WOLF WATER RESOURCES

1001 SE Water Ave.
Suite 180
Portland, OR 97214
503.207.6688

Technical Memorandum

Date:	2/25/2025
To:	Deric Carson, CTUIR
From:	AJ Jones, PE. W2r
Project:	Lookingglass Creek Restoration
Subject:	Bridge Fish Passage Design

Fish Passage and Bridge Design

A stream simulation approach was taken to ensure adequate fish passage for the proposed bridge relocation crossing. As indicated in the bridge design parameters below, the bridge span will be greater than 1.5 times the upstream active channel width at MHHW. To satisfy ODFW and NMFS fish passage conditions the design approach will satisfy the following stream simulation criteria:

- **Channel geometry**
  The channel will maintain its existing geometry, and is designed with a width, side-slopes, and elevations consistent with the channel upstream and downstream of the crossing.
- **Channel slope**
  The existing longitudinal slope of the channel is 1.7% through the bridge, when measured from 300 feet upstream to 300 feet downstream. The bridge crossing design does not affect the channel slope.
- **Hydraulic conditions**
  Hydraulic conditions under the bridge will match those upstream and downstream during channel forming conditions.
- **Channel bed composition**
  The streambed material under the bridge is consistent with the channel composition upstream and downstream.

A 2D HEC-RAS (version 6.4.1) model was developed to evaluate the active channel width at the proposed bridge design location and to ensure that the bridge elevation and geometry can safely pass the 1% ACE flood.

ODOT Technical Services Bulletin GEO09-07(B), defines the Active Channel Width as:

The stream width as measured at OHW away from the influence of artificial structures or impacts and confluent tributaries. In the absence of a clear OHW, active channel width is measured at bankfull elevation in a non-incised stream. A suitable surrogate measurement for OHW in an incised stream channel would be the stream width as measured at the 2-year flood elevation (Q2 Table 1).

Table 1. Modeled Flows

Flow Description	Annual Chance Exceedance (%)	Flow (cfs)
Summer Median (July-Sept.)	100%	23
Spring Median (April – June)	99.9%	129
Q2	50%	373
Q10	10%	645
Q100	1%	1,121

A factor in the selection of the bridge location is the natural confinement at this location. The stream naturally transitions to an incised and confined morphology. Per the guidance referenced above the wetted width at the 2-year flood elevation was selected to determine the Active Channel Width. The inundation extents and bridge location are shown below in Figure 1. This 40-foot width (red line) of the 2-year flood at this location was confirmed in the field and is consistent with other active channel indicators such as the absence of woody vegetation.

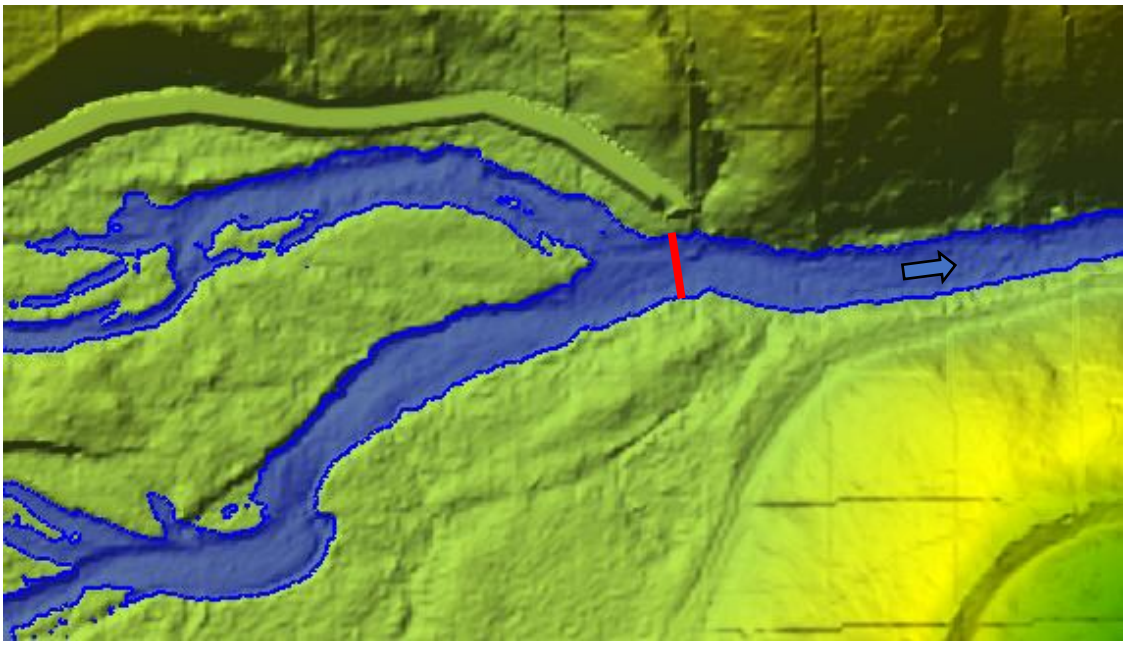

Figure 1. The 2-year flood extent (blue) and bridge location (red) where the active channel width was measured.

Table 2. Summary of Bridge Design Parameters.

Parameter	Value	Notes
Structure design approach	Stream simulation / maximum hydraulic connectivity, 100-year flood and wood debris loading capacity	Bridge span exceeds 60 feet (1.5 times the upstream channel width); Channel geometry emulates nearby natural channel form
Channel width at OHW	40 feet	OHW of 2,723 feet (NAVD88)
Deck elevation and low chord	Deck: 2,729 feet (NAVD88) Low chord: 2,726 feet (NAVD88) OHW: 2,723 feet (NAVD88) 1% ACE: 2,725 feet (NAVD88)	Low chord is set 3 feet above the OHW surface elevation and 1 foot above the 1% ACE water surface elevation
Span length	75 feet	Abutment to abutment; Span is greater than 1.5 times upstream active channel to accommodate channel continuity under bridge
Max. velocity below bridge	8.5 ft/s	Bedrock exposed at the surface near bridge location. Site investigations will inform if scour rock is needed.
Width	Approx 14 feet	Total width of the travel surface
Use / load rating	HS-20	Medium vehicle & emergency vehicles
Safety	Bumper rails	Access is mainly limited vehicular traffic
Debris loading (lateral loading)	7 ft/s	For bridge/abutment connection hardware design
Abutments	Precast concrete blocks	Compacted gravel foundation stabilization
Abutment scour protection	To be determined based on geotechnical and site investigations	Will be designed for stability under 1% ACE hydraulics