Scope Definition of Hood River Bridge Replacement Project

Date: November 30, 2021

Subject: Engineers Preliminary Project Cost Estimate Update – Project Scope Assumptions
WSP Job No. 80550A

From: Stuart Bennion, PE, SE

To: Kevin Greenwood, Hood River Bridge Project Director

The Port of Hood River has requested a Scoping Document to update the preliminary Project Cost Estimate (PCE) and document the assumptions that are used to update the PCE for the proposed Hood River – White Salmon Replacement Bridge project (the project). This document outlines the main elements of construction for the new bridge and approaches, as well as the removal of the existing bridge. Items not directly covered in this document are assumed to follow normal Washington State Department of Transportation (WSDOT) and Oregon Department of Transportation (ODOT) standards and practices. Some construction schedule items are discussed herein, but a separate memo covers the schedule development. Some general points for this PCE update include the following.

- The engineering for the project completed to date is limited to about 5 percent design.
- The project alignment is based on the EC-2 alignment from the alternative analysis.
- There are several contracting methods that the Port is investigating to construct the new bridge and remove the existing one. The PCE updated is based on a traditional design, bid, build contracting method.
- This document is not intended to change any element of the project as described and analyzed in the published Supplemental Draft Environmental Impact Statement (SDEIS) nor the Final EIS that is currently being developed. It is noted that the design is continuing to be developed and new information is included as it is developed. All engineering updates that affect environmental commitments or considerations will be discussed and, if required, the proper jurisdictions will be engaged for consultation prior to implementation.
- A lot of discussion and work is still required to determine project partners, funding sources, project owner, and bridge owner. Tolling is part of this larger discussion. While some information about tolling will be included in this document, it will be kept at a high level.
- Aesthetics are an important consideration for this project and will impact aspects of the project. The bridge is located within the Columbia River Gorge National Scenic Area (CRGNSA) and will require coordination with stakeholders regarding certain bridge features. Items that will be evaluated include barrier, column, and wall treatments and finishes; railing

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types; project signage; pedestrian and architectural lighting; and other such features that lend themselves to aesthetic treatment. Items, such as bridge type, size, and location, as well as the number of lanes, traffic safety features, pier sizes, wall types, and other items controlled by engineering requirements, will not be included in those discussions. It should be noted that selection of the alternative analyzed in the SDEIS were developed based on aesthetic requirements of the CRGNSA

- Right-of-way (ROW) acquisition will be handled by the Port. Information related to ROW, such as the identification of temporary and permanent easements, is incorporated by the Port.
- Active transportation provisions are included in the design and Americans with Disabilities Act (ADA) requirements will be incorporated based on current standards.
- PCE inputs from the Port, determination of project cost escalation, and project contingencies based on both known and unknown project risks will not be included.

The updated PCE is intended to serve as a tool to monitor design and construction assumptions and to track how project development decision/revision impacts the project cost estimate. The layout of work is intermixed between one approach to building the project and the sequence of work. The examples of both construction staging and marine support show the complexity of how some activities cross over into multiple sections of this document. Each topic has a specific section to discuss general impacts/assumptions that effect the entire project, but the topics also get discussed in more detail for specific work activities in other sections, such as bridge removal or shaft construction. The Table of Content outlines the format for general design and construction topics covered in this document.

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ENVIRONMENTAL COMMITMENT SUMMARY

The in-water-work window (IWWW) will be established as October 1 through March 15. This was confirmed as the most biologically defensible window for this Proposed Action given the location on the river, as it allows for an expedited construction schedule, while still avoiding the peak run timing of both adult and juvenile salmon and steelhead. Work activities that will be restricted to this IWWW will include all activities conducted below the ordinary high-water mark (OHWM) that are conducted in contact with the wetted channel of the river, with the exception of vibratory pile removal. Such activities include (but are not limited to) vibratory and impact pile installation, installation of drilled shaft shoring casings, installation of cofferdams, and unconfined wire saw demolition of the existing pier foundations.

The following activities will not be restricted to the IWWW and may be conducted year-round, consistent with any applicable permit conditions.

- Vibratory pile removal (temporary pipe piles and sheet piles).
- Operation of barges and other water-based construction vessels (such as small skiffs), including movement, anchoring, and repositioning.
- Work conducted below the OHWM elevation but in isolated and/or dewatered conditions, or above the wetted channel. Such activities include (but are not limited to) work within drilled shaft shoring casings (installation of temporary casings and slip casings, excavation,

reinforcement, concrete placement), construction of formwork and concrete placement for spread footings, cast-in place concrete work, and demolition work within cofferdams.

- Work conducted waterward of the OHWM, but above the OHWM elevation (overwater work). Such activities include (but are not limited to) installation of superstructure elements of the bridge, cast-in-place (CIP) concrete work, and overwater demolition activities.

The project location includes environmentally sensitive areas for archeological resources, Tribal property, Tribal treaty fishing rights, Section 4(f) and Section 6(f) properties, hazardous material sites around commercial businesses and sites considered for construction staging, considerations for noise and vibration monitoring, and work timeframes that affect habitat. Information for these and other environmental items not included in this section or otherwise in this document can be found in the SDEIS and/or biological assessment.

PROJECT DESIGN CRITERIA

At part of the 2011 Type, Size, and Location (TS&L) report process, a design criterion was established for the bridge. At the start of the investigation of design criteria, it became apparent that many of the design criteria are based on a small group of fundamental or foundational criteria. These foundational criteria were discussed at a Project Management Team (PMT) meeting held on July 13, 2010 and are noted with footnote 2 (in Table 1). The PMT provided direction on these criteria, which enabled the remainder of the design criteria to be established. Tables 1 and 2 show the agreed-to design criteria and associated footnotes from the 2011 TS&L report.

Table 1. Bridge Design Criteria from 2011 TS&L Report

DESIGN ELEMENT	WSDOT (2010)	ODOT (2008)	2003 DEIS	PMT RECOMMENDATION
Units of Measure	English	English	English	English
Functional Class	Minor Arterial[1]	Urban Principal Arterial –State Highway		Principal Arterial[2]
Design Speed (mph)	40-60(or 5 over posted)	40 (5 over posted)	50	40[2]
Shoulder Widths (ft)				
Left	NA	NA	NA	NA
Right	8	8	8	8 min[2]

[1] http://www.wsdot.wa.gov/mapsdata/tdo/FunctionalClassMaps/PDF/bingen.pdf

[2] This design element is considered a foundational design element and was discussed at the 7/13/10 PMT meeting.

Table 2. Bridge Design Criteria from 2011 TS&L Report (continued)

DESIGN ELEMENT	WSDOT (2010)	ODOT (2008)	2003 DEIS	PMT RECOMMENDATION
Nav. Clearance (ft): Horizontal Vertical	Permit with Coast Guard.	Permit with Coast Guard.	450 80	450 H[2] 80 V[2]
Ability to Widen Bridge or restripe for 3rd lane			yes	Not required[2]
Pedestrian /Bike lane width (ft)	12 min. (Clear width)	14[3] (incl. 2' shy dist. to rail)	16 (Clear width)	12 foot plus two viewing areas[2]
Bridge width (out to out)			59'-8"[4]	56'-4"[5]
Storm water collection	In shoulders	In shoulders or pipe		In shoulders[2]
Horizontal Clearance	AASHTO Roadside Design Guide	AASHTO Roadside Design Guide		AASHTO Roadside Design Guide
Pedestrian /Bike lane location			West side of bridge only	West side of bridge only[2]
Lane Widths (ft)	12	12		12
Roadway Cross Slope	2%	2%		2% - Crown
Maximum Superelevation	10%	4%		4%
Maximum Tangent Grades	5%[6]	5%	4.5%	5%
Stopping Sight Distance (ft)	305-570	305		305
Minimum CL Radius (ft)	540[7]	575		575
Specific Structural Design Criteria	WSDOT Bridge Design Manual	ODOT Bridge Design and Drafting Manual		Project Specific
General Bridge Design Criteria	AASHTO LRFD	AASHTO LRFD		AASHTO LRFD
RR Hor. Clearance (ft)	14 (BNSF)	14 (BNSF)		14 (BNSF)
Vertical Clearance	16' – 6"	17' – 0"		17' – 0"
RR Vertical Clearance	23' – 6"	23' - 0"		23' – 6"
Bridge Railing Height	Br railing-Test level 4 Ped railing- 42"	Br railing-Test level 4 Bike railing- 44"		Br Rail-42" Type S/W Rail-44" Metal
Seismic Design Criteria	1000 yr No Collapse	500 yr Serviceability 1000 yr No Collapse		500 yr Serviceability 1000 yr No Collapse

[3] Refer to the Oregon Bicycle and Pedestrian Plan for additional combined standards. Shared pedestrian and bicycle paths are not encouraged.
[4] Includes 40' roadway, 16' ped/bike path and allowance for bridge railing and ped railing.
[5] 56'-4" width provides for ped rail, 12' bike, br rail, 8' shldr, 12' lane, 12' lane, 8' shldr, br rail
[6] 7% is allowable, (WSDOT Exhibit 1140-7 urban 40mph), but 5% max for ADA.

[7] Based on WSDOT exhibit 1250-5

NEW BRIDGE CONSTRUCTION

Bridge Configuration

The proposed new bridge shown in Figures 1 and 2 are taken from the TS&L plan set developed by WSP (Parsons Brinkerhoff at the time) and T.Y. Lin International. The engineering, sections, span lengths, and pier configurations have not been re-engineered since that time, but are still consistent with current practices for this bridge type. One change is to increase Span 14 that crosses over the BNSF railroad tracks an additional 22 feet to provide better horizontal clearance. The total bridge length is now 4,412 feet from back of pavement seat to back of pavement seat. The bridge superstructure is separated into three units. The midspan unit crosses over the main river channel with a 500-foot main span and two side spans of 400 feet each. The required navigation clearance for the bridge is 450 feet wide by 80 feet high and includes a middle clearance requirement that is 250 feet wide and 90 feet high. The remaining river spans are each 300 feet long, with variable spans at each end of the bridge. Span 1 sits on a standard CIP concrete abutment and provides sufficient vertical clearance to maintain the Port's multi-use path along the riverfront. Span 1 is only 180 feet long. Span 14 crosses over BNSF and must meet the minimum vertical and horizontal requirements and provide construction access that are discussed further in the Washington Approach section of this document.

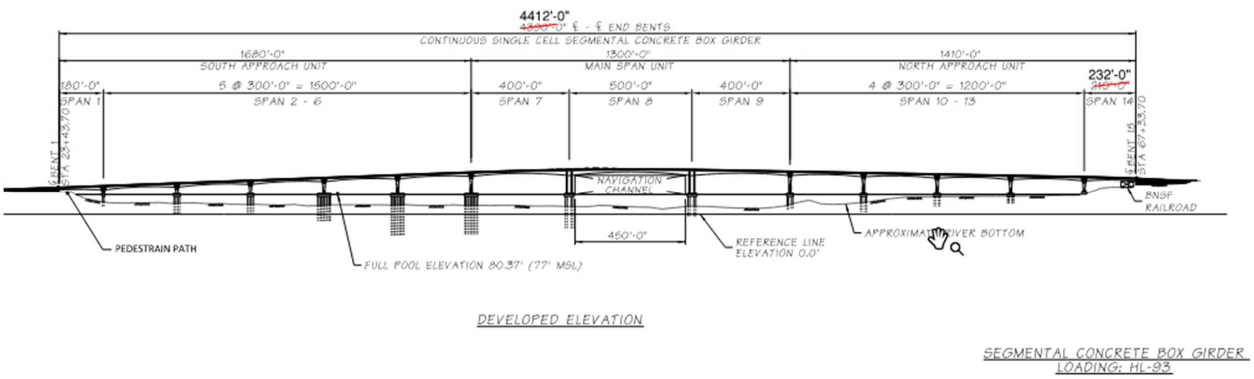

Figure 1. New Bridge Span Configuration

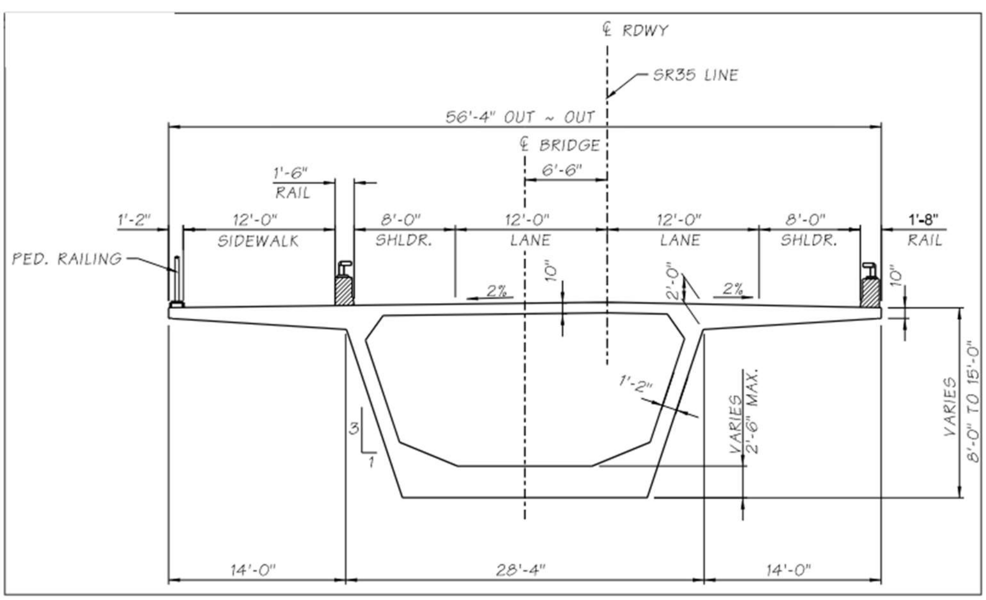

Figure 2. Bridge Typical Section

Geotechnical Explorations

Currently there are three borings located in the river. Figure 3 shows where the three existing borings are located and identifies the proposed locations for future geotechnical explorations - Borings B-4 through B-15. Boring test holes B-1, B-2, and B-3 are available in Appendix A of the 2011 TS&L report. Varying layers, 2 feet to 100+ feet, of alluvial silts and sands sit on a thinner layer of decomposed basalt. Below the decomposed basalt layer is a more competent basalt bedrock formation. The geophysical survey did not produce meaningful results at Borings B-1 and B-2 due to the thickness of the alluvial layer over the bedrock and the limitations of the equipment to penetrate 100+ feet of sediment. The Troutdale rock formation, which has been identified further down-river, has not been seen in the borings taken to date. However, the depth of the borings into the basalt rock layer has only extended approximately 20 feet or less. Future boring exploration is intended to extend deeper. For purposes of this PCE update, we are assuming that all foundation will extend into the bedrock and the Troutdale formation may be encountered on this project.

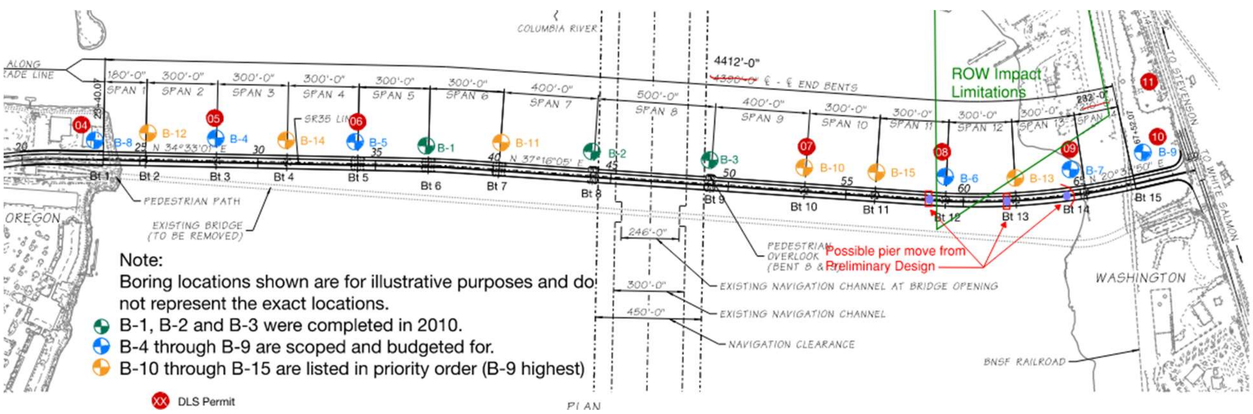

Figure 3. Current and Proposed Geotechnical Exploration Locations

The bridge crosses over an environmentally sensitive parcel and may require pier adjustments for Spans 11, 12, and 13. This is still being investigated and this PCE update assumes the span configurations will not be changed. Another consideration in Spans 11 to 14 is to add a noise wall segment on the downstream side of the bridge to limit bridge users view to the same parcel. This PCE update has included a noise wall segment using 6-foot-tall, 10-inch-wide concrete panels with form liner treatment and pigmentation on both sides. It is likely that these panels will be precast and attached with grouted anchors.

Bridge Foundations

Construction of pier footings, columns, and superstructure is considered out-of-water work; though barges, divers, formwork, anchors systems, spuds, and other construction methods will be used in the water. The pile cap and shaft caps are assumed to be constructed off site, in the Portland area, using a precast element that can be loaded onto a barge and floated to the bridge site. Piers 2 to 5 and 11 to 13 will be placed on a barge and picked from barge to the piers. Piers 5 to 10 are cast in the Portland area, placed on barge, and floated to the site. The barge will be flooded, and the precast segment floated into place. Piers 5 to 7 will use a temporary pile reaction frame and this precast cap as a template for pile placement. Divers below and construction workers on top of the precast element will help locate, brace, and then lock off the precast element to the pile frames or shafts. A ballast system will be determined by the contractor. The system will then be sealed so that work is considered out of the water. The details for the precast element, anchorage, and sealing process will be addressed in final design.

Once sealed off, the precast pile/shaft caps will be reinforced for the remaining cap section and bridge columns. The columns can be either CIP or precast concrete elements; we assumed CIP. The flared tops of the columns are required to match the superstructure section and anchor the segmental PT superstructure. The split column configuration at Piers 8 and 9 still needs to be designed but is assumed to reduce the column weight and still provide the required capacity. This configuration also adds to the aesthetic look of the bridge with signature piers on each side of the main river channel. Theses pier column configurations may still be changed in the design process. Table 3 shows the bridge quantities for concrete in the foundations, excluding shaft concrete or concrete in the pipe piles if an increased moment connection is required at the top the piles. Note that column and pier table concrete are include in the superstructure concrete costs.

Table 3. Foundation Concrete Volumes

Location	Concrete Volumes
--	cuyd
Pile Caps	6238
Abutment Footings	257
Abutment Stemwalls	629
Total Concrete	**7124**
Pile Caps, Precast	**2902**

Tables 4 and 5 show the drilled shaft quantities and SDEIS impacts. Installation of drilled shafts will be conducted by first oscillating a temporary outer steel shoring casing to isolate shaft construction from the IWWW, with an outer diameter approximately 12 inches larger than that of the finished drilled shaft, to act as an isolation structure. The outer shoring casings will be 84 inches for the 72-inch shafts and 108 inches for the 96-inch shafts. Note that the shaft size, depth, and number still need to be verified with further geotechnical exploration and design. Conservatively, the casing shoring placement and the shaft construction are assumed to be performed using an oscillator/rotator-type drilled shaft rig. Currently there are two construction companies located in the Pacific Northwest that have this type of equipment, although there are others nationally. This is a conservative assumption in that this type of rig produces the largest force to barges and work bridges and is one of the larger construction footprint operations for drilled shaft construction. The vertical force required to drive down the drilling casing and the needed torque to oscillate/rotate the casing also require secondary reaction piles around the casing. Four reaction piles are assumed at each drilled shaft location. Table 5 includes "Other Temporary Piles." Most of these are tied to the reaction piles and added work-bridge piles to handle the drilling process. A second support crane works in tandem with the drilling crane and a third crane will sometimes be used for the pick of the fabricated rebar cage. The drilling process through a water column requires a containment platform to manage drilling spoils, baker-tanks to handle displaced water that requires treatment before it can be discharged at an approved location, concrete pump trucks with a tremie tube for concrete placement, and other specialty equipment. The construction schedule assumes two on-land shaft crews, one on each side of the river working from the work trestles, and one barge-mounted shaft crew working with tow barge mounted cranes and supplemental barges. Each crew will need a similar set up of cranes, baker-tanks, platforms, dump trucks, concrete trucks and pump truck, containment, etc., as well as construction and inspection crews with support boats.

Table 4. Drilled Shaft Quantities

Pier/Bent	Shaft Dia.	Shaft Qty	Shaft Top El	Shaft Tip Elevation	Shaft Volume (all shafts)	Shaft LF (EA)	Shaft Length
#	ft	#	ft	ft	cy	ft	ft
2	6	2	76.37	27	103	49	99
3	6	4	76.37	-2	328	78	313
4	6	4	76.37	-6	345	82	329
8	8	6	76.37	-70	1635	146	878
9	8	6	76.37	-10	965	86	518
10	6	4	76.37	20	236	56	225
11	6	4	76.37	10	278	66	265
12	6	4	76.37	32	186	44	177
13	6	4	76.37	46	127	30	121
				TOTAL	**4204**	**640**	**2928**

One cofferdam is assumed at Pier 14 on the new bridge. Table 6 shows the assumed area and environmental impacts for this cofferdam. Construction activities for this pier cofferdam will be similar to the discussion for the cofferdams used in the bridge removal, discussed later on. One difference at this site is the use of a concrete seal. The contactor will over-excavate to place the seal (assumed 5 feet thick) to the bottom of concrete footing elevation and will allow for dewatering of the cofferdam.

Piers 14 and 15 will be constructed with CIP concrete footings. Pier 14 will have a pier column. Pier 15 will be a concrete abutment with L-style backwall and curtain walls. Structural earth walls with concrete facia will extend beyond Pier 15.

Table 5. Drilled Shaft Enviornemtnal Impacts for Shafts and Other Temporary Piles

Project Element	Approximate Dimensions (ft)	Approximate Total Quantities	Temporary Benthic Impact (sq ft)	Temporary Overwater Coverage (sq ft)	Approximate Duration
Drilled Shaft Shoring Casings	84-inch and 108-inch diameter	29, 84-inch-diameter casings and 13, 108-inch-diameter casings	426	-	4 months (each)
Other (non-load-bearing) Temporary Piles	24-inch diameter	200, 24-inch steel pipe piles	628	-	4 months (each)

Table 6. Pier 14 Cofferdam – Environmental Impacts

Project Element	Approximate Dimensions (ft)	Approximate Total Quantities	Temporary Benthic Impact (sq ft)	Temporary Overwater Coverage (sq ft)	Approximate Duration
Cofferdam (Spread footing)	30 x 38	136 linear feet of sandbags or similar	580	-	12-16 months

Piers 1, 5, 6, and 7 will use pipe piles instead of drilled shafts. This still needs to be verified based on future geotechnical explorations but is assumed in this PCE update. Table 7 shows the pile bent configuration. The steel pipe piles are assumed to be 48 inches in diameter and 1/2 inch thick, though this thickness is often increased by the contractor to account for pile-driving impact forces. The PCE update assumes the contractor upsizes the piles to 3/4-inch thickness. The piles will be installed using vibratory methods and then driven using impact hammers to either reach the required tip elevation or to proof pipe capacity if vibrated to the tip elevation. Pile driving is assumed to use diesel-driven pile hammers using vegetable oil with proper containment. Vibratory installation methods assume a King-Kong-type vibratory hammer, or similar. Pile lengths will require in-field welding to add pile sections. A pile-driving frame will be installed just above the water surface and the precast cap for Piers 5 to 7 will be integrated with this frame to help direct the piles in the correct orientation/alignment. Piles will be installed above the water surface elevation and then divers will cut the piles off to the required height prior to placing the CIP pier concrete.

Table 7. Pile Bent Configurations

Pier/Bent	Qty	Pile Top El	Pile Tip El	Pile Length (all piles)
#	#	ft	ft	ft
1	5	76.37	0	381.85
5	25	76.37	-35	2784.25
6	25	76.37	-94	4259.25
7	25	76.37	-91	4184.25
			TOTAL	**11609.6**

Vibratory methods are to be used for work pile removal outside of IWWWs. Oversized casing shoring used to isolate shaft construction is to be cut 2 feet below mudline and removed outside IWWWs.

Bridge Superstructure

The assumed bridge type is a CIP segmental box girder. One pair of traveler forms will construct each balanced cantilever section. The construction process for this type of structure uses form-travelers shown in Images 1 and 2 below from the recent WSDOT State Route 520 (SR 520) Floating Bridge and Landings (FB&L) project. The form-travelers support segments of reinforced CIP concrete superstructure (deck, diaphragm, and box) elements while they are poured and then cured. These segments have post-tensioning (PT) ducts placed throughout the section. Once the PT in each segment is secured, the form-traveler moves sequentially from the pier cap out to the middle of a span, alternating placement on each side of the pier to balance the loading. Four pairs are assumed for the project to minimize the construction schedule. The duration for moving forms, building pier sections, and tying-in segments is included in the schedule. Assumed durations for cantilever segmental box construction is from the FB&L project.

The American Segmental Bridge Institute (ASBI) has created an animation that demonstrates the segmental bridge construction process: https://www.youtube.com/watch?v=RFMazS96wXY

The construction activity for each form-traveler pair, one on each side of the pier, requires intensive coordination, monitoring, engineering, and adjustment to both align and balance the bridge within specific tolerances. The accelerated schedule for this project assumes four sets of form-travelers working from different pier locations. The critical loading for this type of bridge is to account for camber and creep with the largest loads imparted to the bridge at time of the middle closure pour. After the final closures are accomplished, the last PT stressing will lock adjacent segments together and provide for a completed superstructure.

Where adjacent spans are not balanced, a counter-balanced load can be used, as seen near the abutment in Image 2. A similar type of construction will be needed in Span 1 and possibly in

Span 14 of the new bridge to help balance the loading and provide for no uplift at the abutments during construction or in service. If balancing is not possible, the design team may need to lengthen the end span, though that change is not accounted for in the PCE update.

Along with the longitudinal PT required in the bridge, additional transverse PT is used to allow for wider overhanging deck sections with a narrower box section to provide better bridge aesthetics. Transverse PT can also provide for a more serviceable deck by reducing the potential for any tension due to live loading. The bridge width will also increase at Piers 8 and 9 to provide down-river viewpoints (belvederes) for the multi-use path on the bridge. Supplemental support (such as additional transverse PT, overhang ribs, or stays) will likely be required at these locations.

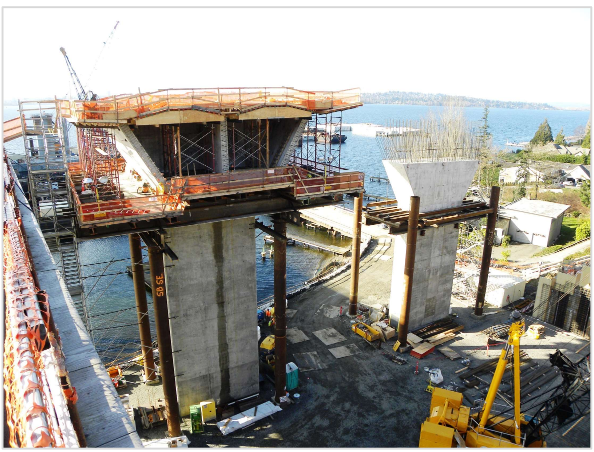

Image 1. Pier Segment and Form-Travelers

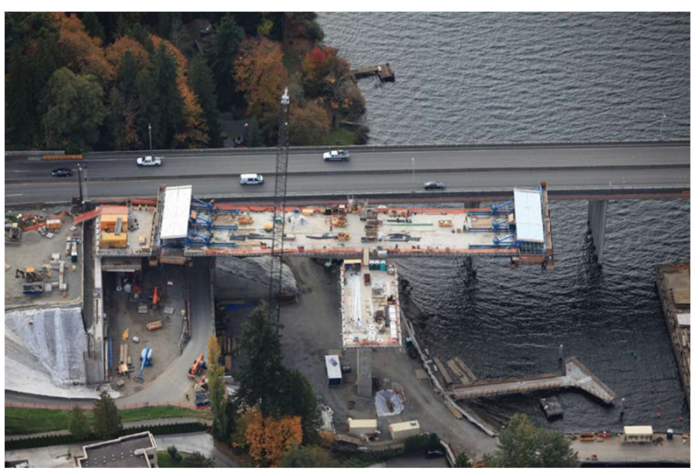

Image 2. Balanced Form-Travelers Extending away from the Pier

The CIP concrete box superstructure construction process provides a rough finished deck surface. The contractor can choose from several options to meet the required riding surface tolerances. This PCE update assumes that an extra thickness of concrete will be cast on the deck surface to allow the contractor to grind the bridge deck to the required smoothness.

Bridge approach slabs will extend away from each bridge abutment at least 25 feet.

Bridge bearings (either two or four based on design) will be required at Piers 1 and 15. These are not designed yet but are assumed to be large disk bearings to accommodate both thermal and earthquake forces.

Bridge expansion joints (approximately 113 feet in total length) will be modular-type joints to account for large thermal movements. Steel coverings with minor grade changes (less than 1/4 inch) are required over the joints along the multi-use path.

The segmental box sections will have access hatches to allow for inspection and maintenance of utilities that may run inside the superstructure. The number and type of utilities inside the box are not yet determined, but it is assumed that there will be at least power and drainage conveyance inside the box. Compatible utility expansion joints will be required at the bridge expansion locations. The utility sizes and support system details are not yet worked out. An allowance has been added to the PCE update.

Bridge Aesthetics

Bridge aesthetics is an important component of the project. As stated previously, the community and other stakeholders still need to weigh in on the final aesthetic decisions. For purposes of this PCE update, the aesthetic application to the project is assumed to be accommodated using concrete form-liners, bridge barrier treatments, pedestrian railing, fencing, pigmentation for concrete and painting or powder-coating for steel, and lighting based on what is allowed in the environmental commitments. Aesthetic lighting can also be incorporated into the pier design but is not addressed in the SDEIS. The PCE update added an allowance of $5 million for aesthetic treatments/lighting. Image 3 shows an artistic rendering of what bridge elevation and deck layout could look like.

Image 3. Artist Rendering of New Bridge

OREGON APPROACH CONSTRUCTION

Figure 4 shows the reconstructed Port of Hood River approach to the bridge on the Oregon side of the Columbia River. The overall concept for reconstructing the Oregon approach is straightforward. However, the recreational, economical, commercial, and Port use of facilities and property around this bridge approach require special attention when both scoping the work during construction and considering post-construction use. The following subsections, though not all inclusive, provide insight to key considerations for the project development.

Figure 4. Oregon Port Impacts of New Bridge Approach Roadway

Intersection Improvement

The Oregon approach roadway construction extends in each direction from the existing intersection. This intersection currently ties the following roadways together.

- Button Bridge Road to the north connecting to Port commercial businesses, the toll facility, and the existing Hood River Bridge.
- Button Bridge Road to the south connecting to U.S. 30 Mount Hood Highway and the on- and off-ramps to Interstate 84 (I-84) Vietnam Veterans Memorial Highway.
- East Marina Drive to the east into commercial businesses.
- East Port Marina Drive to the west connecting to the Port boat launch, Port office building and maintenance building, and extend back to other Port facilities, Marina, and commercial businesses.

For purposes of the PCE, the roadway improvements to the south are intended to end before ODOT ROW limits, though traffic control, signing, and other construction modifications may be required for safety and permit purposes. There is a consideration that the existing I-84 westbound on- and off-ramps are close enough to the intersection improvements that ODOT may require the project to relocate those ramp tie-ins to U.S. 30, connecting to Button Bridge Road. These I-84 ramp were reconstructed in the last ten years. Significant modifications to these ramps are no included in the PCE update.

New signal foundations and structures will be required. It is intended to use the existing poles and new poles for staging at the intersection, though up to two temporary timber signal poles and wire systems may be required. Other utility relocations will be required. The current assumption is that all utility relocations can be done with traffic control or night work to minimize lane closures.

Pedestrian, bicycle, and other recreational transportation is an important components and resource to the Port facilities. In addition to crossings at the interchange, there is a multi-use path along the waterfront that crosses under the existing bridge. The contractor will be able to close the multi-use path during construction at the bridge, but specific signing and fencing will be required to redirect the users to a detour route. It is assumed the contractor will always have to maintain a multi-use crossing at the intersection. Staging of this intersection to provide access for construction equipment, materials, and supplies will need to be a major focus of the next design effort so as to identify impacts and traffic control requirements.

Port of Hood River Boat Launch

The Hood River Marina Park and Basin received federal funding in the 1970s from the Land and Water Conservation fund, which results in protection of these areas under Section 6(f). This requires that the lands may not be wholly or partly converted to uses other than outdoor recreation without approval of the National Park Service. Any conversion or occupancy longer than 180 days is considered permanent and must be replaced with equivalent property.

The Hood River Marina Park and Basin includes, but is not limited to, the boat launch, parking, the marina facilities, Marina Green, and Port Marina Park. The current National Environmental Policy Act (NEPA) document has identified some permanent impacts to parking at the boat launch with the creation of the access road to the Port facilities. Replacement of the loss could be required but is not currently identified. Cost considerations should include the need for replacement resources for any use of Marina Park that is longer than 180 days. Significant impacts during construction to the boat launch shall be kept to a minimum (see Marine Support section of this document), which could require re-evaluation under NEPA, including consideration for impacts under both Sections 6(f) and 4(f). Future design efforts need to define the amount of access that can be permitted for the contractor to utilize the boat launch during construction.

Port Facilities

The existing Port office building and maintenance building are located just west of the proposed bridge approach roadway, north of the boat launch, at the mouth of the Marina Boat Basin. There is a significant challenge to maintain access, parking, storage, and function of these two facilities after construction and certainly during construction. A proposed two-lane access road has been developed to a 5 percent design, but still requires coordination with the Port to finalize the concept. The usefulness of this proposed access road is greatly impacted by the contractor's work (see Approach Phasing and Construction Access subsection below). The office building and maintenance building are both assumed to be demolished and a new location for these activities established prior to start of bridge construction to provide contractor access to the river at this location. For purposes of this PCE update, the costs for the land, leases, demolition, permitting, new construction, permitting, port personnel and demolition are included as programmatic costs. All properties will be restored to original or better condition with the project.

Approach Phasing and Construction Access

The Oregon approach roadway will be constructed in several phases to accommodate maintenance of traffic movements from the existing bridge to the new bridge.

A permanent retaining wall will be built up to accommodate the grade change with a new access road to the Port facilities on the west side. A temporary wall will likely be required on the east side of the new approach fill to accommodate the traffic switch from old to new. Wall systems are assumed to be structural earth walls or geosynthetic wall types. Currently no ground improvements are anticipated, but additional subsurface explorations and geotechnical recommendations are needed to confirm that assumption and are covered in contingency costs. Sidewalks on sloped grades will include adequate shoulder distance and fencing behind guardrails. Sidewalks above all structures will use moment slabs under the roadway with pedestrian traffic barriers and hand railings to accommodate bicyclists. Transitions of guardrail systems to bridge barriers will use current state standards.

Access to the existing bridge and the work trestles located between the new and old bridge is an important consideration due to the shallower river section near the Oregon bank. Prior to construction of the Oregon approach roadway, the contractor will have access to the work trestle through the Port property. Once the approach roadway is constructed, access to the work trestle is either from the river, around the approach fill and under the new bridge southern span, or across the footprint where the stormwater facility is shown in blue in Figure 4. This last alternative would be preferred by the contractor but would require the drainage pond to be relocated. This current location of the stormwater facility on the Oregon side is also a concern for the Port, as there may be interest to use this area for more economically beneficial use after the project is completed. Additional engineering needs to be performed to see if relocating the stormwater facility up along East Port Marina Drive or another location is viable. The current scope for updating the PCE assumes the contractor has access across the area currently shown as a drainage pond until the project is complete. Additional construction access is described in the Construction Staging and Marine Support sections of this document.

Tolling

The Oregon approach roadway is the current location for the tolling facility where users of the Hood River Bridge from either direction make payments. There is uncertainty as to who will own and maintain the new bridge. It is currently assumed that the facility will continue to be tolled to provide a funding source for construction and maintenance and will likely be located on the Oregon approach again. There is some benefit to considering the Washington approach to simplify construction staging and transition from one tolling system to another but could create complications if the owner is in Oregon and tolling is in Washington, or vice versa. The current PCE assumes a tolling system will be staged on the Oregon side of the river. The new tolling system is also assumed to be an electronic system that will likely only accommodate payment-on-the-move tolling. Tolling costs are carried currently by the Port program costs.

WASHINGTON APPROACH CONSTRUCTION

Figure 5 shows the current design configuration for the Washington approach roadway. The alignment on this side of the river has been selected to accommodate construction staging and maintenance of traffic, provides a new crossing of the BNSF railroad line, and reduces impacts to environmentally sensitive properties. A roundabout design has been proposed for the SR 14 intersection connecting to the new Port of Hood River Bridge. This type of intersection has been successfully constructed in Washougal, Washington, down-river of this project location along SR 14 and at Wind River Highway near Carson, Washington. The design also improves ADA and multi-use functionality up to the logical termini along SR 14, until those systems can be further developed later. The removal of stop lights on the entirety of SR 14 is a goal of WSDOT and the current light at the intersection to the bridge is the last remaining stop light on the SR 14 system.

The roundabout will push up against a gas line facility shown on Figure 5. Work around the gas line will require smaller compaction loads and reduced roadway sections. Moving this facility is not preferred. Where possible, small retaining walls, fences, or railings will separate the multi-use path from the building. Additional coordination and design are still needed at this location.

The alignment shown does not require significant walls, other than just off the bridge abutment. In the current SDEIS process, there is some discussion of moving the eastern leg of the intersection further into the hillside to minimize impacts to environmentally sensitive areas. This change would cut into a steep slope and a tall cut wall will be required. No geotechnical investigation has been performed at this potential wall location. Future site investigations will consider survey, geology, slope stability, landslides, artesian conditions, drainage, and construction considerations, but no information is available at this time for these items. The PCE assumes a 350-foot-long by 30-foot-tall soldier pile wall with permanent ground anchors to resist any slope instabilities.

There is an existing drainage facility on the east side of the current Washington approach roadway that serves SR14 and needs to be maintained. The project intends to maintain this facility. Additional drainage facilities will be required based on project improvements and the figure below shows potential locations for these ponds. Drainage consideration costs included in the PCE are considered a high-level estimate until further design can be performed.

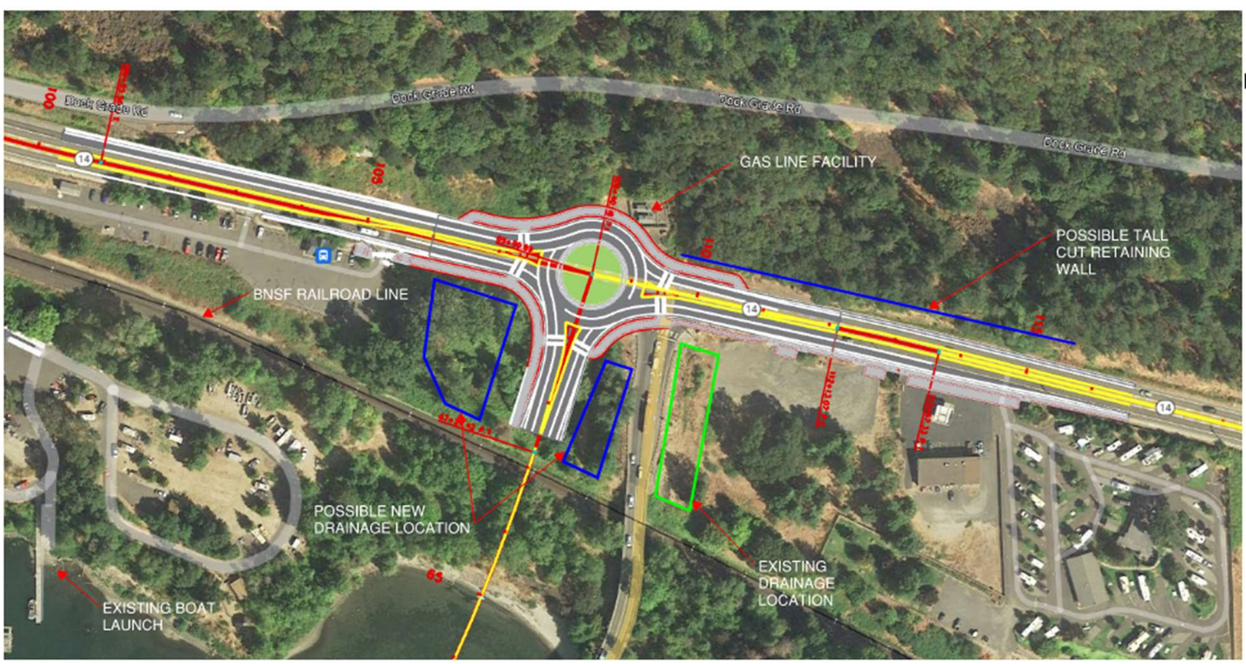

Figure 5. Washington Approach Design Configuration

Approach Phasing

SR 14 has considerable truck traffic heading east-west, in addition to crossing the existing bridge. Local traffic also uses this highway to commute between Hood River, Oregon, and the cities of White Salmon and Bingen and unincorporated Underwood on the Washington side.

Additionally, SR 14 is used as a bypass route in conjunction with I-84 on the Oregon side. Traffic movements and maintenance of traffic were key drivers in selecting the roundabout solution for this intersection. It is assumed that construction phasing will progress though the following stages.

- Construct the roadway to the north. Do not construct the multi-use path at this time but provide temporary paving for the next traffic move (if needed).
- Move traffic to the new roadway section on north side and create tie-ins to the existing bridge and private drives to the south; maintain these tie-ins through next stage.
- Construct the southern roadway section and approach to new bridge. Include drainage facilities with this stage and tie in the drainage on the new bridge. Construct the multi-use path and sidewalks on south side.
- Construct the roundabout and move traffic onto the new bridge. Close existing bridge access (unless that plan changes). Construct the multi-use path and sidewalk on north side.
- Complete Washington approach and SR 14 improvements.

BNSF Railroad Crossings and Construction Access

The roadway crossing of BNSF railroad line will be accomplished using the last (northernmost) bridge span. Construction access to the approach roadway, the new bridge piers and spans, work trestles, and the existing bridge piers will involve crossing the BNSF railroad tracks. This temporary alignment is assumed to be adjacent to the new bridge, on the downstream side, and then cross under the new bridge to the work trestle after crossing the BNSF tracks. This alignment has not been laid out or submitted to BNSF, both of which should be a priority in the future design efforts. Image 4 shows the steep grading, walls, and benching required to get down to the water along a steep slope at the FB&L project; our access and benching will be similar across the BNSF railroad tracks. Another existing route exists just west of the project, along South Dock Grade Road. This crossing connects to private properties and rights would need to be acquired or negotiations made through the ROW process. Again, this access is not included in the PCE update.

Image 4. Steep Access Down to Water at FB&L Project

A certified railroad flagger will be required during all construction work that is performed within BNSF ROW and/or within 25 feet of the railroad tracks. Non-foul approval for moving construction equipment and materials across the railroad has not be coordinated yet, but it is assumed it will be granted and limit the amount of railroad flagging time during construction. Cost for extensive and prolonged railroad flagging can be expensive; design elements should be carried forward when possible to limit the duration of railroad flaggers on the project. A cost has been included in the programmatic cost section of the PCE. Some of these considerations include:

- Formwork and construction access for pier construction located outside BNSF ROW; assume at least 10 feet from face of piers or 5 feet from face of foundations, whichever is closer.
- Use prefabricated structural elements (steel or concrete) to span over railroad tracks. CIP concrete deck and barrier elements are acceptable with appropriate formwork/falsework. Access to falsework should be outside the 25-foot buffer of the tracks and is preferred outside the BNSF ROW.
- Provide a 2-foot buffer above the minimum 23-foot-6-inch vertical clearance over BNSF railroad tracks to account for construction activities and tolerances.

Other special considerations when working with BNSF include:

- Using the Union Pacific Railroad - BNSF Railway Guidelines for Railroad Grade Separation Projects to develop the project, which has been agreed to between WSDOT and BNSF.

- Fully encase all utilities located on the bridge across the BNSF ROW, or consider getting permission with BNSF for directional drilling or other underground placement of utilities across their property. A utility permit with BNSF will be required either way.
- BNSF will require pre-approved construction impact drawings, showing limits of construction work relative to the railroad tracks as part of the submittal process.
- New bridge crossings, which this project will be considered, has a specific 10, 30, 60, and 90 percent and final design approval process. This process generally cannot be accelerated as it is typically accomplished by a third-party consultant under contract to the railroad and must be completed prior to going to advertisement for construction.

There is an existing crossing of the BNSF tracks using the existing bridge, but it will not be useful for the new construction. There is discussion by others of maintaining the existing bridge coming from SR 14 over the BNSF tracks and development of a pedestrian access stairway down to the river shoreline. This access is not included in the current PCE update.

GENERAL CONSTRUCTION STAGING AND ACCESS

Construction Staging Areas and Concrete Batching

A project of this magnitude and duration will require construction access and staging on each side of the river at the bridge site as well as up to 15 or 20 acres of storage/staging area near the project location. Figures 6A and 6B show potential construction staging areas that need additional evaluation before they can reasonable be carried forward by the project.

Figure 6A shows the Port owned Lower Mill site property that has 15 acres located just 10 miles from the project site along OR-35. Stretches of OR-35 are tight with sharp curves, including several near the Port entrance. It is assumed that some modifications of OR-35 will likely be required to have the contractor fully utilize this location. The PCE assumes this site is available to the contractor, but additional barge and tug boat methods are accounted for based on the distance from the Lower Mill site to the project site.

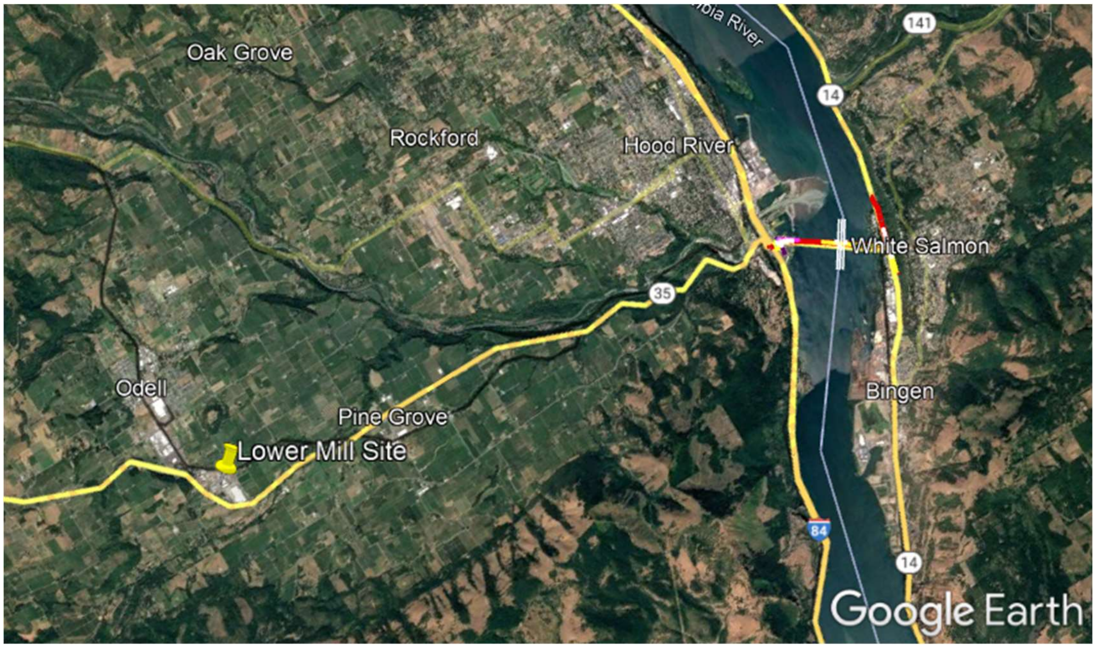

Figure 6A. Potential Construction Staging Areas

The PCE update assumes two locations on the Oregon side, beside the bridge site, and one location on the Washington side for lay down, staging, and stockpiling, even if the Lower Mill site is used. Figure 6B identifies locations (A to H), but no reviews or analysis of these areas has been completed. Location "X" is the Port office building location and maintenance facility, which the location of is assumed to be used by the contractor for river access. This area will enable the contractor direct access off I-84 to stockpile and/or assemble bridge materials, construction formwork, and equipment and the ability to crane materials right onto a barge at the project location. Only locations G and H are also adjacent to the river. Any modifications to the river shoreline may require re-evaluation under NEPA and additional project permits. Additionally, location "Y" is a Port owned facility called Marina Green that is likely subject to Section 4f and 6f resources and requires additional considerations for impacts. Marina Green could be a prime location for contractor use, but is not included in the current PCE update. The effort to defined construction assess through Port properties should be incorporated into the next phase of design/program work, including a more in-depth evaluation of staging needs to secure sites to use in construction, otherwise higher risks are placed on the contractor to get through the process during construction. The PCE update assumes at least one staging location is utilized on the Washington side of the river.

Figure 6B. Potential Construction Staging Areas

Off-site locations often require development as part of the project to serve the function of construction efforts they are intended for. Image 5 shows the before and after development of an off-site staging and water access site for the WSDOT SR 520 FB&L project. A critical piece of the success in this site is the loading configuration of the pre-assembled materials and stockpile materials to barges for shipment to the project location.

Image 5. Site Access for WSDOT SR 520 FB&L Project

There are two quarry sites located near the project. The one on the Oregon side is located across I-84 from the Port of Hood River. The one on the Washington side is located upriver on the east side of Bingen, Washington. Both of these sites could be used for stockpiling and are assumed to accommodate a concrete mix plant on each side of the river. There are time restrictions between concrete batching and placement. There can be time extensions with special retarding additives, but this requires special provisions in the contract or approval of a contractor-proposed changed. Once on site, placement from the approach roadway or the work trestle can be done with trucks going directly to a pump truck for placement. Work off a barge will require concrete transfer to the given bridge location that impacts construction time, mix designs, and placement methods. For this project, it is assumed that the contractor will not use a slick line system. The delivery of concrete on this project is going to be a major effort. The PCE update assumes that concrete placement on the water will be handled by building a concrete placing barge positioned at the Port Maintenance location with Transi-Lift crane and work trestle access (see discussion in Work Trestle section). Redi-mix trucks will be loaded onto a barge and two barges with four trucks each are assumed to be moving back and forth during a placement.

There are concrete mix requirements for different concrete placement work, such as drilled shaft, bridge abutment, pier column, or segmental box concrete pours. It is assumed that the WSDOT or ODOT specifications will cover concrete mix types, except for concrete in the bridge superstructure. The timing, density, and concrete properties are a key element in the placement and sequencing of work for a segmental concrete box bridge. A special provision will be written and included in the contract to require the contractor to develop and a submit their mix design for approval. On past projects, this mix design is altered throughout construction, with approval based on in-place performance so that the contractor can dial in how to align the different span cantilevers to meet at the right location.

Work Trestles

The Columbia River is generally deep enough to accommodate recreational boats and some barges up near the shoreline, but changes in river depth creates an added risk for even the shallower draft river vessels. Larger cranes or barges loaded with heavy materials will be limited on how close they can get to the river edge. At this early stage of engineering, and to capture a conservative impact in the environmental documentation, work trestles are assumed for some distance on each side of the river. Typical work trestles segments are 30 feet wide and constructed in two 30-foot spans (60 feet total) so that a pile bent (two to four piles per bent) are placed with a boom that can reach out from the last segment. A steel bent cap is placed on top of the piles with steel stringers running between bent caps. The work surface is typical a timber deck system with a containment system for environmental purposes. Larger cranes may require crane mats to help distribute weight. If river currents are strong enough and/or if the equipment using the work trestle distributes a large lateral force or torsion, then battered piles are often installed to account for these loads. The pile count included in the environmental documentation allowed for some batter piles on this project. Image 6 shows a work trestle configuration with support crane over the Puyallup River in Washington State along I-5.

Image 6. Work Trestle Configuration in Puyallup River

Image 7 shows a similar congestion of work activates using a work trestle and barge configurations on the FB&L project.

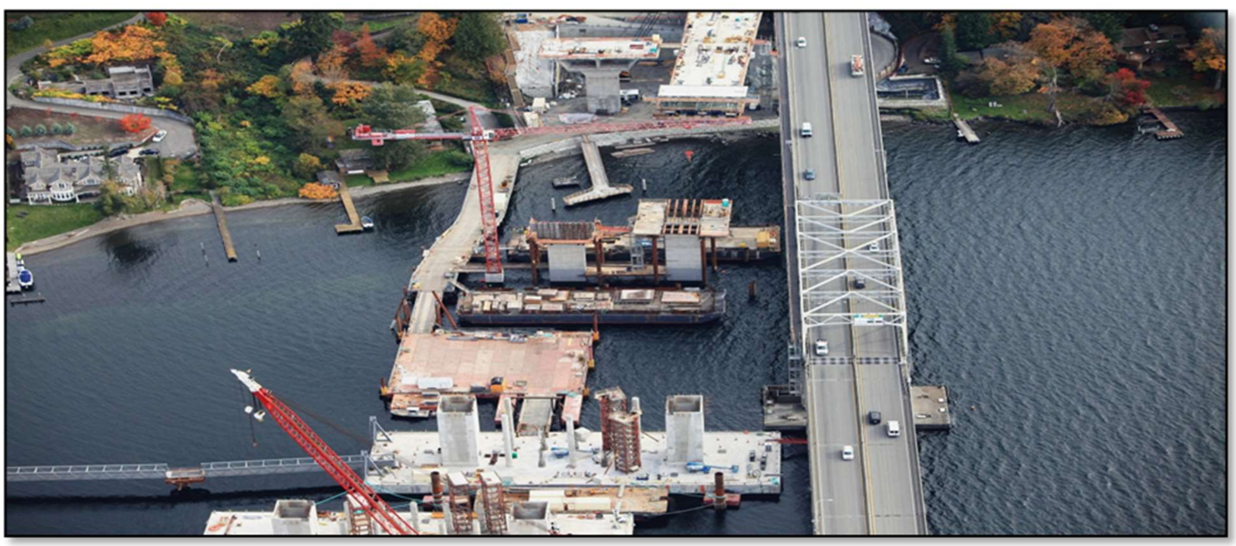

Image 7. Site Access, Staging, and Work Trestle at FB&L Project

The PCE update has modified the plan for the work trestles in the river to construct the project, compared to what is currently shown in the SDEIS document. The overall impacts are similar in square foot area and number of piles. Figure 7 shows one work bridge for both construction and demolition extending about 750 feet into the river between the old and new bridges.

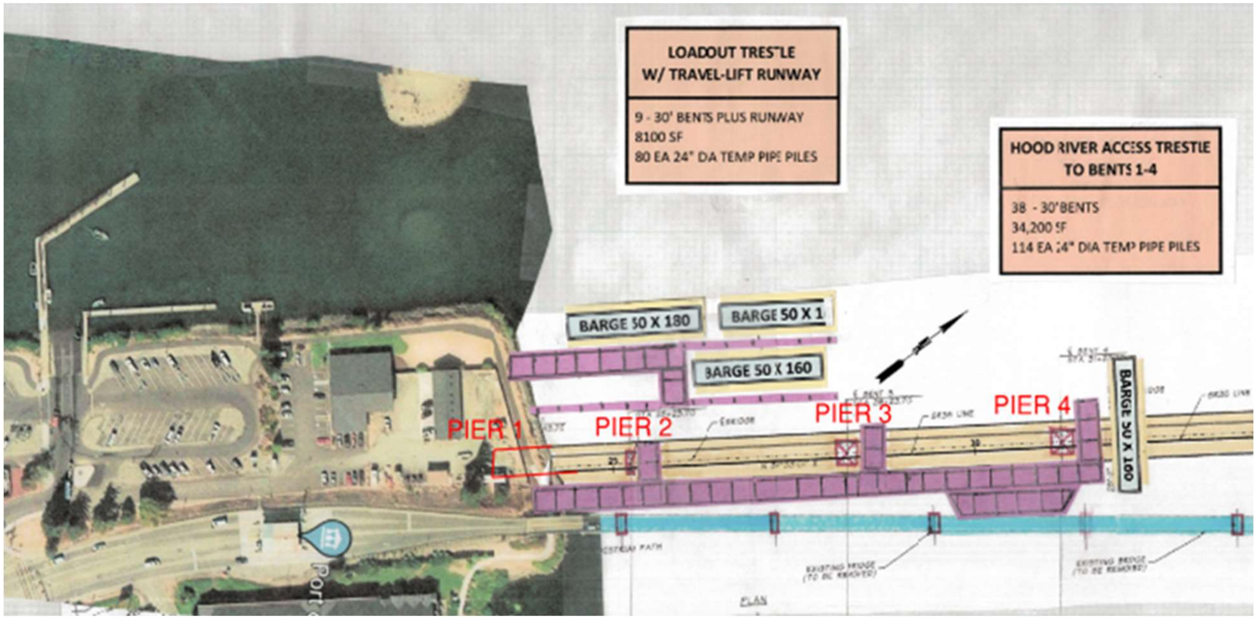

Figure 7. Oregon Side Work Trestles (PCE Update)

Work trestle finger piers will extend to the locations needed for foundation construction and wider section is added towards the end to facilitate coffer cell placement for existing pier removal. The other work bridge shown in Figure 7 is constructed downstream of the new bridge that functions as a loadout trestle for barges. As discussed, previously, this assumption requires the Port facilities to be relocated. Work trestle fingers run parallel away from the staging area and accommodate a Transi-Lift crane to move back and forth from land out over the river. A section on the downstream side is constructed as a 30-foot-wide trestle with a 90-degree finger pier at the end to access both loading barge and also serves as a mooring or loading location for other barges using service cranes.

Figure 8 shows the work trestle configuration for the Washington side, modified from two separate trestles listed in the SDEIS to a single trestle that uses finger piers to reach both the new bridge pier construction and the existing bridge pier removal. Again, this trestle is 30 feet wide and extends approximately 900 feet out into the river. The access road across the BNSF railroad alignment may require this trestle to swing more upriver.

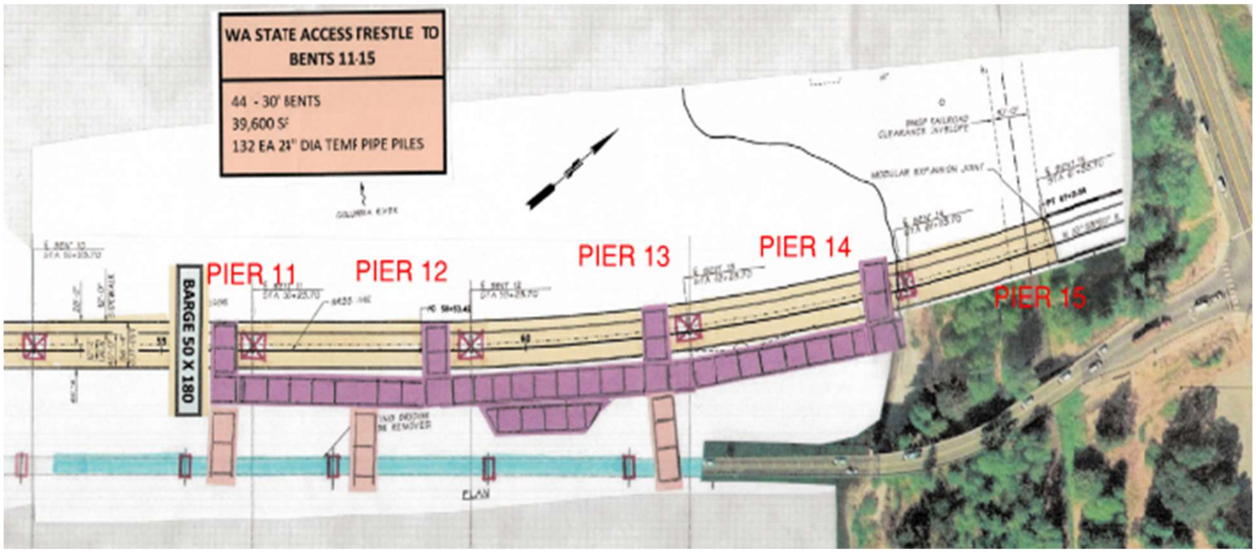

Figure 8. Washington Side Work Trestles (PCE Update)

Table 8 shows the assumed work trestle size and number of piles used for each work trestle in the river. This is a slight change to the area and location of the work trestles listed in the DEIS documents.

Table 8. Work Trestle Size and Number of Pile in River

Project Element	Temporary Overwater Coverage (sq ft)	Approximate Total Quantities
Temporary Loadout Trestle (OR)	8,100	80, 24-inch steel pipe piles
Temporary Access Trestle (OR)	34,200	114, 24-inch steel pipe piles
Temporary Access Trestle (WA)	39,600	132, 24-inch steel pipe piles

Marine Support

The Columbia River is controlled by a series of dams that work together and adjust to seasonal conditions and environmental commitments for fish migration. The river currents and elevations fluctuate based on the amount of water retained by the Bonneville Dam downstream and released by the Dalles Dam upstream. The approximate flow along this stretch of the river fluctuates but is about 2 to 3 feet per second. The current accelerates river travel time downstream and slows travel time upstream. The farther away the river access sites are from the bridge site, the more construction time it will take for roundtrips of river-going vessels for staff, supplies, and materials.

The Bonneville Dam (RM 146.1) the dam at the Dalles (RM 191.5) both shuts down their lock access annually for one month; in 2022 this will be from February 13th to March 12th, and from February 13th to March 19th, receptively. This is not specifically shown in the schedule, but will require the contractor to manage movement of martials around these closures each year.

The current PCE assumes there will be boat launch access near the bridge from at least one location near the project. The PCE update assumes that the main day to day work activities will be done from a boat ferry system set up by the contractor and loading/unloading of field workers/inspectors will primarily function off the work trestles in the river. The costs for the ferry service are include in relative work activities.

All of the temporary works will be orchestrated with river traffic needs to ensure safe passage in and through the construction zone throughout the duration of the project. The construction of the new bridge and the demolition of the existing bridge will require a considerable fleet of river barges, tugboats, and personal watercraft for both the contractor's personnel and the construction inspection staff. Additionally, there will need to be barges outfitted with specialized drill shaft installation equipment, pipe pile and sheet pile driving equipment, and construction cranes. For some of the work, specialized derrick cranes (see Image 6) will be mobilized for large picks, such as shaft rebar cages, truss segments, the counterweight system, and other work. The larger derrick cranes are available around the Portland/Vancouver area, as well as the Puget Sound region to support this project. The locks at Bonneville are only 86 feet wide limiting the larger derrick cranes from transiting upriver as well as limiting barge sizes. DB General, for example, is 105 feet wide. There are also seasonal lock closures for maintenance that will prevent vessel movement through Bonneville. The contractor will want to tie his workstations (barges, trestles, cranes, etc.) together and create better access between the construction activities. Image 8 shows one example of the footprint needed when creating a work site on a water surface.

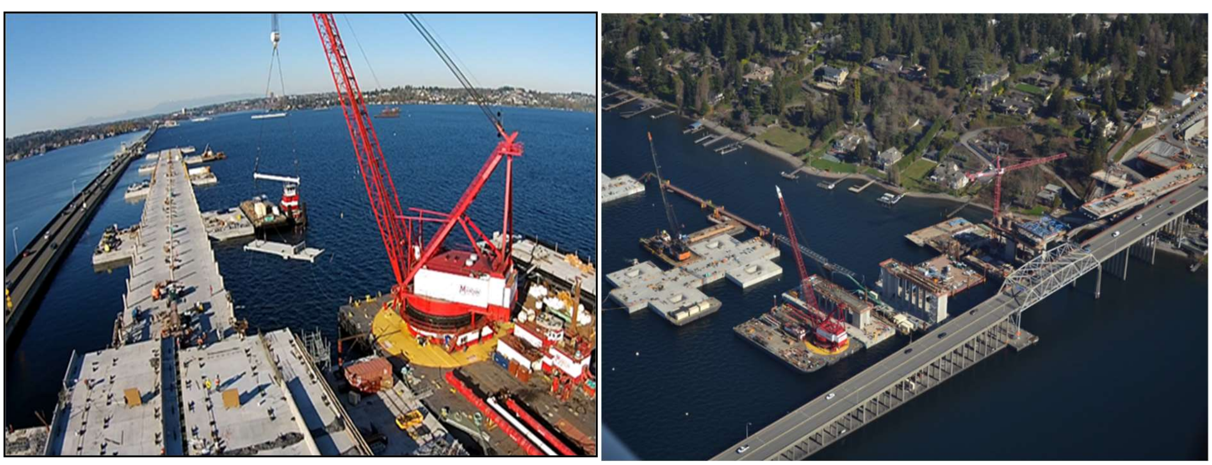

Image 8. Derrick Crane at FB&L Project (left); In-Water Work Access at FB&L Project (right)

Barges will vary in size but will typically measure approximately 45 feet by 140 feet (approximately 6,300 square feet). Up to 20 barges are assumed on site during the first IWWW, but no more than 15 barges are estimated to be moored or moving equipment for Columbia River bridge construction at a given time throughout the remainder of the project. Barges will most likely come from Portland or points downriver on the Columbia River, though it is possible that one or two barges could come from Puget Sound or elsewhere. This data is summarized in Table 8. Each barge crane team will have two barge-mounted cranes and a support crane at a minimum. Additional support barges for materials will also be included in the work. A rough count of barges at one time could include:

- Four or more marine derricks
- Two laydown barges per derrick (8 total)
- One concrete placing barge
- Two concrete delivery barges
- Two service and equipment maintenance barges
- One water treatment barges
- One spoils handling barges
- One anchor or mooring barges

Construction barges will be secured via multiple means. Construction barges are typically equipped with "spuds," which are vertical piles in special brackets attached to the barge. These are lowered and anchored into the riverbed to secure the barge in place. Because of wind, current, and wave action, the barges may also be anchored with multiple large anchors, so-called "Danforth" anchors, which are attached to winches on the deck of the barges. These anchors are set up-river, as well as transverse to the current to hold the barges in place and allow their location to be adjusted using the winches. Each barge will have up to four spuds, one at each corner of the barge. Each barge will also have four anchors, two of which will be set up-river, and one in each direction transverse to the current.

Image 9. Tugboats In Action

Tugboats will be a key component of marine support efforts and are expensive. Image 9 shows tugboats moving derrick cranes and precast floating elements, similar to our assumed pier cap segments, to the FB&L project site. Tugboats are assumed for the following work activities, though this list is not all inclusive:

- Moving barges around the project site.
- Assisting commercial traffic through the main river channel during construction of Piers 8 and 9 of the new bridge and while cofferdams are in place for Piers 11 and 12 of the existing bridge.
- Hauling materials from up-river or down-river staging areas; particularly precast pier caps for the new bridge or other elements that can be fabricated in the Portland/Vancouver area or other sites and shipped to the project.

The PCE update has assigned tugboats to each specific activity and has included two extra tugboats full time for moving material around during the entire project.

EXISTING BRIDGE REMOVAL

The existing bridge is tolled from the Oregon side and is broken into three components for purposes of this scoping document: the Oregon approach spans, the main river crossing, and Washington approach spans; see Figure 9.

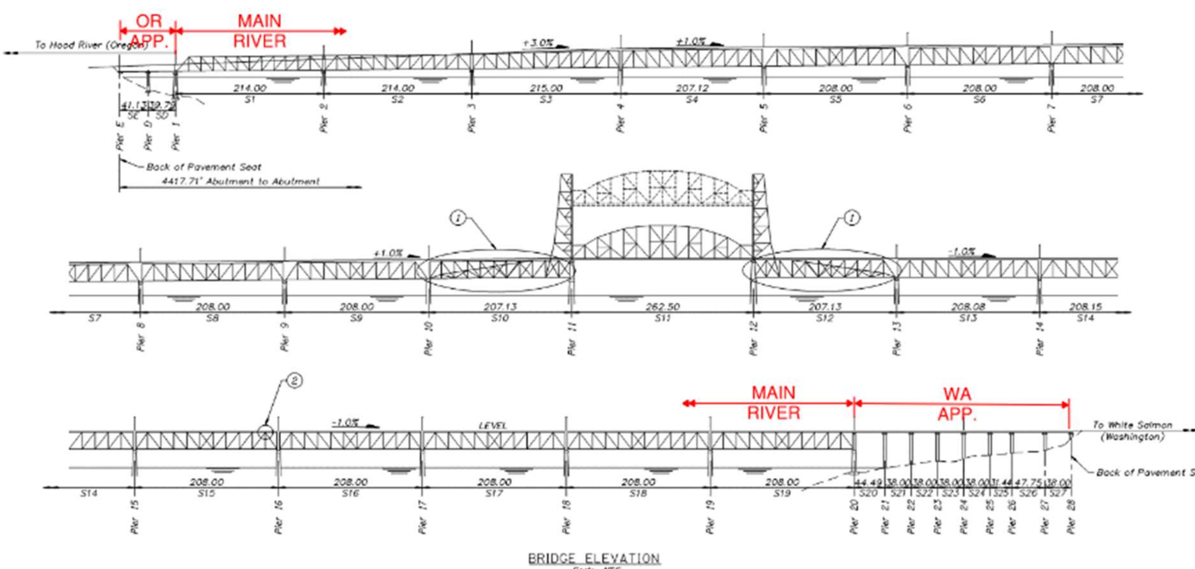

Figure 9. Existing Bridge Layout

The bridge deck is 19.5 feet wide (assumed 21-foot bridge width) and 4,418 feet long and carries two lanes of opposing traffic. The Oregon approach consists of two spans (E and D) using steel girders with concrete deck, supported on concrete piers, and crosses over the Hood River Waterfront Trail. The Washington approach consists of eight spans (20 to 27) reinforced concrete girders and concrete, supported on concrete piers, and crosses over the railroad line in Span 26. The main river crossing has 19 spans of fracture critical truss segments, an open-grid steel deck system, and a movable lift span truss with counterweights located in Span 11 over the main river channel. The main river channel bridge is supported on concrete piers with a combination of spread footings or pile supported footings. Piers 11 and 12 have exposed piles surrounded by riprap to mitigate scour. The riprap is required to be removed as part of the SDEIS commitments.

Existing Superstructure Removal

The superstructure elements can be removed separate from the foundations. Bridge removal around Span 26 will require specific procedures to meet railroad criteria, including railroad flagging during construction, but is included as incidental in the square footage quantity for bridge removal. There is discussion about leaving the segment of the existing bridge over the railroad in place and developing this into a pedestrian access down to the shoreline, but that is not included in the current assumptions. Otherwise conventional removal techniques will be used for the Washington and Oregon approach segments that are outside the OHWM of the river.

Removal of the river superstructure segments can be done any time throughout the year and is considered out of water work from an environmental standpoint. Concrete deck (approach sections) will be demolished with pulverizers and crushers, with protection to prevent debris from falling into the river. The exception will be the spans over the BNSF railroad, which will be removed in cut segments.

It is assumed that deck segments, secondary truss members, and floor system will be removed first, span by span. This will allow the contractor to lift assembled truss segments from pier to pier using barge-mounted cranes or derrick cranes and place these truss segments on barges to be dismantled. Image 10 shows a situation like this on the FB&L project.

Image 6~~10~~. Removal of the 1963 Floating Bride Truss on FB&L Project

The truss dismantling can be done either:

1) from the barge and hauled off to other locations in pieces. This would require a large in-water footprint, extra barges for dismantled pieces, workers, equipment, containment systems on each barge, and room to execute the work.
2) by shipping truss segments by barge to a separate location and use another set of cranes to place it on land. This option requires a larger staging area on land with barge access. The benefit is that the containment, dismantling, and removal of material off site is better controlled, safer, and likely to cost less.

The location for the barge configuration or the on-land staging area for dismantling has not been identified; however, the PCE update assumes Option No. 2 above; the trestle segments will be barged down to the Portland area and dismantled there. This greatly reduces the containment and over-water work with contaminated materials. The moveable lift span and counterweights can be removed in a similar fashion but may require larger crane configurations.

Salvage values for steel members is not generally included on transportation projects. This is often left to the contractor and they use the offset savings to lower their competitive bid pricing for design, bid, build contracting methods. If another contracting method is assumed at a future date, the Port could revisit this assumption. Our experience is that the salvage price of steel bridges is negligible ($0.01 per pound), specifically with the issue of lead paint removal, which typically costs more than the material is worth.

Sequence of the existing bridge superstructure segment removal is critical for timing of coffer cell placement at piers to meet IWWW.

Existing Foundation Removal

Removal of the existing bridge foundations on the Washington and Oregon approach spans will be done using conventional methods and removal will extend to the bottom of footings.

A cofferdam is assumed at both Pier 1 and Pier 20, adjacent to the main river spans as well as all in-river piers. Figure 10 shows approximately the assumed limits for the work trestle (green lines) from both the Oregon and Washington approaches as well as the pier removal limits (blue lines) and associated cofferdams (red lines) required for removal. Demolition of existing piers is done inside the coffer cell, but in the wet (no seal) with equipment, divers, and specialty methods. Existing bridge piers will be removed 3 feet below the mudline. Coffer cells are assumed to be placed 3 feet around the perimeter of each existing in-water pier for demolition except at Piers 11 and 12 along the main river channel. These two piers will have the coffer cell extend around the riprap. Image 11 shows a similar cofferdam configuration used at the FB&L project for WSDOT. The cofferdam size at Piers 11 and 12 will constrict the main river crossing. Extra tugboats will be required during the use of either of these two cofferdams to help navigate large commercial river-going vessels. It has not been negotiated yet, but is assumed that the U.S. Coast Guard will allow both coffer cells to be in place at the same time and barge equipment will be allowed to work around one of these two piers at a time. Note that other piers have riprap as well, but the PCE update assumes the riprap will be removed prior to coffer cell placement.

Due to the size of the cofferdams, it is assumed that internal bracing will be required to resist the water pressure at depth of excavation. Crane reach to the bottom of coffer cells is a concern. The depth of the river and lack of visibility will necessitate divers during foundation removal. Diving inside cofferdams is considered confined diving and requires additional mitigation and increases diving costs. The use of excavators for removal to the bottom of foundation is not practical and other methods, such as wire cutting, will be required. Remotely operated vehicles with video cameras is a method that can be used to confirm completed work at depth. Table 9 shows the cofferdam information at each pier location and Table 10 shows the environmental impacts for the cofferdams below the OHWM.

Cells will be installed in one IWWW and stay in place for one or two additional IWWWs as required to accomplish the pier removal. Vibratory removal of coffer cells is not permitted outside of the IWWW.

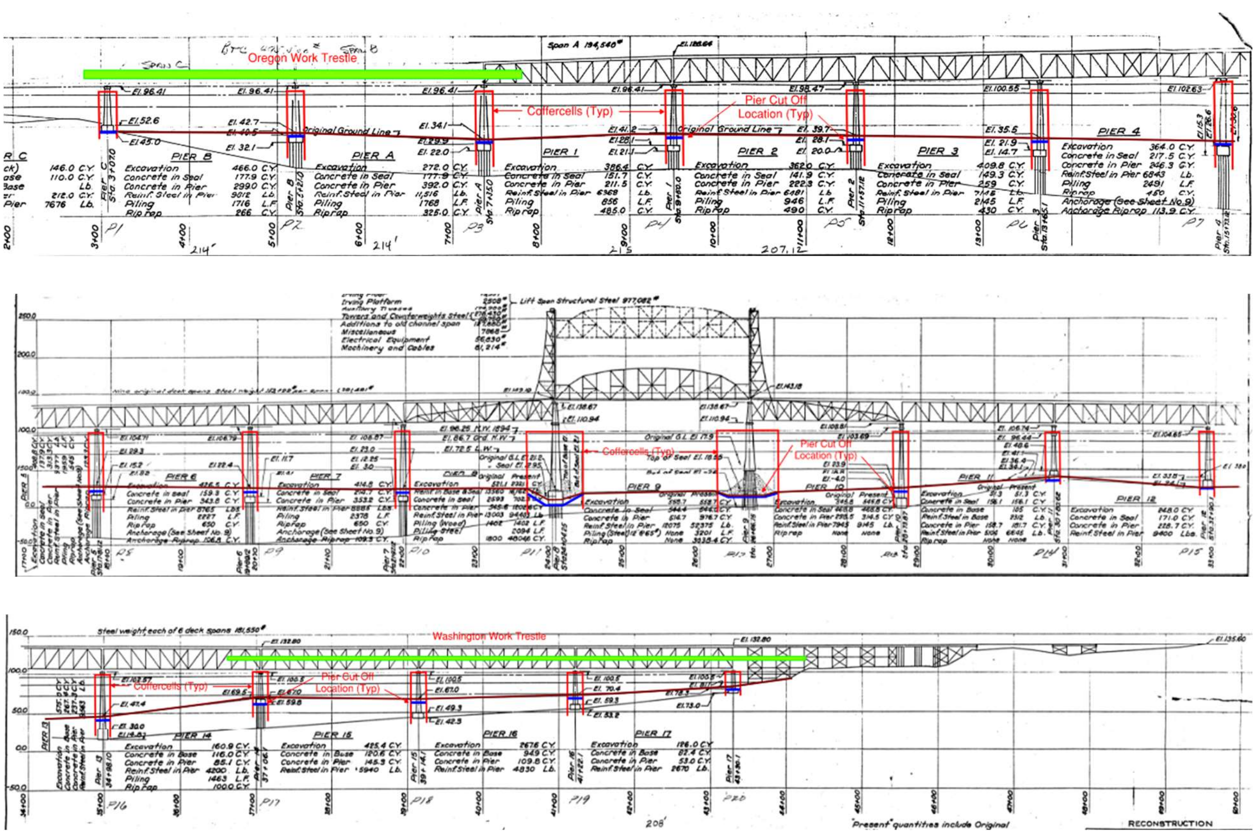

Figure 10. Existing Bridge Removal Exhibit; Foundations

Image 7~~11~~. Cofferdam Images at FB&L Project

Table 9. Existing Bridge Pier Removal - Cofferdams

Bent	Bent Height A	Bent Height B	Top Width	Base Width	Base Length	Coffer Cell Clear Dist.	Coffer Cell Perimeter	"HW 1894" Elev.	Approx Base Elev	Key Depth	Area
#	ft	ft	ft	ft	ft	ft	ft	ft	ft	ft	sqft
1	0	0	0	38	16	3	120.0	96.25	45	10	7350
2	0	0	0	38	16	3	120.0	96.25	32.1	10	8898
3	0	0	0	38	16	3	120.0	96.25	22	10	10110
4	0	76.21	20	28.18	14	3	96.4	96.25	21.1	10	8204.273
5	0	88.28	20	28.68	14	3	97.4	96.25	20	10	8397.013
6	0	83.75	20	28.49	14	3	97.0	96.25	14.7	10	8878.443
7	0	88.44	20	28.69	14	3	97.4	96.25	15.3	10	8855.802
8	0	95.32	20	28.97	14	3	97.9	96.25	8.2	10	9603.344
9	0	102.4	20	29.27	14	3	98.5	96.25	4.1	10	10065.18
10	0	105.98	20	29.42	14	3	98.8	96.25	3	10	10204.37
11	25.90	104.35	27.33	77.76	54	3	275.5	96.25	2.1	10	28695.49
12	25.90	108.35	27.33	77.93	54	3	275.9	96.25	-2.6	10	30026.73
13	0	103.75	20	29.32	14	3	98.6	96.25	-4	10	10875.7
14	0	59.25	20	27.47	14	3	94.9	96.25	34.1	10	6849.741
15	0	0	0	34	14	3	108.0	96.25	24.1	10	8872.2
16	0	0	0	34	14	3	108.0	96.25	14.8	10	9876.6
17	0	0	0	32	14	3	104.0	96.25	59.8	10	4830.8
18	0	0	0	30	15	3	102.0	96.25	42.3	10	6522.9
19	0	0	0	30	14	3	100.0	96.25	53.2	10	5305
20	0	0	0	30	14	3	100.0	96.25	73	10	3325

Table 10. Cofferdam Environmental impacts

Project Element	Approximate Dimensions (ft)	Approximate Total Quantities	Temporary Benthic Impact (sq ft)	Temporary Overwater Coverage (sq ft)	Approximate Duration
Cofferdams (Demolition) (up to 22 total)	Varies by bent 16 x 30 to 50 x 86	Up to 70,000 linear feet steel sheet pile	24,000	-	12-16 months (each)

Contaminated Materials

It is assumed that lead base paint will be removed using approved containment systems. Removal techniques require an SSPC Guide 6 Class 2a containment system, which normally requires impenetrable walls with rigid or flexible framing (like tarps), fully sealed joints, partially sealed entryways, forced air flow, and exhaust air filtration (dust collector). Workers are also required to use proper personal protective equipment (PPE) in regulated areas, which includes normal PPE, respiratory protection, and air monitoring. Some lead paint mitigation will be required using hanging containment system off the existing bridge in the current location. This is assumed to be a minor amount of work, as the contractor will likely use a puddy material that strips paint locally to allow for plasma-torch cutting. The puddy can be contained with tarps and buckets. The PCE assumes most of the removal process will occur at a secondary site with a containment setup located off the river in the Portland area. The cost of containment and removal is captured in the bridge demolition costs.

Other contaminated materials, such as asbestos, would be treated in similar manner to the lead base paint removal. The demolition of the Port facilities and any construction sites used for staging will have to follow federal standard for cleanup. The cost for cleanup of Port facilities is assumed in the cost of decommissioning and removing the buildings. Costs for any staging areas is assumed to be incidental to the staging area costs and is distributed equally to bid items associated with the work.

OTHER PROJECT CONSIDERATIONS

The following scoping assumptions are tied to contractor work activities that will affect a variety of bid items and associated costs are distributed throughout relative work. This list is not intended to be exhaustive and covers only specific work activities that have been identified with significant impacts to the PCE.

The existing gas line and two communication lines will be relocated to the new bridge. Final configuration of utilities needs to be included in future engineering efforts.

Temporary Field Office

The project field office could be located either in Washington or Oregon, though there is a benefit to the construction workers to have the field office they report to be in Washington to minimize the State Income Tax from Oregon. The time working in Oregon must be tracked and income tax is owed for that time. Contractors are aware of the various taxing agencies and will address the requirements related to the location of the work and taxes due. No specific site is currently identified for the field office locations, but our PCE update assumes the office is on the Washington side.

Each construction location (see staging area discussion below) will require some field staff and at least one work trailer with office equipment. Additional work vehicles and travel time will also be required to navigate the various staging areas that are likely required on the project.

Construction Equipment

A project of this size, mostly in- or over-water, with a three-year window to build the new bridge and tie-in the approach intersections and a three-year window to remove the existing bridge will have equipment moving in and out of the project and all over the place constantly as the work tasks change. Examples of major equipment needed specifically for this project include:

- Tugboats to move barges and river going vessels.
- Barges for moving material and others to support work activities and cranes.
- Service boats to take material and workers out to different in-water sites.
- Pile driving and support equipment for construction and/or removal of work trestles, foundation piles, and cofferdams.
- Drilled shaft cranes and equipment, including, and not limited to, baker-tanks, dump trucks, concrete pump truck, concrete mix trucks, rebar suppliers, and cross sonic logging test equipment.
- Several mooring points will need to be set up in the river to tie off the floating equipment.
- In-water workers and dive teams for pier cap placement for the new bridge and pier removal of the existing bridge.
- Cranes, booms, lifts, and loaders for on land assembly and dismantling of both bridge components and temporary works. Note that the on-land equipment will be needed at each of the varies staging facilities, as well as the bridge site and docks.
- The walls and approach roadways will require excavators, cranes, graders, compactors, water trucks, pavers, etc. on both sides of the river.
- Form-travelers (see New Bridge Construction section for discussion).
- Tower cranes may be another means of servicing the superstructure work. This would require seperate in-water foundations but would reduce the duration of the marine cranes. Based on the heavy winds, tower cranes are not included in the PCE update costs.

Other miscellaneous items, such as water supply, power/generators, lighting, temporary sanitary stations, staff and office equipment (vests, hats, computers, and harnesses), fuels, lubricants, and consumables, are assumed to be included. The contractor will also have costs associated with construction engineering for temporary works, deconstruction, creep modeling, etc. that are incidental to the work elements. The costs for these items are included in the appropriate work activities or in general overhead of the PCE update.

SCB:AJD:nb