Technical Memorandum

Date:	August 20, 2021
Project:	Chehalis River Basin Flood Damage Reduction Project
To:	Chehalis Basin Flood Control Zone District
From:	HDR – Matt Prociv, P.E.
Subject:	Description of Construction – Phase Fish Passage Facility

1.0 Introduction and Purpose

To reduce flood damage to life and property along the Chehalis River, the Chehalis River Basin Flood Control Zone District (District) is proposing to construct a flood retention facility near the town of Pe Ell on the mainstem of the Chehalis River. The development of fish passage alternatives is an integral component of the flood retention structure (Flood Retention Only - Expandable [FRE]) design for both the construction and operational phases. Relative to the operational phase, project engineers and collaborative partners previously evaluated several fish passage technologies and selected preferred options for run-of-river (i.e., non-operational) and flood retention operations (HDR 2014a, 2014b, 2016, 2017). Evaluation and selection was performed by the Fish Passage Technical Subcommittee (Subcommittee), a collaborative working group consisting of representatives from the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), Washington Department of Ecology (Ecology), Washington Department of Fish and Wildlife (WDFW), and the Quinault Indian Nation (Quinault). The selected fish passage options for the permanent FRE facility were advanced to an early, preliminary level of design. These options included run-of-river conduits through the FRE facility to provide passage during non-operational periods, and a Collect, Handle, Transfer, and Release (CHTR) fish passage facility for use during flood retention (HDR 2018a, 2018b).

Although the Subcommittee and subsequent design efforts advanced development of fish passage for the proposed permanent FRE facility, temporary fish passage during construction of the facility has not been equally advanced. In 2019, Ecology and the U.S. Army Corps of Engineers (USACE) requested additional information on the anticipated provisions that may be implemented during construction to provide fish passage through the project area. This information would support development of the Draft Environmental Impact Statements (EISs) prepared pursuant to the State Environmental Policy Act (SEPA; Ecology 2020) and National Environmental Policy Act (NEPA; USACE 2020), respectively. In response to these requests, the District advanced conceptual fish passage options for the construction period but did not identify a single preferred design to be incorporated as part of the project. Since that time, the District has identified a preferred approach to fish passage during construction. Ecology and USACE are currently developing final versions of their EIS documents.

This Technical Memorandum describes the District's approach to providing fish passage during construction and revisions to fish passage performance metrics identified in the SEPA EIS. In

January 2021, the District initiated a collaborative process with WDFW to identify design criteria that may guide future alternative development and preference. While the District has not yet conducted an alternative development and selection process, they wish to correct the assumption in the draft SEPA EIS that temporary fish passage would be provided by a picket weir and low passage performance. This Technical Memorandum describes a trap and transport fish passage operation using velocity barrier technology and suggests fish passage performance values associated with this type of facility and operation. The description incorporates the design criteria suggested by WDFW (2021). The District will advance the current design, including selection of a velocity barrier, through subsequent design phases.

2.0 Description of Construction Phase Fish Passage Facility

2.1 Technical and Biological Criteria

The technical and biological design criteria for fish passage during construction is similar to the technical and biological design criteria established for the CHTR facility (HDR 2018b) plus input received from WDFW during the January 2021 collaborative criteria development process. WDFW asked the District to "set the bar high" initially by providing passage for all species and life stages—understanding, however, that achieving such a goal may be challenging given the level of uncertainty and lack of documentation present for some species and life stages. The lack of passage information for non-salmonid species limits the ability to incorporate design features that accommodate these species with a high level of certainty. As such, the facility will be designed based on known criteria for adult and juvenile salmonid passage, adult lamprey passage, and with consideration given to the swimming capability and behavior of other resident species. Like the strategy adopted for the permanent CHTR facility, all species and life stages collected by the facility would be passed upstream. However, there are currently no like facilities in operation so passage performance for species other than salmonids and lamprey would be uncertain.

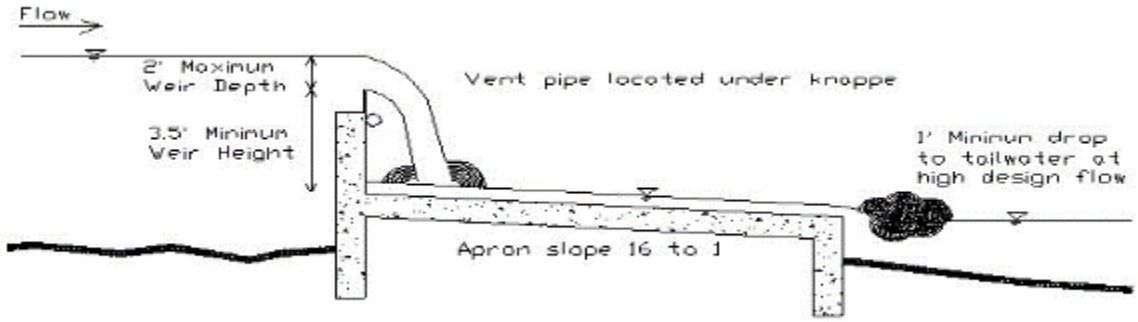
2.2 Facility Description

The trap and transport facility is intended to provide fish passage to upstream-moving adult and juvenile spring and fall Chinook Salmon, Coho Salmon, Winter Steelhead Trout, Coastal Cutthroat Trout, and resident fish, as well as adult Lamprey while construction cofferdams are in place and the river is routed around the FRE construction site. The trap and transport facility would be designed to safely collect these species and life stages and transport them upstream of the dam using specialized vehicles. The trap and transport facility would be located downstream of the diversion tunnel outlet, as close to the tunnel outlet as practicable without adversely affecting passage performance.

The facility would consist of a velocity barrier, adult and juvenile fish ladders, auxiliary water supply system, lamprey ramp, fish lift system, holding gallery, sorting facility, and transport vehicles. The velocity barrier would span the full width of the river and be designed according to NMFS criteria (Section 5.4, NMFS 2011). Figure 1 shows a section of a velocity barrier from the NMFS Anadromous Salmonid Passage Facility Design guidelines. The remainder of the trap and transport facility would be located on the right bank of the river. The auxiliary water system

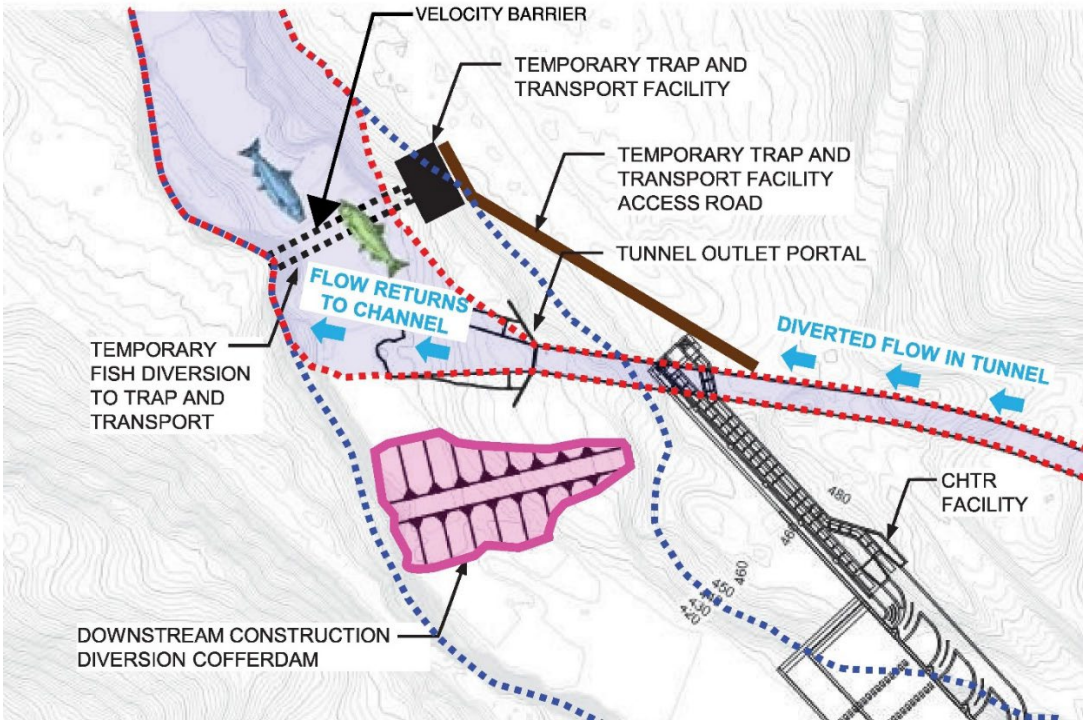
would supply water to the fish ladder entrance(s) for fish attraction. The velocity barrier would prohibit upstream movement of aquatic species while the auxiliary water supply system would attract them to the collection facility. Adult and juvenile fish ladders would be connected to the fish lift system at the upstream end and the fish entrance at the downstream end. Water supplied to the holding gallery, sorting facility, transport vehicles, fish ladders, and auxiliary water supply system would come from a local pump station. The pump station would be located on the right bank and may be located upstream or downstream of the trap and transport facility. Pumping facilities would be designed to meet WDFW (2009) and NMFS (2011) criteria, including juvenile salmonid screening criteria. Figure 2 illustrates a potential trap and transport facility with velocity barrier.

Figure 1. Velocity Barrier



Source: NMFS (2011)

Figure 2. Illustration of Potential Temporary Trap and Transport Facility with Velocity Barrier



2.3 Fish Passage Operation

The trap and transport facility would be installed prior to in-water work upstream and operate continuously during the construction period. Description of the installation and operation of the trap and transport facility is described in the Proposed Flood Retention Dam Construction Schedule Supplemental Information (District 2019).

The velocity barrier is a non-mechanical fish barrier. There are no moving parts, no systems that require human intervention, nor obstructions that may impede flow or downstream fish movement. During passage conditions (95% to 5% exceedance flow; NMFS 2011; WDFW 2000a), river elevations and flow depths and velocities prevent upstream movement of aquatic species while allowing safe passage for fish moving downstream. At higher flows and flood events, mobilized debris and sediment pass downstream over the barrier without impairing its ability to be a barrier to aquatic species during passage conditions. The barrier also would be constructed of concrete, which is more resilient to debris and sediment than mechanical barriers such as pickets.

3.0 Suggested Changes to Passage Performance in NEPA and SEPA Environmental Impact Statements

The SEPA Draft EIS based the performance of the fish passage facility during construction on the assumption that a picket barrier would be utilized to prevent fish movement upstream of the trap and transport facility. As noted in the Draft EIS, a picket barrier in use year-round in this environment is expected to be damaged regularly by downstream passing debris and sediment, reducing the barrier's effectiveness and increasing the potential for harm to aquatic species. These detrimental effects to fish passage are reflected in the estimated passage survival values identified in the Draft EIS (Section 5.3.2, Ecology 2020).

The District has selected a velocity barrier, rather than a picket barrier, to prevent aquatic species from passing upstream of the trap and transport facility. As described above, the velocity barrier is anticipated to prevent upstream movement of aquatic species with better effectiveness and less potential for harm. The functional characteristics of the velocity barrier are similar to that of the operating FRE facility: both barriers (velocity barrier and FRE structure) are located adjacent to the fish entrances, prevent the upstream migration of aquatic species (when the CHTR is operating), are not rendered less effective due to damage from debris and sediment, and do not increase the potential for harm to downstream moving fish (no downstream movement is possible during CHTR operation). As such, the estimated passage survival of a trap and transport facility with velocity barrier would be the same as that of the permanent CHTR facility, as developed by the Fish Passage Technical Subcommittee (see Table 1 [Table 4-10, HDR 2017]).

Table 1. Capture, Handling, Transport, and Release, Anticipated Performance, and Survival[1]

TARGET SPECIES	PERFORMANCE	SURVIVAL	TOTAL SURVIVAL
ADULT UPSTREAM			
Spring Chinook	93%	98%	**91%**
Fall Chinook	93%	98%	**91%**
Coho	93%	98%	**91%**
Winter Steelhead	93%	98%	**91%**
Coastal Cutthroat	88%	98%	**86%**
Pacific Lamprey	60%	90%	**54%**
Western Brook Lamprey	60%	90%	**54%**
JUVENILE UPSTREAM			
Spring Chinook	60%	90%	**54%**
Fall Chinook	60%	90%	**54%**
Coho	60%	90%	**54%**
Winter Steelhead	65%	90%	**58.5%**
Coastal Cutthroat	60%	90%	**54%**

[1] Total Survival is the product of Performance and Survival. This definition was adopted by the Fish Passage Technical Subcommittee as part of the 2017 fish passage alternatives assessment (HDR 2017).
Source: Table 4-10 in HDR (2017).

4.0 Conclusions

A trap and transport facility with a velocity barrier is anticipated to have better estimated passage survival than a trap and transport facility with a picket barrier. The District has selected a trap and transport facility with a velocity barrier to provide fish passage during construction of the FRE structure. The District will advance the current design, including selection of a velocity barrier, through subsequent design phases. The District requests that the SEPA and NEPA final EISs reflect the use of a velocity barrier and revise the estimated passage survival to match that of the CHTR facility as developed by NMFS, WDFW, Ecology, USFWS, and Quinault and documented in the Conceptual Report (HDR 2017).

5.0 Literature Cited

Chehalis River Basin Flood Control Zone District (District)

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2014b Combined Dam and Fish Passage Alternatives Technical Memorandum. Prepared for the State of Washington.

2016 Combined Dam and Fish Passage Conceptual Design Report. Draft. Prepared for the State of Washington.

2017 Combined Dam and Fish Passage Conceptual Design Report. Appendix G – Fish Passage Alternative Concept Design. Prepared for the State of Washington.

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2020 Chehalis River Basin Flood Damage Reduction Project. NEPA Environmental Impact Statement. September 2020.

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