channel availability during Stage 1 would include the following:

- The Alternative Barge Channel would be open without any height or width restrictions.
- The Barge Channel would be open without any height or width restrictions.
- The Primary Navigation Channel would be open without any height or width restrictions.

#### 5.1.2 Construction Stage 2

Stage 2 consists of completing Pier 2 and beginning Pier 3 construction for both northbound and southbound spans. The work would be sequenced as follows:

- Construct a shaft cap at Pier 2.
- Remove the cofferdam and construct columns and a pier cap at Pier 2.
- Extend the temporary work bridge from Pier 2 to Pier 3.

- 1 • Install temporary works at Pier 3.
- 2 • Construct drilled shafts for Pier 3.

3 Navigation channel availability during Stage 2 would include the following:

- 4 • The Alternative Barge Channel would be open without any height or width restrictions.
- 5 • The Barge Channel would be open without any height or width restrictions.
- 6 • The Primary Navigation Channel would be open without any height or width restrictions.

### 7 5.1.3 Construction Stage 3

8 Stage 3 consists of completing Pier 3, beginning Pier 4, and placing the span 1 girders for both  
9 northbound and southbound spans. The work would be sequenced as follows:

- 10 • Install the suspended isolation system and construct a shaft cap at Pier 3.
- 11 • Construct the columns and a pier cap and remove the temporary works at Pier 3.
- 12 • Extend the temporary work bridge from Pier 3 to Pier 4.
- 13 • Install temporary works and construct drilled shafts at Pier 4.
- 14 • Install a temporary bent on the northside of Pier 1 southbound and erect the south end of the  
15 span 1 girders.
- 16 • Install temporary bents on each side of the Pier 2 southbound shaft cap and erect the pier  
17 table girders.
- 18 • Jack the span 1 southbound girders into place to close span 1.
- 19 • Remove the temporary bents and repeat to complete span 1 northbound.

20 Navigation channel availability Stage 3 would include the following:

- 21 • The Alternative Barge Channel would be closed.
- 22 • The Barge Channel would be open without any height or width restrictions.
- 23 • The Primary Navigation Channel would be open without any height or width restrictions.

### 24 5.1.4 Construction Stage 4

25 Stage 4 consists of completing Pier 4, beginning Pier 5, and placing span 2 girders for both  
26 northbound and southbound spans. The work would be sequenced as follows:

- 27 • Install the suspended isolation system and construct a shaft cap at Pier 4.
- 28 • Construct the columns and a pier cap and remove the temporary works at Pier 4.
- 29 • Extend the temporary work bridge from Pier 4 to Pier 5.
- 30 • Install temporary works and construct drilled shafts at Pier 5.
- 31 • Install temporary bents on each side of the Pier 3 southbound shaft cap and erect the pier  
32 table girders.

- 1 • Jack the span 2 southbound girders into place to close span 2.
- 2 • Remove the temporary bents and repeat to complete span 2 northbound.

3 Navigation channel availability during Stage 4 would include the following:

- 4 • The Alternative Barge Channel would be closed.
- 5 • The Barge Channel would be closed.
- 6 • The Primary Navigation Channel would be open without any height or width restrictions.

### 7 5.1.5 Construction Stage 5

8 Stage 5 consists of completing Pier 5, beginning Pier 6, and placing span 3 girders for both  
9 northbound and southbound spans. Sequenced work includes the following:

- 10 • Install the suspended isolation system and construct a shaft cap at Pier 5.
- 11 • Construct the columns and a pier cap and remove the temporary works at Pier 5.
- 12 • Install temporary works and construct drilled shafts at Pier 6.
- 13 • Install temporary bents on each side of the Pier 4 southbound shaft cap and erect the pier  
14 table girders.
- 15 • Jack the span 3 southbound girders into place to close span 3.
- 16 • Remove the temporary bents and repeat to complete span 3 northbound.

17 Navigation channel availability during Stage 5 would include the following:

- 18 • The Alternative Barge Channel would be closed.
- 19 • The Barge Channel would be closed.
- 20 • The Primary Navigation Channel would be open without any height or width restrictions.

### 21 5.1.6 Construction Stage 6

22 Stage 6 consists of completing Pier 6 and placing span 4 girders for both northbound and southbound  
23 spans. The work would be sequenced as follows:

- 24 • Install the suspended isolation system and construct a shaft cap at Pier 6.
- 25 • Construct the columns and a pier cap and remove the temporary works at Pier 6.
- 26 • Install temporary bents on both sides side of the Pier 5 southbound shaft cap and erect the  
27 north end of the span 4 girders.
- 28 • Jack the span 4 southbound girders into place to close span 4.
- 29 • Remove the temporary bent and repeat to complete span 4 northbound.

30 Navigation channel availability during Stage 6 would include the following:

- 31 • The Alternative Barge Channel would be closed.
- 32 • The Barge Channel would be closed.

- The Primary Navigation Channel would be open without any height or width restrictions.

### 5.1.7 Construction Stage 7

Stage 7 consists of completing Pier 7 and placing span 5 girders for both northbound and southbound spans. The work would be sequenced as follows:

- Construct the columns and a pier cap at Pier 7.
- Install a temporary bent on the south side of the Pier 6 northbound shaft cap and erect the south end of the span 5 girders.
- Jack the span 5 northbound girders into place to close span 5.
- Remove the temporary bent and repeat to complete span 5 southbound.

Navigation channel availability during Stage 7 would include the following:

- The Alternative Barge Channel would be open with 150 feet of horizontal clearance and 72 feet of vertical clearance.
- The Barge Channel would be closed.
- The Primary Navigation Channel would be closed.

### 5.1.8 Construction Stage 8

Stage 8 consists of girder erection and construction of southbound spans 6 and 7. Following completion of stage 8, northbound and southbound traffic on the existing river bridge would temporarily be routed on the new southbound bridge. The work would be sequenced as follows:

- Install a temporary bent on the south side of Pier 8 southbound and erect the north end of span 7 girders.
- Install temporary bents on each side of the Pier 7 southbound shaft cap and erect the pier table girders.
- Install a temporary bent on the north side of the Pier 6 southbound shaft cap and erect the pier table girders.
- Jack the span 6 southbound girders into place to close span 6.
- Place the span 7 southbound girders from land to close span 7.

Navigation channel availability during Stage 8 would include the following:

- The Alternative Barge Channel would be open with 150 feet of horizontal clearance and 72 feet of vertical clearance.
- The Barge Channel would be open with 200 feet of horizontal clearance and 43 feet of vertical clearance.
- The Primary Navigation Channel would be closed.

### 1 5.1.9 Construction Stage 9

2 Stage 9 consists of the partial demolition of the existing southbound bridge to accommodate the  
3 completion of the new northbound bridge. The work would be sequenced as follows:

- 4 • Remove span 1 of the existing southbound bridge.
- 5 • Construct drilled shafts and a shaft cap at Pier 8 northbound.
- 6 • Lower the existing southbound lift span, and lower and remove the counterweights.
- 7 • Remove the existing southbound lift span.
- 8 • Remove the lift tower and existing southbound span 2.

9 Navigation channel availability during Stage 10 would include the following:

- 10 • The Alternative Barge Channel would be open with 150 feet of horizontal clearance and 72 feet  
11 of vertical clearance.
- 12 • The Barge Channel would be open with 200 feet of horizontal clearance and 43 feet of vertical  
13 clearance.
- 14 • The Primary Navigation Channel would be closed.

### 15 5.1.10 Construction Stage 10

16 Stage 10 consists of constructing northbound spans 6 and 7 and erecting girders. Sequenced work  
17 includes the following:

- 18 • Install a temporary bent on the south side of Pier 8 northbound and erect the north end of the  
19 span 7 girders.
- 20 • Install temporary bents on each side of the Pier 7 northbound shaft cap and erect the pier  
21 table girders.
- 22 • Install a temporary bent on the north side of the Pier 6 northbound shaft cap and erect the  
23 south end of the span 6 girders.
- 24 • Jack the span 6 northbound girders into place to close span 6.
- 25 • Place the span 7 northbound girders from land to close span 7.

26 Navigation channel availability during Stage 11 would include the following:

- 27 • The Alternative Barge Channel would be open with 150 feet of horizontal clearance and 72 feet  
28 of vertical clearance.
- 29 • The Barge Channel would be open with 200 feet of horizontal clearance and 43 feet of vertical  
30 clearance.
- 31 • The Primary Navigation Channel would be closed.

## 1 6. DEMOLITION DESCRIPTIONS

2 Demolition of the existing Interstate Bridge would be the same for both the movable-span and fixed-  
 3 span configurations. The following sections describe the general progression of the overall stages of  
 4 the Columbia River bridges demolition (see Appendix E).

### 5 6.1.1 Demolition Stage 1

6 Stage 1 consists of removing span 5 to open the new Primary Navigation Channel and prepare span 4  
 7 for removal. Sequenced work includes the following:

- 8 • Demolish the decks at northbound and southbound spans 4 and 5
- 9 • Remove the existing northbound and southbound span 5 via barge.

10 Navigation channel availability during Stage 1 would include the following:

- 11 • The Alternative Barge Channel would be open with 150 feet of horizontal clearance and 72 feet  
 12 of vertical clearance.
- 13 • The Barge Channel would be closed.
- 14 • The Primary Navigation Channel would be open with 200 feet of horizontal clearance and 100  
 15 feet of vertical clearance.

### 16 6.1.2 Demolition Stage 2

17 Stage 2 consists of removing span 4 and preparation to remove the existing northbound lift span and  
 18 span 2. The work would be sequenced as follows:

- 19 • Lower the existing northbound lift span.
- 20 • Lower and remove the northbound counterweights.
- 21 • Remove both lift towers for the northbound lift span.
- 22 • Remove the existing northbound and southbound span 4 via barge.
- 23 • Demolish the decks at northbound lift span and span 2.

24 Navigation channel availability during Stage 2 would include the following:

- 25 • The Alternative Barge Channel would be open with 150 feet of horizontal clearance and 72 feet  
 26 of vertical clearance.
- 27 • The Barge Channel (new Primary Navigation Channel) would be open with 200 feet of  
 28 horizontal clearance and 116 feet of vertical clearance for fixed-span configuration and 178  
 29 feet of vertical clearance for movable-span configuration when open and 89 feet when closed.
- 30 • The Primary Navigation Channel would be closed.

### 1 6.1.3 Demolition Stage 3

2 Stage 3 consists of removing the spans north of Pier 3, removing pier 4, and preparing the existing  
3 spans south of Pier 5 for removal. The work would be sequenced as follows:

- 4 • Remove the existing northbound lift span via barge.
- 5 • Remove the existing northbound span 2 via barge.
- 6 • Install a cofferdam at Pier 4 and demolish the concrete pier.
- 7 • Remove piles or cut them off to 4 feet below the -27 foot CRD authorized channel dredge  
8 depth.
- 9 • Remove the cofferdam at Pier 4.
- 10 • Remove the decks at northbound and southbound spans 6, 7, 8, 9, 10, and 11.

11 Navigation channel availability during Stage 3 would include the following:

- 12 • The Alternative Barge Channel would be closed.
- 13 • The Barge Channel (new Primary Navigation Channel) would be open with 200 feet of  
14 horizontal clearance and 116 feet of vertical clearance for fixed-span configuration and 178  
15 feet of vertical clearance for movable-span configuration when open and 89 feet when closed.
- 16 • The Primary Navigation Channel would be closed.

### 17 6.1.4 Demolition Stage 4

18 Stage 4 consists of removing spans south of Pier 5. The work would be sequenced as follows:

- 19 • Remove the existing northbound and southbound spans 6, 7, 8, 9, and 10 via barge.
- 20 • Remove the existing northbound and southbound span 11 with a land-based crane.

21 Navigation channel availability during Stage 4 would include the following:

- 22 • The Alternative barge would be closed.
- 23 • The Barge Channel (new Primary Navigation Channel) would be open without any restrictions.  
24 Horizontal clearance for both configurations would be 300 feet. Vertical clearance for the  
25 fixed-span configuration would be 116 feet. Vertical clearance for the movable-span  
26 configuration would be 178 feet when open and 89 feet when closed.
- 27 • The Primary Navigation Channel would be open with 200 feet of horizontal clearance and 100  
28 feet of vertical clearance.

### 29 6.1.5 Demolition Stage 5

30 Stage 5 consists of demolishing all remaining piers. The work would be sequenced as follows:

- 31 • Install coffer dams at Piers 2, 3, 5, 7, 8, 9, 10, and 11.
- 32 • Remove concrete Piers 2, 3, and 5.

- 1           ○ Remove piles or cut them off to a depth of 4 feet below the -27 foot CRD authorized
- 2           channel dredge depth.
- 3           ● Remove concrete Piers 6, 7, 8, 9, 10, and 11.
- 4           ○ Remove piles or cut them off to a depth of 4 feet below the existing river bottom or
- 5           authorized channel depth, whichever is greater.

6   Navigation channel availability during Stage 5 would include the following:

- 7           ● The Alternative Barge Channel would be open with 150 feet of horizontal clearance and 90 feet
- 8           of vertical clearance for the movable-span configuration and 114 feet of vertical clearance for
- 9           the fixed-span configuration.
- 10          ● The Barge Channel (new Primary Navigation Channel) would be open without any restrictions.
- 11          Horizontal clearance for both configurations would be 300 feet. Vertical clearance for the
- 12          fixed-span configuration would be 116 feet. Vertical clearance for the movable-span
- 13          configuration would be 178 feet when open and 89 feet when closed.
- 14          ● The Primary Navigation Channel would be open with 200 feet of horizontal clearance and 99
- 15          feet of vertical clearance for the movable-span configuration and 100 feet of vertical clearance
- 16          for the fixed-span configuration.

## 7. POTENTIAL VESSEL IMPACTS DURING CONSTRUCTION

Vessel impacts during construction were evaluated against both the movable-span and fixed-span bridge configurations. Since the vertical navigation clearance during construction is equivalent for each option, the results of the analysis were equivalent for both design options.

**Horizontal clearances.** As illustrated in Appendix A, there would be times when the maximum horizontal clearance in the proposed/modified navigation channels available for passage may be limited to 150 feet. While that is less than the horizontal clearances in the existing channels, and 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 during construction would restrict marine navigation.

**Vertical clearances.** Appendix A shows multiple conditions under which construction staging would result in vertical clearances that are less than the proposed final clearance of 178 feet for the movable-span configuration and 116 feet for the fixed-span configuration.

Condition 1 would provide a maximum vertical clearance of 72 feet above 0 CRD. During construction of the movable-span configuration, there would be two instances of Condition 1, ranging in duration from 7 to 9 months. During the construction of the fixed-span configuration, there would be one instance of Condition 1, ranging in duration from 9 to 10 months.

Condition 2 would limit vertical clearance to 100 feet above 0 CRD. During the construction of the movable-span configuration, there would be two instances of Condition 2, ranging in duration from 2 to 20 months. During construction of the fixed-span configuration, there would be one instance of Condition 2, ranging in duration from 24 to 32 months.

Vessels/river users inventoried in the IBR Program *Navigation Impact Report* were reviewed to determine potential impacts due to limited vertical clearances during bridge construction (IBR 2025). The review considered four distinct operating scenarios for each condition:

- Ordinary high water (OHW) (16 feet above 0 CRD) with a 10-foot air gap.
- OHW with a 5-foot air gap.
- A river level of 8.65 feet (exceeded less than 20% of the year on average) with a 10-foot air gap.
- A river level of 8.65 feet with a 5-foot air gap.

OHW is exceeded only 1.2% of the time within the time frame assessed, and it is not a typical water level for the river but its use here is consistent with the methodology used in the IBR Program *Navigation Impact Report* (IBR 2025).

Potential impacts during the two construction conditions were evaluated by vessel class, as described in Section 8.

## 1 7.1 Commercial Tugs and Tow Vessels

2 **Condition 1.** As illustrated in Table 7-1, a 72-foot vertical clearance would constrain typical tugs  
3 within this class at OHW with an assumed air gap of 10 feet. However, the number of constrained  
4 vessels drops with a 5-foot air gap and is further reduced to two or less if a river stage of 8.65 feet is  
5 assumed. It should be noted that many of the vessels that are indicated as impacted successfully  
6 navigate the existing Interstate Bridge without a bridge lift using the existing barges channels that  
7 provide for 72 feet or less vertical clearance.

8 **Condition 2.** No tugs would be affected by the 100 feet of vertical clearance during Condition 2.

1 **Table 7-1. Tug and Barge Vessels Potentially Height-Constrained during Construction**

2 **Two Conditions Considered:** 1) Single-level movable-span: two closures of the primary channel ranging from 7 to 9 months, 72-foot clearance provided by the Alternative Barge Channel. Single-level fixed-span: potentially one closure of the primary channel ranging from 9 to 10 months, 72-foot clearance provided by the Alternative Barge Channel.  
 3  
 4 2) Limited vertical clearance (100 feet) during construction over the primary shipping channel. Single-level movable-span: two instances ranging from 2 to 20 months. Single-level fixed-span: potentially one instance ranging from 24 to 32 months.

5  = Potential impact during Condition 1  = Potential Impact during Condition 2

Owner	Vessel Name	Air Draft (Feet)	Condition 1 = 72-Foot Vertical Clearance				Condition 2 = 100-Foot Vertical Clearance				
			@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		
			Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	
1	Bernert Barge Lines	Kathryn B	54								
2	Bernert Barge Lines	Lori B	52								
3	Cadman	Aggregate Barge	49								
4	Foss	Pacific Explorer	61								
5	Foss	PJ Brix	58.3								
6	SDS Lumber Company	Dauby	56								
7	Shaver	Cascades	56								
8	Shaver	Clearwater	56								
9	Shaver	Deschutes	58								
10	Shaver	Lassen	44								
11	Shaver	Umatilla	55								
12	Shaver	Willamette	58								
13	Tidewater	Betty Lou	58								
14	Tidewater	Captain Bob	56								
15	Tidewater	Challenger	49								

Permanent and Temporary Alterations to Federal Navigation Projects

Owner	Vessel Name	Air Draft (Feet)	Condition 1 = 72-Foot Vertical Clearance				Condition 2 = 100-Foot Vertical Clearance				
			@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		
			Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	
16	Tidewater	Clarkston	48								
17	Tidewater	Crown Pt	51								
18	Tidewater	Defiance	49								
19	Tidewater	Granite Pt	48								
20	Tidewater	Hurricane	49								
21	Tidewater	Invader	48								
22	Tidewater	Legend	51								
23	Tidewater	Maverick	47								
24	Tidewater	Outlaw	48								
25	Tidewater	Rebel	51								
26	Tidewater	Ryan Pt	51								
27	Tidewater	Sundial	48								
28	Tidewater	The Chief	50								
29	Tidewater	Tidewater	50								

- 1 a OHW = 16 feet above 0 CRD
- 2 b River levels at the Interstate Bridge were below 8.65 feet for 80% of the days over the past 40 years.
- 3 CRD = Columbia River Datum; OHW = ordinary high water

## 1 7.2 Marine Contractor Vessels

2 **Condition 1.** Most contractor derrick barges would be constrained under many of the scenarios  
3 evaluated, as shown in Table 7-2. One mitigating factor to consider is that the construction barges do  
4 not routinely transit through the project area but are deployed as needed for projects. As a result, a  
5 limited-duration restriction may have little practical impact. In addition, it is likely that some of the  
6 listed barges would be associated with the bridge construction contract and some vessels may be  
7 able to be dismantled or undertake other actions if necessary.

8 **Condition 2.** Lesser numbers of construction barges would be limited by a 100-foot clearance at OHW  
9 and a 10-foot air gap. The river stage and air gap have a major influence on the number of impacted  
10 vessels: at an 8.65-foot river stage with a 5-foot air gap, the number of impacted vessels drops  
11 considerably.

## 12 7.3 Marine Industry and Fabricator Vessels

13 **Condition 1.** The vessel/user class impacted under this condition includes the three fabricators  
14 located upstream of the bridge, mostly at the Columbia Business Center, as shown in Table 7-3. With a  
15 72-foot vertical bridge clearance, none would be able to pass under any of the river stage/air gap  
16 scenarios tested. Transits are typically infrequent and may be scheduled around the limitation.

17 **Condition 2.** With a 100-foot vertical clearance, the three fabricators would be limited to products  
18 that would pass within the available clearance.

## 19 7.4 Federal Government Vessels

20 **Condition 1.** The vessel/user class impacted under this condition includes the Navy barges used for  
21 transporting nuclear materials to Hanford, the *M/V Ironwood* (a Job Corps training vessel), the Port of  
22 Portland dredge *Oregon*, and the USACE dredge *Yaquina*, as shown in Table 7-4. The Condition 1  
23 vertical clearance limitation of 72 feet would restrict nearly all federal vessels at OHW. The *M/V*  
24 *Ironwood* and the dredge *Yaquina* would not be able to pass under any conditions during this  
25 condition. The Navy barges are used to transport items to Hanford, requiring transit of bridges that  
26 provide less than 72 feet of vertical clearance, and impacts would not be anticipated.

27 **Condition 2.** With a vertical clearance of 100 feet, the *M/V Ironwood* would be able to pass at OHW  
28 with a 5-foot air gap. The USACE dredge *Yaquina* would not be able to pass with a 5-foot air gap for the  
29 river stages considered. However, since the routine dredging upriver of the bridge occurs in August–  
30 September each year, the river levels that typically occur during that condition can be more closely  
31 considered. For the period of 1973–2011, the average daily low-water levels ranged from 1.2 to 2.7 feet  
32 above 0 CRD, and average daily high-water levels ranged from 4.3 to 5.6 feet above 0 CRD. With an air  
33 draft of 92 feet, the *Yaquina* could pass at daily low-water periods with an air gap of 5 feet or greater.

34 A separate analysis has been completed for the *Yaquina* and is summarized in a technical  
35 memorandum (Art Anderson 2025). The technical memorandum analyzes the impact of the project on  
36 the *Yaquina*. During construction, the bridge's reduced clearance of 74 feet could obstruct the vessel's  
37 passage, as its current mast antenna height is 92 feet. To mitigate this, modifications are

1 recommended to allow the mast to be lowered, ensuring clearance with a 5-foot air gap. These  
2 modifications involve removal and repositioning of electronics, structural alterations, and installation  
3 of a new hinged mast system. The resulting modifications would allow the *Yaquina* to pass under the  
4 bridge during and after construction, regardless of whether the movable-span or fixed-span design  
5 options move forward. The total estimated cost for the vessel modification is approximately \$125,000.  
6 This modification, plus scheduled bridge openings with the contractor during construction, would  
7 allow for safe and unimpeded passage of the *Yaquina*.

1 **Table 7-2. Marine Contractor Vessels Potentially Height-Constrained during Construction**

2 **Two Conditions Considered:** 1) Single-level movable-span: two closures of the primary channel ranging from 7 to 9 months, 72-foot clearance provided by the Alternative Barge Channel. Single-level  
 3 fixed-span: potentially one closure of the primary channel ranging from 9 to 10 months, 72-foot clearance provided by the Alternative Barge Channel.  
 4 2) Limited vertical clearance (100 feet) during construction over the primary shipping channel. Single-level movable-span: two instances ranging from 2 to 20 months.  
 5 Single-level fixed-span: potentially one instance ranging from 24 to 32 months.

6  = Potential impact during Condition 1  = Potential Impact during Condition 2

Owner	Vessel Name	Air Draft (Feet)	Condition 1 = 72-foot Vertical Clearance				Condition 2 = 100-foot Vertical Clearance					
			@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>			
			Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet		
1	Advanced American Construction	DB 125	78									
2	Advanced American Construction	DB 4000	79.5									
3	Advanced American Construction	DB 4041	71									
4	Advanced American Construction	DB 4100	92									
5	Advanced American Construction	Paul Bunyon	78									
6	Advanced American Construction	Millennium (c)	50/155									
7	Bergerson Construction Inc.	Betsy Ross (d)	40/70									
8	Bergerson Construction Inc.	Carr Barge	70									
9	Bergerson Construction Inc.	Sectional Barge										
10	Diversified Marine	BMC 44	78									
11	Diversified Marine	Cougar	50									
12	Diversified Marine	DB Freedom (e)	61									
13	Diversified Marine	DB Lucy	85									

Permanent and Temporary Alterations to Federal Navigation Projects

	Owner	Vessel Name	Air Draft (Feet)	Condition 1 = 72-foot Vertical Clearance				Condition 2 = 100-foot Vertical Clearance			
				@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>	
				Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet
14	Diversified Marine	DB Vulcan	89								
15	Diversified Marine	DMI 100	60								
16	Diversified Marine	DMI 50	60								
17	Diversified Marine	DMI 60	84								
18	Dutra Group	Derrick No. 24	70								
19	Dutra Group	Paula Lee	77.5								
20	General Construction	DB Alameda	71								
21	General Construction	DB General									
23	General Construction	DB Oakland	78.8								
25	General Construction	DB Olympia	70.1								
26	General Construction	DB Pacific	86.5								
27	General Construction	DB Seattle	85.9								
28	Hickey Marine Enterprises	Sea Hawk	75								
29	Hickey Marine Enterprises	Sea Horse	88								
30	Hickey Marine Enterprises	Sea Lion	75								
31	Hickey Marine Enterprises	Sea Vulture	75								
32	J.E. McAmis	Heidi Renee	81								
33	JT Marine	Cristy T	50								
34	JT Marine	DB Astoria	80								
35	JT Marine	DB Taylor (f)	80								
36	JT Marine	Stacy T	55								
37	Knife River	KR-1	48.5								
38	Manson Construction	Derrick No. 24	99								

Permanent and Temporary Alterations to Federal Navigation Projects

Owner	Vessel Name	Air Draft (Feet)	Condition 1 = 72-foot Vertical Clearance				Condition 2 = 100-foot Vertical Clearance				
			@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		
			Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	
39	Manson Construction	Haakon	84								
40	Mark Marine Service	Barge #7	80								
41	Mark Marine Service	DB Camas	75								
42	Mark Marine Service	DB Columbia	66								
43	Mark Marine Service	Patricia	48								
44	Mark Marine Service	Umatilla	50								
45	Port of Portland	Dredge Oregon	103								
46	Ross Island Sand and Gravel	RI Dredge no.6	77								
47	Ross Island Sand and Gravel	RI Dredge no.7	77								
48	Ross Island Sand and Gravel	RI Dredge no.8	77								
49	Ross Island Sand and Gravel	RI Dredge no.9	77								

- 1 a OHW = 16 feet above 0 CRD
- 2 b River levels at the Interstate Bridge were below 8.65 feet for 80% of the days over the past 40 years.
- 3 c Heights shown are with the boom in the closed and raised position.
- 4 d Heights shown are with boom in the lowered and typical travel position. Spuds are 70 feet.
- 5 e Diversified Marine has indicated that the crane boom for the DB Freedom can be lowered to a horizontal position, leaving the crane gantry as the highest fixed point on the vessel (61 feet).
- 6
- 7 f Mitigation discussions are underway to provide for modification of the DB Taylor to allow the boom to be lowered to a horizontal position. When that occurs the highest
- 8 points on the vessel will be the raised spuds at 80 feet.
- 9 DB = Derrick Barge; CRD = Columbia River Datum; OHW = ordinary high water

1 **Table 7-3. Marine Industry and Fabricator Vessels Potentially Height-Constrained during Construction**

2 **Two Conditions Considered:** 1) Single-level movable-span: two closures of the primary channel ranging from 7 to 9 months, 72-foot clearance provided by the Alternative Barge Channel. Single-  
 3 level fixed-span: potentially one closure of the primary channel ranging from 9 to 10 months, 72-foot clearance provided by the Alternative Barge Channel.  
 4 2) Limited vertical clearance (100 feet) during construction over the primary shipping channel. Single-level movable-span: two instances ranging from 2 to 20 months.  
 5 Single-level fixed-span: potentially one instance ranging from 24 to 32 months.

6  = Potential impact during Condition 1  = Potential Impact during Condition 2

7

Owner	Vessel Name	Air Draft (Feet)	Condition 1 = 72-Foot Vertical Clearance				Condition 2 = 100-Foot Vertical Clearance				
			@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		
			Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	
1	Greenberry Industrial	Future possible shipment	136/165								
2	Oregon Ironworks Vigor Works LLC	Future possible shipment	125/150								
3	Thompson Metal Fab Inc	Largest Reported Shipment	141								

8 a OHW = 16 feet above 0 CRD  
 9 b River levels at the Interstate Bridge were below 8.65 feet for 80% of the days over the past 40 years.  
 10 CRD = Columbia River Datum; OHW = ordinary high water

1 **Table 7-4. Marine Industry and Fabricator Vessels Potentially Height-Constrained during Construction**

2 **Two Conditions Considered:** 1) Single-level movable-span: two closures of the primary channel ranging from 7 to 9 months, 72-foot clearance provided by the Alternative Barge Channel. Single-  
 3 level fixed-span: potentially one closure of the primary channel ranging from 9 to 10 months, 72-foot clearance provided by the Alternative Barge Channel.  
 4 2) Limited vertical clearance (100 feet) during construction over the primary shipping channel. Single-level movable-span: two instances ranging from 2 to 20 months.  
 5 Single-level fixed-span: potentially one instance ranging from 24 to 32 months.

6  = Potential impact during Condition 1  = Potential Impact during Condition 2

	Owner	Vessel Name	Air Draft (Feet)	Condition 1 = 72-foot Vertical Clearance				Condition 2 = 100-foot Vertical Clearance			
				@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>	
				Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet
1	Nuclear transporters (Puget Sound Naval Shipyard)	Barge 40	50								
2	Nuclear transporters (Puget Sound Naval Shipyard)	Barge 60	43								
3	Nuclear transporters (Puget Sound Naval Shipyard)	Beluga	43								
4	Nuclear transporters (Puget Sound Naval Shipyard)	Edgecumbe	43								
5	Port of Portland	Dredge Oregon	63								
6	Tongue Point Job Corps Maritime Training Program	M/V Ironwood	77								
7	U.S. Army Corps of Engineers	Yaquina	92								

8 a OHW = 16 feet above 0 CRD  
 9 b River levels at the Interstate Bridge were below 8.65 feet for 80% of the days over the past 40 years.  
 10 CRD = Columbia River Datum; OHW = ordinary high water

## 1 7.5 Passenger Cruise Vessels

2 **Condition 1.** Most passenger cruise vessels could be impacted by a 72-foot vertical clearance,  
3 depending on the time of year and river stage at which this phase of construction would be  
4 implemented (Table 7-5). At a river stage of 8.65 feet, and assuming a 5-foot air gap, the number of  
5 potentially impacted vessels is reduced. Most cruise vessels travel to upstream destinations that  
6 require transit under bridges with less vertical clearance than the new IBR Columbia River Bridge will  
7 have during construction and are not expected to be impacted.

8 **Condition 2.** With a vertical clearance of 100 feet, all passenger cruise vessels other than the *Lady*  
9 *Washington* would be able to pass at OHW. At a river stage of 8.65 feet, the *Lady Washington* would be  
10 able to pass with a 5-foot air gap. With an air draft of 85 feet and an air gap of 5 feet, the *Lady*  
11 *Washington* could pass at times of the year when the river stage is at 10 feet above 0 CRD or less, which  
12 occurred on average on more than 90% of the days between 1972 and 2012.

## 13 7.6 Recreational Sailboats

14 **Condition 1.** The vessel inventory identified multiple sailboats that would potentially be affected by a  
15 72-foot clearance during this phase (see Table 7-6). Most would be unable to pass under any of the  
16 river stage/air gap scenarios tested.

17 **Condition 2.** Two recreational sailboats, the *Radiance* and the *Rage*, would be potentially constrained  
18 during this phase of construction. However, with allowance for a 5-foot air gap, both could pass at  
19 least 80% of the time. With an air draft of 85 feet, and an air gap of 5 feet, the *Radiance* could pass at  
20 times of the year when the river stage is 10 feet above 0 CRD or less, which occurred on average more  
21 than 90% of the days between 1972 and 2012. Similarly, with an air draft of 80 feet, and a 5-foot air  
22 gap, the *Rage* could pass at times of the year when the river stage is 15 feet above 0 CRD or less, which  
23 occurred on average on more than 98% of the days during the same condition.

## 24 7.7 Potential Mitigation for Construction-Related Navigation 25 Restrictions

26 **Condition 1.** Due to the potentially large number of impacted vessels, and the anticipated duration of  
27 this construction condition, proposed mitigation efforts include direct advance notice to all  
28 potentially affected parties, as well as more broadly distributed construction bulletins to appropriate  
29 outlets (e.g., the U.S. Coast Guard [USCG] Local Notice to Mariners), so that potentially affected river  
30 users can schedule passages through the construction zone outside of the constricted time condition.

31 As described above, the number of potentially impacted vessels/river users would depend on the time  
32 of year when this phase of construction takes place. Federal vessels are a special case for this phase of  
33 construction. Since the *Yaquina* is used routinely for maintenance dredging in August/September  
34 each year, contract requirements for the bridge contractor may need to include restrictions on the  
35 time of year that Condition 1 could be implemented, including the ability for the USACE to schedule  
36 passage or a potential prohibition on implementing Condition 1 in August–September. For  
37 recreational sailboats, if necessary, masts may need to be removed for transit and replaced

- 1 downriver. This is not a simple process and would require suitable facilities upstream and
- 2 downstream with the infrastructure needed to perform the activity.

1 **Table 7-5. Passenger Cruise Vessels Potentially Height-Constrained during Construction**

2 **Two Conditions Considered:** 1) Single-level movable-span: two closures of the primary channel ranging from 7 to 9 months, 72-foot clearance provided by the Alternative Barge Channel. Single-  
 3 level fixed-span: potentially one closure of the primary channel ranging from 9 to 10 months, 72-foot clearance provided by the Alternative Barge Channel.  
 4 2) Limited vertical clearance (100 feet) during construction over the primary shipping channel. Single-level movable-span: two instances ranging from 2 to 20 months.  
 5 Single-level fixed-span: potentially one instance ranging from 24 to 32 months.

6  = Potential impact during Condition 1  = Potential Impact during Condition 2

	Owner	Vessel Name	Air Draft (Feet)	Condition 1 = 72-Foot Vertical Clearance				Condition 2 = 100-Foot Vertical Clearance			
				@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>	
				Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet
1	American Cruise Lines	Queen of the West	63								
2	American Cruise Lines	American Pride	63								
3	American Cruise Lines	American Song	56								
4	American Queen Steamboat Company	American Empress	52								
5	American Waterways Inc.	Crystal Dolphin	48								
6	American Waterways Inc.	Portland Spirit	48								
7	Grays Harbor Historical Seaport	The Lady Washington <sup>(c)</sup>	90/65								
8	Linblad Expeditions, Inc	National Geographic Sea Bird	59								
9	Linblad Expeditions, Inc	National Geographic Quest	62								
10	Linblad Expeditions, Inc	National Geographic Sea Lion	59								

8 a Ordinary High Water = 16 feet above 0 CRD  
 9 b River levels at the Interstate Bridge were below 8.65 feet for 80% of the days over the past 40 years.  
 10 c Heights reflect raised and step-down height.  
 11 CRD = Columbia River Datum; OHW = ordinary high water

1 Table 7-6. Recreational Sailboats Potentially Height-Constrained during Construction

2 **Two Conditions Considered:** 1) Single-level movable-span: two closures of the primary channel ranging from 7 to 9 months, 72-foot clearance provided by the Alternative Barge Channel. Single-  
 3 level fixed-span: potentially one closure of the primary channel ranging from 9 to 10 months, 72-foot clearance provided by the Alternative Barge Channel.  
 4 2) Limited vertical clearance (100 feet) during construction over the primary shipping channel. Single-level movable-span: two instances ranging from 2 to 20 months.  
 5 Single-level fixed-span: potentially one instance ranging from 24 to 32 months.

6  = Potential impact during Condition 1  = Potential Impact during Condition 2

Owner	Vessel Name	Air Draft (Feet)	Condition 1 = 72-Foot Vertical Clearance				Condition 2 = 100-Foot Vertical Clearance				
			@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		
			Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	
1	Legendary Yachts, Inc	Radiance	85								
2	McClure Loving Trust	Nancy Riley	71								
3	Private Owner	Camelot	62								
4	Private Owner	Galatea	61								
5	Private Owner	Halsey	66								
6	Private Owner	High Flight	51								
7	Private Owner	Luscious	65								
8	Private Owner	Moondance	59								
9	Private Owner	Runaway	70								
10	Private Owner	Rya	66								
11	Private Owner	Saphira	54								
12	Private Owner	Sargasso	65								
13	Private Owner	Sovereign	58								
14	Private Owner	Stella Polare	68								

Permanent and Temporary Alterations to Federal Navigation Projects

	Owner	Vessel Name	Air Draft (Feet)	Condition 1 = 72-Foot Vertical Clearance				Condition 2 = 100-Foot Vertical Clearance				
				@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		
				Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	
15	Private Owner	Sylvia	58									
16	Private Owner	Tropicale	61									
17	Private Owners	Whisper	74									
18	Private Owner	Autumn Wind	72									
19	Private Owner	Benicia	50									
20	Private Owner	Magic Pearl	56									
21	Private Owner	Mistral	65									
22	Private Owner	Moonstruck	63									
23	Private Owner	Riva	64.5									
24	Private Owner	Wakadui	66									
25	Private Owner	Wind Dancing	66									
26	Private Owner	Crystal Swan	63									
27	Private Owner	Down Wind Drift	59									
28	Rose City Yacht Club	Draco	60									
29	Rose City Yacht Club	Morgan Le Fay	58									

Permanent and Temporary Alterations to Federal Navigation Projects

Owner	Vessel Name	Air Draft (Feet)	Condition 1 = 72-Foot Vertical Clearance				Condition 2 = 100-Foot Vertical Clearance					
			@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>		@ OHW <sup>(a)</sup>		@ River Level = 8.65 Feet <sup>(b)</sup>			
			Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet	Air Gap = 10 Feet	Air Gap = 5 Feet		
30	Schooner Creek Boat Works	Rage	80									

- 1 a OHW = 16 feet above 0 CRD
- 2 b River levels at the Interstate Bridge were below 8.65 feet for 80% of the days over the past 40 years.
- 3 CRD = Columbia River Datum; OHW = ordinary high water

- 1 **Condition 2.** For construction barges, the extended duration of Condition 2 means that passages can  
2 be planned to occur at non-peak river stages. In addition, a reduced air gap of 5 feet is adequate for a  
3 temporary condition. This limits the number of potentially impacted vessels to 6 to 16 (depending on  
4 river stage). Some may be deployed to work on the bridge construction. Others that may be deployed  
5 to work elsewhere upriver of the bridge may need to consider temporary modifications such as  
6 removing spuds, reconfiguring crane gantries, or arranging for other equipment to support projects.
- 7 For the fabricators, the vertical limitations during construction would restrict their ability to ship large  
8 products during both Condition 1 and Condition 2. Such restrictions should be considered in  
9 discussions with the fabricators regarding the overall effects of the project.
- 10 For federal vessels, a separate analysis has been completed for the *Yaquina* (Art Anderson 2025). The  
11 Program is in discussion with the USACE to modify the hopper dredge *Yaquina* so that the main mast  
12 can be adjusted or hinged. The modification would allow the USACE to lower and raise the upper  
13 portion of the mast by means of a manual or electric winch. This modification would reduce the  
14 vertical navigation clearance to 69 feet, allowing safe passage of the vessel underneath the project  
15 bridge once constructed. Therefore, there would be no impacts to the *Yaquina* during or after  
16 construction, regardless of whether the movable-span or fixed-span design moves forward.
- 17 No mitigation is anticipated for passenger cruise vessels or recreational sailboats, as all identified  
18 vessels can pass during a high percentage of the days during this construction condition.

## 1 8. POTENTIAL PERMANENT VESSEL IMPACTS

2 A movable-span bridge would have no permanent impacts to vessels. However, a fixed-span bridge  
 3 would impact identified river users, as summarized in the IBR Program *Navigation Impact Report* (IBR  
 4 2025) and in Table 8-1. As discussed in Section 7.4, the dredge *Yaquina* is not considered an impacted  
 5 vessel in the context of the table below, since structural modifications would allow the *Yaquina* to  
 6 pass under the bridge during and after construction, regardless of whether the movable-span or fixed-  
 7 span design options move forward. Additional restrictions to daytime bridge openings due to light-rail  
 8 transit operations to help with on-time performance and system reliability may be implemented.

9 Table 8-1. Potential permanent vessel impacts and proposed mitigation.

Vessel	Owner	Vessel Type	Air Draft (feet)	Proposed Mitigation
TBD (fabricator’s tallest future shipment)	Greenberry Industrial	Barge with fabricated materials	136	Mitigation agreements pending.
TBD (fabricator’s tallest reported shipment)	Thompson Metal Fab	Barge with fabricated materials	165	Mitigation agreements pending.
<i>DB Taylor</i>	JT Marine	Shipyards services company vessel	209	The vessel has multiple configurations, including a new configuration with a 260-foot boom. Existing conditions require the vessel to disassemble, modify vessel, or use mobile cranes mounted on barges upriver of bridge.
<i>DB 4100</i>	Advanced American Construction	Marine contractor vessel	92	Modify vessel, or use mobile cranes mounted on barges upriver of bridge.
<i>DB Millenium</i>	Advanced American Construction	Marine contractor vessel	155	Lower crane boom, and lower mast.

10 DB = Derrick Barge; TBD = to be determined

## 9. PUBLIC SAFETY

During the construction of the replacement bridges, the IBR Program would implement a comprehensive River Safety Management Plan addressing all river users. This plan would detail how the IBR Program and its contractors would undertake construction in a manner that is protective of river navigation and safety.

This plan is expected to include the following information:

- Identification of agency and contractor personnel responsible for overseeing and implementing waterway safety.
- Roles, responsibilities, and contacts for all agencies involved in management of the waterway.
- Specification of minimum navigation clearances for all stages of construction.
- Plans for navigation aids necessary during construction.
- Provisions for providing assist tugs when necessary to support safe navigation when vertical or horizontal clearances are reduced, and when assistance is needed to safely navigate the restricted channels.
- Plans for small watercraft (including motorized), non-motorized, and sail-powered vessels.
- A communications plan for conducting outreach throughout the construction process to inform the navigation community, recreational boaters, and other river users of waterway of restrictions and other construction activities that may restrict or otherwise change local navigation conditions. Outreach could include the following:
  - Publication of notices in the USCG Local Notice to Mariners, local maritime publications, social media, local media, and other similar platforms.
  - SMS text or email notification programs.
  - Signage and notices at boat ramps, water access points, marinas, and other locations frequented by river users to inform them of the construction activities and where to find additional information about the project.
  - Notifying individual vessel owners when they specifically could be impacted during construction.

## 10. REFERENCES

- 1
- 2 Art Anderson. 2025. Vessel Impact – Yaquina. Technical Memorandum. May 2, 2025.
- 3 IBR (Interstate Bridge Replacement Program). 2025. Navigation Impact Report. November 2021,  
4 Revised June 2025.
- 5 USACE (U.S. Army Corp of Engineers). 1980. Layout and Design of Shallow-Draft Waterways.  
6 Engineering Manual 1110-2-1611. December 1980. Accessed October 20, 2023.  
7 [https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM\\_111](https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_111)  
8 [0-2-1611.pdf](https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_111)
- 9 USACE (U.S. Army Corp of Engineers). 2006. Hydraulic Design of Deep-Draft Navigation Projects.  
10 Engineering Manual 1110-2-1613. May 2006. Accessed October 20, 2023.  
11 [https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM\\_111](https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_111)  
12 [0-2-1613.pdf](https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_111)

1 **APPENDIX A: NAVIGATION CLEARANCE**  
2 **DURING CONSTRUCTION (MOVABLE-SPAN**  
3 **AND FIXED-SPAN CONFIGURATIONS)**

# DRAFT

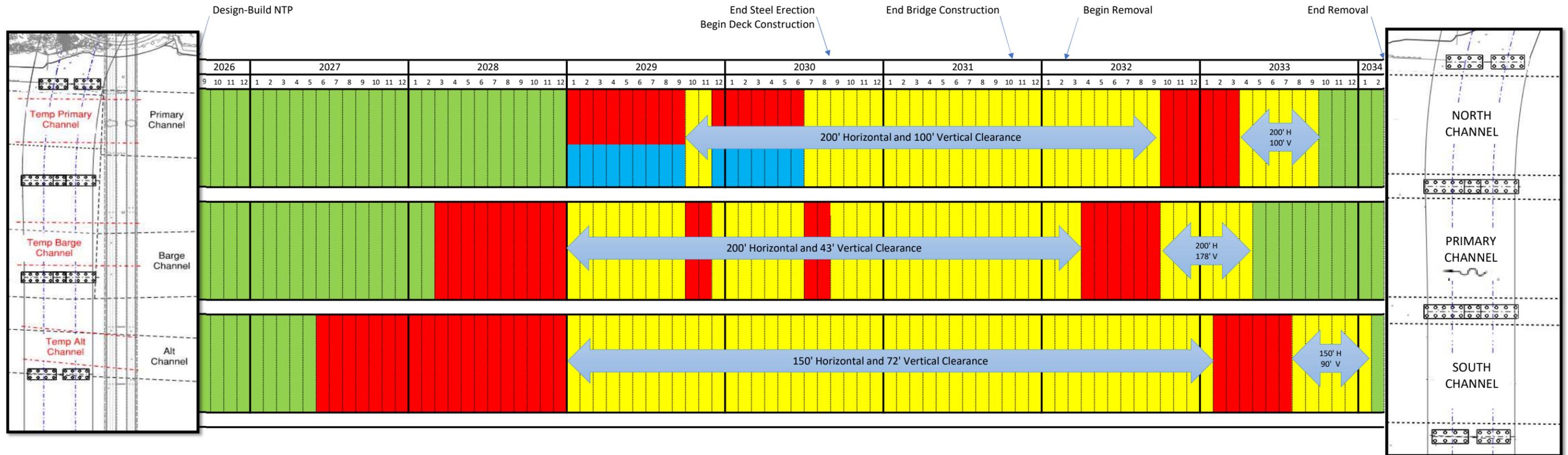
## IBR Navigation Clearance During Construction: Movable Single Level Bridge with Lift Span between Piers 5 & 6

Pre-Construction

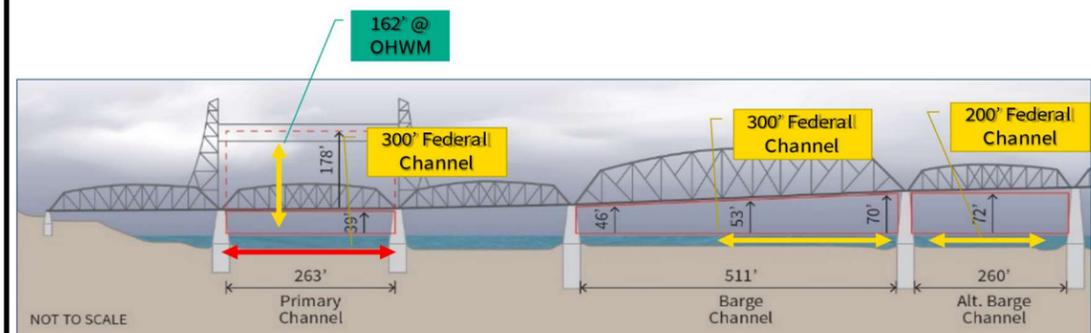
LEGEND



Post-Construction



### Current Conditions

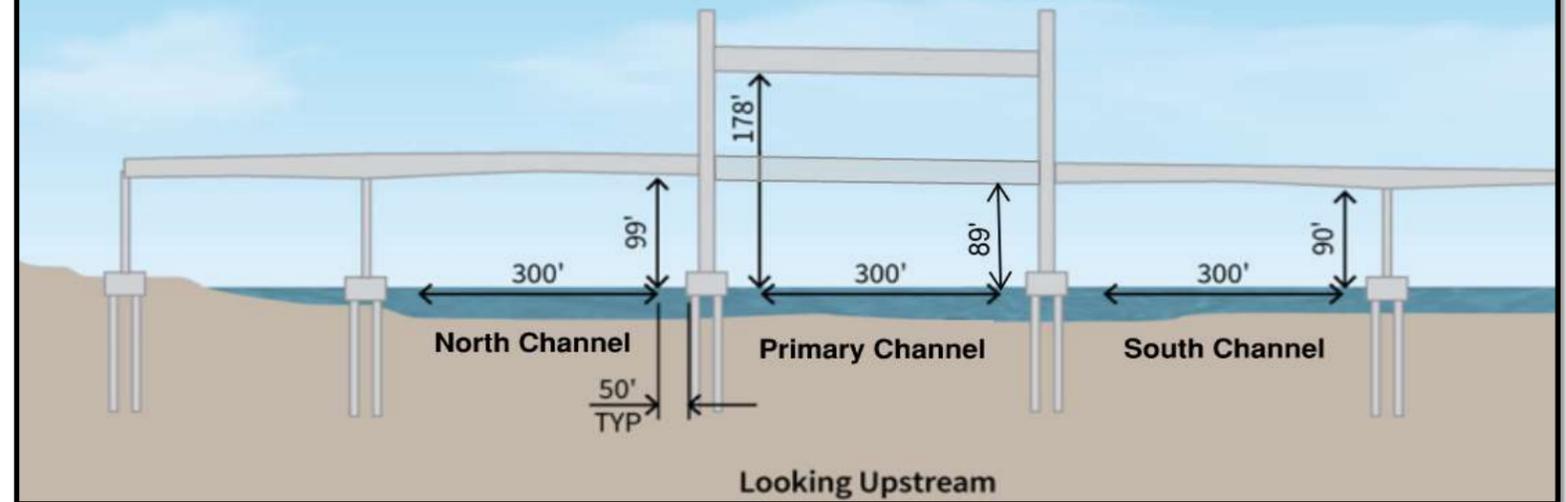


Yellow boxes = authorized channel width for navigation channels

May 17, 2022



### Proposed Conditions

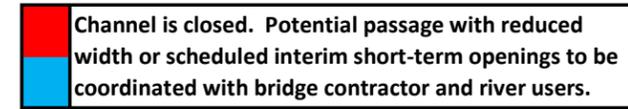
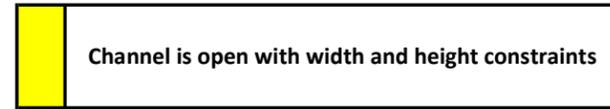


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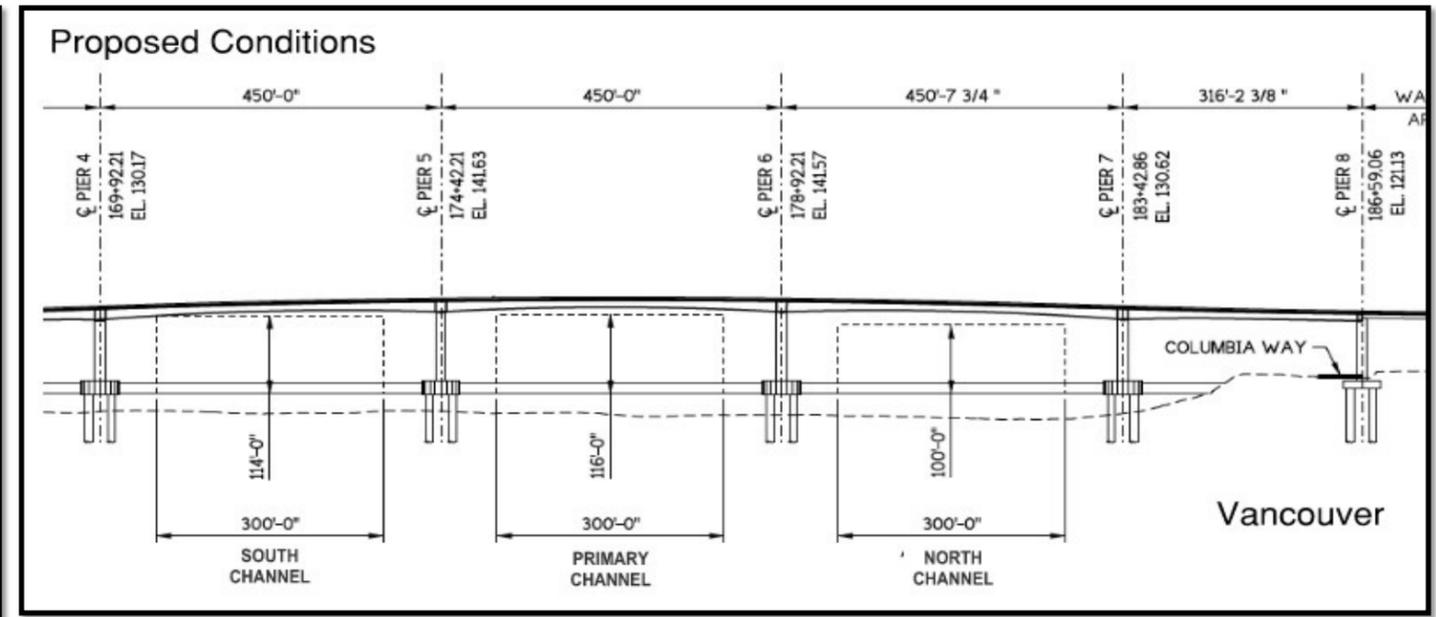
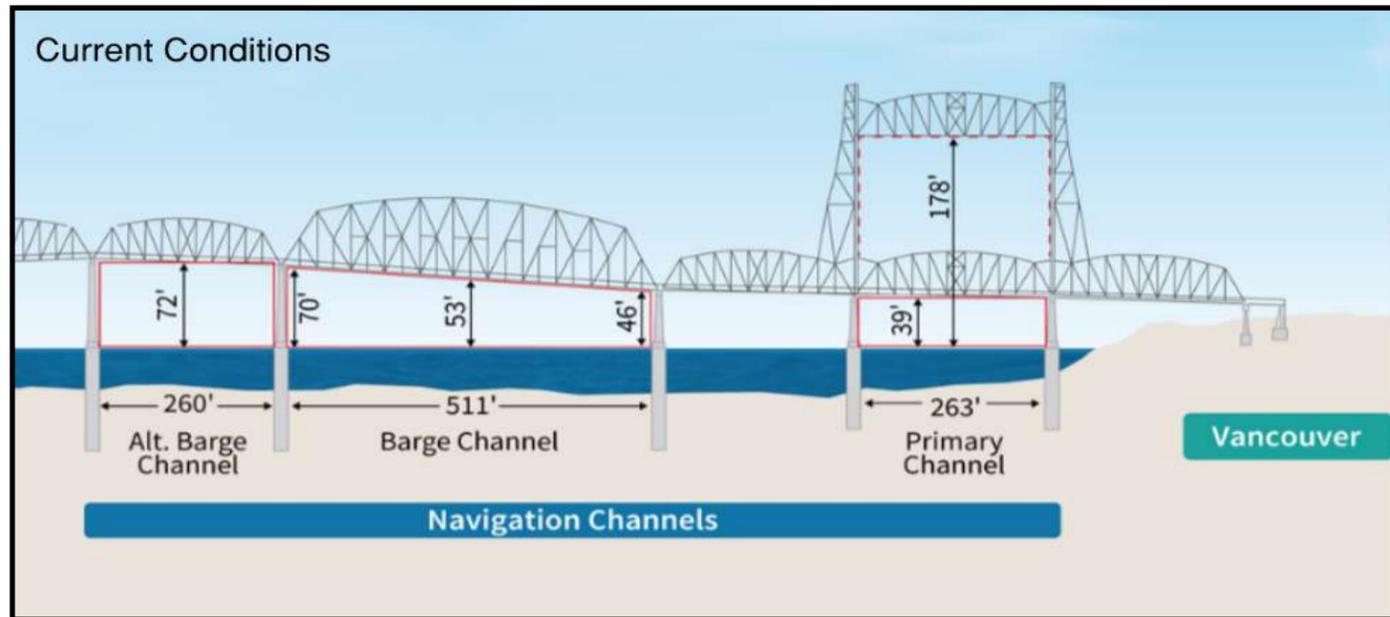
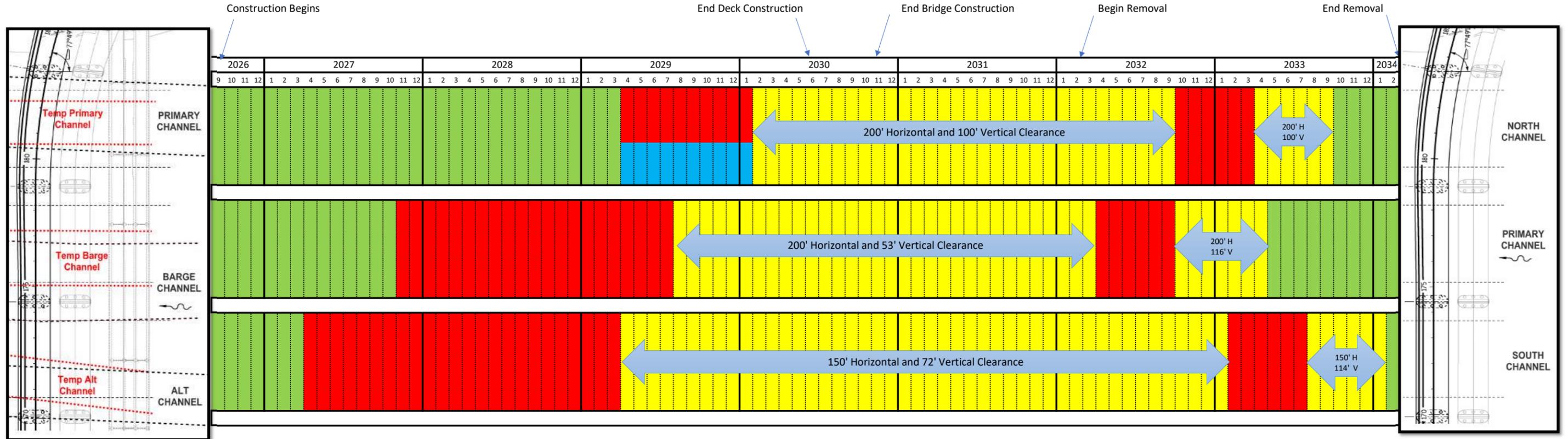
## IBR Navigation Clearance During Construction: Steel Girder Fixed Span

Pre-Construction

LEGEND

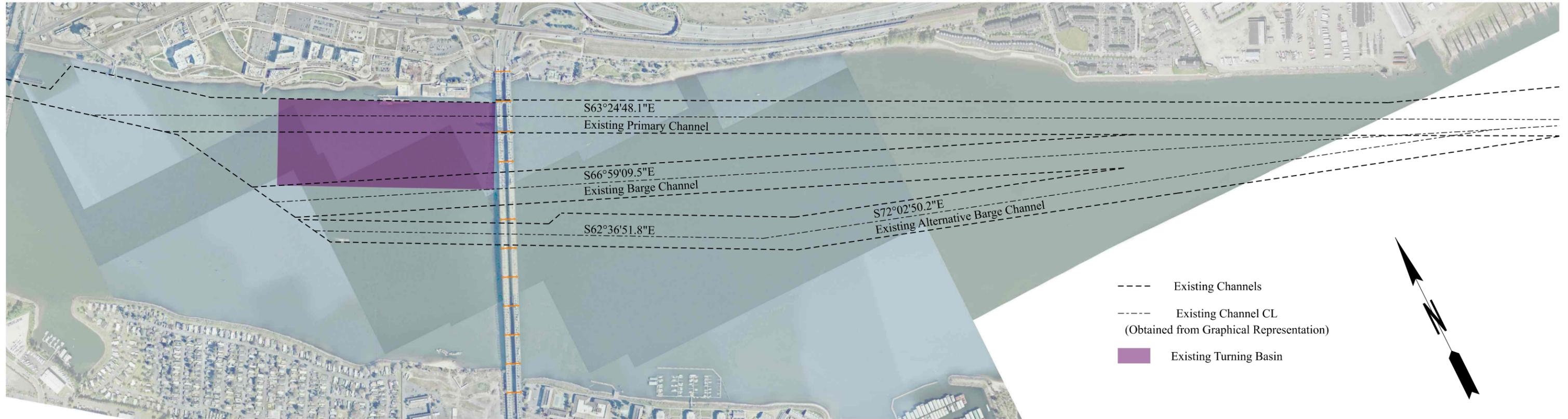


Post-Construction



1 **APPENDIX B: EXISTING AND PROPOSED**  
2 **NAVIGATION CHANNELS**

# DRAFT

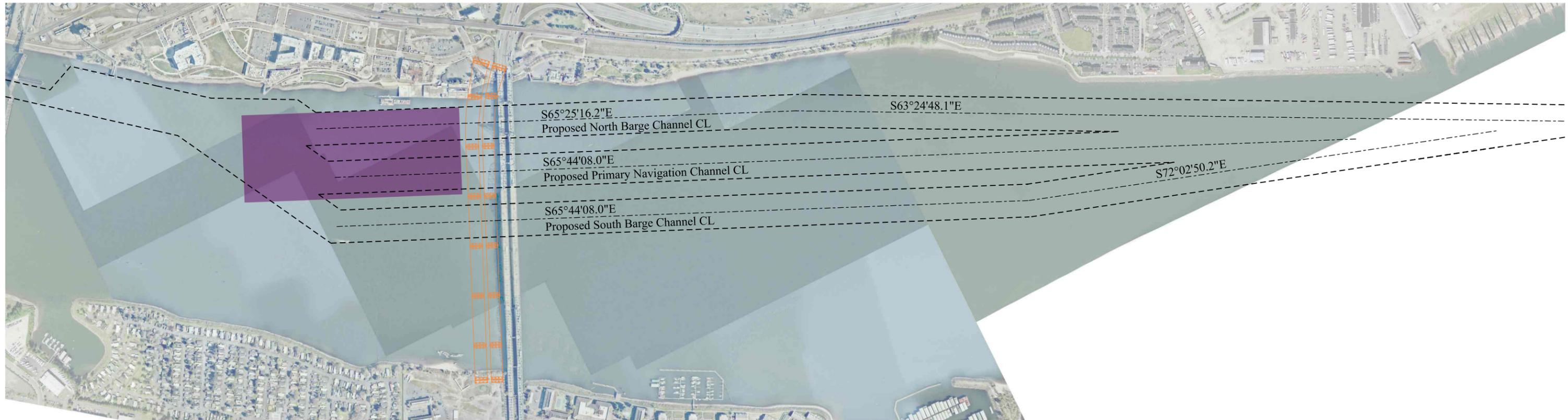


## EXISTING FEDERAL NAVIGATION PROJECTS



DISCLAIMER:  
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THIS INFORMATION SHOULD REVIEW OR CONSULT THE PRIMARY DATA AND INFORMATION SOURCE TO ASCERTAIN THE USABILITY OF THIS INFORMATION.

DRAFT



- Proposed Channels
- Proposed Channel CL
- Proposed Turning Basin

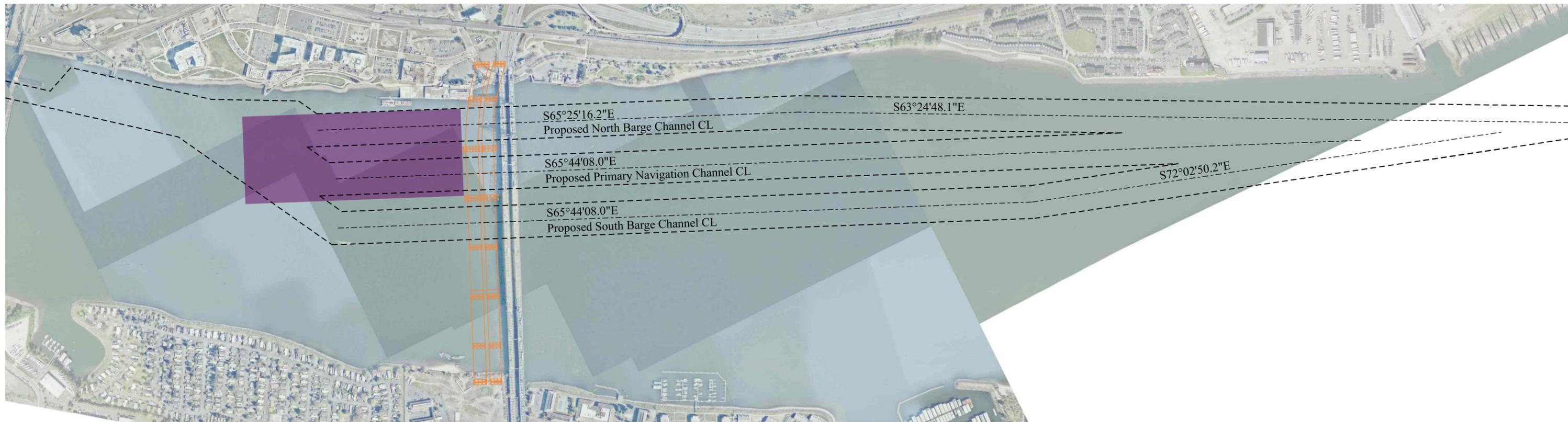


PROPOSED ALTERATIONS TO  
FEDERAL NAVIGATION PROJECTS  
FIXED-SPAN BRIDGE

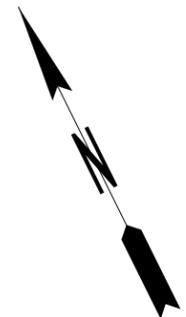


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DRAFT



- Proposed Channels
- Proposed Channel CL
- Proposed Turning Basin

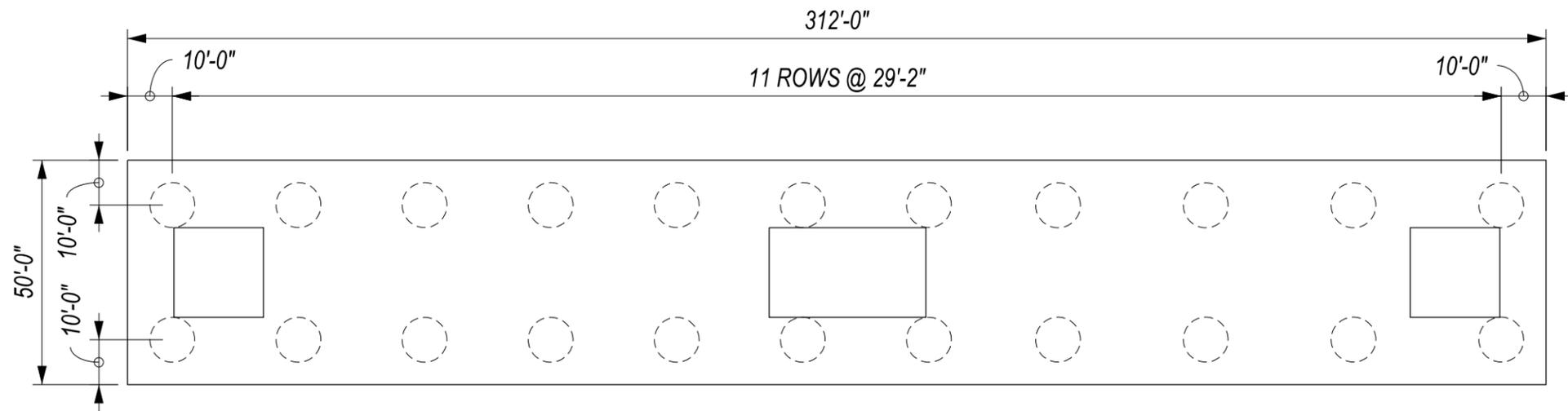


PROPOSED ALTERATIONS TO  
FEDERAL NAVIGATION PROJECTS  
MOVABLE-SPAN BRIDGE

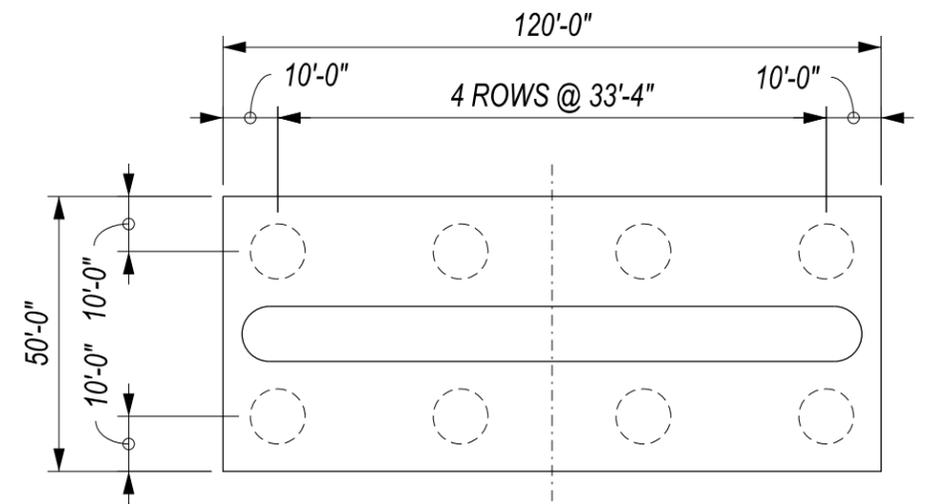


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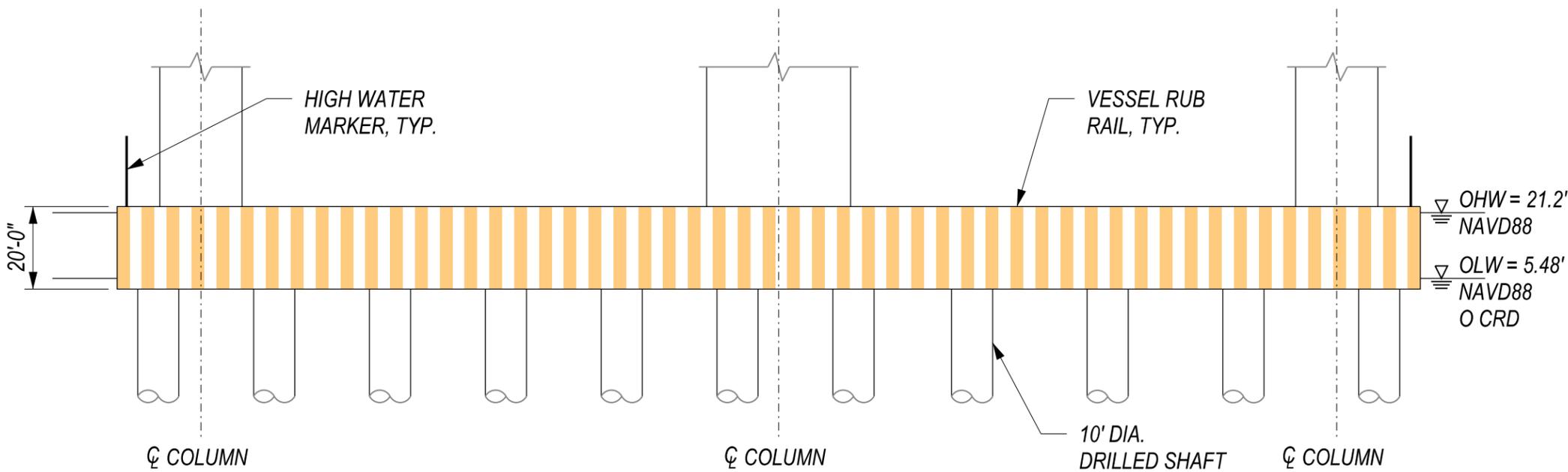
# DRAFT



PLAN VIEW

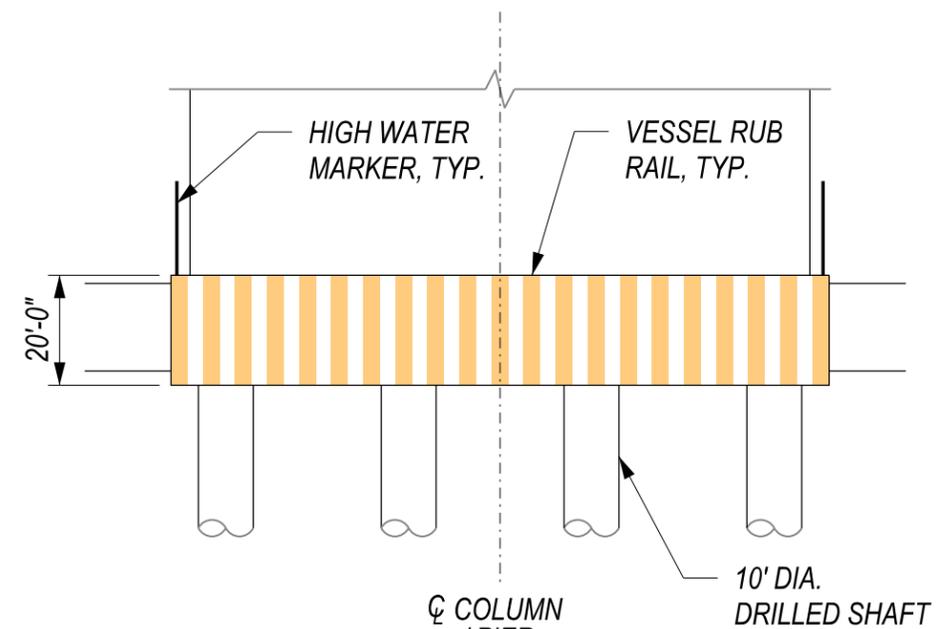


ϕ COLUMN / PIER  
PLAN VIEW



ELEVATION

PIERS 5, 6 DETAIL



ELEVATION

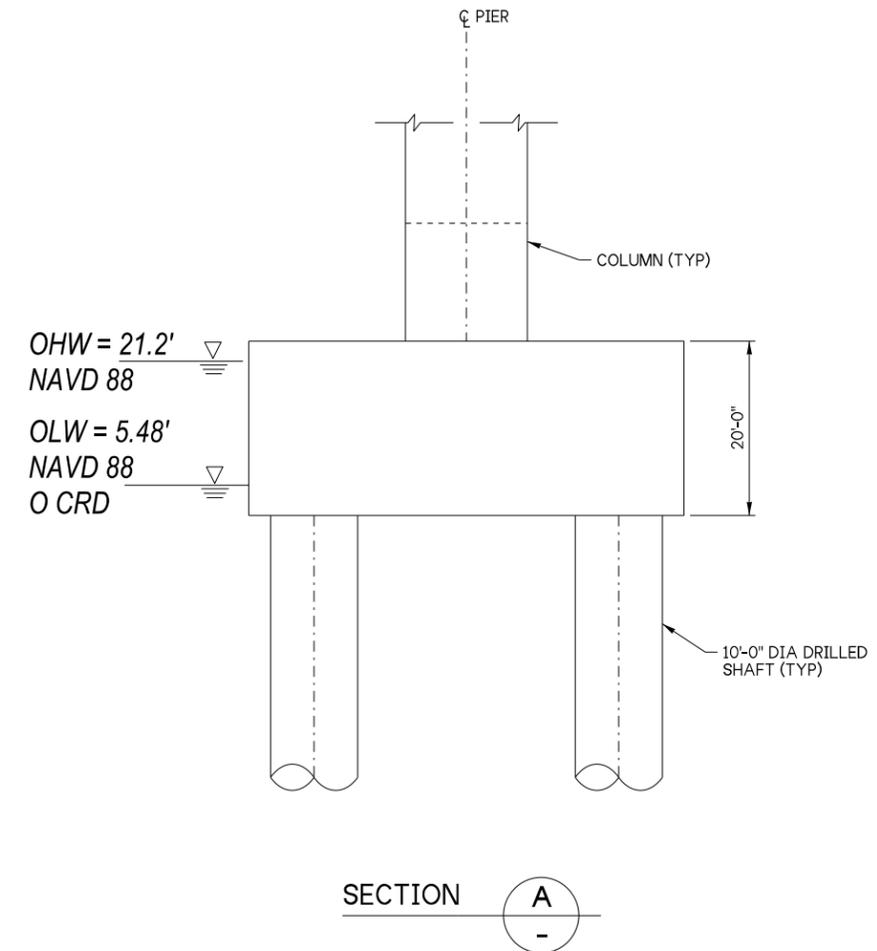
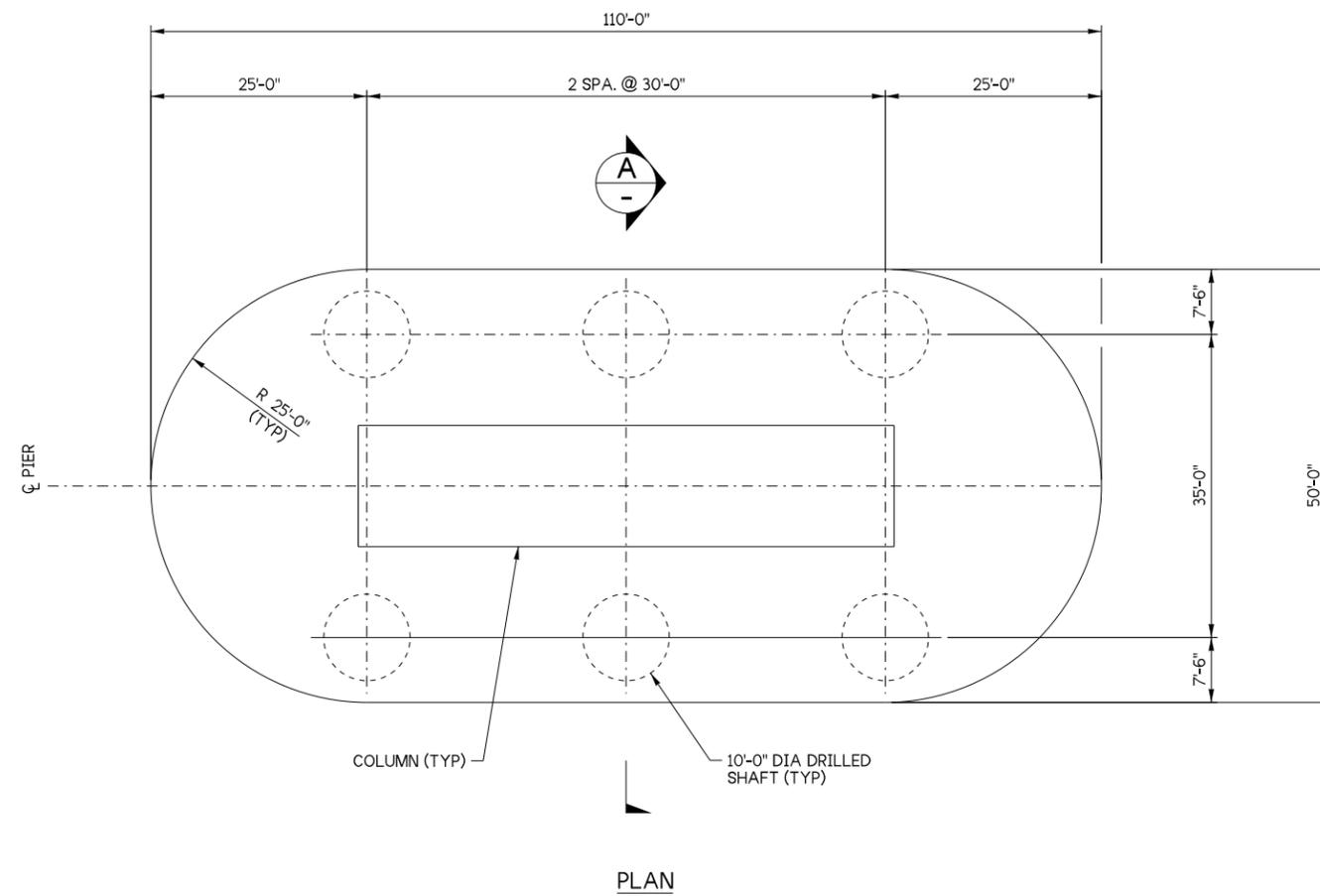
PIERS 1, 2, 3, 4, 7, & 8 DETAIL

## PIER FOOTING DETAILS MOVABLE-SPAN BRIDGE



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DRAFT



PIERS 2 THRU 7  
PIER 2 SHOWN. PIERS 3 THRU 7 SIMILAR.

PIER FOOTING DETAILS  
FIXED-SPAN BRIDGE



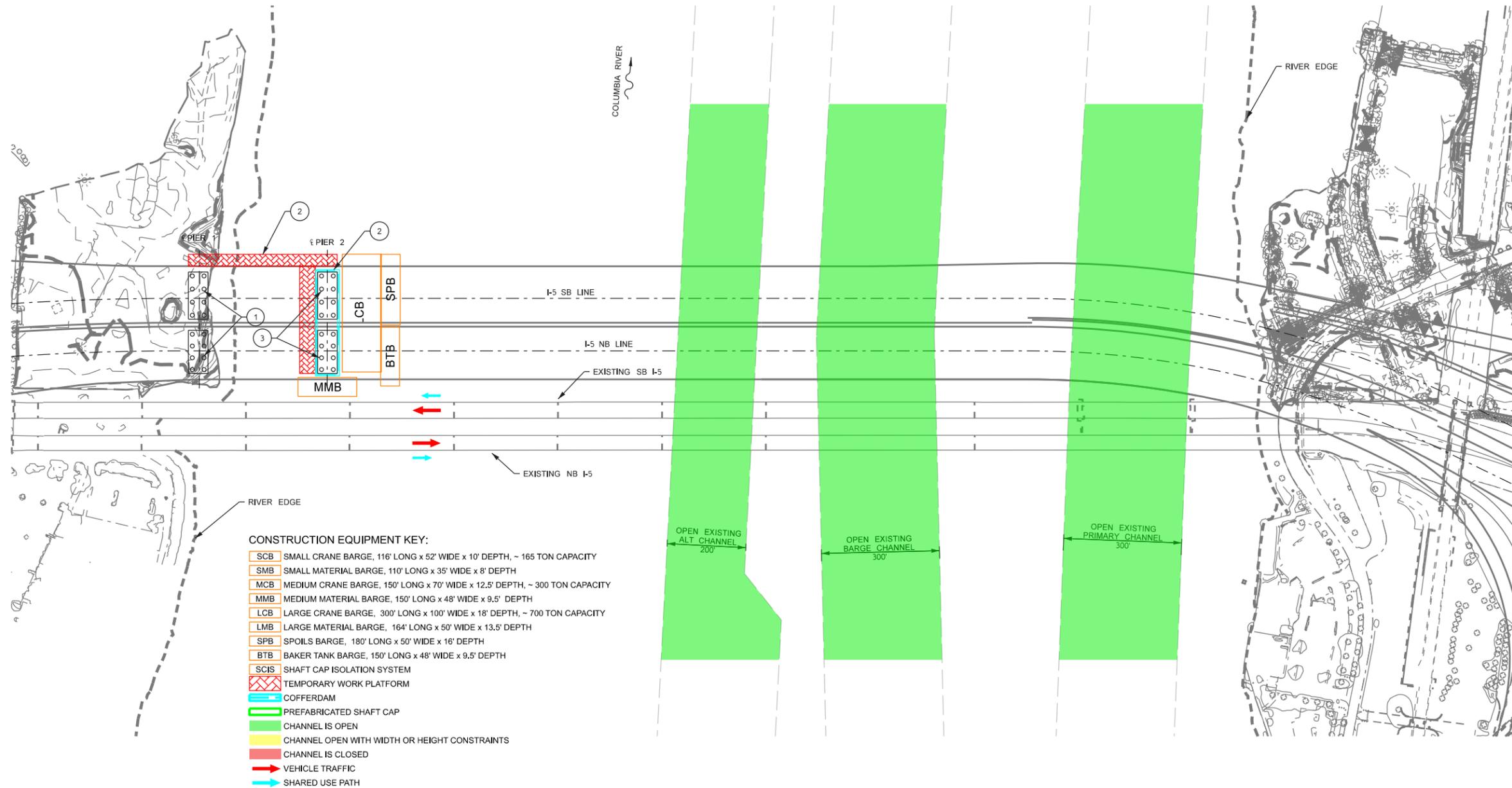
1 **APPENDIX C: COLUMBIA RIVER BRIDGES**  
2 **CONSTRUCTION SEQUENCE: MOVABLE-**  
3 **SPAN CONFIGURATION**

# DRAFT



**CONSTRUCTION SEQUENCE:**

- 1 CONSTRUCT DRILLED SHAFTS, SHAFT CAPS AND PIER AT PIER 1.
- 2 INSTALL COFFERDAM AND WORK BRIDGE AT PIER 2 FOR CONSTRUCTION OF NB AND SB SHAFTS AND SHAFT CAPS.
- 3 INSTALL TEMPORARY WORKS AT PIER 2, INSTALL SHAFTS, CLEAN-OUT, INSTALL REINFORCING, AND PLACE SHAFT CONCRETE FOR NB AND SB STRUCTURES.



## MOVABLE-SPAN PHASE 1 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



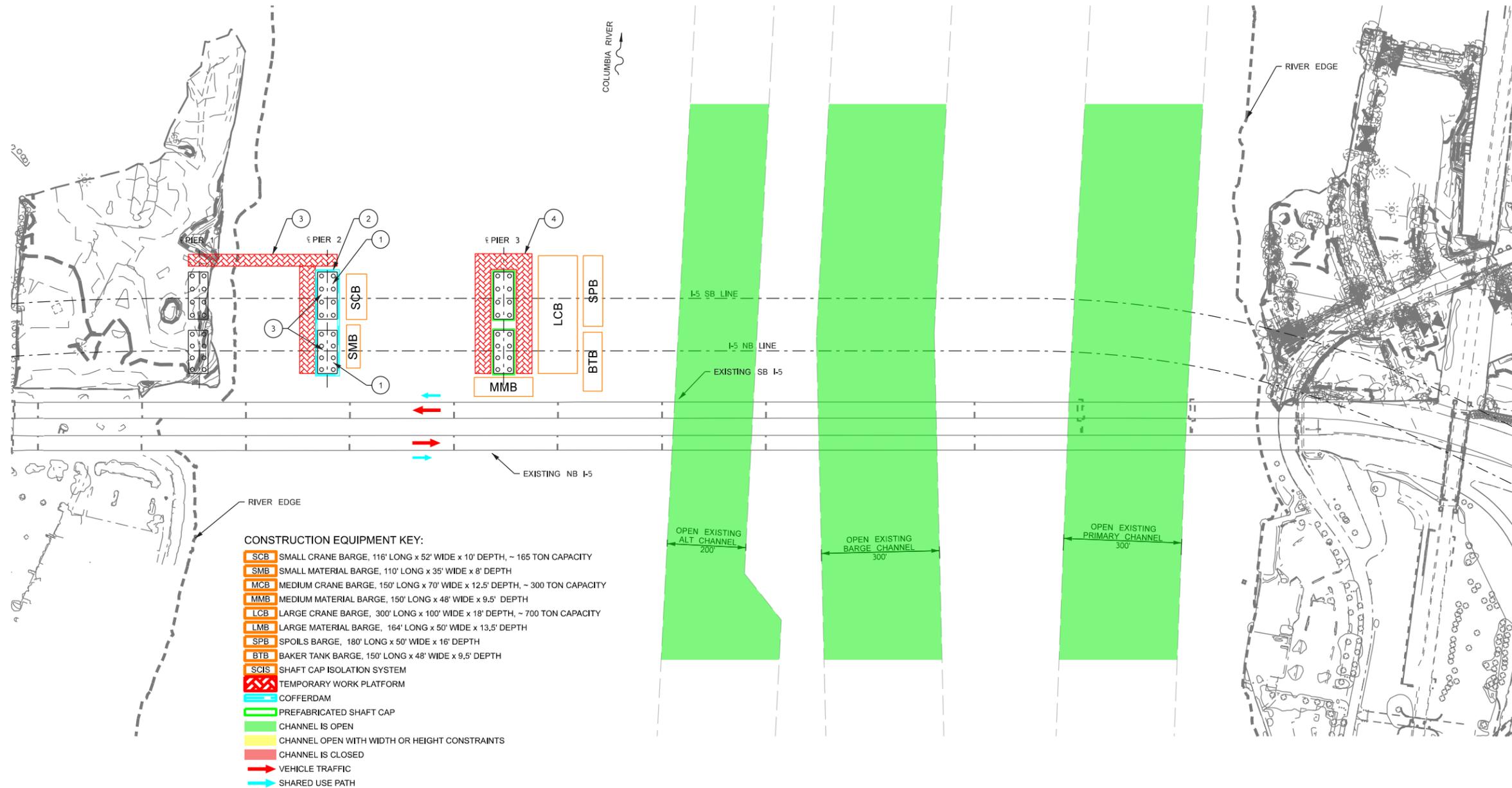
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# DRAFT



**CONSTRUCTION SEQUENCE:**

- 1 CONSTRUCT NB AND SB SHAFT CAPS AT PIER 2.
- 2 REMOVE COFFERDAM AT PIER 2.
- 3 CONSTRUCT COLUMNS AND PIER CAP AT PIER 2 FOR NB AND SB STRUCTURES. REMOVE WORK BRIDGE.
- 4 INSTALL TEMPORARY WORKS AT PIER 3. INSTALL SHAFTS, CLEAN-OUT, INSTALL REINFORCING AND PLACE SHAFT CONCRETE FOR NB AND SB STRUCTURES.



## MOVABLE-SPAN PHASE 2 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



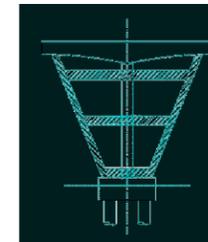
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# DRAFT

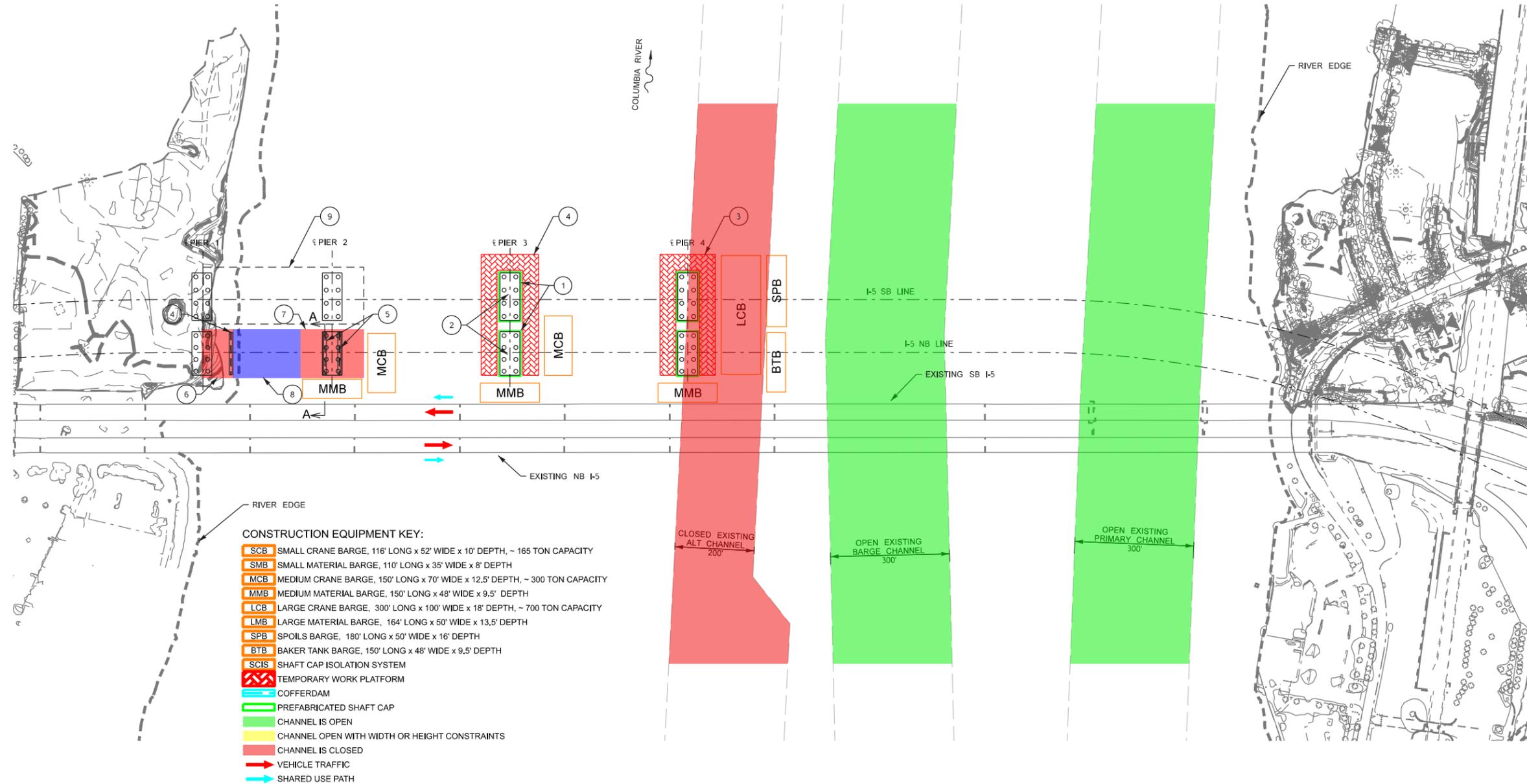


**CONSTRUCTION SEQUENCE:**

- 1 INSTALL PREFABRICATED SHAFT CAP SEGMENTS AT PIER 3 AND CONSTRUCT SHAFT CAP ISOLATION SYSTEM. CONSTRUCT NB AND SB SHAFT CAPS.
- 2 CONSTRUCT COLUMNS AND PIER CAP AT PIER 3 FOR NB AND SB STRUCTURES. REMOVE TEMPORARY WORKS.
- 3 INSTALL TEMPORARY WORKS AT PIER 4, INSTALL SHAFTS, CLEAN-OUT, INSTALL REINFORCING, AND PLACE SHAFT CONCRETE FOR NB AND SB STRUCTURES.
- 4 CONSTRUCT TEMPORARY BENT NEAR PIER 1 NB.
- 5 INSTALL TEMPORARY BENTS ON THE PILE CAP AT EACH SIDE OF PIER 2 NB.
- 6 ERECT THE SOUTH END OF THE NB GIRDERS FROM PIER 1 ACROSS THE TEMPORARY BENT.
- 7 ERECT THE NB PIER TABLE GIRDERS AT PIER 2 ACROSS THE TEMPORARY BENTS.
- 8 STRAND JACK NB GIRDER PACKS INTO PLACE TO CLOSE SPAN 1.
- 9 REMOVE TEMPORARY BENTS FOR NB BRIDGE AND REPEAT PROCEDURE FOR SPAN 1 OF THE SB BRIDGE



SECTION A



## MOVABLE-SPAN PHASE 3 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



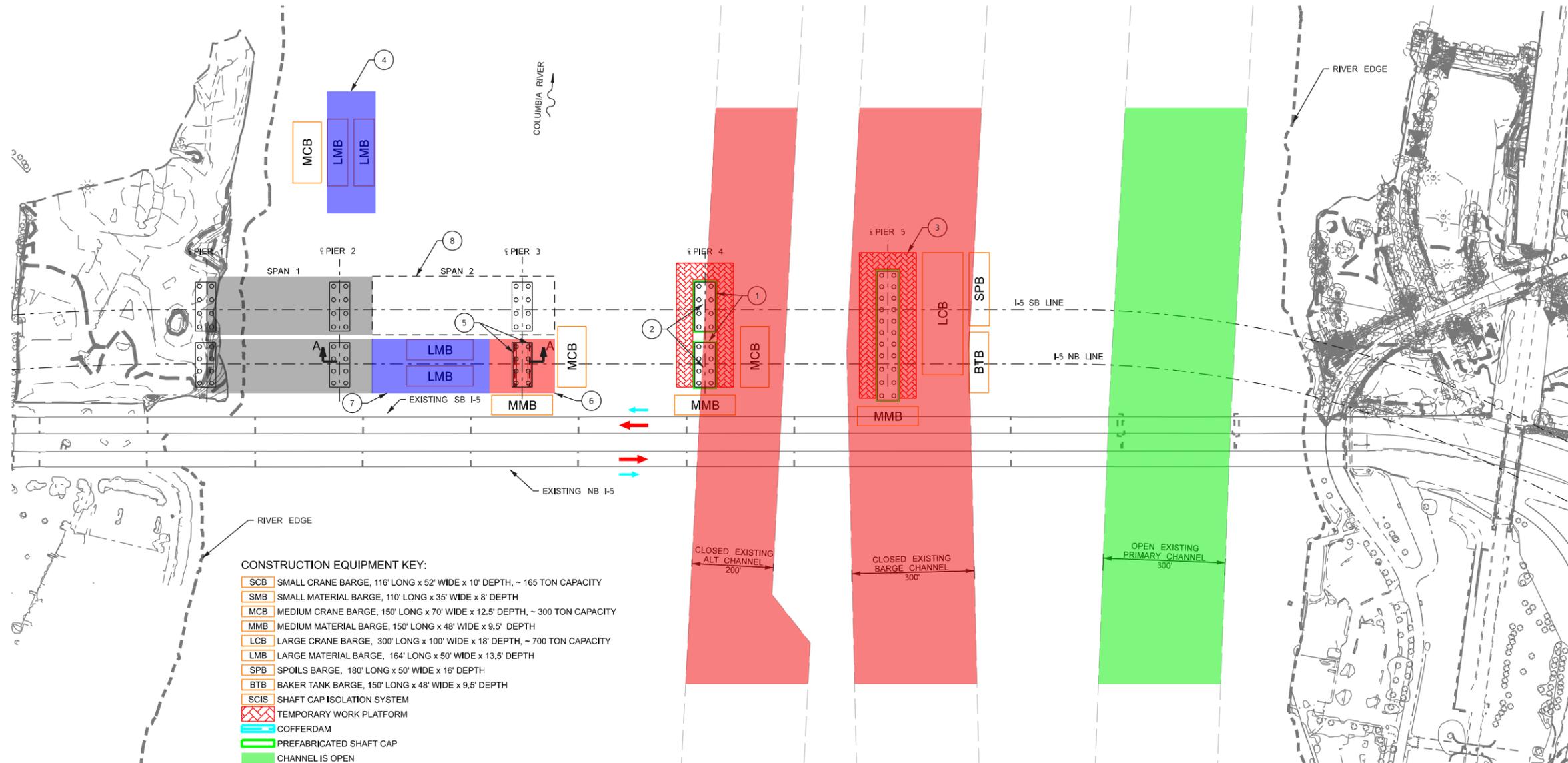
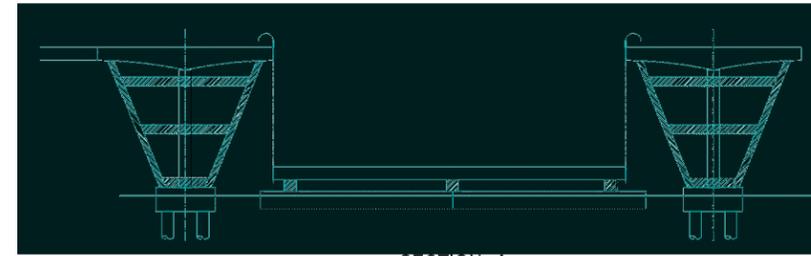
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# DRAFT



**CONSTRUCTION SEQUENCE:**

- 1 INSTALL PREFABRICATED SHAFT CAP SEGMENTS AT PIER 4 AND CONSTRUCT SHAFT CAP ISOLATION SYSTEM. CONSTRUCT NB AND SB SHAFT CAPS.
- 2 CONSTRUCT COLUMNS AND PIER CAP AT PIER 4 FOR NB AND SB STRUCTURES. REMOVE TEMPORARY PIER 4 & OPEN TEMPORARY ALTERNATE BARGE CHANNEL.
- 3 CLOSE EXISTING BARGE CHANNEL. INSTALL TEMPORARY WORKS AT PIER 5. INSTALL SHAFTS, CLEAN-OUT, INSTALL REINFORCING AND PLACE SHAFT CONCRETE FOR NB AND SB STRUCTURES.
- 4 PREASSEMBLE GIRDER PACKS FOR NB SPAN 2 ON BARGES IN STAGING NEAR SHORE.
- 5 INSTALL TEMPORARY BENTS ON THE SHAFT CAP AT EACH SIDE OF PIER 3 NB.
- 6 ERECT THE NB PIER TABLE GIRDERS AT PIER 3 ACROSS THE TEMPORARY BENTS.
- 7 STRAND JACK NB GIRDER PACKS INTO PLACE TO CLOSE SPAN 2.
- 8 REMOVE TEMPORARY BENTS FROM NB SHAFT CAP AT PIER 3 AND REPEAT PROCEDURE FOR SPAN 2 OF THE SB BRIDGE.



- CONSTRUCTION EQUIPMENT KEY:**
- SCB SMALL CRANE BARGE, 116' LONG x 52' WIDE x 10' DEPTH, ~ 165 TON CAPACITY
  - SMB SMALL MATERIAL BARGE, 110' LONG x 35' WIDE x 8' DEPTH
  - MCB MEDIUM CRANE BARGE, 150' LONG x 70' WIDE x 12.5' DEPTH, ~ 300 TON CAPACITY
  - MMB MEDIUM MATERIAL BARGE, 150' LONG x 48' WIDE x 9.5' DEPTH
  - LCB LARGE CRANE BARGE, 300' LONG x 100' WIDE x 18' DEPTH, ~ 700 TON CAPACITY
  - LMB LARGE MATERIAL BARGE, 164' LONG x 50' WIDE x 13.5' DEPTH
  - SPB SPOILS BARGE, 180' LONG x 50' WIDE x 16' DEPTH
  - BTB BAKER TANK BARGE, 150' LONG x 48' WIDE x 9.5' DEPTH
  - SCIS SHAFT CAP ISOLATION SYSTEM
  - TEMPORARY WORK PLATFORM
  - COFFERDAM
  - PREFABRICATED SHAFT CAP
  - CHANNEL IS OPEN
  - CHANNEL OPEN WITH WIDTH OR HEIGHT CONSTRAINTS
  - CHANNEL IS CLOSED
  - VEHICLE TRAFFIC
  - SHARED USE PATH

## MOVABLE-SPAN PHASE 4 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



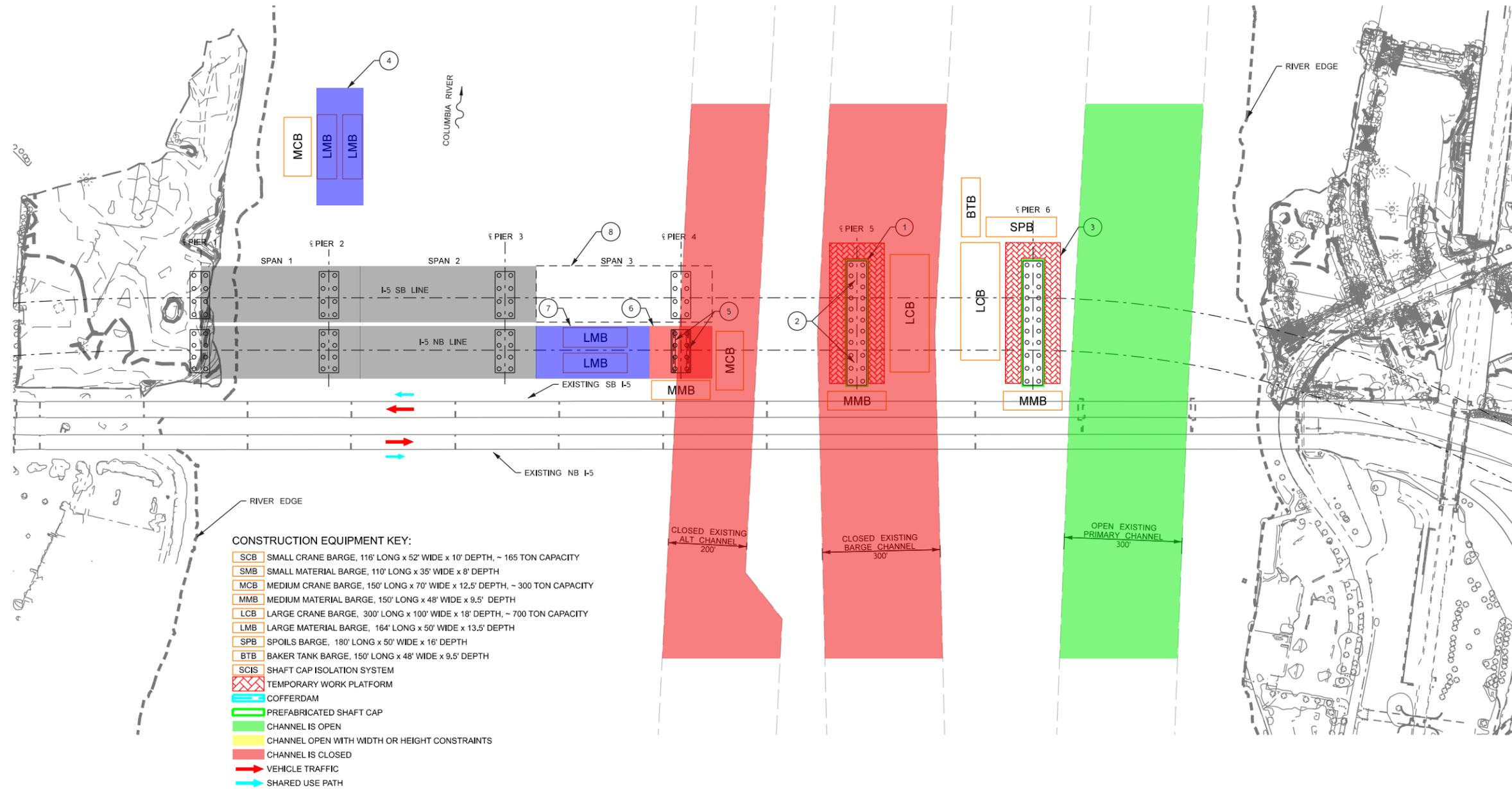
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# DRAFT



**CONSTRUCTION SEQUENCE:**

- 1 INSTALL PREFABRICATED SHAFT CAP SEGMENTS AT PIER 5 AND CONSTRUCT SHAFT CAP ISOLATION SYSTEM. CONSTRUCT NB AND SB SHAFT CAPS.
- 2 CONSTRUCT COLUMNS, PIER CAP, AND VERTICAL LIFT TOWERS FOR NB AND SB STRUCTURES AT PIER 5. REMOVE TEMPORARY WORKS.
- 3 INSTALL TEMPORARY WORKS AT PIER 6. INSTALL SHAFTS, CLEAN-OUT, INSTALL REINFORCING AND PLACE SHAFT CONCRETE FOR NB AND SB STRUCTURES.
- 4 PREASSEMBLE GIRDER PACKS FOR NB SPAN 3 ON BARGES IN STAGING NEAR THE SHORE.
- 5 INSTALL TEMPORARY BENTS ON THE SHAFT CAP AT EACH SIDE OF PIER 4 NB.
- 6 ERECT THE NB PIER TABLE GIRDERS AT PIER 4 ACROSS THE TEMPORARY BENTS.
- 7 STRAND JACK NB GIRDER PACKS INTO PLACE TO CLOSE SPAN 3.
- 8 REMOVE TEMPORARY BENTS FROM NB SHAFT CAP AT PIER 4 AND REPEAT PROCEDURE FOR SPAN 3 OF THE SB BRIDGE.



## MOVABLE-SPAN PHASE 5 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



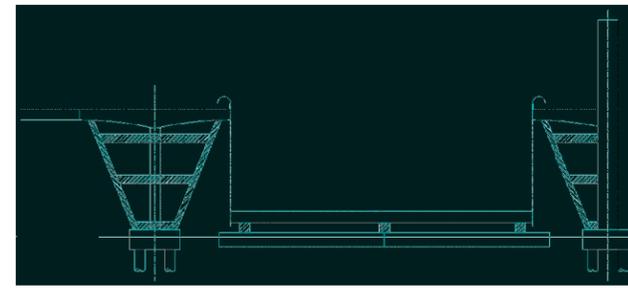
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# DRAFT



**CONSTRUCTION SEQUENCE:**

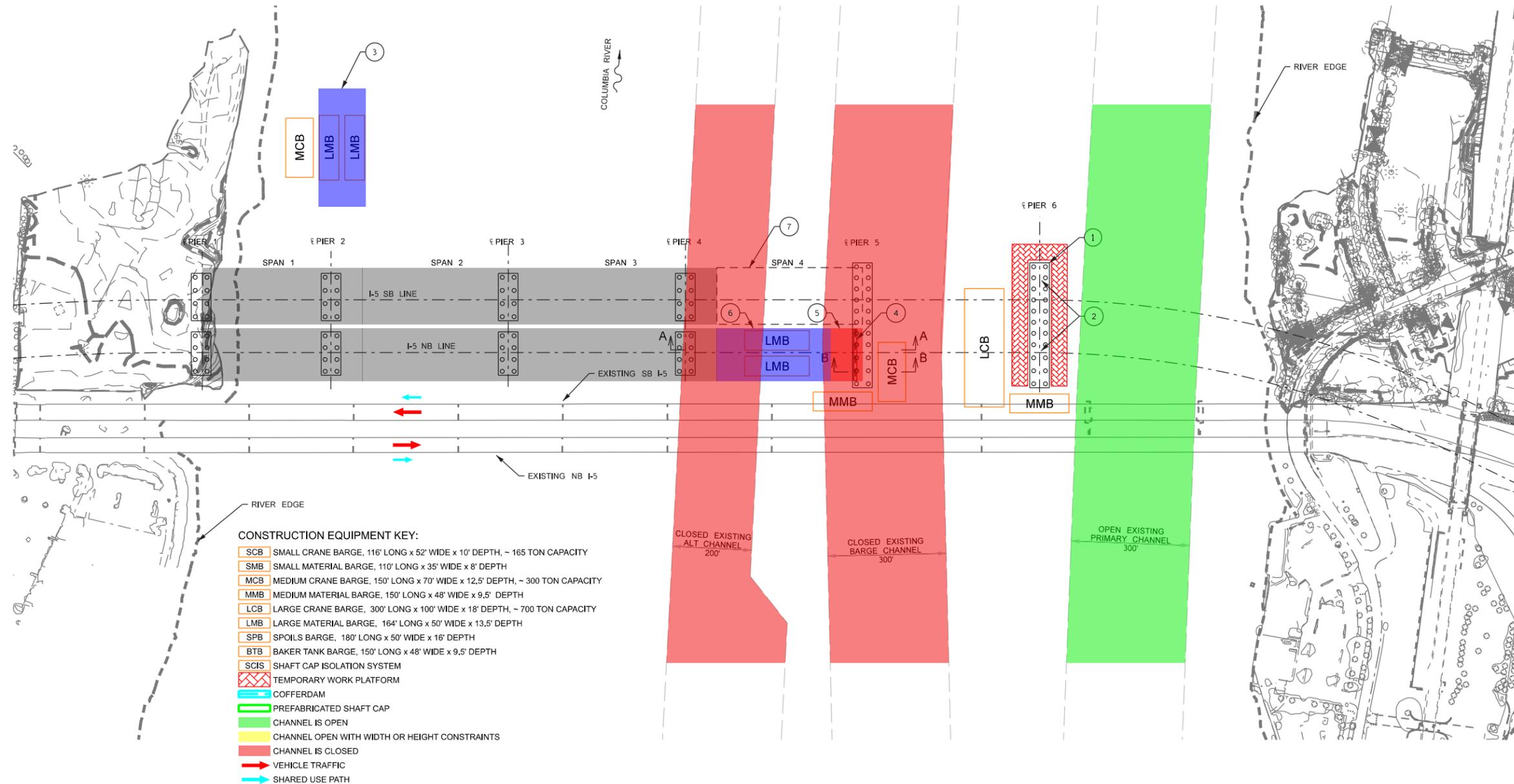
- 1 INSTALL PREFABRICATED SHAFT CAP SEGMENTS AT PIER 6 AND CONSTRUCT SHAFT CAP ISOLATION SYSTEM, CONSTRUCT NB AND SB SHAFT CAPS.
- 2 CONSTRUCT COLUMNS, PIER CAP, AND VERTICAL LIFT TOWERS FOR NB AND SB STRUCTURES AT PIER 6. REMOVE TEMPORARY WORKS.
- 3 PREASSEMBLE GIRDER PACKS FOR NB SPAN 3 ON BARGES IN STAGING NEAR THE SHORE.
- 4 INSTALL TEMPORARY BENT ON THE SHAFT CAP ON THE SOUTH SIDE OF PIER 5 NB.
- 5 ERECT THE NB GIRDER ENDS AT PIER 5 ACROSS THE TEMPORARY BENT.
- 6 STRAND JACK NB GIRDER PACKS INTO PLACE TO CLOSE SPAN 4.
- 7 REMOVE TEMPORARY BENT FROM NB SHAFT CAP AT PIER 5 AND REPEAT PROCEDURE FOR SPAN 4 OF THE SB BRIDGE.



SECTION\_A



SECTION\_B



## MOVABLE-SPAN PHASE 6 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



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# DRAFT

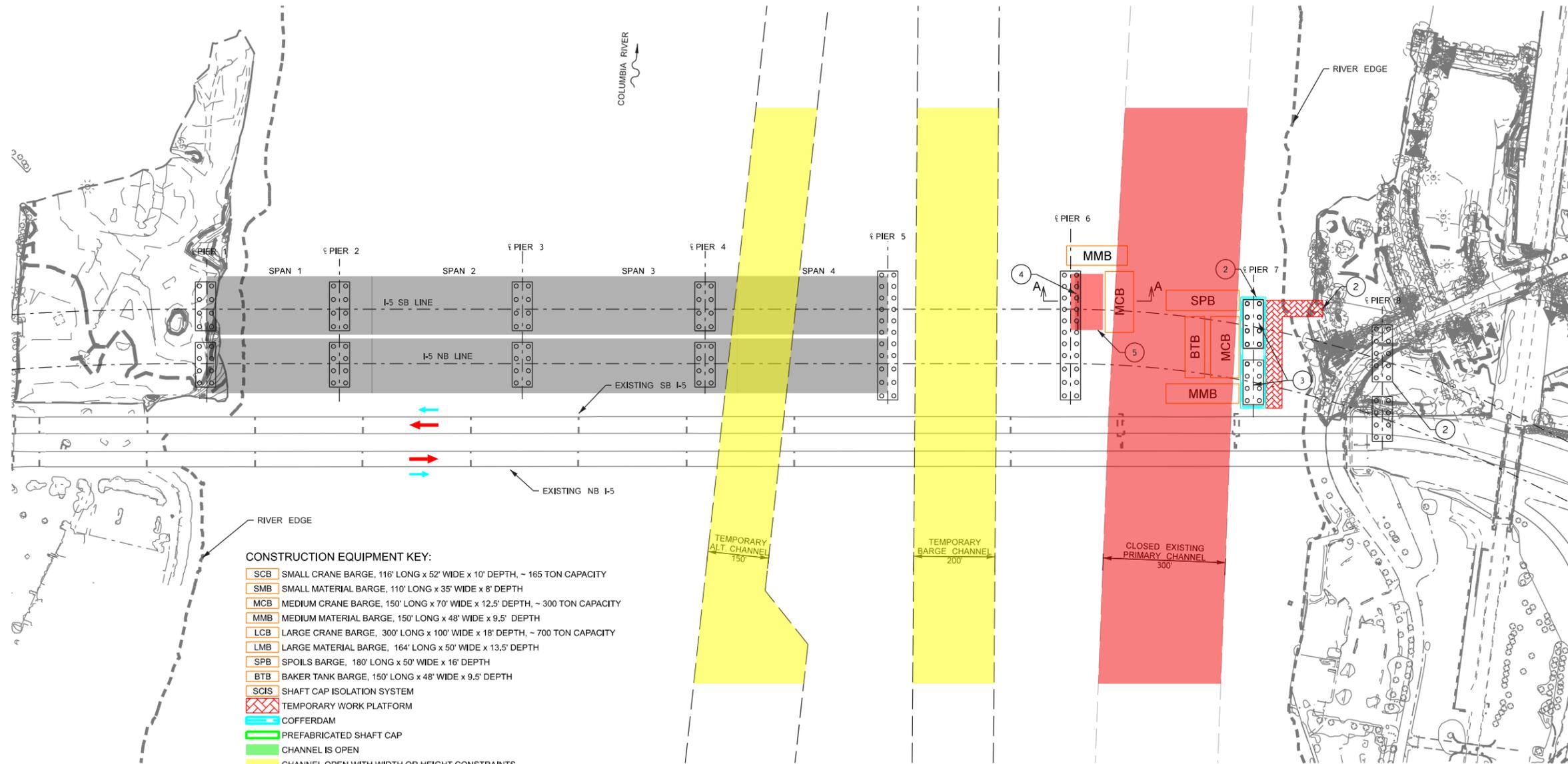


CONSTRUCTION SEQUENCE:

- ① CONSTRUCT DRILLED SHAFTS, SHAFT CAPS AND PIER AT PIER 6 SB.
- ② INSTALL COFFERDAM AND WORK BRIDGE AT PIER 7 FOR CONSTRUCTION OF NB AND SB SHAFTS AND SHAFT CAPS.
- ③ INSTALL TEMPORARY WORKS AT PIER 7, INSTALL SHAFTS, CLEAN-OUT, INSTALL REINFORCING, AND PLACE SHAFT CONCRETE FOR NB AND SB STRUCTURES. CONSTRUCT COLUMNS AND PIER CAP AT PIER 7 FOR NB AND SB STRUCTURES. REMOVE COFFERDAM AND WORK BRIDGE.
- ④ CONSTRUCT TEMPORARY BENT NEAR PIER 6 SB.
- ⑤ ERECT THE SB GIRDER ENDS AT PIER 6 ACROSS THE TEMPORARY BENT.



SECTION A



CONSTRUCTION EQUIPMENT KEY:

- SCB SMALL CRANE BARGE, 116' LONG x 52' WIDE x 10' DEPTH, ~ 165 TON CAPACITY
- SMB SMALL MATERIAL BARGE, 110' LONG x 35' WIDE x 8' DEPTH
- MCB MEDIUM CRANE BARGE, 150' LONG x 70' WIDE x 12.5' DEPTH, ~ 300 TON CAPACITY
- MMB MEDIUM MATERIAL BARGE, 150' LONG x 48' WIDE x 9.5' DEPTH
- LCB LARGE CRANE BARGE, 300' LONG x 100' WIDE x 18' DEPTH, ~ 700 TON CAPACITY
- LMB LARGE MATERIAL BARGE, 164' LONG x 50' WIDE x 13.5' DEPTH
- SPB SPOILS BARGE, 180' LONG x 50' WIDE x 16' DEPTH
- BTB BAKER TANK BARGE, 150' LONG x 48' WIDE x 9.5' DEPTH
- SCIS SHAFT CAP ISOLATION SYSTEM
- TEMPORARY WORK PLATFORM
- COFFERDAM
- PREFABRICATED SHAFT CAP
- CHANNEL IS OPEN
- CHANNEL OPEN WITH WIDTH OR HEIGHT CONSTRAINTS
- CHANNEL IS CLOSED
- VEHICLE TRAFFIC
- SHARED USE PATH

## MOVABLE-SPAN PHASE 7 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



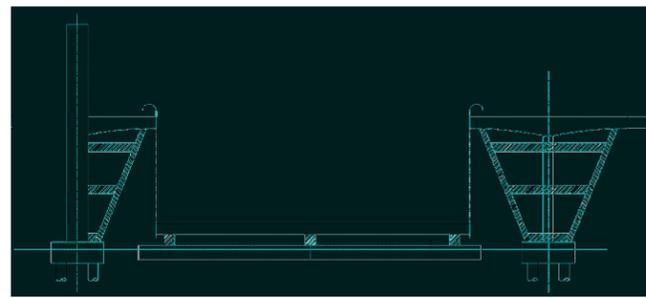
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# DRAFT

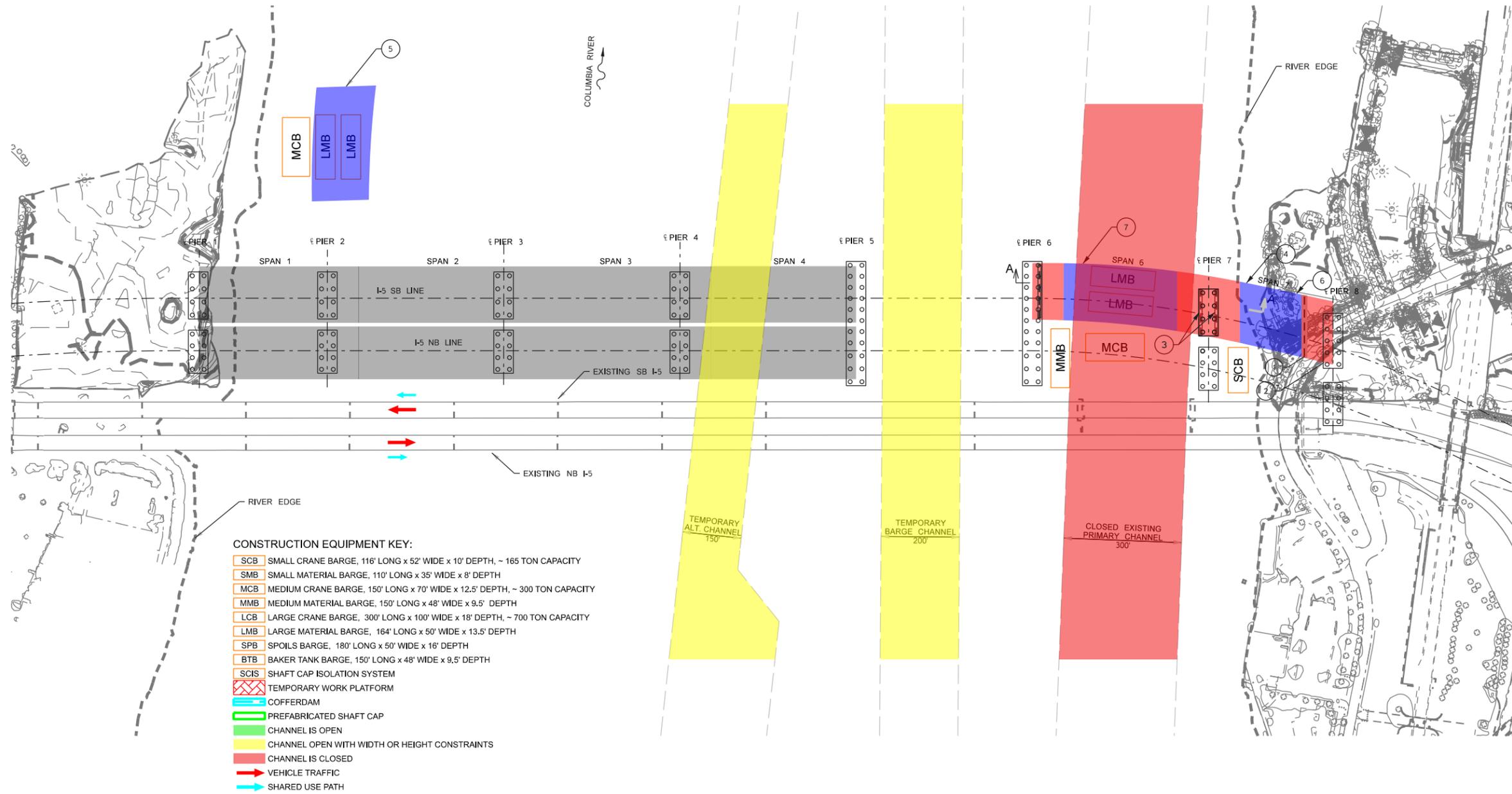


**CONSTRUCTION SEQUENCE:**

- 1 CONSTRUCT TEMPORARY BENT NEAR PIER 8 SB
- 2 ERECT THE NORTH END OF THE SB GIRDERS FROM PIER 8 ACROSS THE TEMPORARY BENT.
- 3 INSTALL TEMPORARY BENTS ON THE PILE CAP AT EACH SIDE OF PIER 7 SB.
- 4 ERECT THE SB PIER TABLE GIRDERS AT PIER 7 ACROSS TEMPORARY BENTS.
- 5 PREASSEMBLE GIRDER PACKS FOR SB SPAN 6 ON BARGES IN STAGING NEAR THE SHORE.
- 6 ERECT GIRDERS TO CLOSE SPAN 7 SB.
- 7 STRAND JACK SB GIRDER PACKS INTO PLACE TO CLOSE SPAN 6.



SECTION A



## MOVABLE-SPAN PHASE 8 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



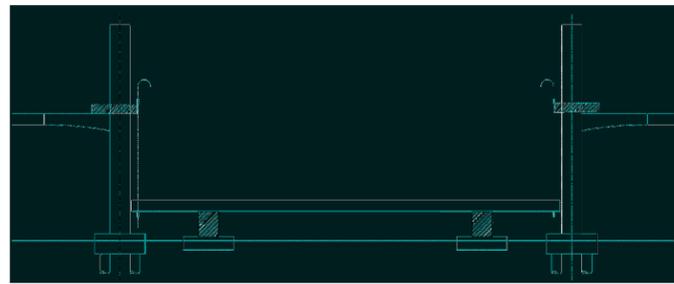
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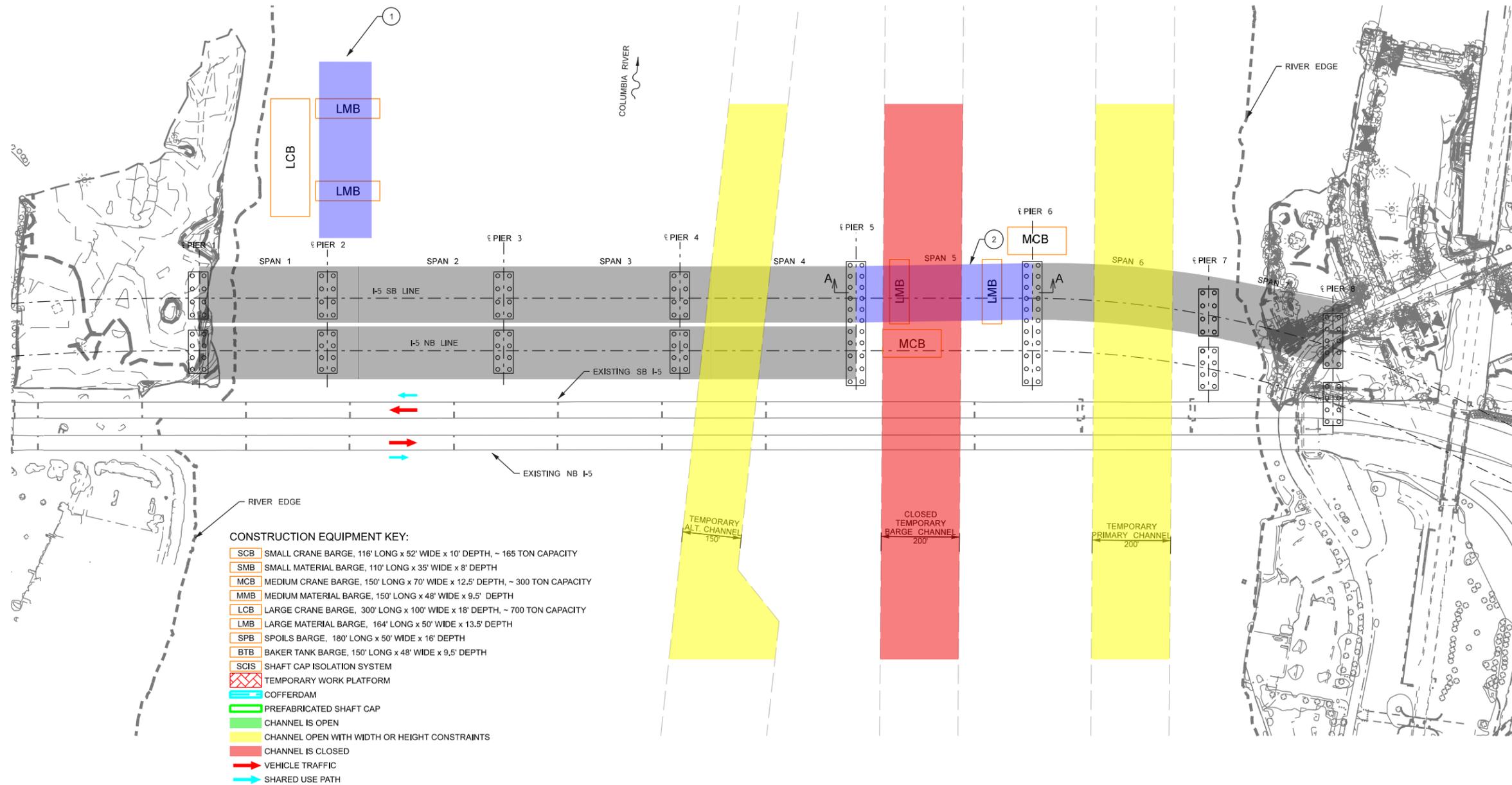


**CONSTRUCTION SEQUENCE:**

- 1 PREASSEMBLE LIFT SPAN FOR SB SPAN 5 ON BARGES IN STAGGING NEAR THE SHORE.
- 2 ERECT LIFT SPAN FOR SB SPAN 5.



SECTION\_A



## MOVABLE-SPAN PHASE 9 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



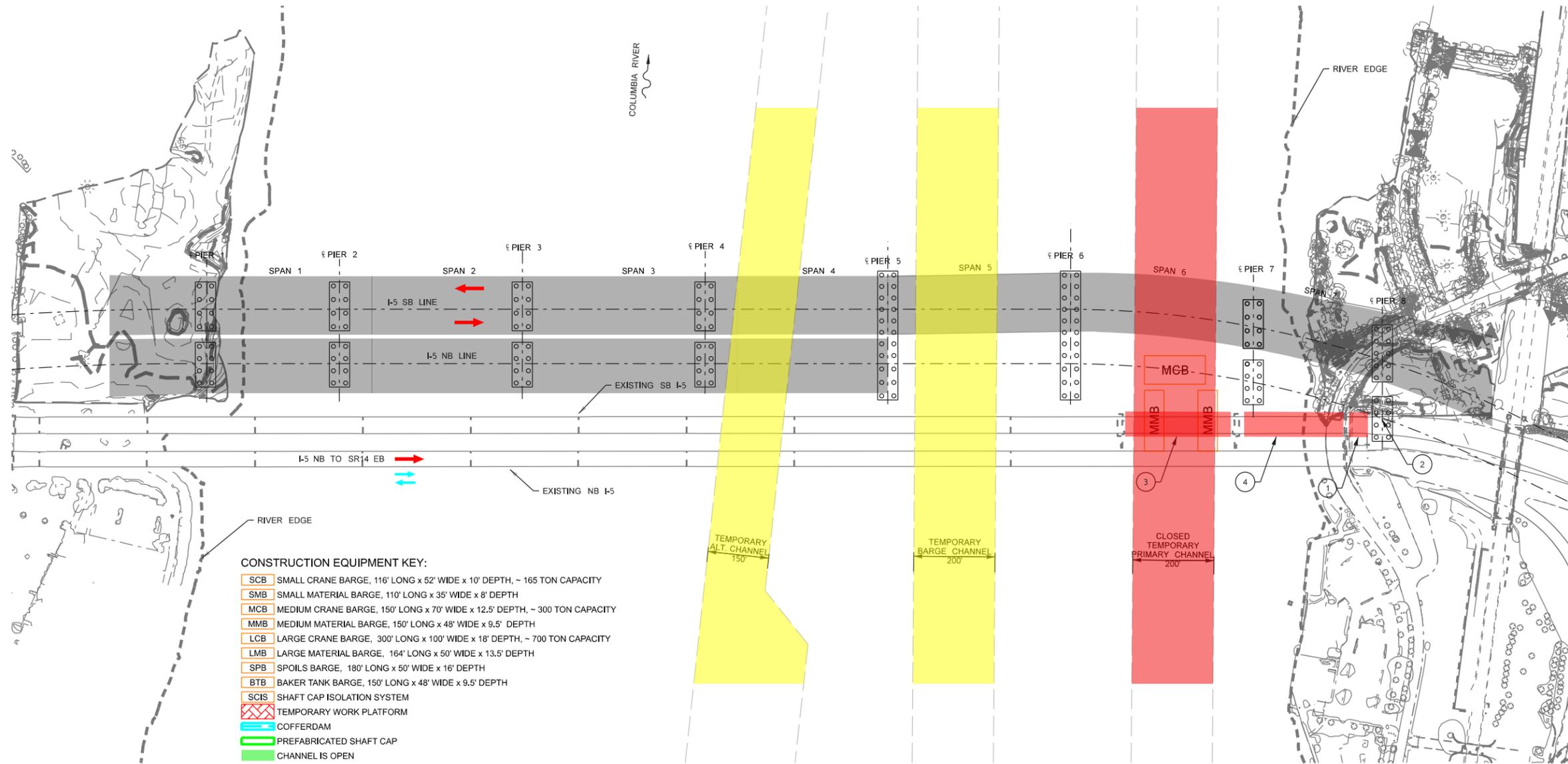
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# DRAFT



**CONSTRUCTION SEQUENCE:**

- 1 REMOVE SPAN 1 SB OF EXISTING STRUCTURE.
- 2 CONSTRUCT DRILLED SHAFTS, SHAFT CAPS AND PIER AT PIER 8 NB.
- 3 REMOVE COUNTERWEIGHTS EXISTING SB LIFT SPAN, REMOVE EXISTING SB LIFT SPAN.
- 4 REMOVE SPAN 2 SB OF EXISTING STRUCTURE, EXISTING PIER 2 TO REMAIN.



**CONSTRUCTION EQUIPMENT KEY:**

- SCB SMALL CRANE BARGE, 116' LONG x 52' WIDE x 10' DEPTH, ~ 165 TON CAPACITY
- SMB SMALL MATERIAL BARGE, 110' LONG x 35' WIDE x 8' DEPTH
- MCB MEDIUM CRANE BARGE, 150' LONG x 70' WIDE x 12.5' DEPTH, ~ 300 TON CAPACITY
- MMB MEDIUM MATERIAL BARGE, 150' LONG x 48' WIDE x 9.5' DEPTH
- LCB LARGE CRANE BARGE, 300' LONG x 100' WIDE x 18' DEPTH, ~ 700 TON CAPACITY
- LMB LARGE MATERIAL BARGE, 164' LONG x 50' WIDE x 13.5' DEPTH
- SPB SPOILS BARGE, 180' LONG x 50' WIDE x 16' DEPTH
- BTB BAKER TANK BARGE, 150' LONG x 48' WIDE x 9.5' DEPTH
- SCIS SHAFT CAP ISOLATION SYSTEM
- TEMPORARY WORK PLATFORM
- COFFERDAM
- PREFABRICATED SHAFT CAP
- CHANNEL IS OPEN
- CHANNEL OPEN WITH WIDTH OR HEIGHT CONSTRAINTS
- CHANNEL IS CLOSED
- VEHICLE TRAFFIC
- SHARED USE PATH

**MOVABLE-SPAN PHASE 10  
COLUMBIA RIVER BRIDGES  
CONSTRUCTION SEQUENCE**



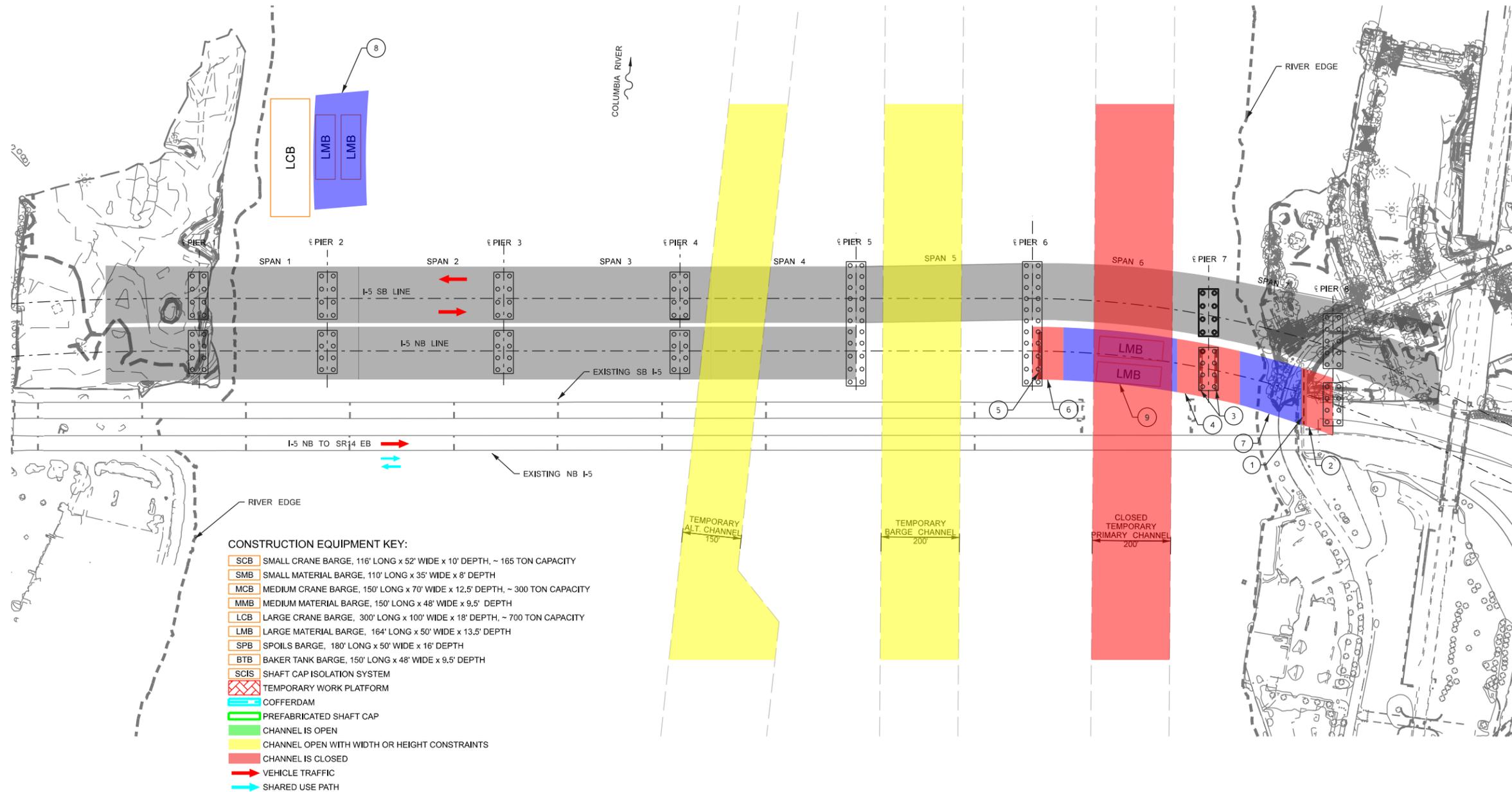
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# DRAFT



**CONSTRUCTION SEQUENCE:**

- 1 CONSTRUCT TEMPORARY BENT NEAR PIER 8 NB.
- 2 ERECT THE NORTH END OF THE NB GIRDERS FROM PIER 8 ACROSS THE TEMPORARY BENT.
- 3 INSTALL TEMPORARY BENTS ON THE PILE CAP AT EACH SIDE OF PIER 7 NB.
- 4 ERECT THE NB PIER TABLE GIRDERS AT PIER 7 ACROSS THE TEMPORARY BENTS.
- 5 CONSTRUCT TEMPORARY BENT NEAR PIER 6 NB.
- 6 ERECT THE NB GIRDER ENDS AT PIER 6 ACROSS THE TEMPORARY BENT.
- 7 ERECT GIRDERS TO CLOSE SPAN 7 NB.
- 8 PREASSEMBLE GIRDER PACKS FOR NB SPAN 6 ON BARGES IN STAGGING NEAR THE SHORE.
- 9 STRAND JACK NB GIRDER PACKS INTO PLACE TO CLOSE SPAN 6.



## MOVABLE-SPAN PHASE 11 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



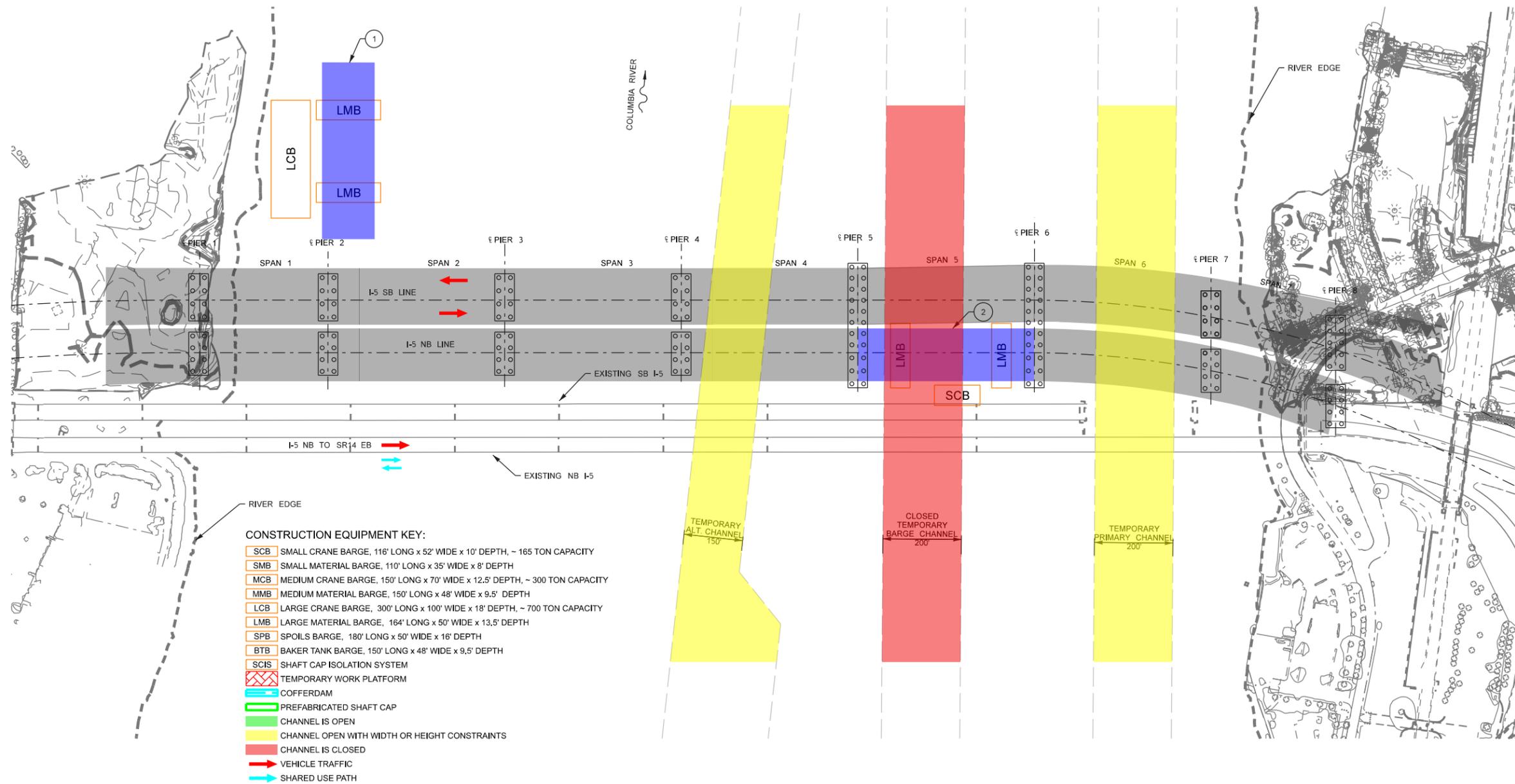
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# DRAFT



CONSTRUCTION SEQUENCE:

- ① PREASSEMBLE LIFT SPAN FOR NB SPAN 5 ON BARGES IN STAGING NEAR THE SHORE.
- ② ERECT LIFT SPAN FOR NB SPAN 5.



## MOVABLE-SPAN PHASE 12 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



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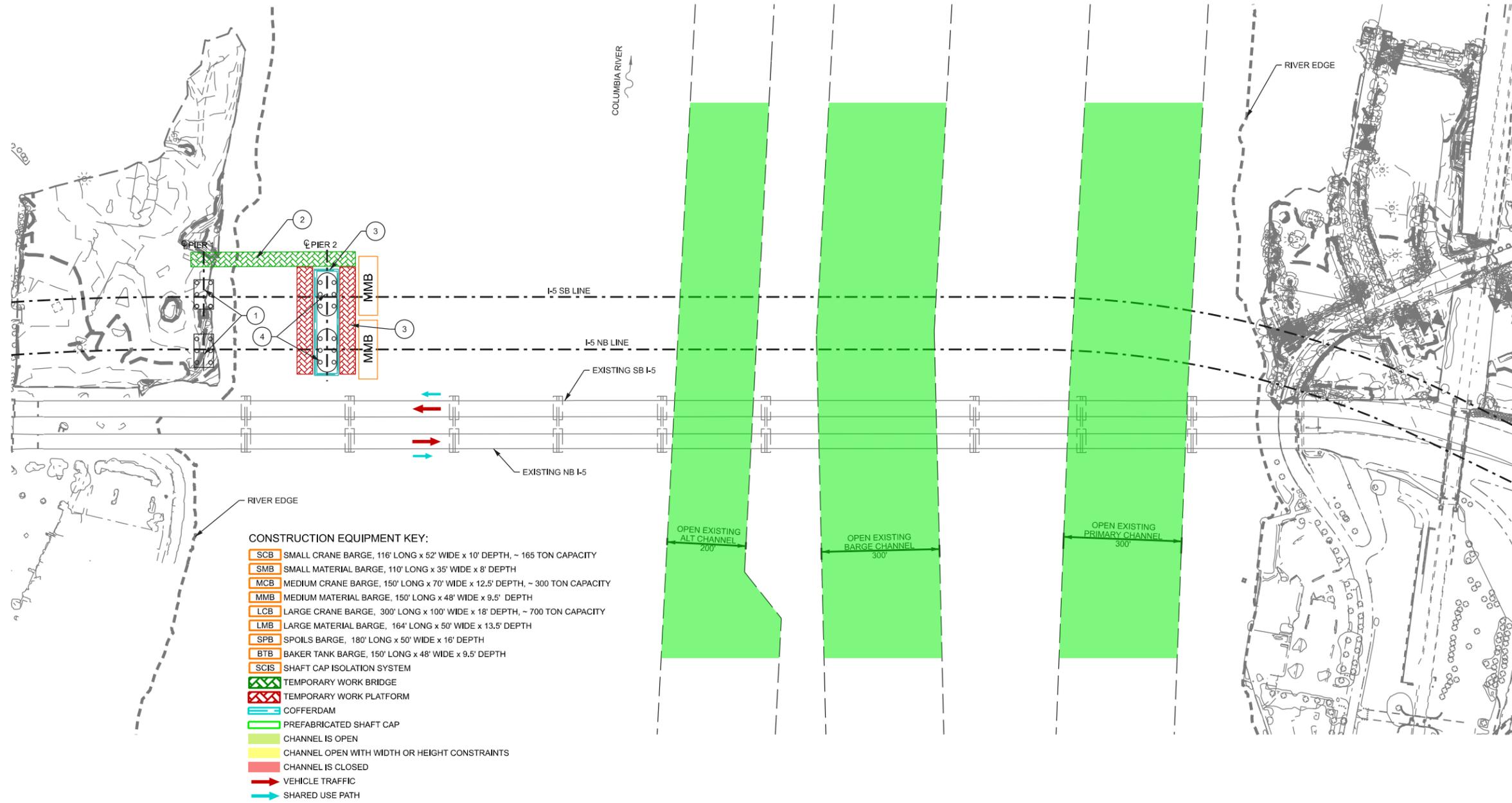
1 **APPENDIX D: COLUMBIA RIVER BRIDGES**  
2 **CONSTRUCTION SEQUENCE: FIXED-SPAN**  
3 **CONFIGURATION**

# DRAFT



**CONSTRUCTION SEQUENCE:**

- 1 CONSTRUCT DRILLED SHAFTS, SHAFT CAPS AND PIER AT PIER 1.
- 2 CONSTRUCT TEMPORARY TRUSSLE BRIDGE.
- 3 INSTALL COFFERDAM AND WORK BRIDGE AT PIER 2 FOR CONSTRUCTION OF NB AND SB SHAFTS AND SHAFT CAPS.
- 4 INSTALL TEMPORARY WORKS AT PIER 2, INSTALL SHAFTS, CLEAN-OUT, INSTALL REINFORCING, AND PLACE SHAFT CONCRETE FOR NB AND SB STRUCTURES.



## FIXED-SPAN PHASE 1 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



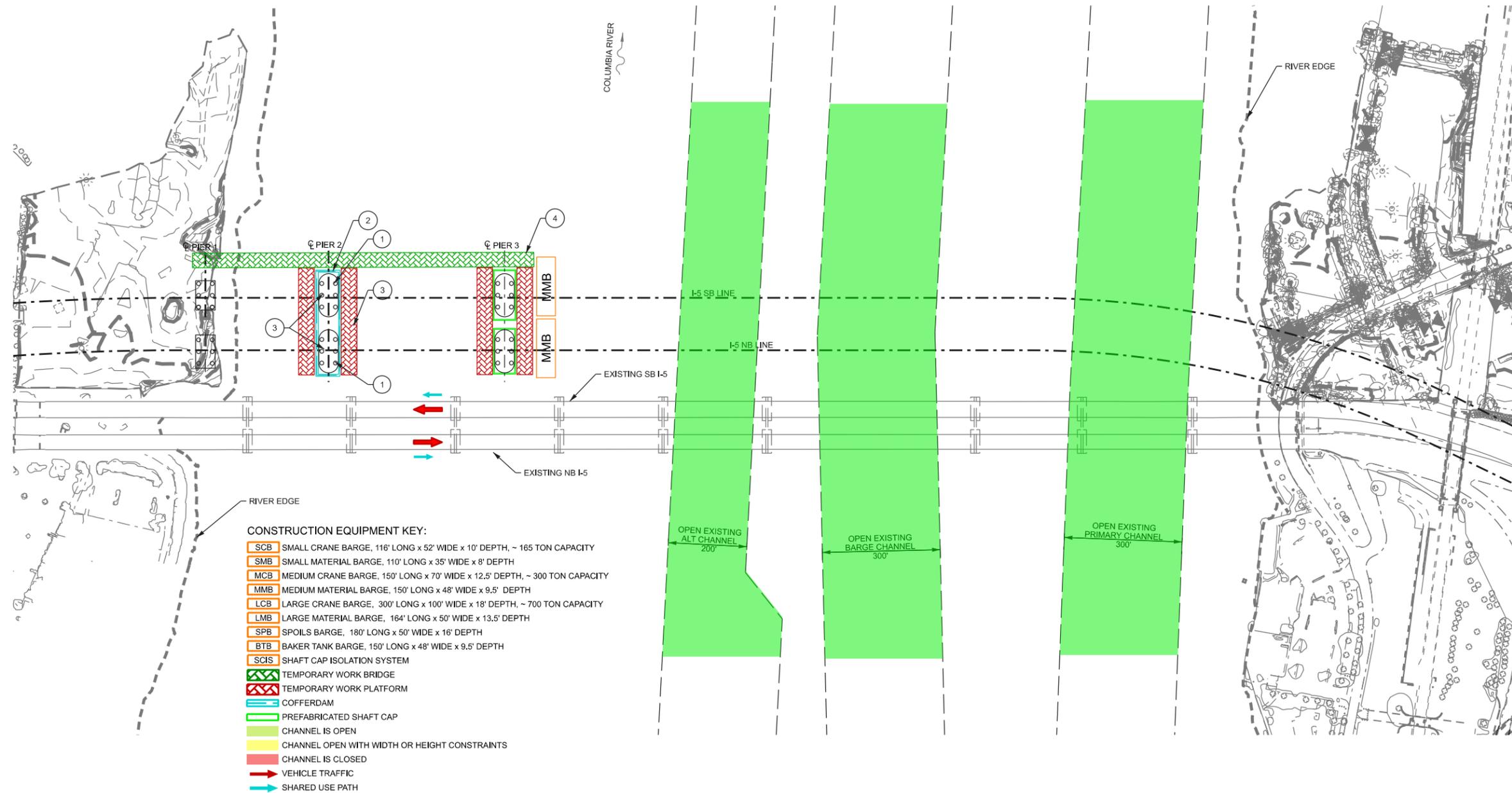
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# DRAFT



**CONSTRUCTION SEQUENCE:**

- 1 CONSTRUCT NB AND SB SHAFT CAPS AT PIER 2.
- 2 REMOVE COFFERDAM AT PIER 2.
- 3 CONSTRUCT COLUMNS AND PIER CAP AT PIER 2 FOR NB AND SB STRUCTURES. REMOVE WORK BRIDGE.
- 4 INSTALL TEMPORARY WORKS AT PIER 3. INSTALL SHAFTS, CLEAN-OUT, INSTALL REINFORCING AND PLACE SHAFT CONCRETE FOR NB AND SB STRUCTURES.



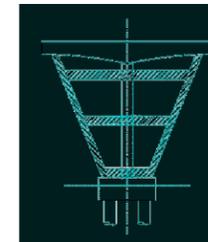
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# DRAFT

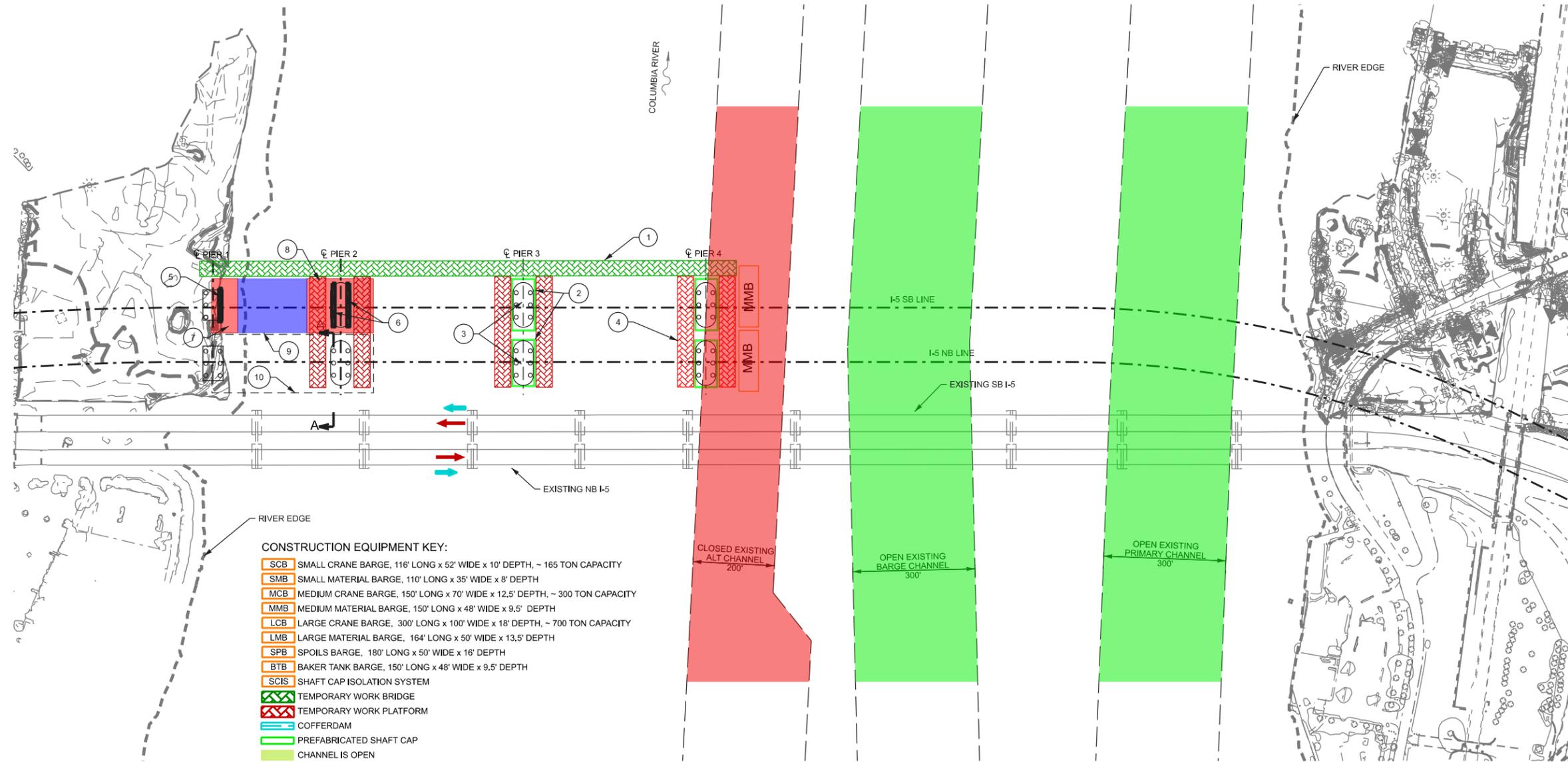


**CONSTRUCTION SEQUENCE:**

- 1 EXPAND TEMPORARY TRUSSLE TO PIER 4.
- 2 INSTALL PREFABRICATED SHAFT CAP SEGMENTS AT PIER 3 AND CONSTRUCT SHAFT CAP ISOLATION SYSTEM. CONSTRUCT NB AND SB SHAFT CAPS.
- 3 CONSTRUCT COLUMNS AND PIER CAP AT PIER 3 FOR NB AND SB STRUCTURES. REMOVE TEMPORARY WORKS.
- 4 INSTALL TEMPORARY WORKS AT PIER 4, INSTALL SHAFTS, CLEAN-OUT, INSTALL REINFORCING, AND PLACE SHAFT CONCRETE FOR NB AND SB STRUCTURES.
- 5 CONSTRUCT TEMPORARY BENT NEAR PIER 1 SB.
- 6 INSTALL TEMPORARY BENTS ON THE PILE CAP AT EACH SIDE OF PIER 2 SB.
- 7 ERECT THE SOUTH END OF THE SB GIRDERS FROM PIER 1 ACROSS THE TEMPORARY BENT.
- 8 ERECT THE SB PIER TABLE GIRDERS AT PIER 2 ACROSS THE TEMPORARY BENTS.
- 9 STRAND JACK SB GIRDER PACKS INTO PLACE TO CLOSE SPAN 1.
- 10 REMOVE TEMPORARY BENTS FOR SB BRIDGE AND REPEAT PROCEDURE FOR SPAN 1 OF THE NB BRIDGE



SECTION A



**CONSTRUCTION EQUIPMENT KEY:**

- SCB SMALL CRANE BARGE, 116' LONG x 52' WIDE x 10' DEPTH, ~ 165 TON CAPACITY
- SMB SMALL MATERIAL BARGE, 110' LONG x 35' WIDE x 8' DEPTH
- MCB MEDIUM CRANE BARGE, 150' LONG x 70' WIDE x 12.5' DEPTH, ~ 300 TON CAPACITY
- MMB MEDIUM MATERIAL BARGE, 150' LONG x 48' WIDE x 9.5' DEPTH
- LCB LARGE CRANE BARGE, 300' LONG x 100' WIDE x 18' DEPTH, ~ 700 TON CAPACITY
- LMB LARGE MATERIAL BARGE, 164' LONG x 50' WIDE x 13.5' DEPTH
- SPB SPOILS BARGE, 180' LONG x 50' WIDE x 16' DEPTH
- BTB BAKER TANK BARGE, 150' LONG x 48' WIDE x 9.5' DEPTH
- SCIS SHAFT CAP ISOLATION SYSTEM
- TEMPORARY WORK BRIDGE
- TEMPORARY WORK PLATFORM
- COFFERDAM
- PREFABRICATED SHAFT CAP
- CHANNEL IS OPEN
- CHANNEL OPEN WITH WIDTH OR HEIGHT CONSTRAINTS
- CHANNEL IS CLOSED
- VEHICLE TRAFFIC
- SHARED USE PATH

## FIXED-SPAN PHASE 3 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



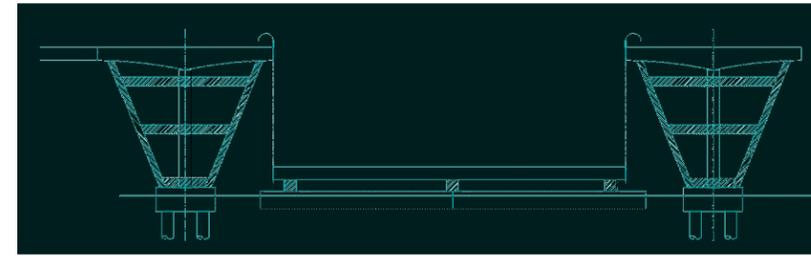
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# DRAFT

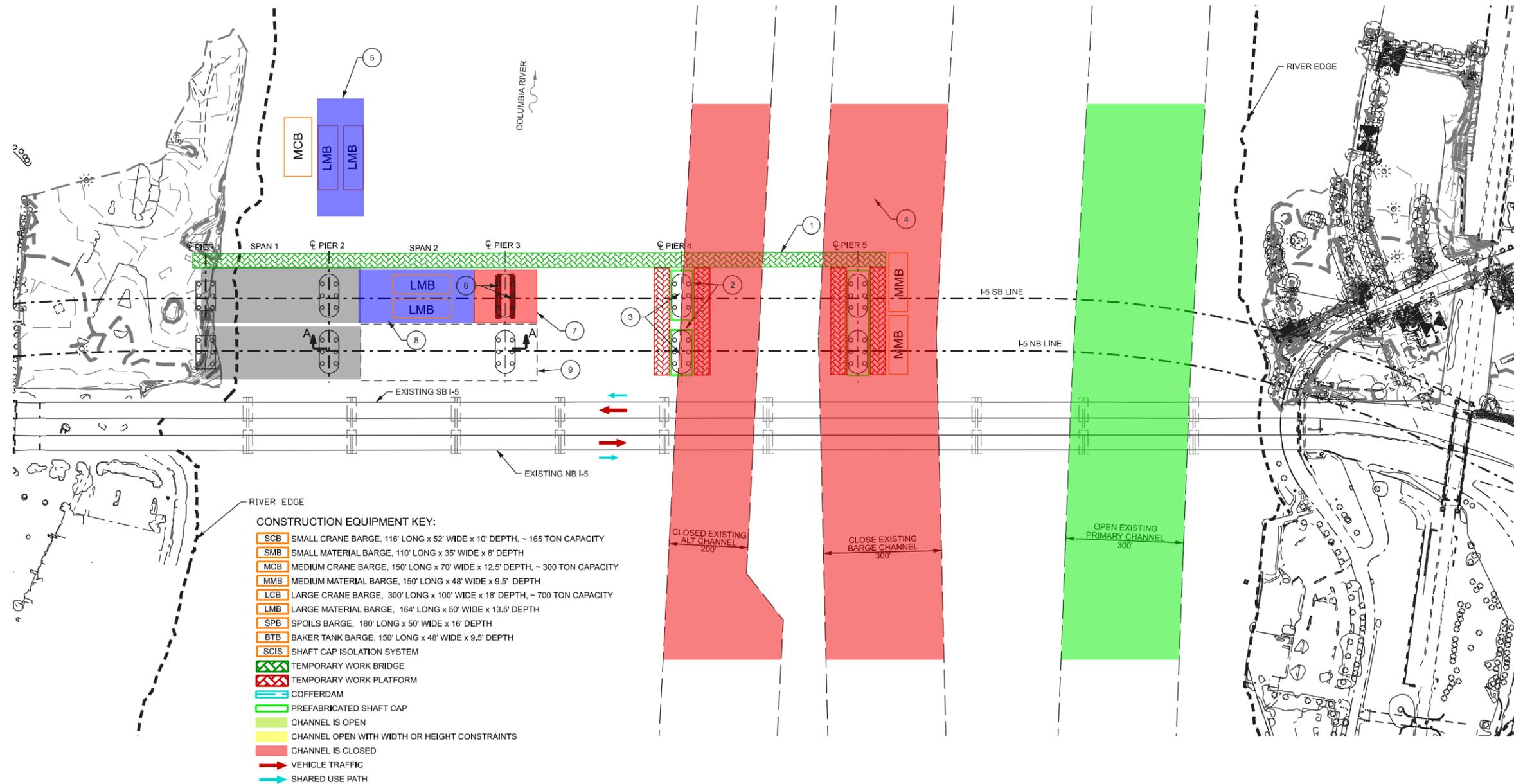


**CONSTRUCTION SEQUENCE:**

- 1 EXPAND TEMPORARY TRUSSLE TO PIER 5.
- 2 INSTALL PREFABRICATED SHAFT CAP SEGMENTS AT PIER 4 AND CONSTRUCT SHAFT CAP ISOLATION SYSTEM. CONSTRUCT NB AND SB SHAFT CAPS.
- 3 CONSTRUCT COLUMNS AND PIER CAP AT PIER 4 FOR NB AND SB STRUCTURES. REMOVE TEMPORARY PIER 4 & OPEN TEMPORARY ALTERNATE BARGE CHANNEL.
- 4 CLOSE EXISTING BARGE CHANNEL. INSTALL TEMPORARY WORKS AT PIER 5. INSTALL SHAFTS, CLEAN-OUT, INSTALL REINFORCING AND PLACE SHAFT CONCRETE FOR NB AND SB STRUCTURES.
- 5 PREASSEMBLE GIRDER PACKS FOR SB SPAN 2 ON BARGES IN STAGING NEAR SHORE.
- 6 INSTALL TEMPORARY BENTS ON THE SHAFT CAP AT EACH SIDE OF PIER 3 SB.
- 7 ERECT THE SB PIER TABLE GIRDERS AT PIER 3 ACROSS THE TEMPORARY BENTS.
- 8 STRAND JACK SB GIRDER PACKS INTO PLACE TO CLOSE SPAN 2.
- 9 REMOVE TEMPORARY BENTS FROM SB SHAFT CAP AT PIER 3 AND REPEAT PROCEDURE FOR SPAN 2 OF THE NB BRIDGE.



SECTION A



## FIXED-SPAN PHASE 4 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



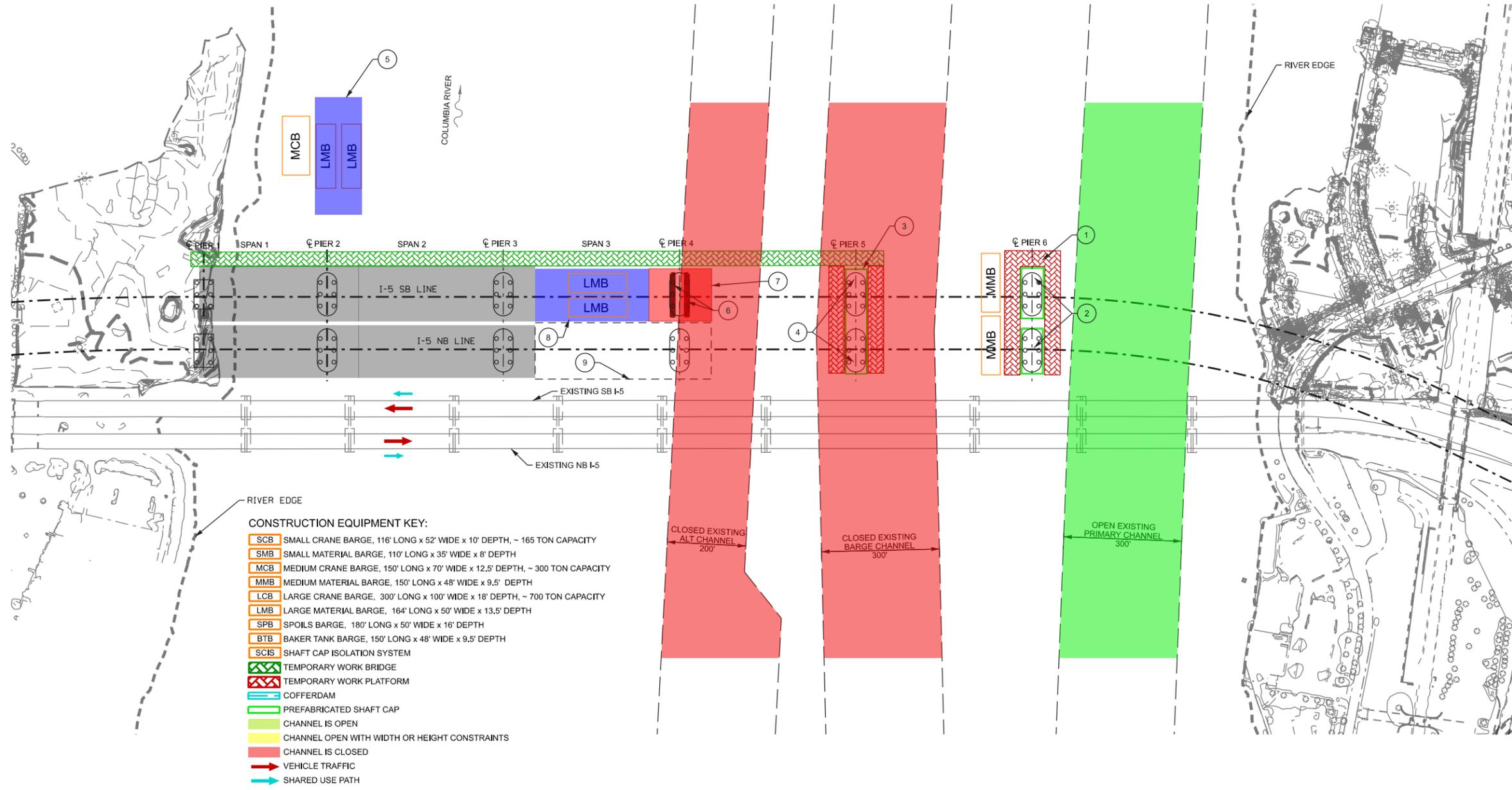
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# DRAFT



**CONSTRUCTION SEQUENCE:**

- 1 INSTALL PREFABRICATED SHAFT CAP SEGMENTS AT PIER 6 AND CONSTRUCT SHAFT CAP ISOLATION SYSTEM. CONSTRUCT NB AND SB SHAFT CAPS.
- 2 CONSTRUCT COLUMNS, PIER CAP, AND VERTICAL LIFT TOWERS FOR NB AND SB STRUCTURES AT PIER 6. REMOVE TEMPORARY WORKS.
- 3 INSTALL PREFABRICATED SHAFT CAP SEGMENTS AT PIER 5 AND CONSTRUCT SHAFT CAP ISOLATION SYSTEM. CONSTRUCT NB AND SB SHAFT CAPS. CONSTRUCT DRILLED SHAFTS, SHAFT CAPS AND PIER AT PIER 8 SB.
- 4 CONSTRUCT COLUMNS, PIER CAP, AND VERTICAL LIFT TOWERS FOR NB AND SB STRUCTURES AT PIER 5. REMOVE TEMPORARY WORKS.
- 5 PREASSEMBLE GIRDER PACKS FOR SB SPAN 3 ON BARGES IN STAGING NEAR THE SHORE.
- 6 INSTALL TEMPORARY BENTS ON THE SHAFT CAP AT EACH SIDE OF PIER 4 SB.
- 7 ERECT THE SB PIER TABLE GIRDERS AT PIER 4 ACROSS THE TEMPORARY BENTS.
- 8 STRAND JACK SB GIRDER PACKS INTO PLACE TO CLOSE SPAN 3.
- 9 REMOVE TEMPORARY BENTS FROM SB SHAFT CAP AT PIER 4 AND REPEAT PROCEDURE FOR SPAN 3 OF THE NB BRIDGE.



## FIXED-SPAN PHASE 5 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



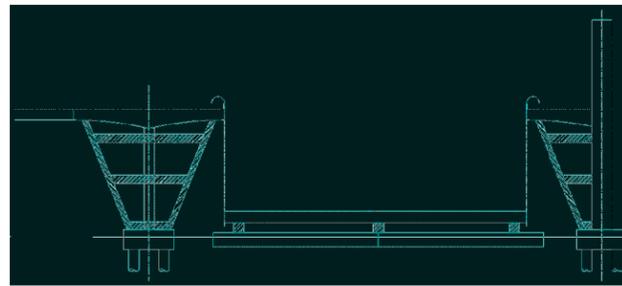
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# DRAFT



**CONSTRUCTION SEQUENCE:**

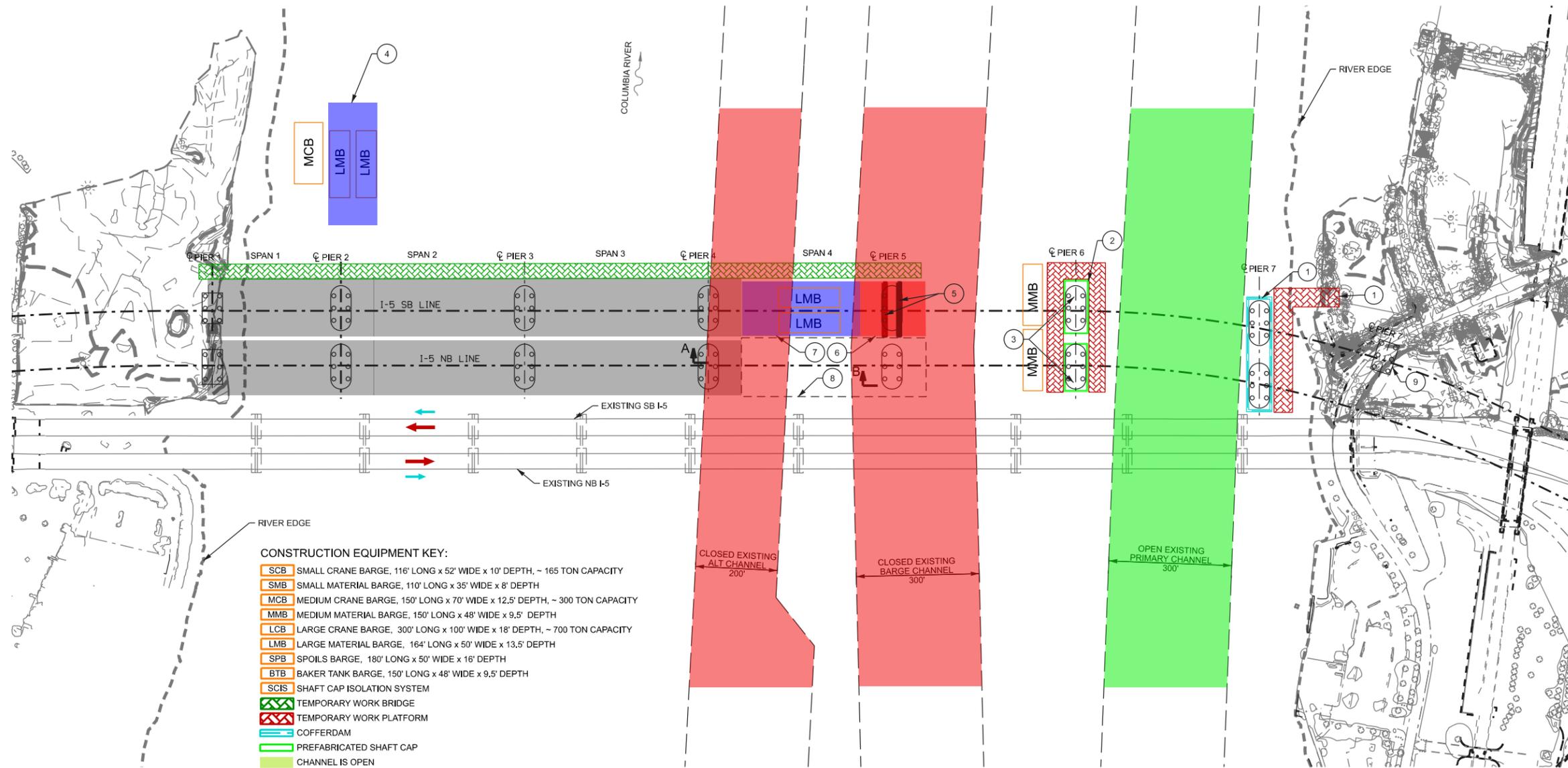
- 1 INSTALL COFFERDAM AND WORK BRIDGE AT PIER 7 FOR CONSTRUCTION OF NB AND SB SHAFTS AND SHAFT CAP.
- 2 INSTALL PREFABRICATED SHAFT CAP SEGMENTS AT PIER 6 AND CONSTRUCT SHAFT CAP ISOLATION SYSTEM. CONSTRUCT NB AND SB SHAFT CAPS.
- 3 CONSTRUCT COLUMNS, PIER CAP, AND VERTICAL LIFT TOWERS FOR NB AND SB STRUCTURES AT PIER 5. REMOVE TEMPORARY WORKS.
- 4 PREASSEMBLE GIRDER PACKS FOR SB SPAN 3 ON BARGES IN STAGING NEAR THE SHORE.
- 5 INSTALL TEMPORARY BENTS ON THE SHAFT CAP ON THE SOUTH SIDE OF PIER 5 SB.
- 6 ERECT THE SB GIRDER ENDS AT PIER 5 ACROSS THE TEMPORARY BENT.
- 7 STRAND JACK SB GIRDER PACKS INTO PLACE TO CLOSE SPAN 4.
- 8 REMOVE TEMPORARY BENT FROM SB SHAFT CAP AT PIER 5 AND REPEAT PROCEDURE FOR SPAN 4 OF THE NB BRIDGE.
- 9 CONSTRUCT SHAFT AND SHAFT CAP FOR PIER 8 SB.



SECTION A



SECTION B



**CONSTRUCTION EQUIPMENT KEY:**

- SCB SMALL CRANE BARGE, 116' LONG x 52' WIDE x 10' DEPTH, ~ 165 TON CAPACITY
- SMB SMALL MATERIAL BARGE, 110' LONG x 35' WIDE x 8' DEPTH
- MCB MEDIUM CRANE BARGE, 150' LONG x 70' WIDE x 12.5' DEPTH, ~ 300 TON CAPACITY
- MMB MEDIUM MATERIAL BARGE, 150' LONG x 48' WIDE x 9.5' DEPTH
- LCB LARGE CRANE BARGE, 300' LONG x 100' WIDE x 18' DEPTH, ~ 700 TON CAPACITY
- LMB LARGE MATERIAL BARGE, 164' LONG x 50' WIDE x 13.5' DEPTH
- SPB SPOILS BARGE, 180' LONG x 50' WIDE x 16' DEPTH
- BTB BAKER TANK BARGE, 150' LONG x 48' WIDE x 9.5' DEPTH
- SCIS SHAFT CAP ISOLATION SYSTEM
- TEMPORARY WORK BRIDGE
- TEMPORARY WORK PLATFORM
- COFFERDAM
- PREFABRICATED SHAFT CAP
- CHANNEL IS OPEN
- CHANNEL OPEN WITH WIDTH OR HEIGHT CONSTRAINTS
- CHANNEL IS CLOSED
- VEHICLE TRAFFIC
- SHARED USE PATH

## FIXED-SPAN PHASE 6 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



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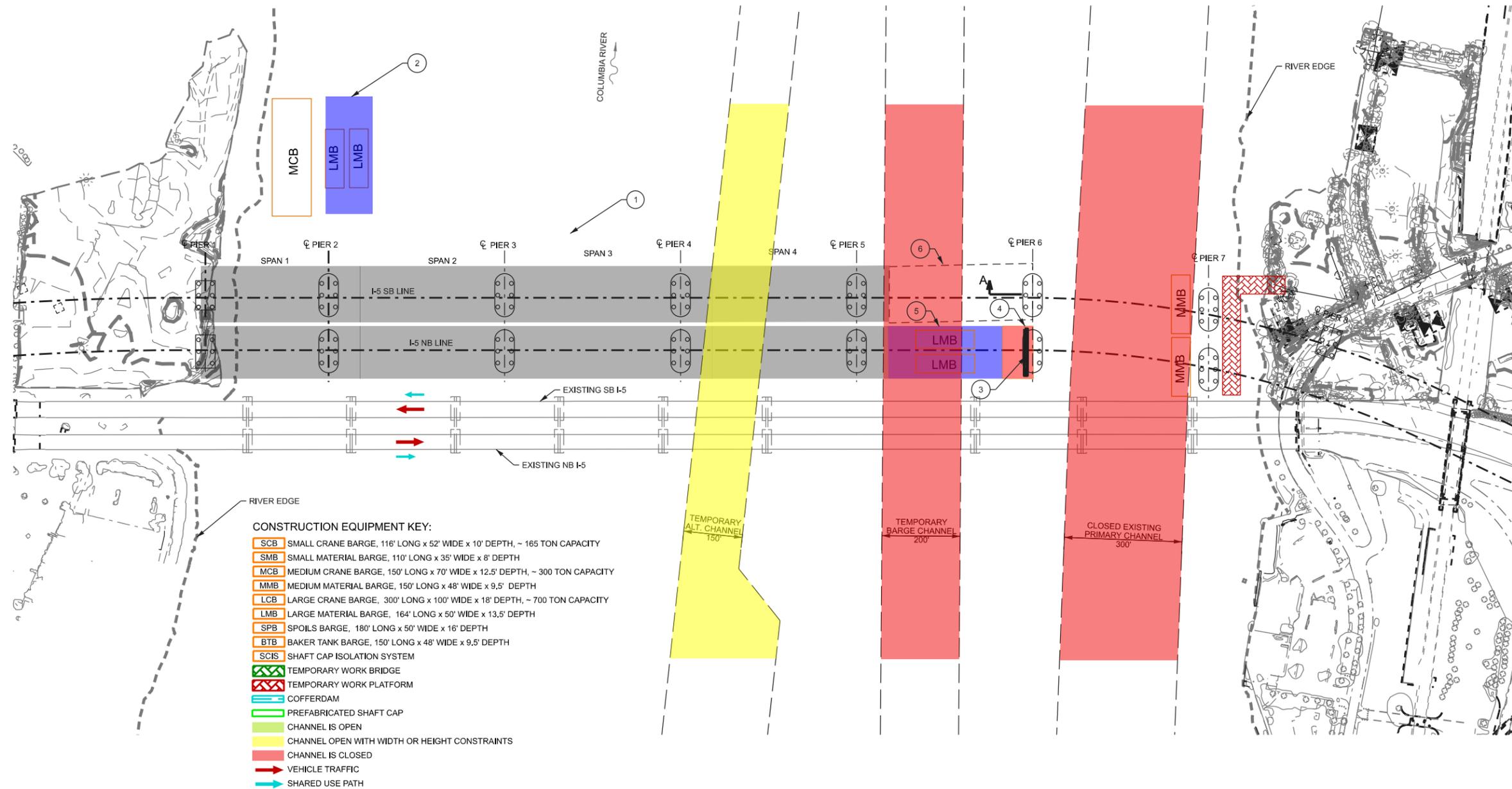


CONSTRUCTION SEQUENCE:

- 1 REMOVE TEMPORARY TRUSS BRIDGE.
- 2 PREASSEMBLE GIRDER PACKS FOR NB SPAN 5 OF BARGES IN STAGING NEAR THE SHORE.
- 3 INSTALL TEMPORARY BENTS ON SHAFT CAPS ON PIER 6 NB.
- 4 ERECT THE NB GIRDER ENDS AT PIER 6 ACROSS THE TEMPORARY BENT.
- 5 STRAND JACK NB GIRDER PACKS INTO PLACE TO CLOSE SPAN 5.
- 6 REMOVE TEMPORARY BENT FROM NB SHAFT CAP AT PIER 6 AND REPEAT PROCEDURE FOR SPAN 5 OF THE SB BRIDGE.



SECTION A



## FIXED-SPAN PHASE 7 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



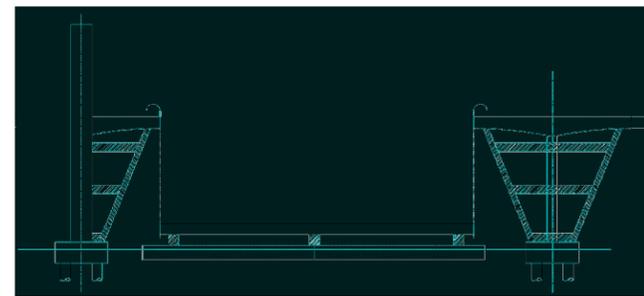
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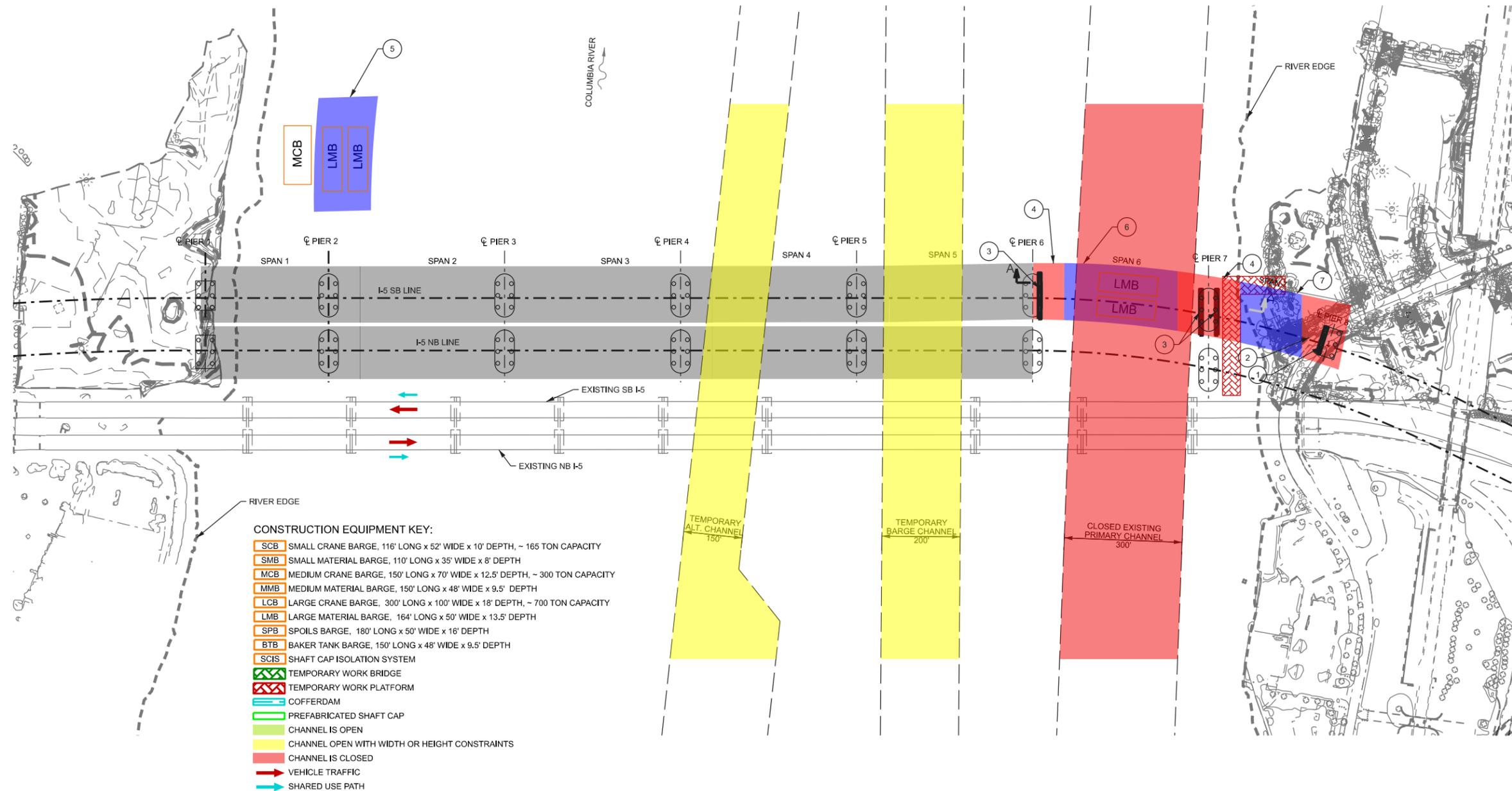


**CONSTRUCTION SEQUENCE:**

- 1 COMSTRUCT TEMPORARY BENT NEAR PIER 8 SB
- 2 ERECT THE NORTH END OF THE SB GIRDERS FROM PIER 8 ACROSS THE TEMPORARY BENT.
- 3 INSTALL TEMPORARY BENTS ON THE PILE CAP AT EACH SIDE OF PIER 7 SB AND NORTH SIDE OF PIER 6.
- 4 ERECT THE SB PIER TABLE GIRDERS AT PIER 7 ACROSS TEMPORARY BENTS AND ON NORTH SIDE OF PIER 6.
- 5 PREASSEMBLE GIRDER PACKS FOR SB SPAN 6 ON BARGES IN STAGING NEAR THE SHORE.
- 6 STRAND JACK SB GIRDER PACKS INTO PLACE TO CLOSE SPAN 6.
- 7 ERECT GIRDERS FROM LAND TO CLOSE SPAN 7 SB.



SECTION A



## FIXED-SPAN PHASE 8 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



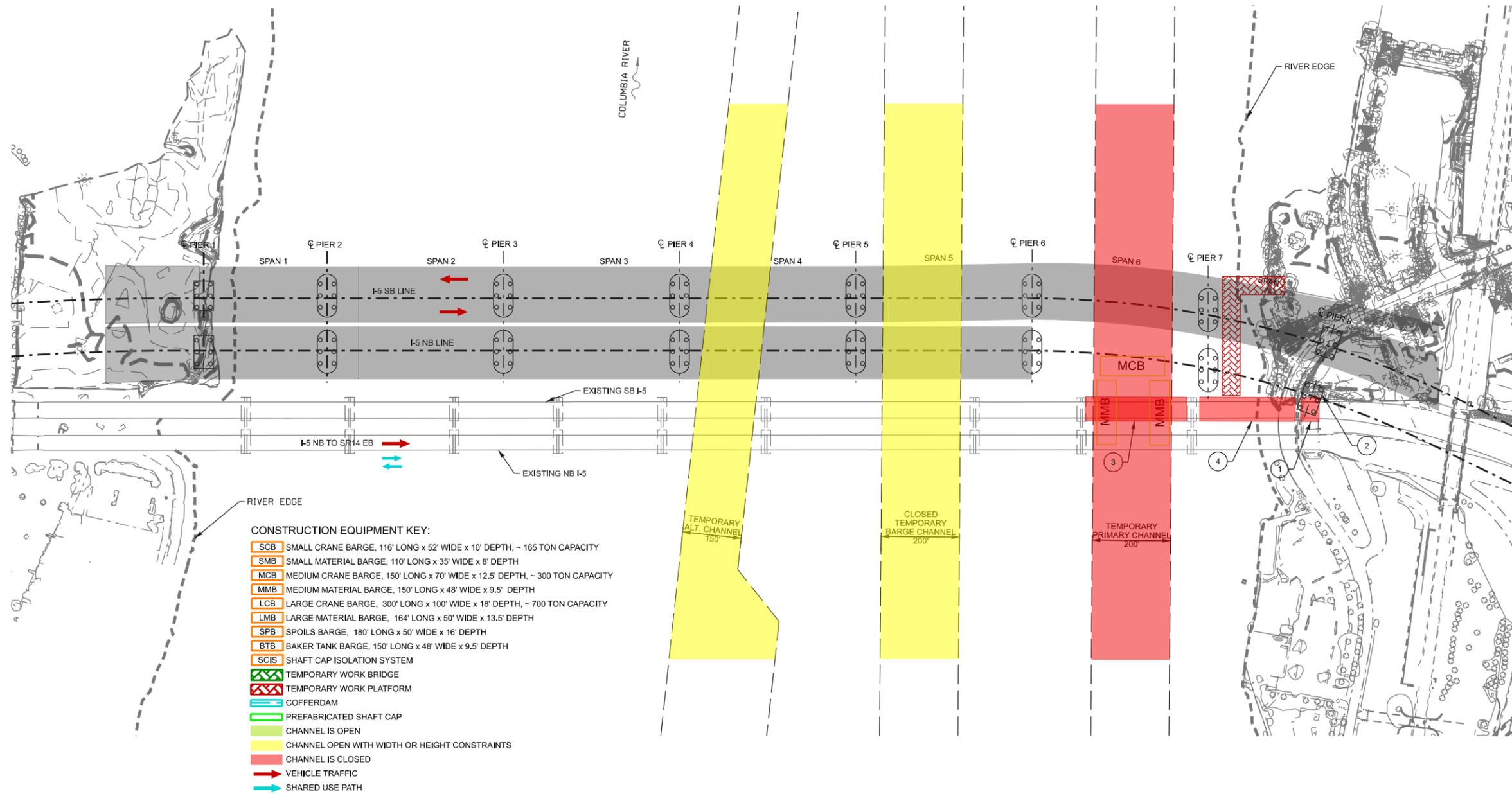
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# DRAFT



**CONSTRUCTION SEQUENCE:**

- ① REMOVE SPAN 1 SB OF EXISTING STRUCTURE.
- ② CONSTRUCT DRILLED SHAFTS, SHAFT CAPS, AND PIER AT PIER 8 NB.
- ③ REMOVE COUNTERWEIGHTS EXISTING SB LIFT SPAN, REMOVE EXISTING SB LIFT SPAN.
- ④ REMOVE SPAN 2 SB OF EXISTING STRUCTURE. EXISTING PIER 2 TO REMAIN.



## FIXED-SPAN PHASE 9 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



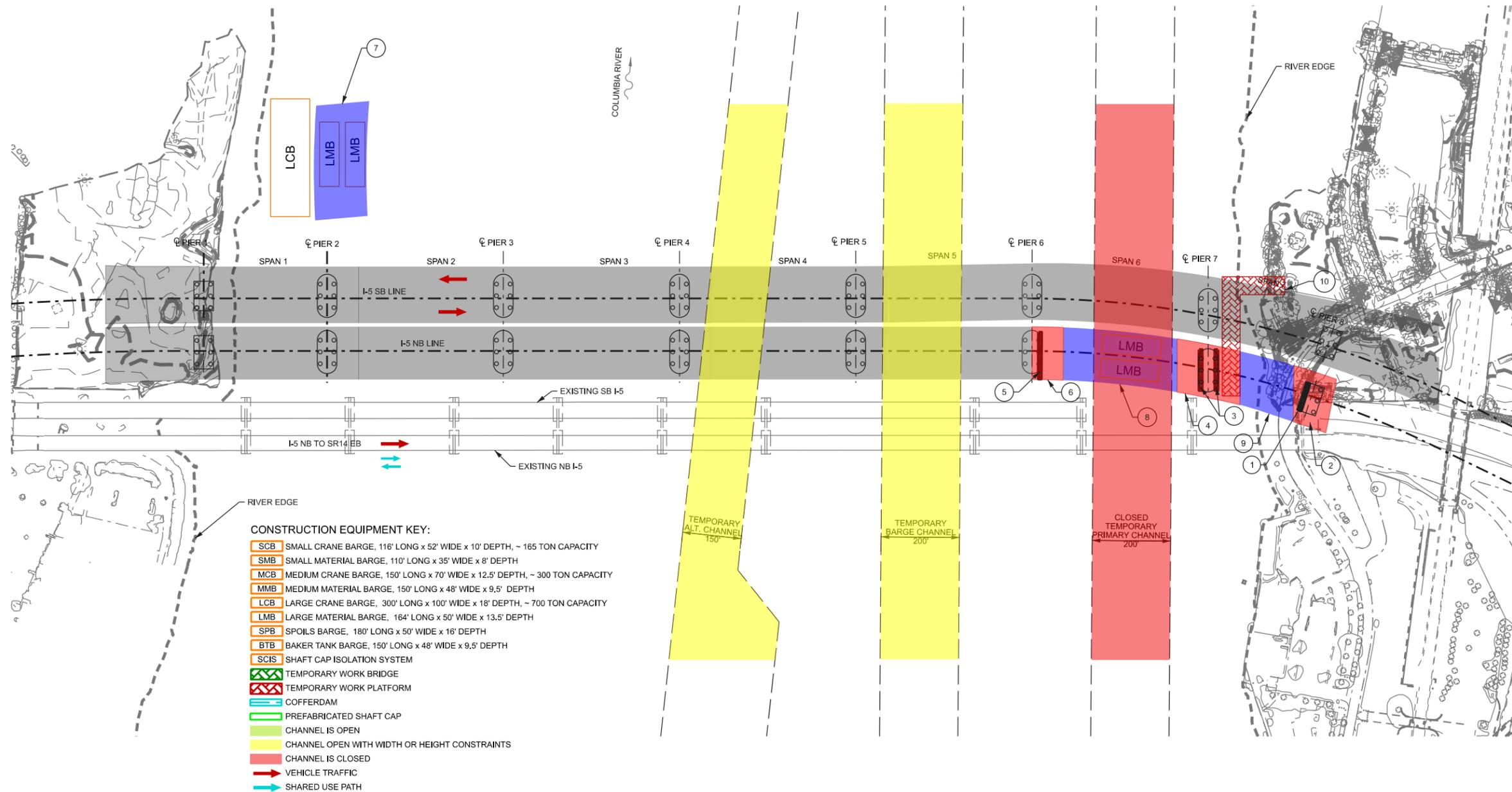
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# DRAFT



**CONSTRUCTION SEQUENCE:**

- 1 CONSTRUCT TEMPORARY BENT NEAR PIER 8 NB.
- 2 ERECT THE NORTH END OF THE NB GIRDERS FROM PIER 8 ACROSS THE TEMPORARY BENT.
- 3 INSTALL TEMPORARY BENTS ON THE PILE CAP AT EACH SIDE OF PIER 7 NB.
- 4 ERECT THE NB PIER TABLE GIRDERS AT PIER 7 ACROSS THE TEMPORARY BENTS.
- 5 CONSTRUCT TEMPORARY BENT NEAR PIER 6 NB.
- 6 ERECT THE NB GIRDER ENDS AT PIER 6 ACROSS THE TEMPORARY BENT.
- 7 PREASSEMBLE GIRDER PACKS FOR NB SPAN 6 ON BARGES IN STAGGING NEAR THE SHORE.
- 8 STRAND JACK NB GIRDER PACKS INTO PLACE TO CLOSE SPAN 6.
- 9 ERECT GIRDERS TO CLOSE SPAN 7 NB.
- 10 REMOVE WORK BRIDGE AT PIER 7.

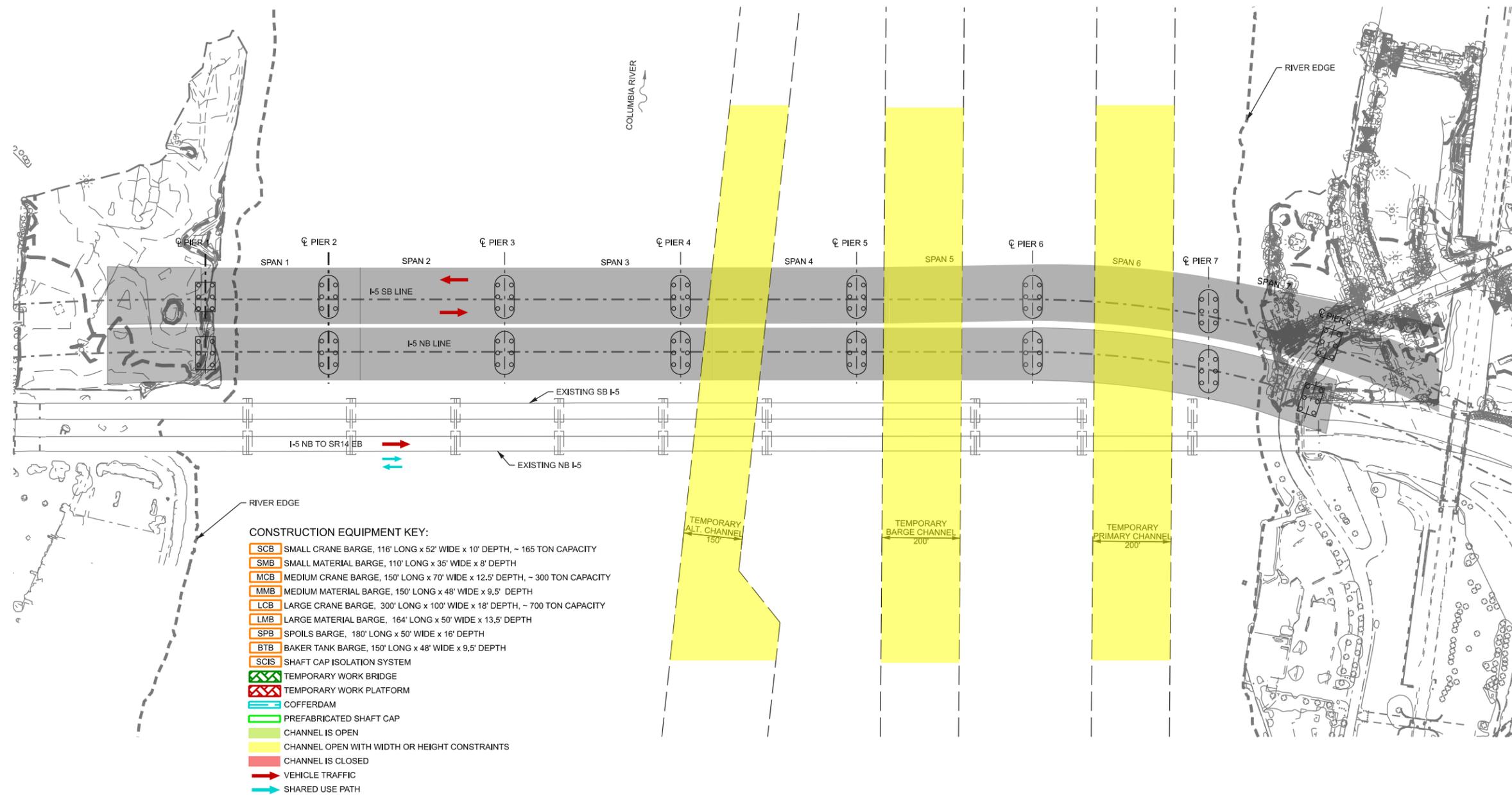


## FIXED-SPAN PHASE 10 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



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# DRAFT



## FIXED-SPAN PHASE 11 COLUMBIA RIVER BRIDGES CONSTRUCTION SEQUENCE



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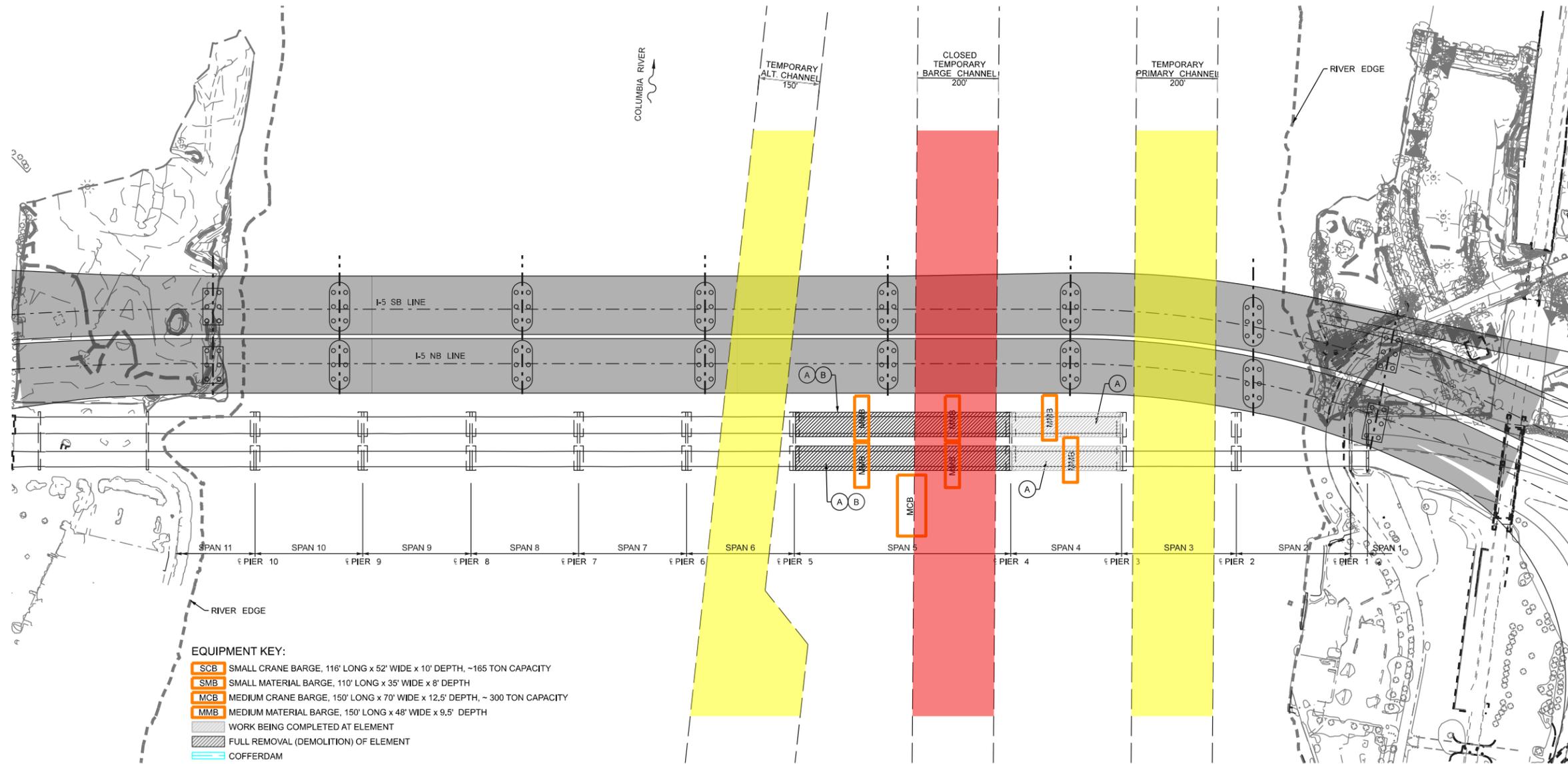
1 **APPENDIX E: COLUMBIA RIVER BRIDGES**  
2 **REMOVAL SEQUENCE**

# DRAFT



DEMOLITION SEQUENCE:

- (A) DEMOLISH NB AND SB DECKS AT SPANS 5 AND 4.
- (B) LIFT AND REMOVE NB AND SB SPAN 5 VIA BARGE.
- (C) OPEN TEMPORARY BARGE CHANNEL (NEW PRIMARY CHANNEL).



EQUIPMENT KEY:

- SCB SMALL CRANE BARGE, 116' LONG x 52' WIDE x 10' DEPTH, ~165 TON CAPACITY
- SMB SMALL MATERIAL BARGE, 110' LONG x 35' WIDE x 8' DEPTH
- MCB MEDIUM CRANE BARGE, 150' LONG x 70' WIDE x 12.5' DEPTH, ~ 300 TON CAPACITY
- MMB MEDIUM MATERIAL BARGE, 150' LONG x 48' WIDE x 9.5' DEPTH
- WORK BEING COMPLETED AT ELEMENT
- FULL REMOVAL (DEMOLITION) OF ELEMENT
- COFFERDAM
- CHANNEL IS OPEN
- CHANNEL OPEN WITH WIDTH OR HEIGHT CONSTRAINTS
- CHANNEL IS CLOSED

PHASE A  
 INTERSTATE BRIDGE DEMOLITION SEQUENCE  
 STEEL GIRDER FIXED-SPAN BRIDGE (STEEL GIRDER LIFT-SPAN BRIDGE SIMILAR)  
 UPSTREAM EXISTING STEEL TRUSS DEMOLITION SEQUENCE

## PHASE A COLUMBIA RIVER BRIDGES DEMOLITION SEQUENCE



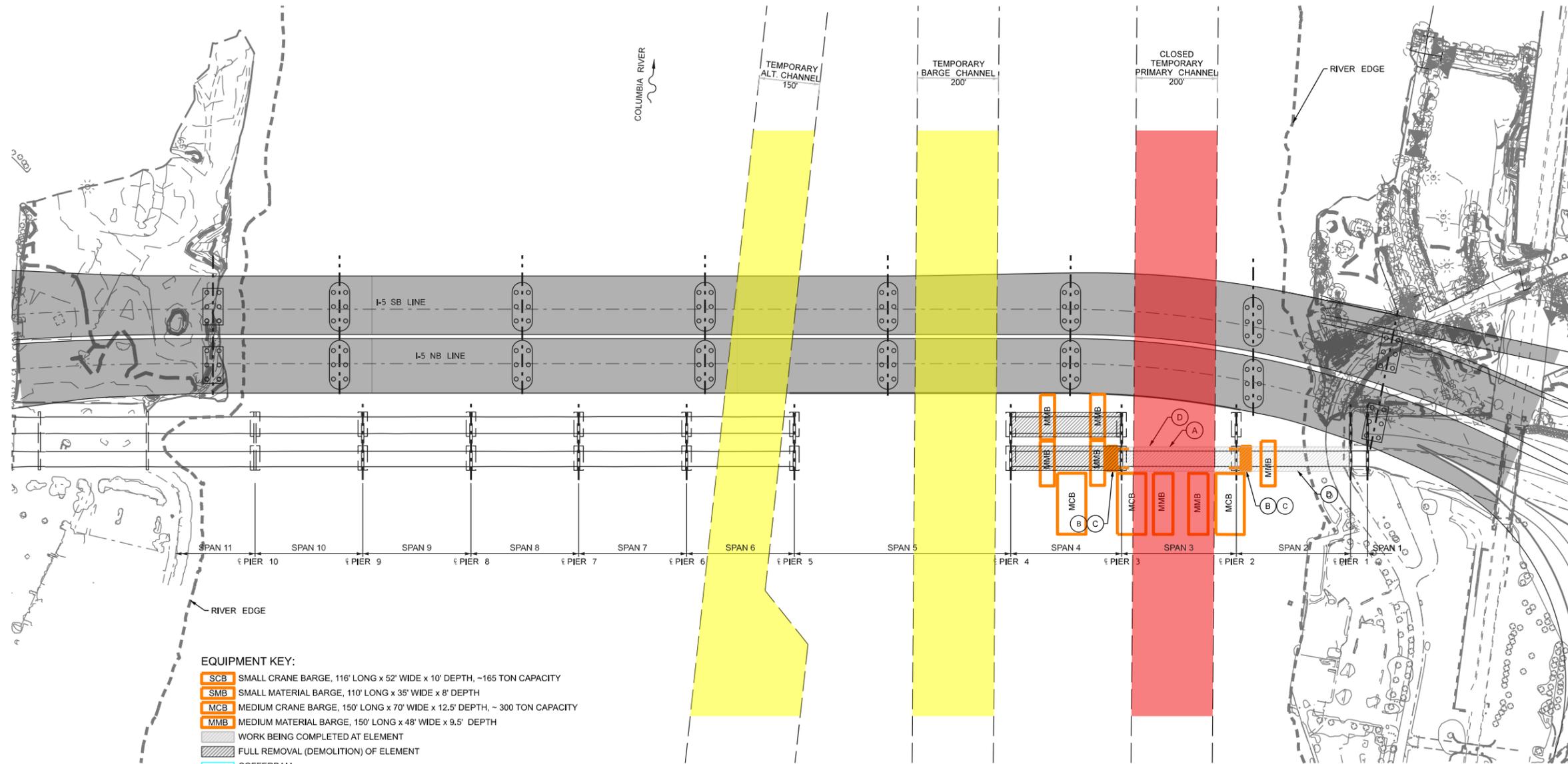
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# DRAFT



DEMOLITION SEQUENCE:

- (A) LOWER NB LIFT SPAN 3.
- (B) LOWER AND REMOVE COUNTERWEIGHTS.
- (C) REMOVE LIFT SPAN TOWERS.
- (D) DEMOLISH NB AND SB DECKS AT SPAN 2.



EQUIPMENT KEY:

- SCB SMALL CRANE BARGE, 116' LONG x 52' WIDE x 10' DEPTH, ~165 TON CAPACITY
- SMB SMALL MATERIAL BARGE, 110' LONG x 35' WIDE x 8' DEPTH
- MCB MEDIUM CRANE BARGE, 150' LONG x 70' WIDE x 12.5' DEPTH, ~ 300 TON CAPACITY
- MMB MEDIUM MATERIAL BARGE, 150' LONG x 48' WIDE x 9.5' DEPTH
- WORK BEING COMPLETED AT ELEMENT
- FULL REMOVAL (DEMOLITION) OF ELEMENT
- COFFERDAM
- CHANNEL IS OPEN
- CHANNEL OPEN WITH WIDTH OR HEIGHT CONSTRAINTS
- CHANNEL IS CLOSED

PHASE B  
 INTERSTATE BRIDGE DEMOLITION SEQUENCE  
 STEEL GIRDER FIXED-SPAN BRIDGE (STEEL GIRDER LIFT-SPAN BRIDGE SIMILAR)  
 UPSTREAM EXISTING STEEL TRUSS DEMOLITION SEQUENCE

## PHASE B COLUMBIA RIVER BRIDGES DEMOLITION SEQUENCE



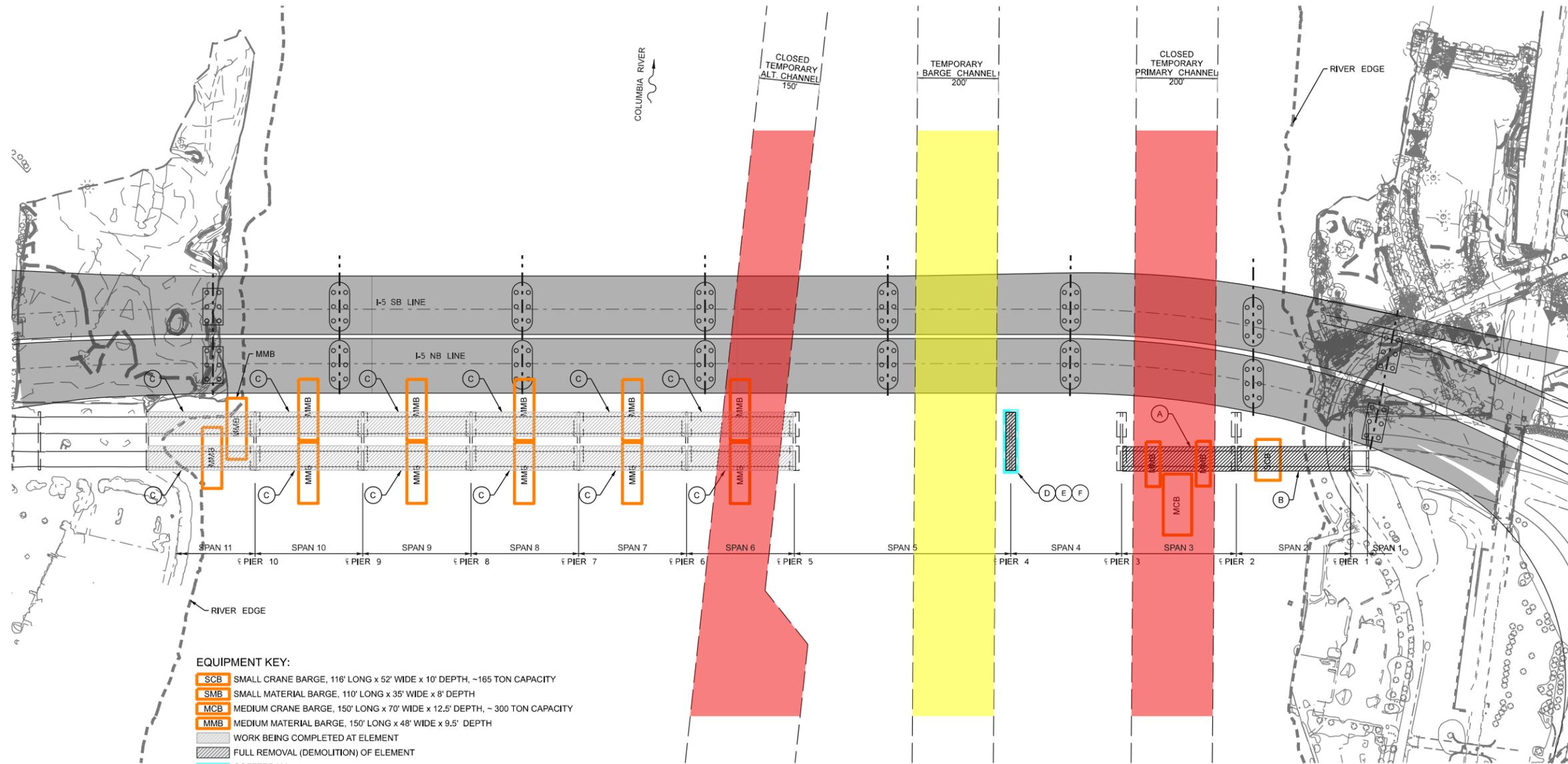
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# DRAFT



**DEMOLITION SEQUENCE:**

- (A) LIFT AND REMOVE NB SPANS 3 VIA BARGE.
- (B) LIFT AND REMOVE NB SPAN 2 VIA BARGE.
- (C) DEMOLISH NB AND SB DECKS AT SPANS 6, 7, 8, 9, 10, AND 11.
- (D) INSTALL COFFERDAM AT PIER 4 FOR REMOVAL OF PIER.
- (E) DEMOLISH AND REMOVE PIER 4 TO FOUR FEET BELOW CHANNEL DREDGE DEPTH.
- (F) REMOVE COFFERDAM AT PIER 4.
- (G) OPEN NEW PRIMARY CHANNEL.



**EQUIPMENT KEY:**

- SCB SMALL CRANE BARGE, 116' LONG x 52' WIDE x 10' DEPTH, ~165 TON CAPACITY
- SMB SMALL MATERIAL BARGE, 110' LONG x 35' WIDE x 8' DEPTH
- MCB MEDIUM CRANE BARGE, 150' LONG x 70' WIDE x 12.5' DEPTH, ~300 TON CAPACITY
- MMB MEDIUM MATERIAL BARGE, 150' LONG x 48' WIDE x 9.5' DEPTH
- WORK BEING COMPLETED AT ELEMENT
- FULL REMOVAL (DEMOLITION) OF ELEMENT
- COFFERDAM
- CHANNEL IS OPEN
- CHANNEL OPEN WITH WIDTH OR HEIGHT CONSTRAINTS
- CHANNEL IS CLOSED

**PHASE C**  
**INTERSTATE BRIDGE DEMOLITION SEQUENCE**  
 STEEL GIRDER FIXED-SPAN BRIDGE (STEEL GIRDER LIFT-SPAN BRIDGE SIMILAR)  
 UPSTREAM EXISTING STEEL TRUSS DEMOLITION SEQUENCE

## PHASE C COLUMBIA RIVER BRIDGES DEMOLITION SEQUENCE



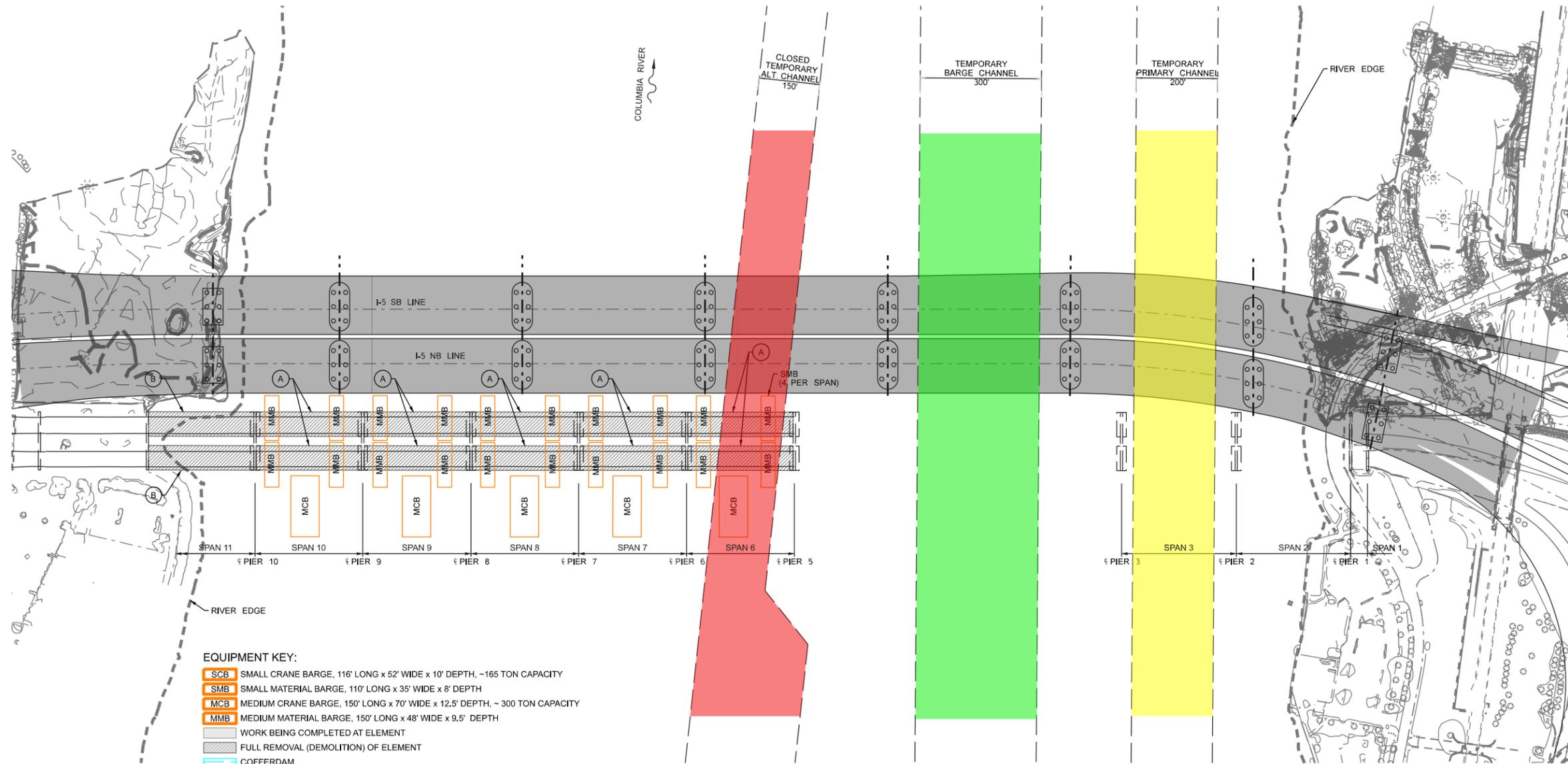
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# DRAFT



**DEMOLITION SEQUENCE:**

- (A) LIFT AND REMOVE VIA BARGE NB AND SB SPANS 6, 7, 8, 9, AND 10.
- (B) DEMOLISH NB AND SB SPAN 11 USING LAND-BASED CRANE.



**EQUIPMENT KEY:**

- SCB SMALL CRANE BARGE, 116' LONG x 52' WIDE x 10' DEPTH, ~165 TON CAPACITY
- SMB SMALL MATERIAL BARGE, 110' LONG x 35' WIDE x 8' DEPTH
- MCB MEDIUM CRANE BARGE, 150' LONG x 70' WIDE x 12.5' DEPTH, ~ 300 TON CAPACITY
- MMB MEDIUM MATERIAL BARGE, 150' LONG x 48' WIDE x 9.5' DEPTH
- WORK BEING COMPLETED AT ELEMENT
- FULL REMOVAL (DEMOLITION) OF ELEMENT
- COFFERDAM
- CHANNEL IS OPEN
- CHANNEL OPEN WITH WIDTH OR HEIGHT CONSTRAINTS
- CHANNEL IS CLOSED

**PHASE D**  
**INTERSTATE BRIDGE DEMOLITION SEQUENCE**  
 STEEL GIRDER FIXED-SPAN BRIDGE (STEEL GIRDER LIFT-SPAN BRIDGE SIMILAR)  
 UPSTREAM EXISTING STEEL TRUSS DEMOLITION SEQUENCE

## PHASE D COLUMBIA RIVER BRIDGES DEMOLITION SEQUENCE



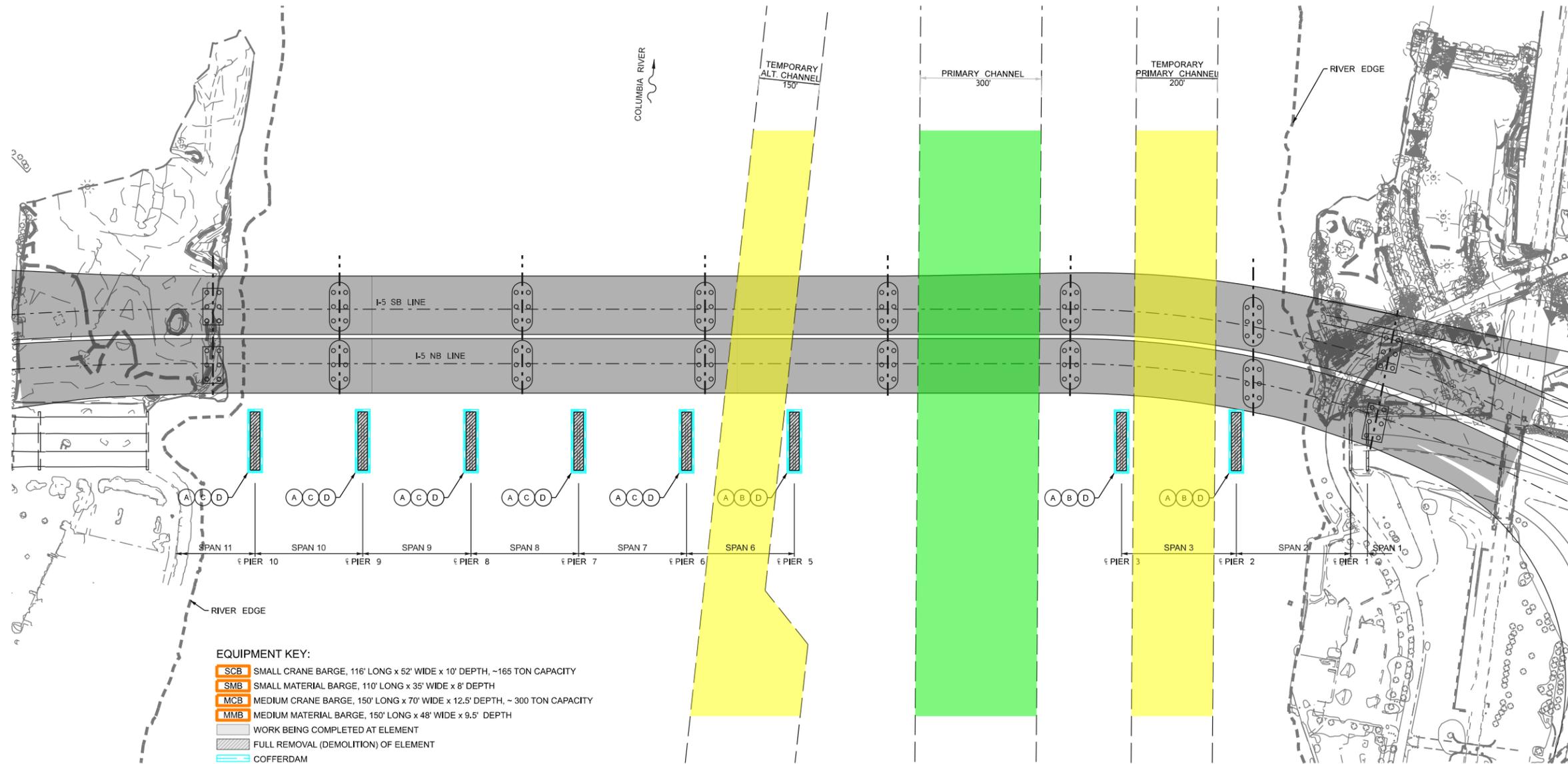
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# DRAFT



**DEMOLITION SEQUENCE:**

- (A) INSTALL COFFERDAMS AT PIERS 2, 3, 5, 6, 7, 8, 9, 10, AND 11.
- (B) DEMOLISH AND REMOVE PIERS 2, 3, AND 5 TO FOUR FEET BELOW CHANNEL DREDGE DEPTH.
- (C) DEMOLISH AND REMOVE PIERS 6, 7, 8, 9, 10, AND 11 TO FOUR FEET BELOW EXISTING RIVER BOTTOM.
- (D) REMOVE COFFERDAMS AT PIERS 2, 3, 5, 6, 7, 8, 9, 10, AND 11.



**EQUIPMENT KEY:**

- SCB SMALL CRANE BARGE, 116' LONG x 52' WIDE x 10' DEPTH, ~165 TON CAPACITY
- SMB SMALL MATERIAL BARGE, 110' LONG x 35' WIDE x 8' DEPTH
- MCB MEDIUM CRANE BARGE, 150' LONG x 70' WIDE x 12.5' DEPTH, ~ 300 TON CAPACITY
- MMB MEDIUM MATERIAL BARGE, 150' LONG x 48' WIDE x 9.5' DEPTH
- WORK BEING COMPLETED AT ELEMENT
- FULL REMOVAL (DEMOLITION) OF ELEMENT
- COFFERDAM
- CHANNEL IS OPEN
- CHANNEL OPEN WITH WIDTH OR HEIGHT CONSTRAINTS
- CHANNEL IS CLOSED

PHASE E  
 INTERSTATE BRIDGE DEMOLITION SEQUENCE  
 STEEL GIRDER FIXED-SPAN BRIDGE (STEEL GIRDER LIFT-SPAN BRIDGE SIMILAR)  
 UPSTREAM EXISTING STEEL TRUSS DEMOLITION SEQUENCE

## PHASE E COLUMBIA RIVER BRIDGES DEMOLITION SEQUENCE



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