

# COUGAR HIGH HEAD BYPASS ALTERNATIVES

Suzanne Hill– PM  
Ryan Woolbright – TL  
Fenton Khan – Fish Biologist  
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WFFDWG Update



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# AGENDA

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## Informational briefing

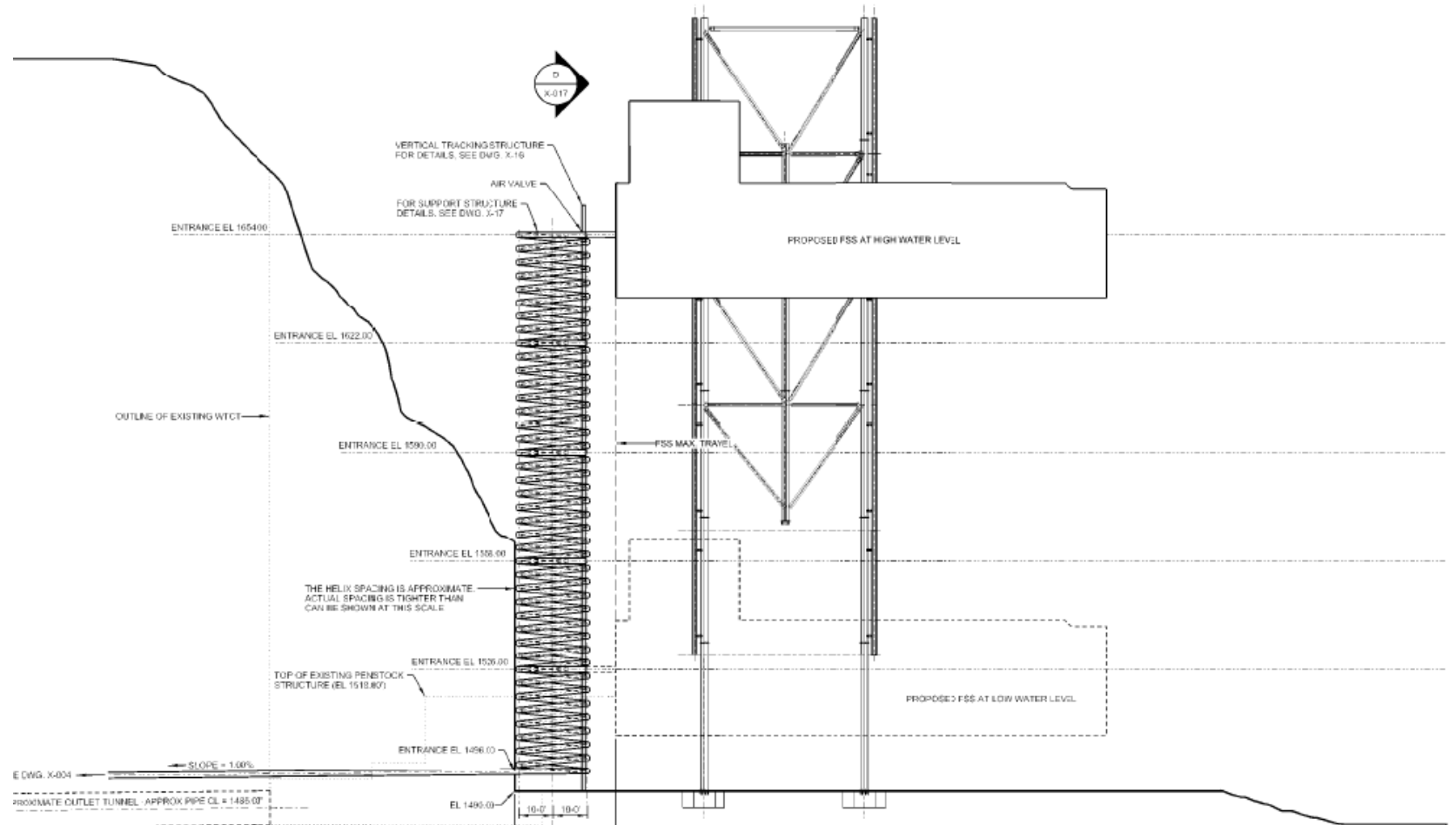
### Cougar High Head Bypass

- Description of alternatives under consideration for High Head Bypass at Cougar
- Selected alternatives to carry forward to the 90% EDR are **2** and **5**

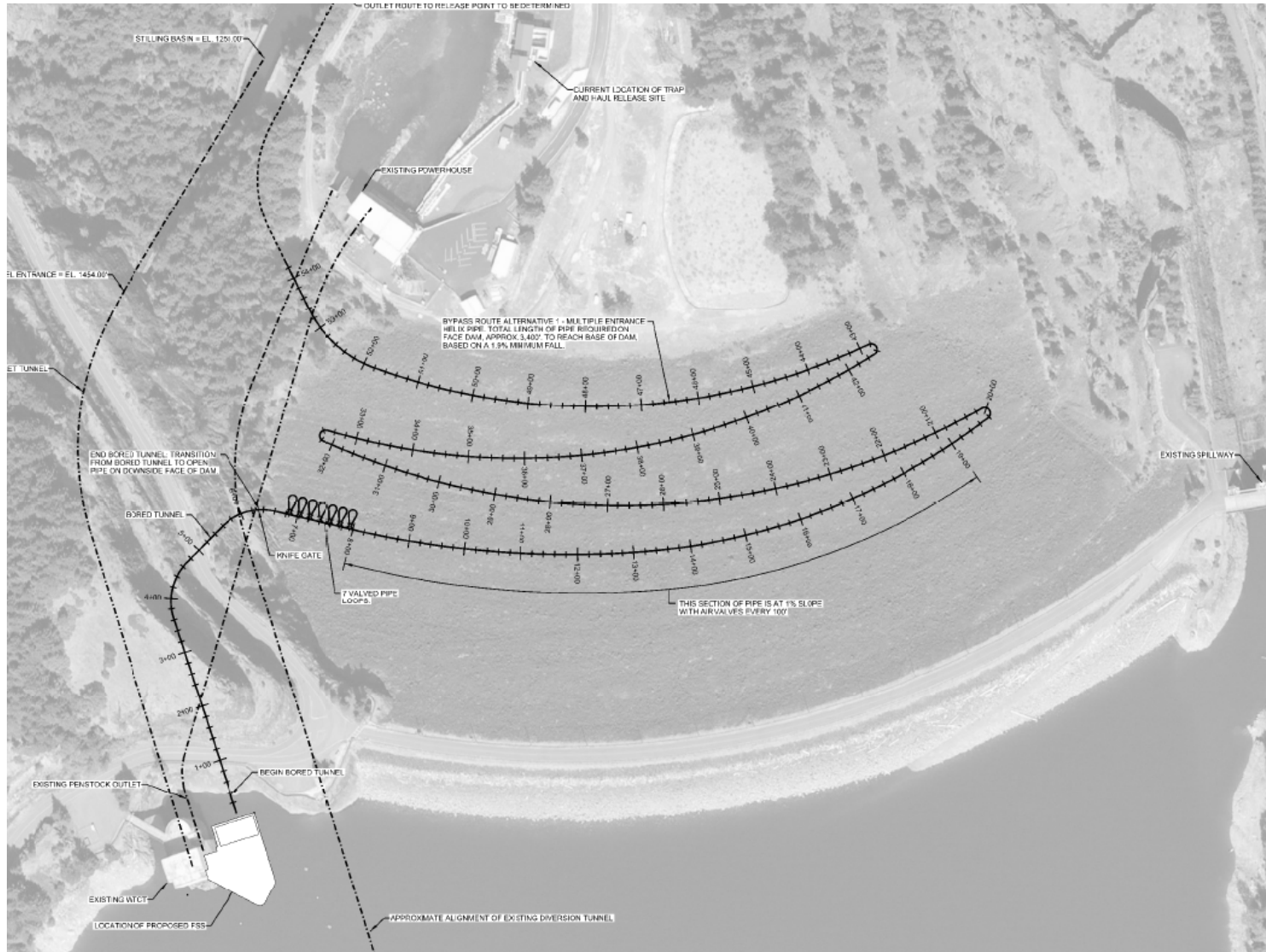
# ALTERNATIVE 1 – HELICAL PIPE



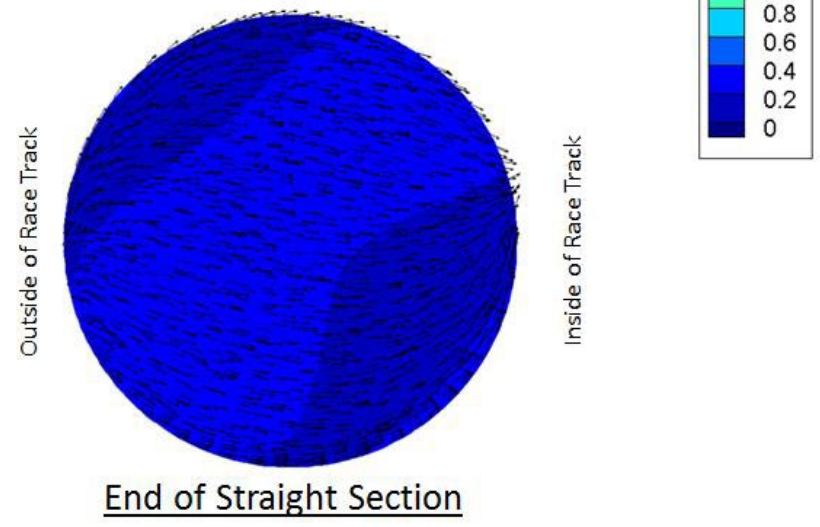
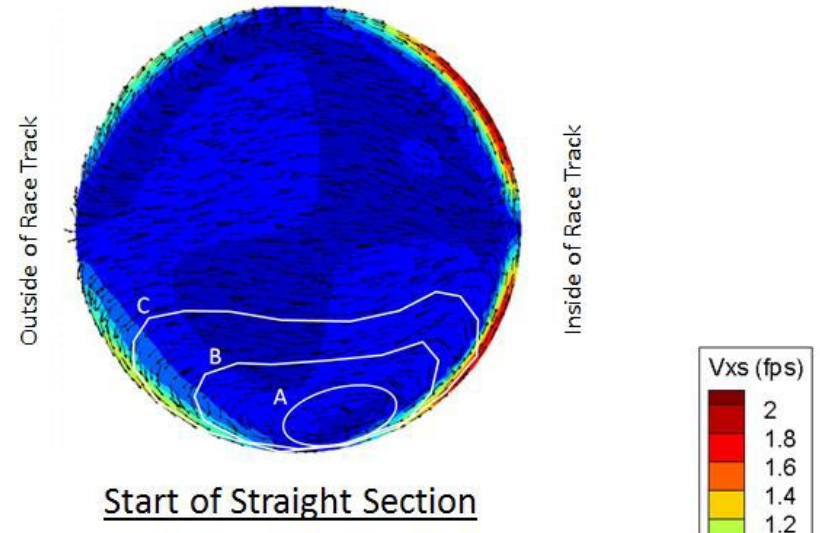
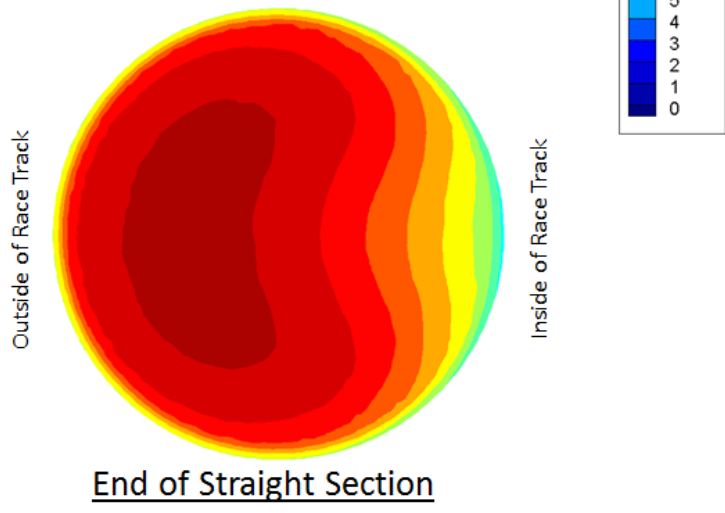
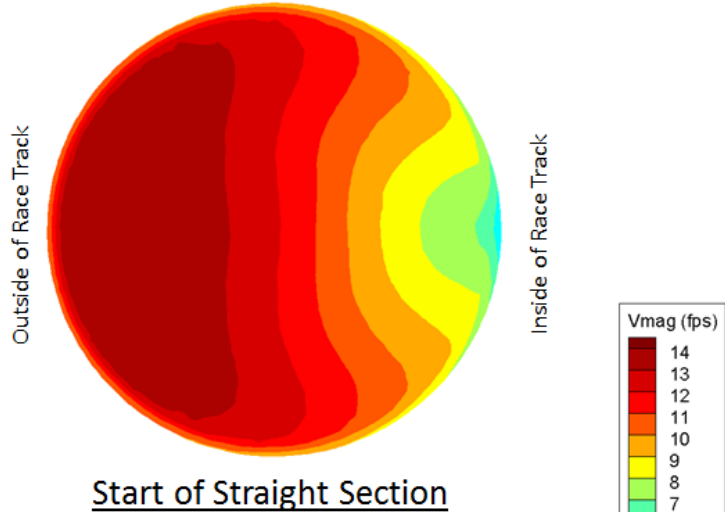
- Helical pipe with multiple inlets to FSS
- Single penetration through left abutment
- Pipe loops dissipate variable head
- Pipe runs along face of dam to dissipate energy



# ALTERNATIVE 1 – HELICAL PIPE



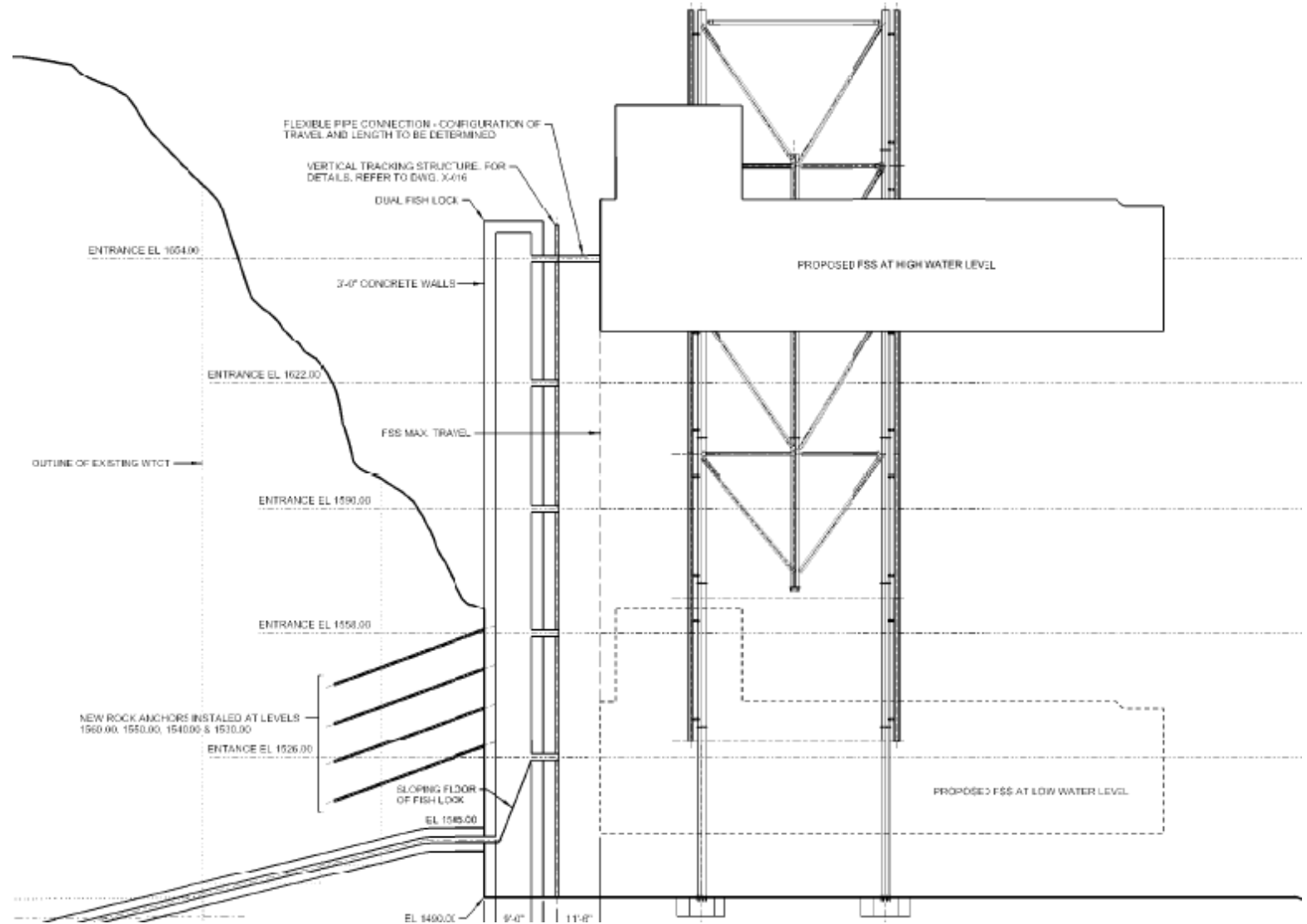
# ALTERNATIVE 1 – INTERNAL PIPE HYDRAULICS



# ALTERNATIVE 2 – FISH LOCK DOWN



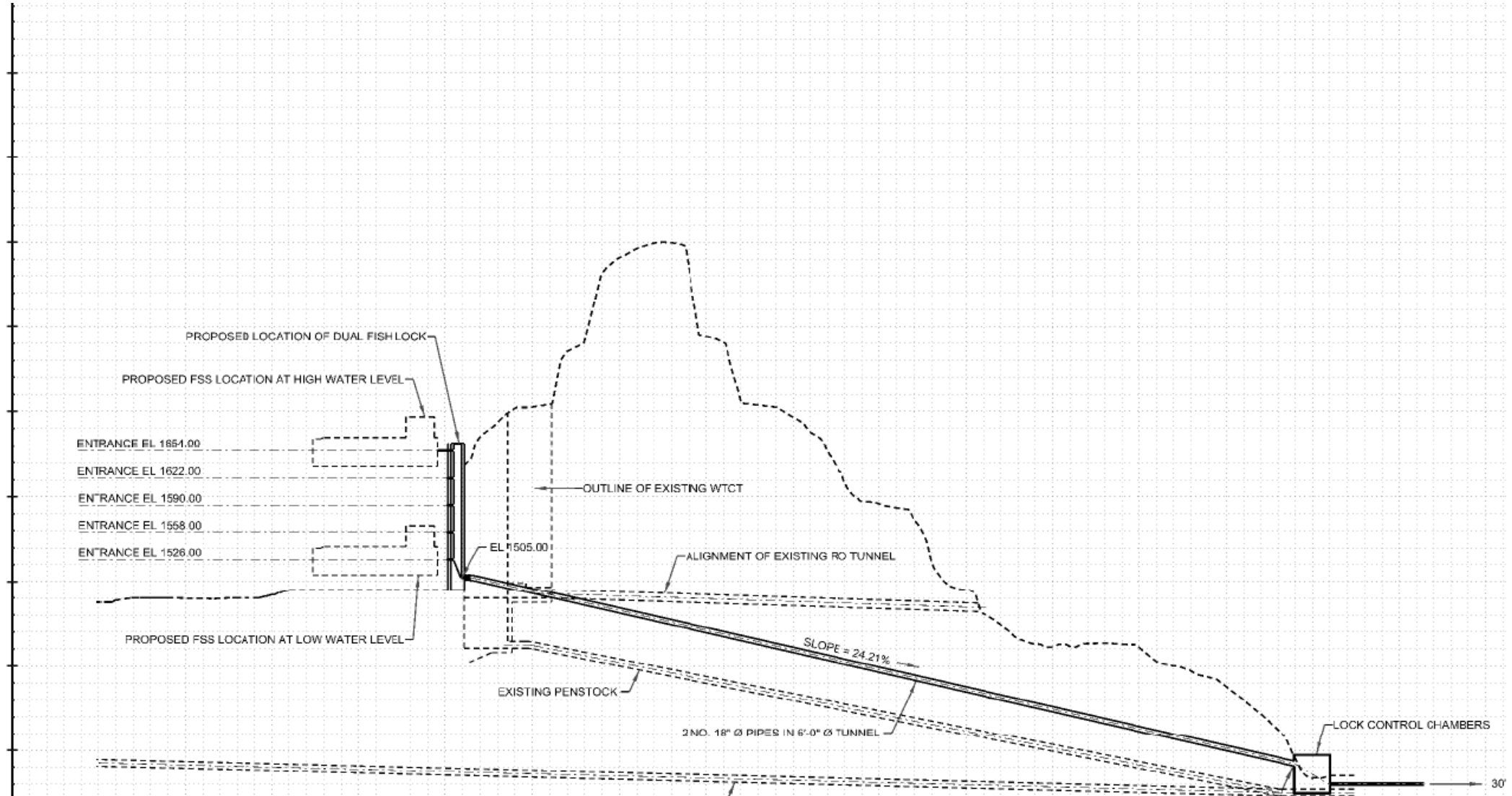
- Dual fish lock with multiple inlets
- Standalone structure in area behind FSS
- All variable head dissipated in the fish lock
- Single penetration through left abutment
- Lock control chamber and valves DS of dam



# ALTERNATIVE 2 – FISH LOCK DOWN

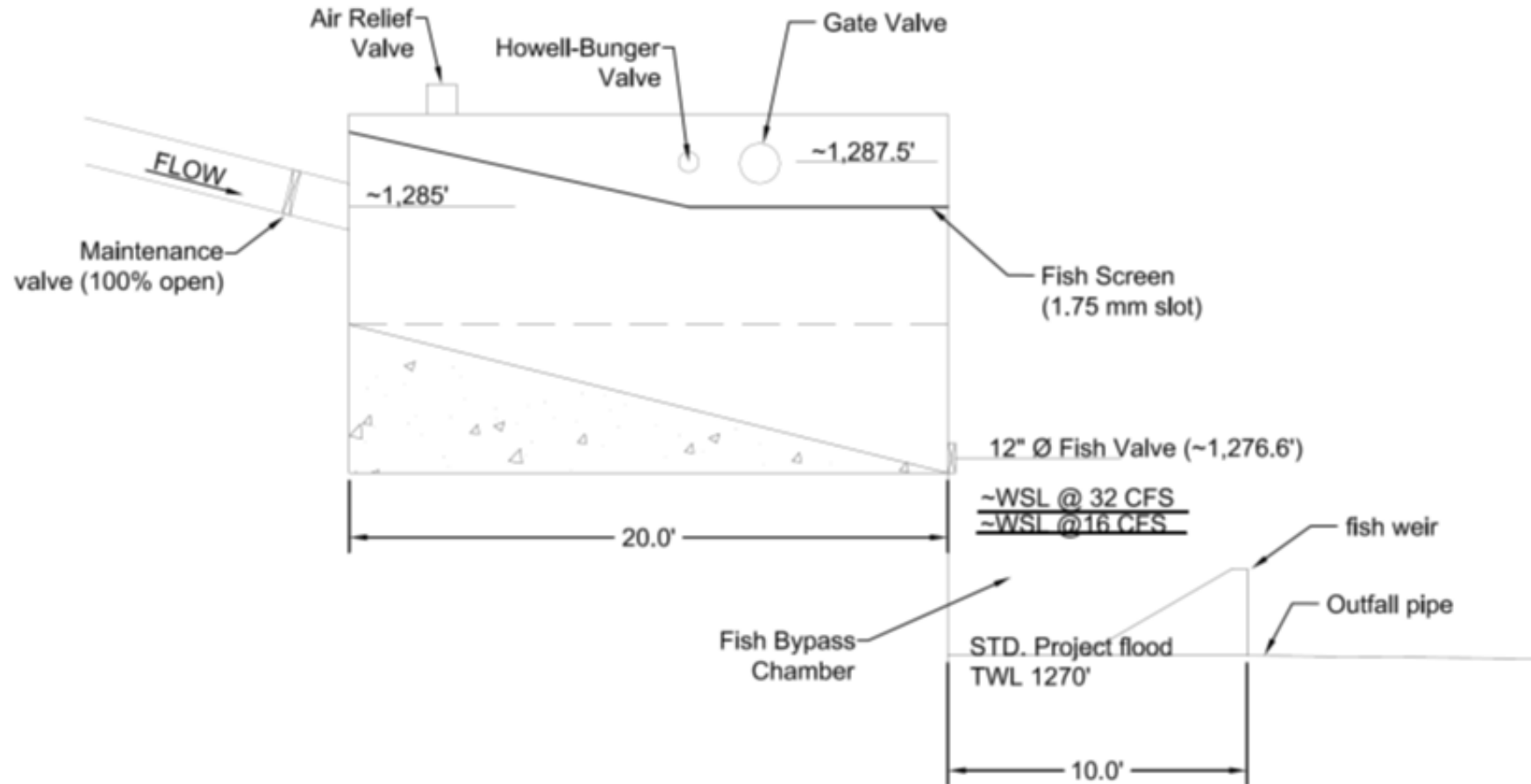


# ALTERNATIVE 2 – FISH LOCK DOWN





# ALTERNATIVE 2 – LOCK CONTROL CHAMBER



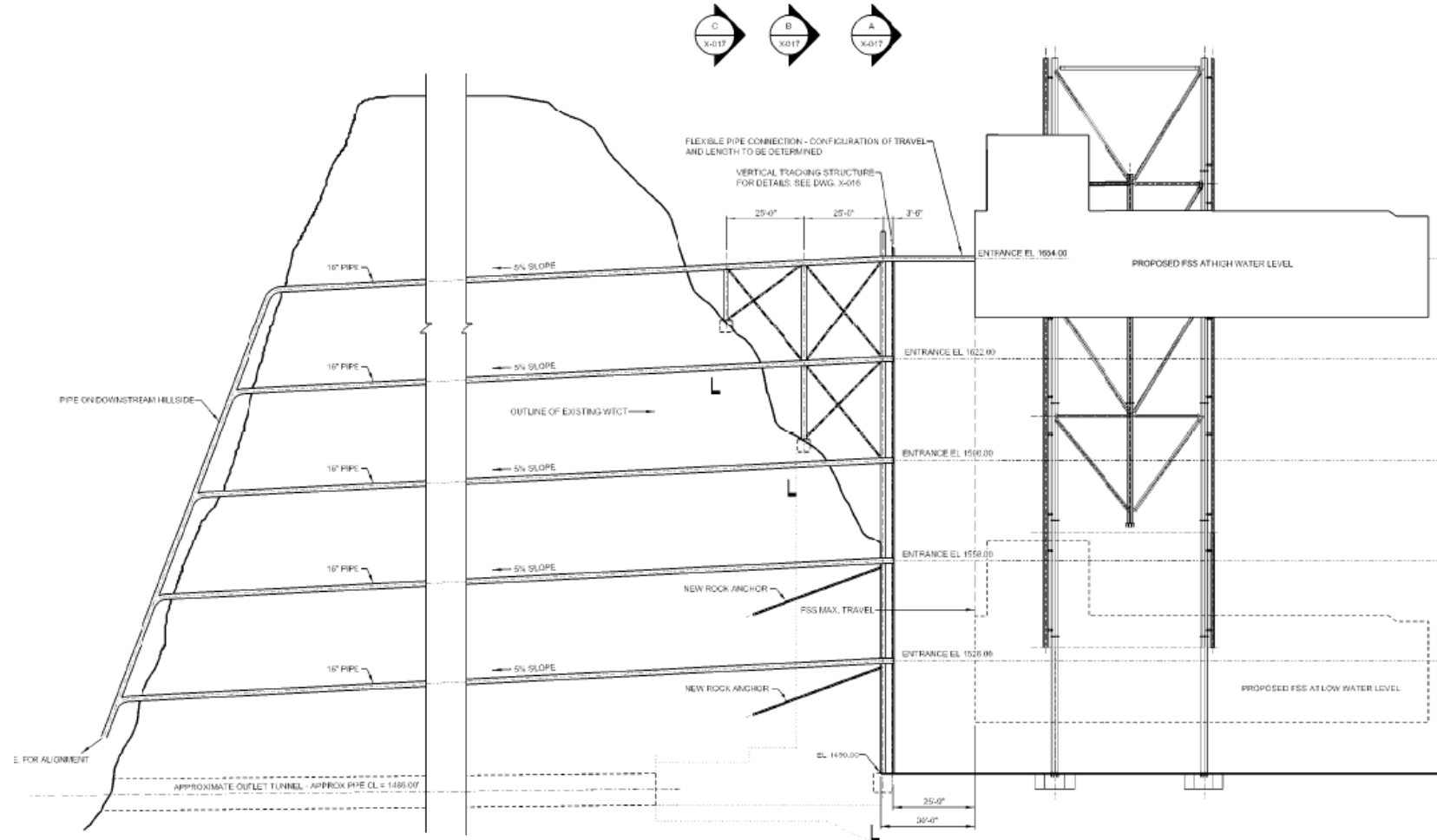
# ENTRANCE ROUTE 5 – MULTIPLE PENETRATIONS



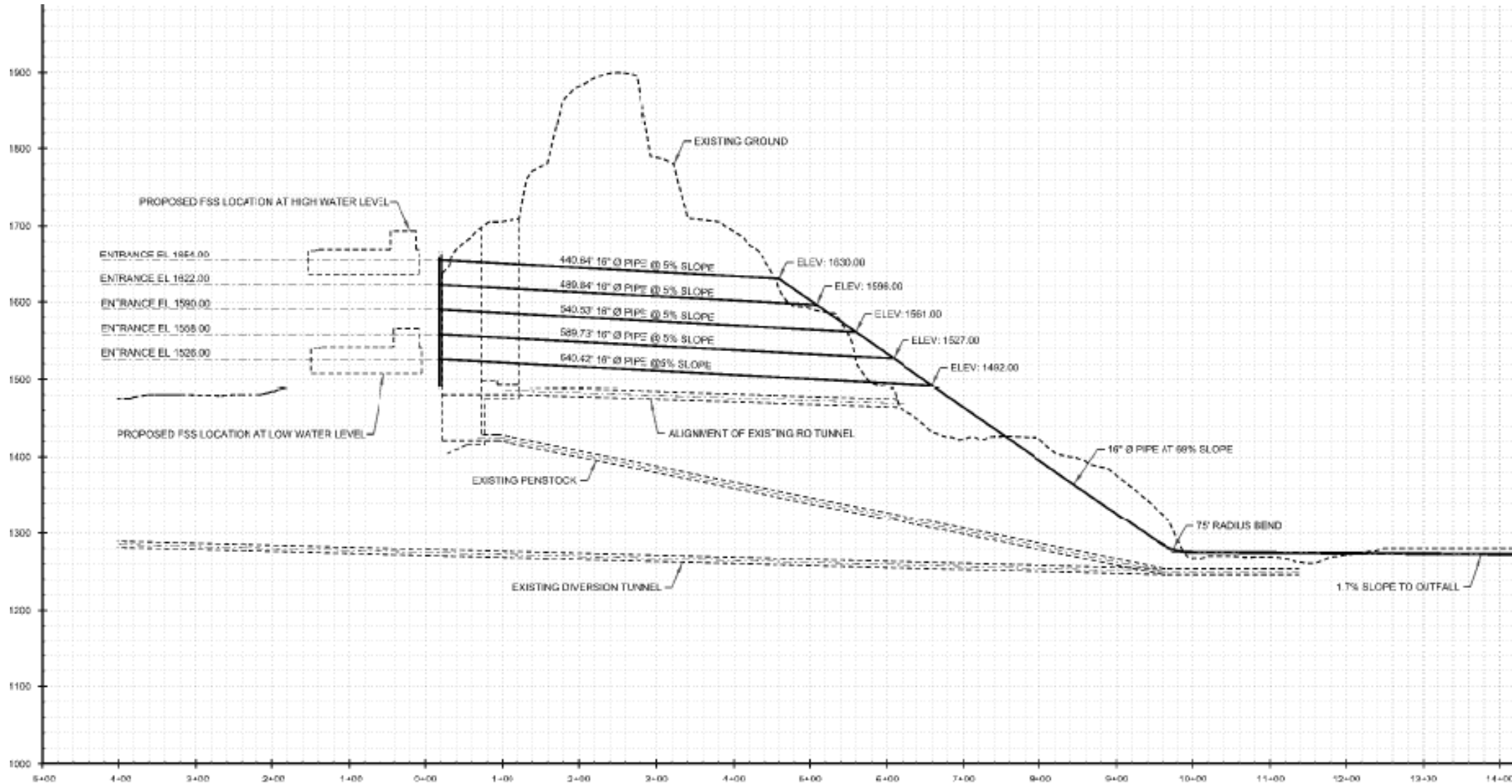
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- Green Peter style entrance with multiple penetrations through left abutment
- Inlets connect to a single pipe downstream
- Open channel flow



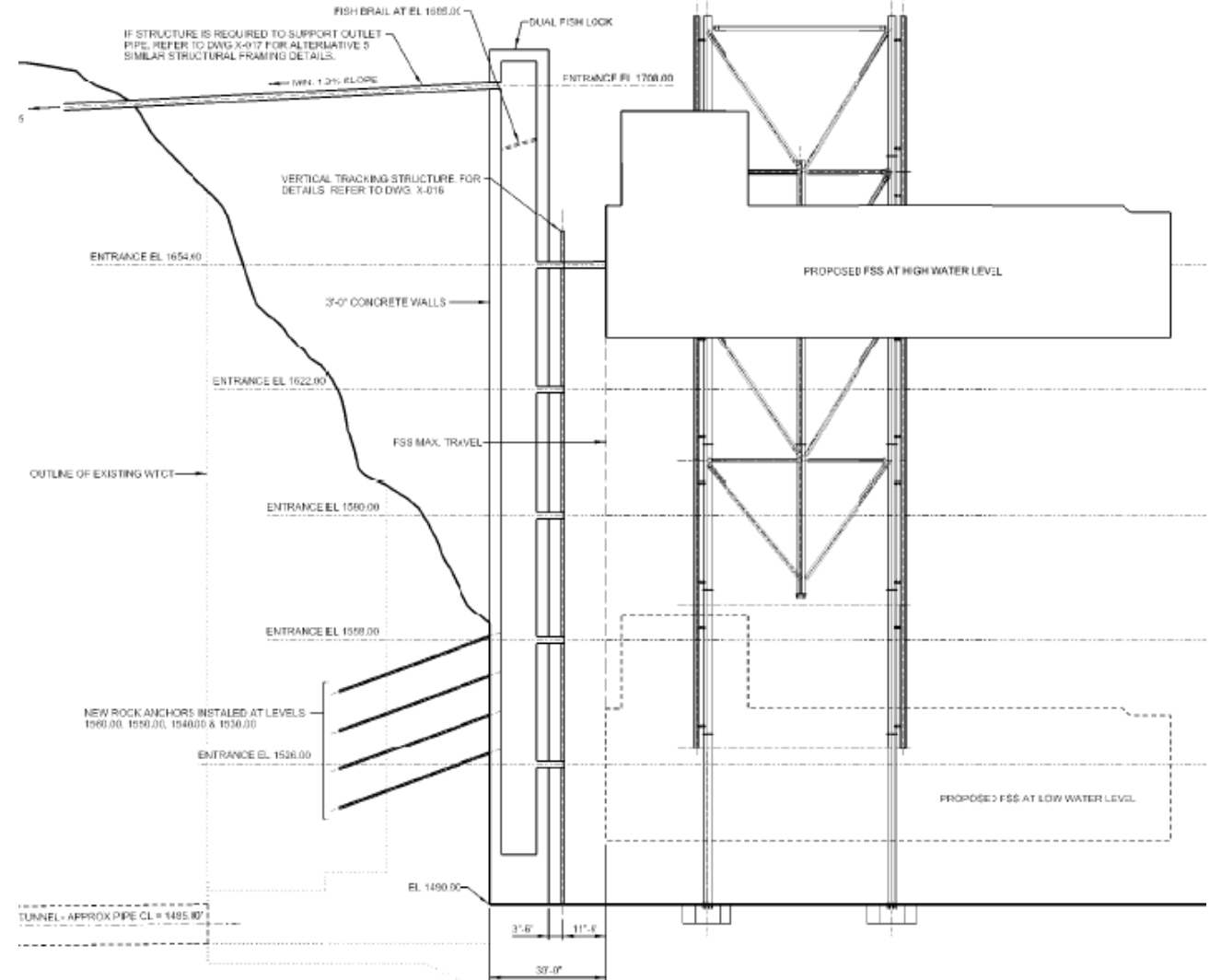
# ENTRANCE ROUTE 5 – MULTIPLE PENETRATIONS



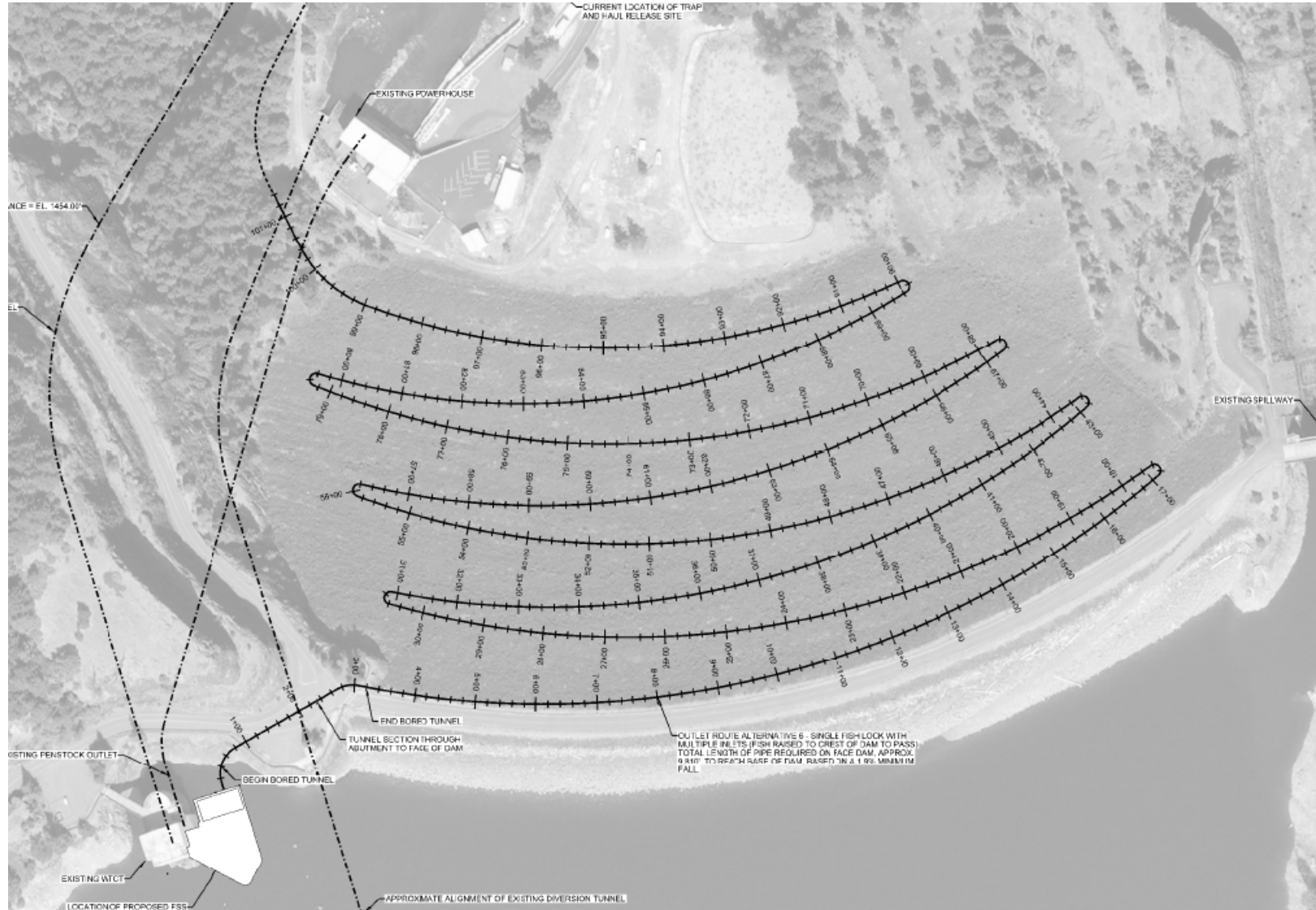
# ALTERNATIVE 6 – FISH LOCK OVER THE DAM



- Dual fish lock to lift fish to crest of the dam
- Requires Pumping and Brail
- DS pipe switchbacks along dam face to dissipate energy.



# ALTERNATIVE 6 – FISH LOCK OVER THE DAM



# 60% EDR ESTIMATE (CAPITAL COST)



<b>Alternative</b>	<b>BOQ Cost Estimate, Mill \$</b>	<b>Contingency, 25%</b>	<b>Total Cost Mill \$</b>
<b>Alternative 1</b>	6.6	1.6	8.2
<b>Alternative 2</b>	6.8	1.7	8.5
<b>Alternative 5</b>	9.9	2.5	12.4
<b>Alternative 6</b>	9.3	2.3	11.6

# ALTERNATIVES MATRIX

Alt. #	Alternative Name	Biological/ Environmental	Technical	Operations	Lifecycle Cost	Total
Alt. 1	Helical Pipe	419	398	246	88	1,151
Alt. 2	Lock to Lower	437	420	250	88	1,195
Alt. 5	Green-Peter Style	397	405	300	88	1,190
Alt. 6	Lock to Lift	419	487	169	66	1,141

\*Weighted and normalized scores

# ODFW ALTERNATIVE



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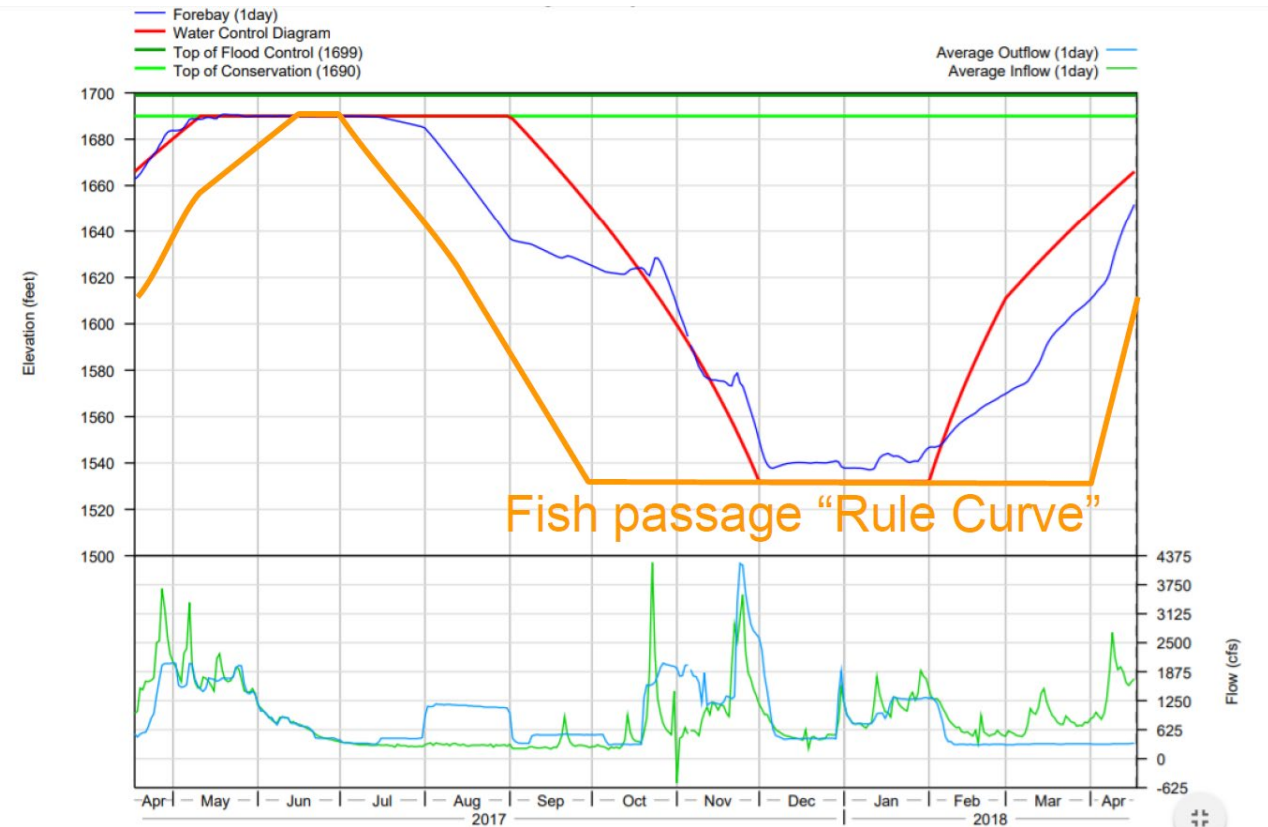
Potential Operational Changes –  
“Fish Passage Rule Curve”  
Single bypass pipe at Elevation less than 1532

## Hybrid system

- Bypass + Trap and Haul
- Bypass when reservoir is low; T&H when the reservoir is full or above the bypass operations

## Concerns:

- Impacts to project
- Impacts to system
- Likelihood of refill
- H&H work outside of task order scope.
- Currently evaluating this alternative in house.





# QUESTIONS?



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