Cougar Downstream Fish Passage Alternative Study

Information for the June 7, 2016 meeting of the Willamette Fish Facility Design Work Group

Prepared by Portland District, Corps

- Current Alternatives -

At-Tower Alternatives

28) Floating Screen on upstream side of WTC tower with WTC modification for lower pool operation, with holding tank and truck transport

This alternative involves installing a guide or track to the existing WTC tower that allows a Floating Screen Structure (FSS) to float up and down along the upstream face of the WTC tower as the reservoir elevation changes. The FSS concept uses up to 1,000 cfs of project outflow as attraction flow. Up to 1,000 cfs of Project outflow would be drawn as surface flow through the FSS entrance, dewatered through v-screens, and passed over the penstock-side WTC weir gate into the WTC tower and out the RO or penstock. The modification of the WTC would allow for surface withdrawal down to minimum conservation pool, el. 1532, to enable collection through most of the operational range (1690-1516). Currently, the WTC is operational to el. 1561.

Fish collected in the FSS and a small percentage of the flow would bypass the screens through a bypass channel at the downstream end of the screens. The bypass flow and fish would be sent to a separate holding barge or facility, where they would be lifted to the top of the tower for truck transport.

29) Floating Screen on upstream side of WTC tower with WTC modification for lower pool operation, with tower bypass

The concept for this alternative for the FSS is the same as 2), but with a tower bypass pipe for fish transport rather than truck transport. After the fish have been collected into the FSS and passed the dewatering screens, a collection pipe with a flexible hose connection will transport the fish to a bypass pipe routed through a new tunnel in the left abutment, and downstream to a release site. The bypass pipe will have “ports” spaced at 25-ft intervals over the operating range, where connections can be automatically adjusted as the pool fluctuates.

Tower Cul-de-Sac

20) Floating Surface Collector (FSC) in Tower cul-de-sac with Barge Holding and Truck Transport

The FSC structure will generally consist of a floating barge structure with a pumped attraction flow, dewatering v-screens, and pumped return flow to the reservoir. The FSC would be similar in concept to the facilities in operation at Upper Baker Dam and in design for Swift Reservoir, except that the Cougar FSC barge would only contain the screens and pumps. After the fish have been collected into the FSC and passed the dewatering screens, they would be sent through a transport pipe to a separate holding barge or facility, where they would be lifted to the top of the tower for truck transport. The FSC structure would be constructed from portable barges latched together to contain dewatering screens, a collection channel, and attraction flow pumps. The FSC would be operational through the forebay range, 1690 to 1516.

5) Floating Surface Collector (FSC) in Tower cul-de-sac with Tower Bypass

The concept for the FSC is the same as Alternative 3, but with bypass provided in the vicinity of the WTC.

Outside Tower Cul-de-Sac

#TBD) Floating Surface Collector (FSC) Outside Tower cul-de-sac

The concept for an FSC outside of the tower cul-de-sac would be considered only if space contstraints and/or structural limitations, such as seismic loading on the tower and/or mooring of a structure within the cul-de-sac prevented the safe construction and operation of an FSC or FSS in the cul-de-sac or at the tower. The concept would be similar to the FSC design within the tower cul-de-sac. Pumped attraction flow would be used to collect fish, with dewatering screens and pumped return flow to the reservoir.

Fish Benefit Workbook Parameter Summary Tables

The rationale and documentation for parameters can be found in Alden (2014), except for run timing. Run timing assumptions are documented in file FBW run timing changes_060216.pdf

- Alden, 2014. Willamette River Fish Benefit Workbook Parameterization; Chinook. Memorandum to Robert Wertheimer and Richard Piaskowski, U.S. Army Corps of Engineers, prepared by Kevin Malone, Isaac Willig, Shari Dunlop, Date 01 April 2014. (see file "Technical Memorandum - Chinook_Final.pdf")

Route Specific Concrete Survival - The survival rate for each possible passage route at a dam (%)

Spillway: Not Applicable

Turbine

Flow (CFS)	Fry (<60 mm)	Subyearling	Yearling
50	60%	60%	60%
690	40%	40%	40%

RO

Q (CFS)	Fry (<60 mm)		Subyearling		Yearling	
	Low Pool El.	High Pool El.	Low Pool El.	High Pool El.	Low Pool El.	High Pool El.
313	56.59%	56.59%	45.94%	45.94%	45.94%	45.94%
664	58.27%	56.59%	49.71%	45.94%	45.94%	45.94%
855	59.18%	57.04%	51.76%	46.95%	49.71%	45.94%
1764	89.17%	59.18%	69.59%	51.76%	51.76%	46.95%
1983	96.40%	62.48%	73.89%	53.72%	69.59%	51.76%
4233	96.40%	96.40%	73.89%	73.89%	73.89%	53.72%
8465	96.40%	96.40%	73.89%	73.89%	73.89%	73.89%

Passage System:

Alternative	Fry (<60 mm)	Subyearling	Yearling
5, 20, 28, 29	98%	99.5%	99.5%

Dam Passage Efficiency (DPE) and Route Effectiveness (RE)

Baseline **-** Fry, Subyearling and Yearling

Dam Passage Efficiency

(applied to daily fish distribution)

Pool ele	Dam e	Note
1690.0	0.10	Max Conservation Pool
1630.0	0.20	
1571.0	0.20	Temp Weir Start
1570.0	0.42	Temp Weir Stop
1532.0	0.42	Min Conservation Pool
1516.0	0.60	Min Power Pool
1500.0	0.70	saddle
1499.0	0.10	Req's Diversion Tunnel
1400.0	0.10	Req's Diversion Tunnel
1290.0	0.70	Req's Diversion Tunnel

Route Effectiveness Curves

(applied to average daily flow distribution)

Q Ratio	Spill	Fish Pass	RO	Turb
0.10	1.000	0.000	2.500	0.500
0.20	1.000	0.000	2.500	0.389
0.30	1.000	0.000	2.500	0.259
0.40	1.000	0.000	2.125	0.195
0.50	1.000	0.000	1.844	0.156
0.60	1.000	0.000	1.537	0.250
0.70	1.000	0.000	1.317	0.357
0.80	1.000	0.000	1.153	0.625
0.90	1.000	0.000	1.056	0.833
1.00	1.0	1.0	1.0	1.0

Fish Passage Alternatives - original assumptions for FSS and FSC (to be updated based on latest data)

Dam Passage Efficiency

(applied to daily fish distribution)

Pool ele	Dam e	Note
1690.0	0.70	Max Conservation Pool
1630.0	0.70	
1571.0	0.70	Temp Weir Start
1570.0	0.42	Temp Weir Stop
1532.0	0.42	Min Conservation Pool
1516.0	0.60	Min Power Pool
1500.0	0.70	saddle
1499.0	0.10	Req's Diversion Tunnel
1400.0	0.10	Req's Diversion Tunnel
1290.0	0.70	Req's Diversion Tunnel

Route Effectiveness Curves

(applied to average daily flow distribution)

Q Ratio	Spill	Fish Pass	RO	Turb
0.10	1.000	4.000	2.500	0.500
0.20	1.000	4.000	2.500	0.389
0.30	1.000	4.000	2.500	0.259
0.40	1.000	4.000	2.125	0.195
0.50	1.000	4.000	1.844	0.156
0.60	1.000	4.000	1.537	0.250
0.70	1.000	4.000	1.317	0.357
0.80	1.000	4.000	1.153	0.625
0.90	1.000	4.000	1.056	0.833
1.00	1.0	1.0	1.0	1.0

Run timing - % Fish Approaching

Baseline

Month	Fry	Subyearlings	Yearlings
September	2.1%	1.0%	0.0%
October	0.6%	5.0%	0.0%
November	0.0%	52.0%	1.0%
December	0.0%	38.0%	1.0%
January	0.0%	0.0%	44.0%
February	0.0%	0.0%	4.0%
March	0.6%	0.0%	12.0%
April	4.5%	0.0%	15.0%
May	26.9%	0.0%	15.0%
June	53.8%	0.0%	7.0%
July	8.7%	1.0%	1.0%
August	2.8%	3.0%	0.0%
	100.0%	100.0%	100.0%

Fish Passage Alternatives - original assumptions for FSS and FSC (to be updated based on latest data)

Month	Fry	Subyearlings	Yearlings
September	2.1%	40.0%	0.0%
October	0.6%	22.0%	0.0%
November	0.0%	7.0%	1.0%
December	0.0%	4.0%	1.0%
January	0.0%	0.0%	35.0%
February	0.0%	0.0%	20.0%
March	0.6%	0.0%	15.0%
April	4.5%	0.0%	10.0%
May	26.9%	0.0%	10.0%
June	53.8%	15.0%	7.0%
July	8.7%	7.0%	1.0%
August	2.8%	5.0%	0.0%
	100.0%	100.0%	100.0%

Template - Comparison of estimated biological benefit, costs, and impacts of downstream passage alternatives for Cougar Dam.

	Alternative Name FSC = floating surface collector FSS = floating screen structure	**Biological Benefits** (estimated annual downstream passage survival)	**Investment (Costs)**				**Results**			
		Spring Chinook	Project First Costs (Total CRFM) ($ MIL)	Additional O&M (PV) ($ MIL)	Lost Hydropower (PV)($ MIL)	Total Life Cycle (Project First Costs + (PV) O&M + (PV) Lost Hydropower) in $ MIL	Flood Risk Management Impact & Dam Safety maintained(Y/N)	Recreation Impacts (High, Moderate, Mixed, Positive)	Cost Effectiveness (Project Lifecycle Cost over Change in Average VSP)	Projected Stakeholder Impact
	Baseline									
	FSS at Tower w/ truck transport									
	FSS at Tower w/ bypass									
	Hybrid – FSS above 1571 w/truck transport									
	Hybrid – FSS above 1571 w/ bypass									
	FSC in Tower cul-de-sac w/ truck transport									
	FSC in Tower cul-de-sac w/ bypass									
	FSC Outside Tower cul-de-sac									