



## Evaluation Results:

- 17 trout tagged in 4 groups
- 4 exited ladder downstream
- 13 passed upstream:
  - 12 passed within 1 day
  - mean ascension time 4.5 hours
  - one fish made 10 roundtrips!



# Clearwater Reconnect

- Provide passage for adult resident trout
- ...plus amphibians and macroinvertebrates
- Provide for downstream passage of flood flows, LWD, bedload
- Allow diversion of full water right
- Operational challenges: balance many goals – how to split flow between reservoir and river channels?









# Fish Creek fish screen

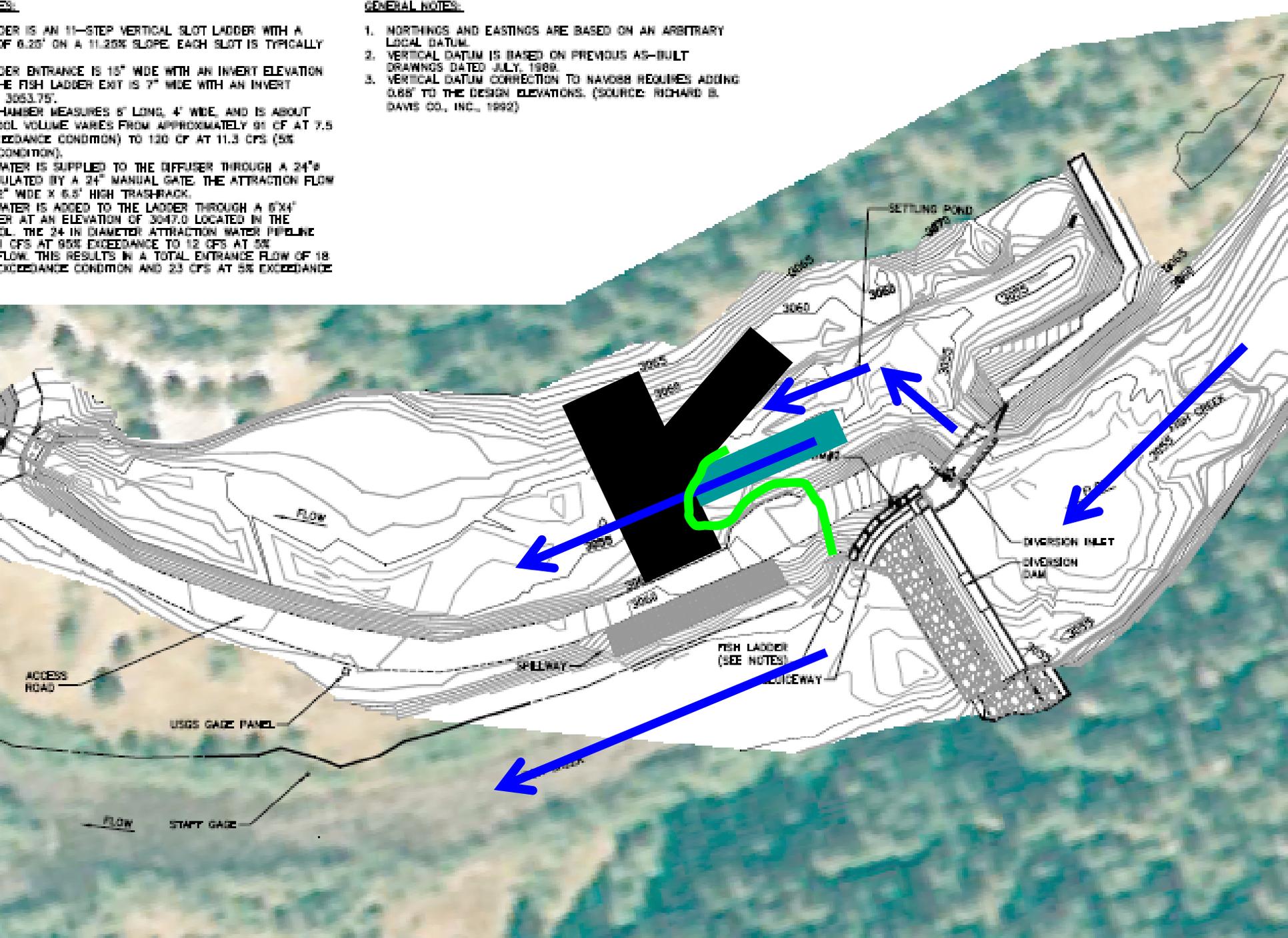
- Preclude rainbow trout from diversion, provide safe downstream passage route
- Dam 9 ft high, diversion capacity 150 cfs
- Operational challenges: no power, all manual gates
- Natural challenges: flashy flows, bedload, ice



DER IS AN 11-STEP VERTICAL SLOT LADDER WITH A  
 OF 0.25' ON A 11.25% SLOPE. EACH SLOT IS TYPICALLY  
 DER ENTRANCE IS 15" WIDE WITH AN INVERT ELEVATION  
 HE FISH LADDER EXIT IS 7" WIDE WITH AN INVERT  
 3053.75'.  
 HANBER MEASURES 8' LONG, 4' WIDE, AND IS ABOUT  
 COL VOLUME VARIES FROM APPROXIMATELY 91 CF AT 7.5  
 EXCEEDANCE CONDITION) TO 130 CF AT 11.3 CFS (5%  
 CONDITION).  
 WATER IS SUPPLIED TO THE DIFFUSER THROUGH A 24"  
 ULATED BY A 24" MANUAL GATE. THE ATTRACTION FLOW  
 2" WIDE X 6.5' HIGH TRASH-RACK.  
 WATER IS ADDED TO THE LADDER THROUGH A 6"x4"  
 ER AT AN ELEVATION OF 3047.0 LOCATED IN THE  
 CL. THE 24 IN DIAMETER ATTRACTION WATER PIPELINE  
 1 CFS AT 95% EXCEEDANCE TO 12 CFS AT 5%  
 FLOW. THIS RESULTS IN A TOTAL ENTRANCE FLOW OF 18  
 EXCEEDANCE CONDITION AND 23 CFS AT 5% EXCEEDANCE

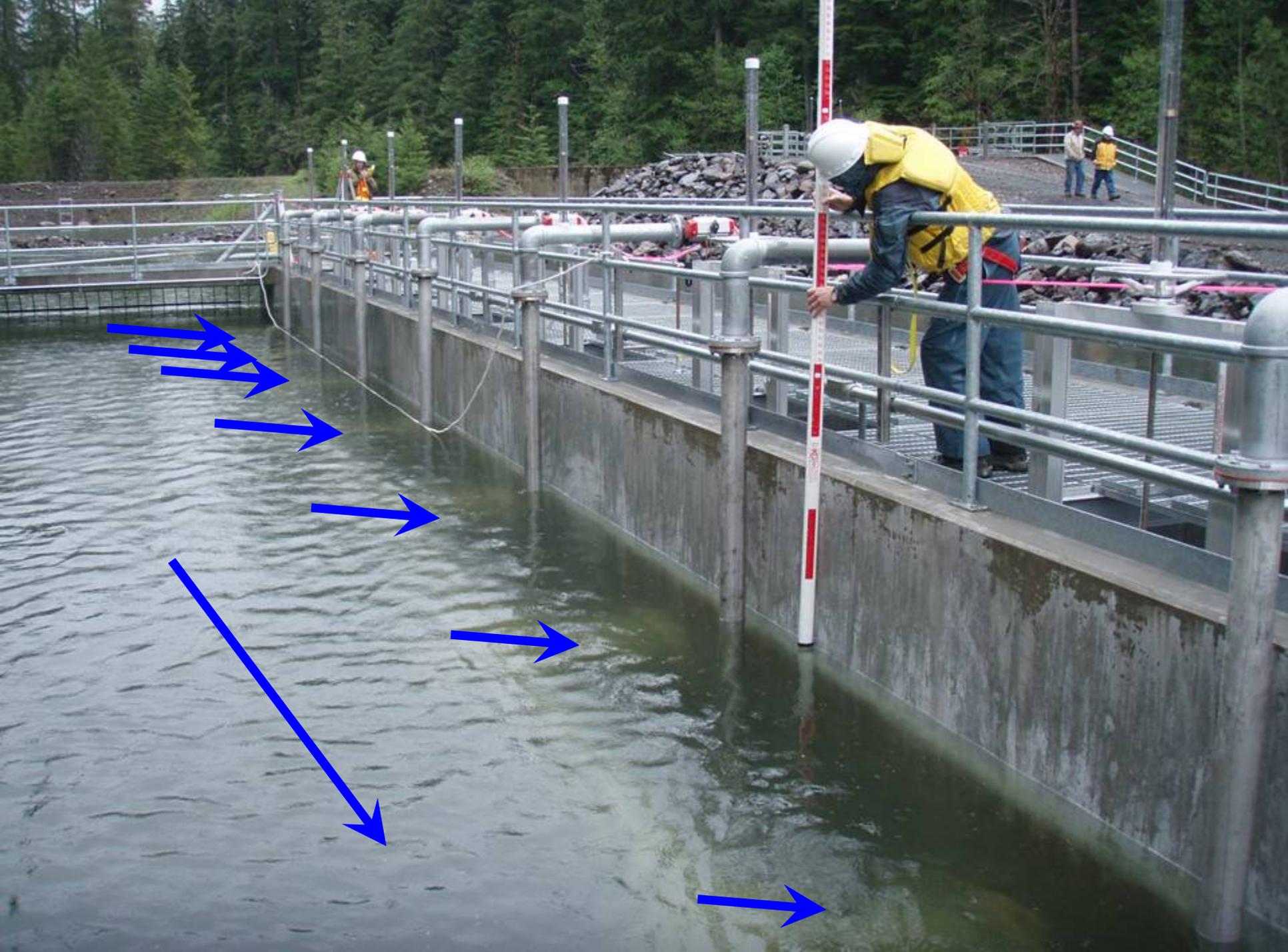
**GENERAL NOTES:**

1. NORTHINGS AND EASTINGS ARE BASED ON AN ARBITRARY LOCAL DATUM.
2. VERTICAL DATUM IS BASED ON PREVIOUS AS-BUILT DRAWINGS DATED JULY, 1989.
3. VERTICAL DATUM CORRECTION TO NAVD83 REQUIRES ADDING 0.88' TO THE DESIGN ELEVATIONS. (SOURCE: RICHARD B. DAVIS CO., INC., 1992)



Built in off-channel settling pond to avoid damage from flashy flows, LWD, and bedload

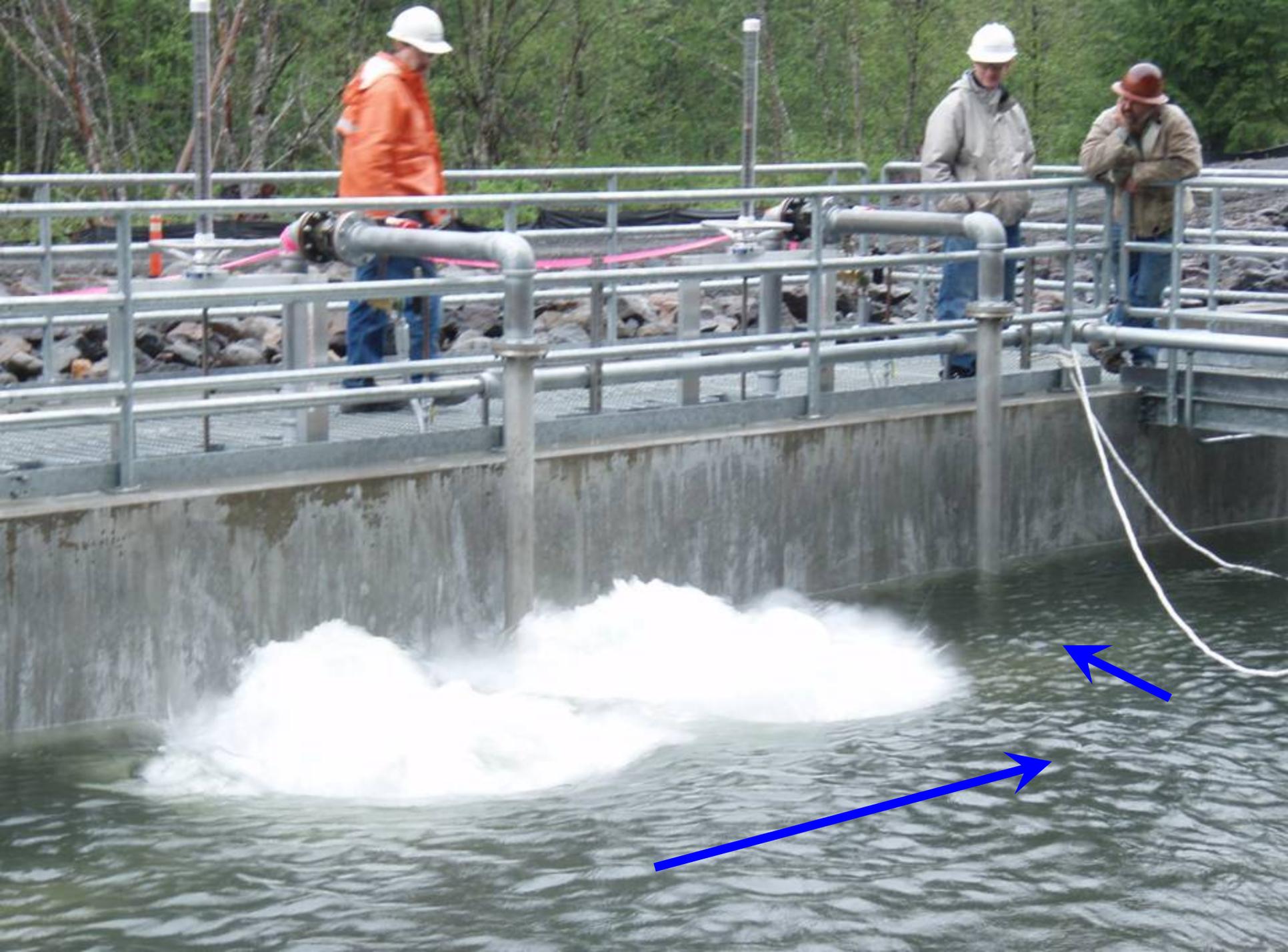




Used pre-baffled,  
irrigation pump  
style

“T-screens” to  
remain submerged  
and avoid ice  
occlusion







**NOTICE**  
No swimming  
No wading  
No fishing  
No boating

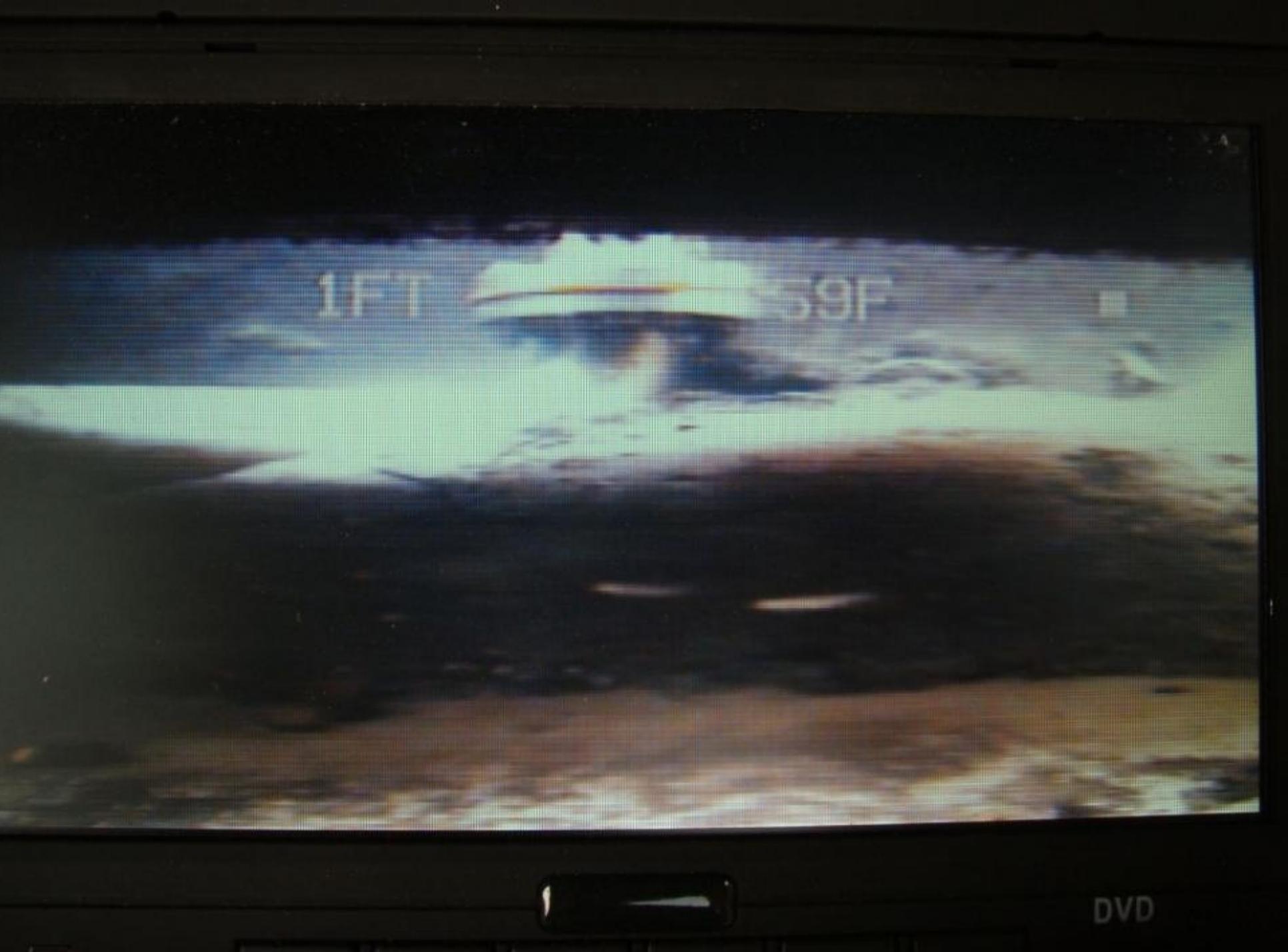
# Fish Creek Fish Screen post-construction

- Balanced screens
- Hydraulic evaluation at high diversion flow
- Biological evaluation at high and low diversion flows, with juvenile and fry of local-strain hatchery rainbow trout
  - Underwater video observations of behavior at screens
  - Enumeration of passage and injury thru bypass system (seining, shocking, snorkeling)

# Fish Cr Screen Biological Evaluation

## #2 – rainbow trout fry





1FT

59F

DVD



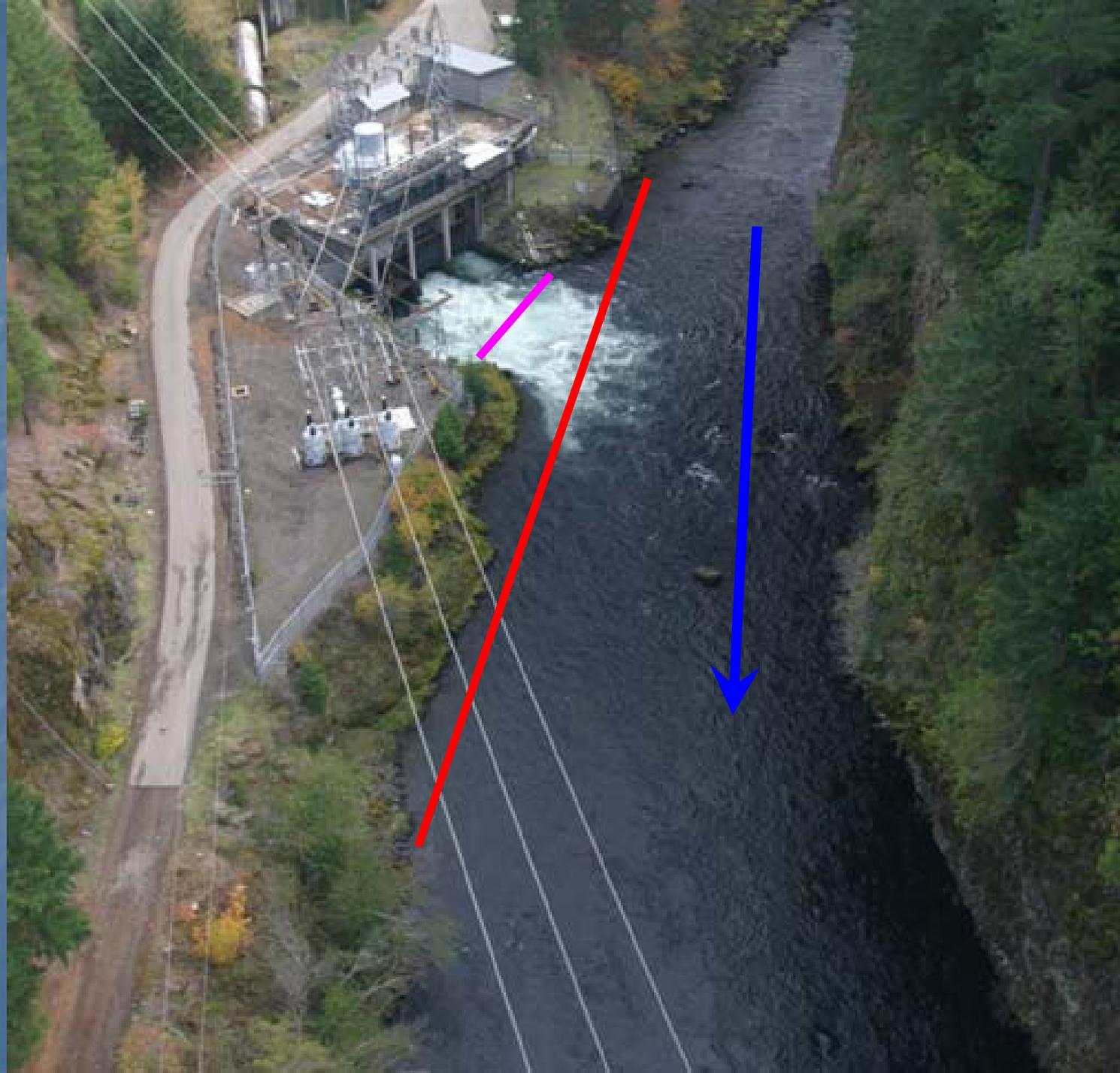
Modified the rip-rap spillway field to reduce fish stranding during drawdown of pool



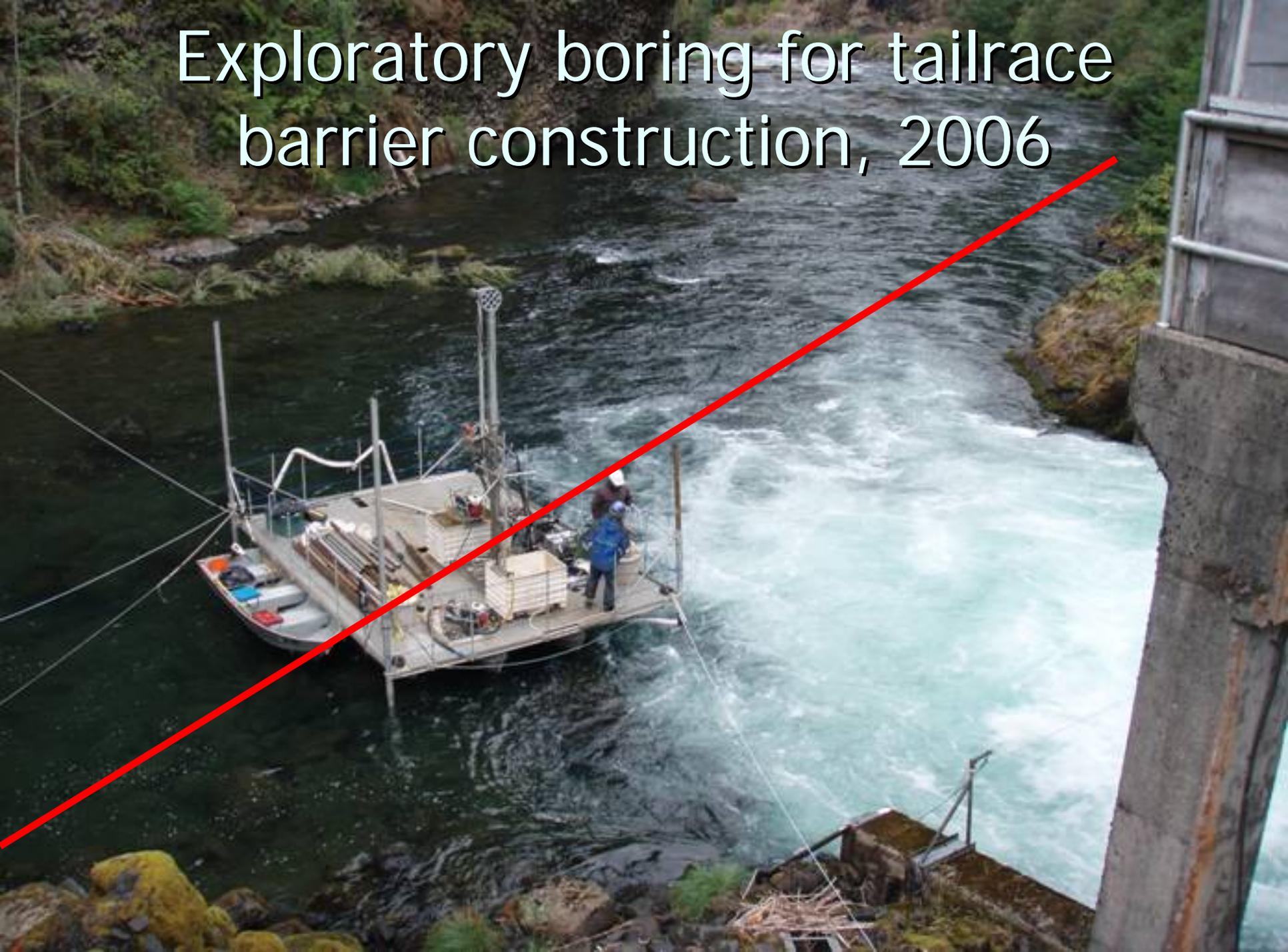
# Soda Springs tailrace barrier

- Preclude adult salmon and steelhead
- Powerhouse capacity 1,600 cfs
- Natural challenges: narrow canyon, fractured basalt and massive boulders, flashy natural flows (coffer dam)

Soda  
Springs  
pre-  
tailrace  
barrier



# Exploratory boring for tailrace barrier construction, 2006













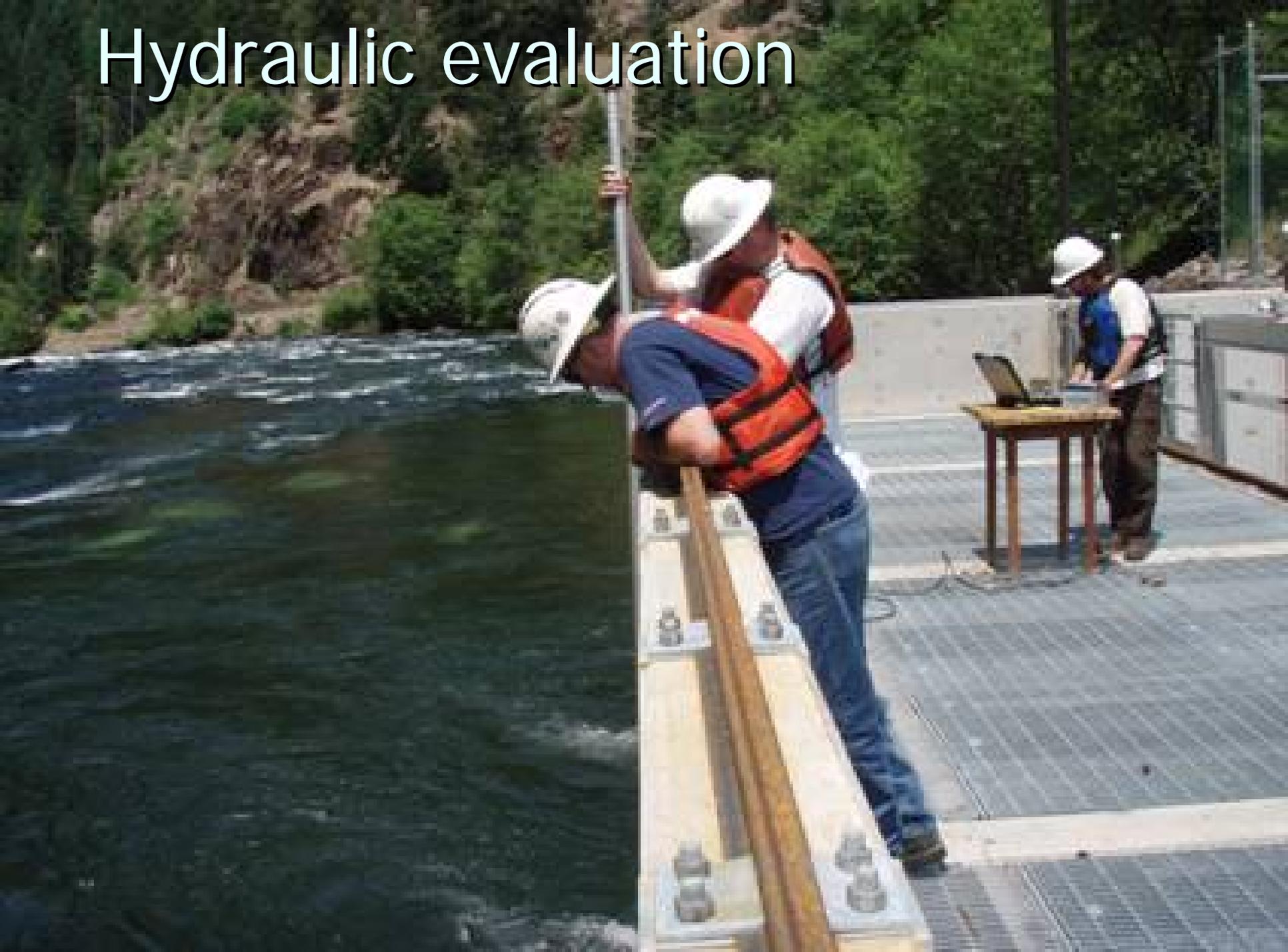


# Soda Springs TRB prior to submersion



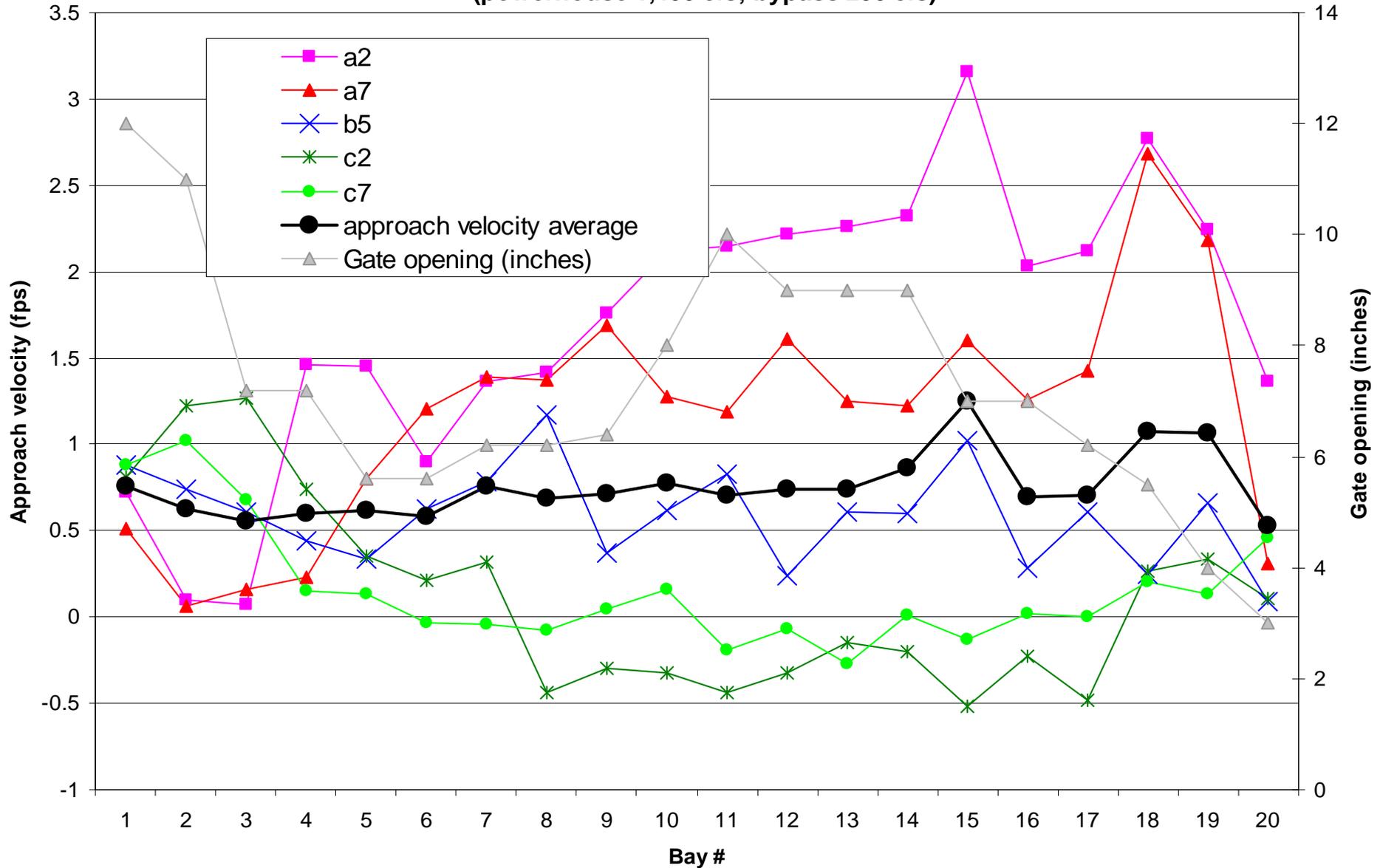


# Hydraulic evaluation

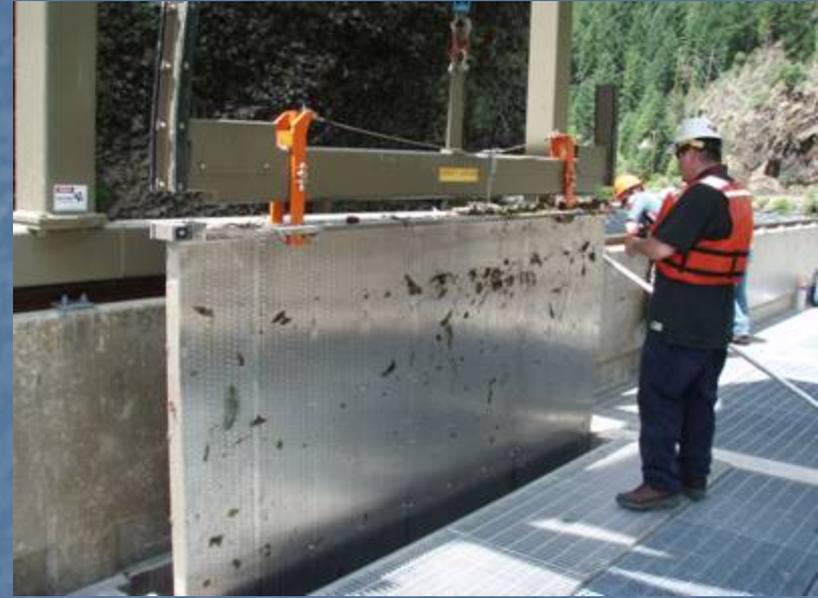


# Hydraulic evaluation

SDS TRB water velocity msmts 7-3-08  
(powerhouse 1,400 cfs; bypass 290 cfs)



# Soda TRB Baffle Testing



# Operational challenges: picket cleaning





# Soda Springs fish passage

- Steelhead, Spring Chinook, Coho, Cutthroat, Lamprey
- Dam 77 ft high, screened flow 1,875 cfs
- Criteria V-screen; Half-Ice-Harbor ladder, extend and smooth spillway
- Operational challenges: reservoir fluctuation 14 ft for re-reg of upstream load following
- Natural challenges: steep canyon with active landslide, fractured rock, dearth of bedrock where needed for foundations!

# SA 4.1 Soda Springs fish passage

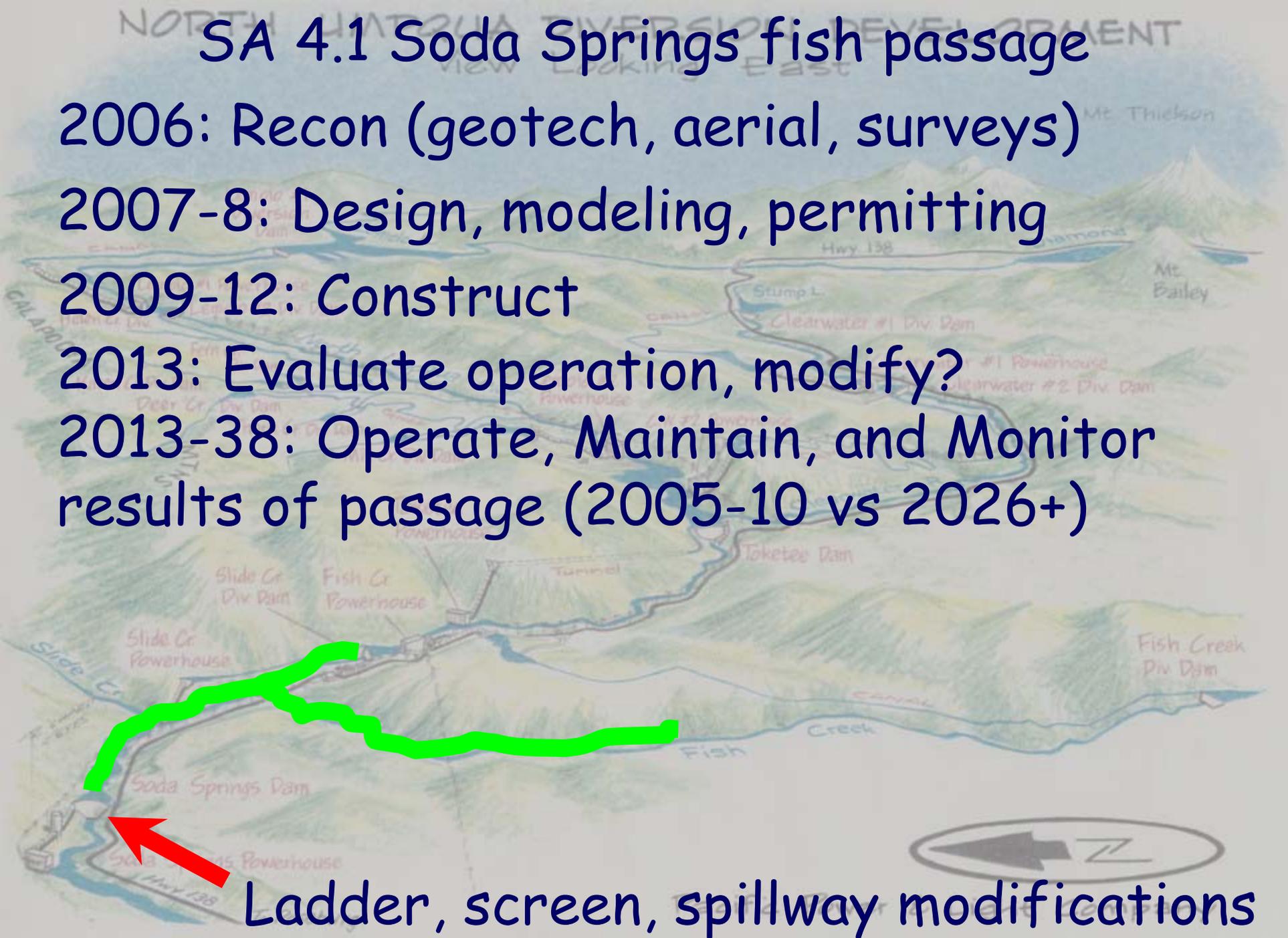
2006: Recon (geotech, aerial, surveys)

2007-8: Design, modeling, permitting

2009-12: Construct

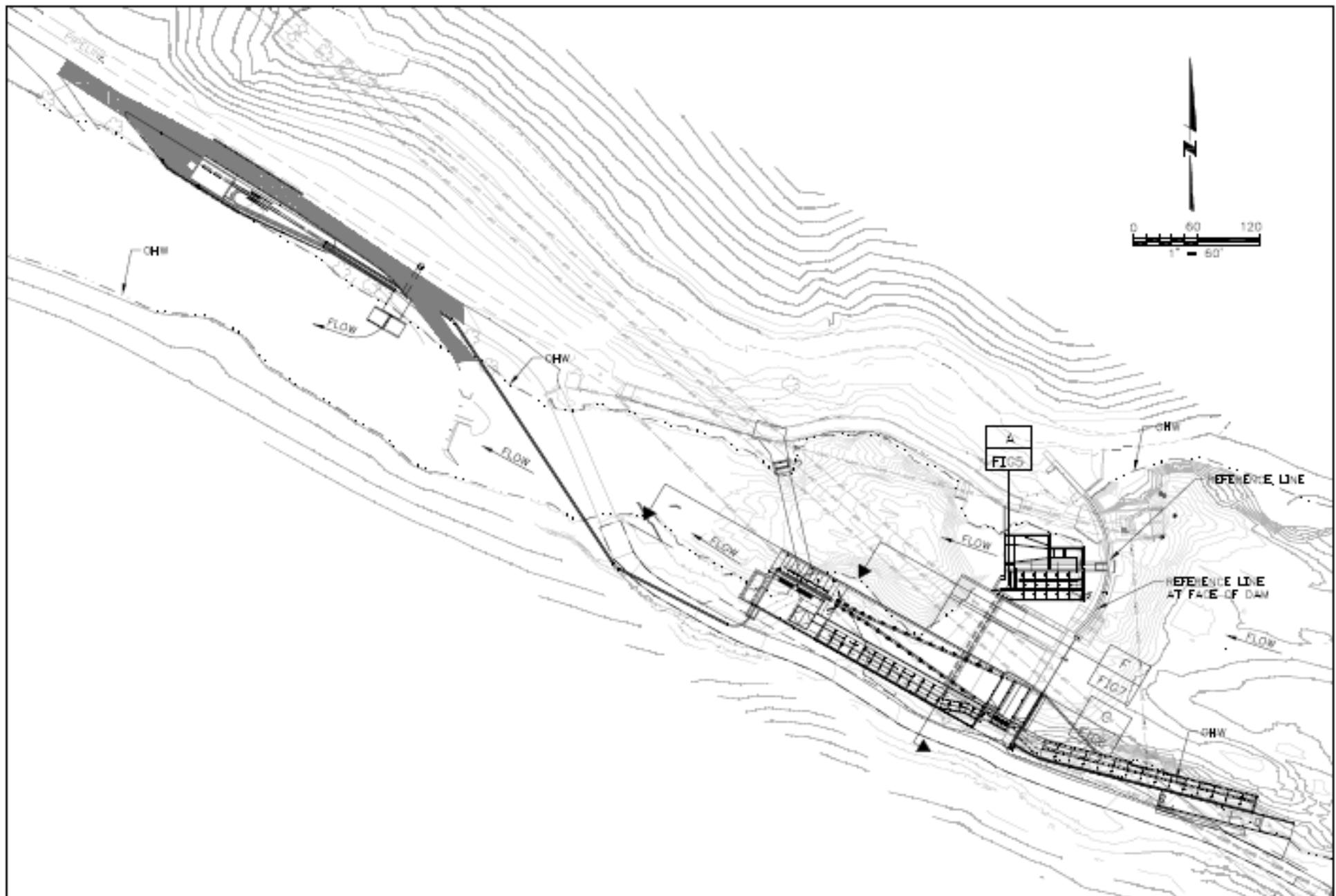
2013: Evaluate operation, modify?

2013-38: Operate, Maintain, and Monitor  
results of passage (2005-10 vs 2026+)



Ladder, screen, spillway modifications



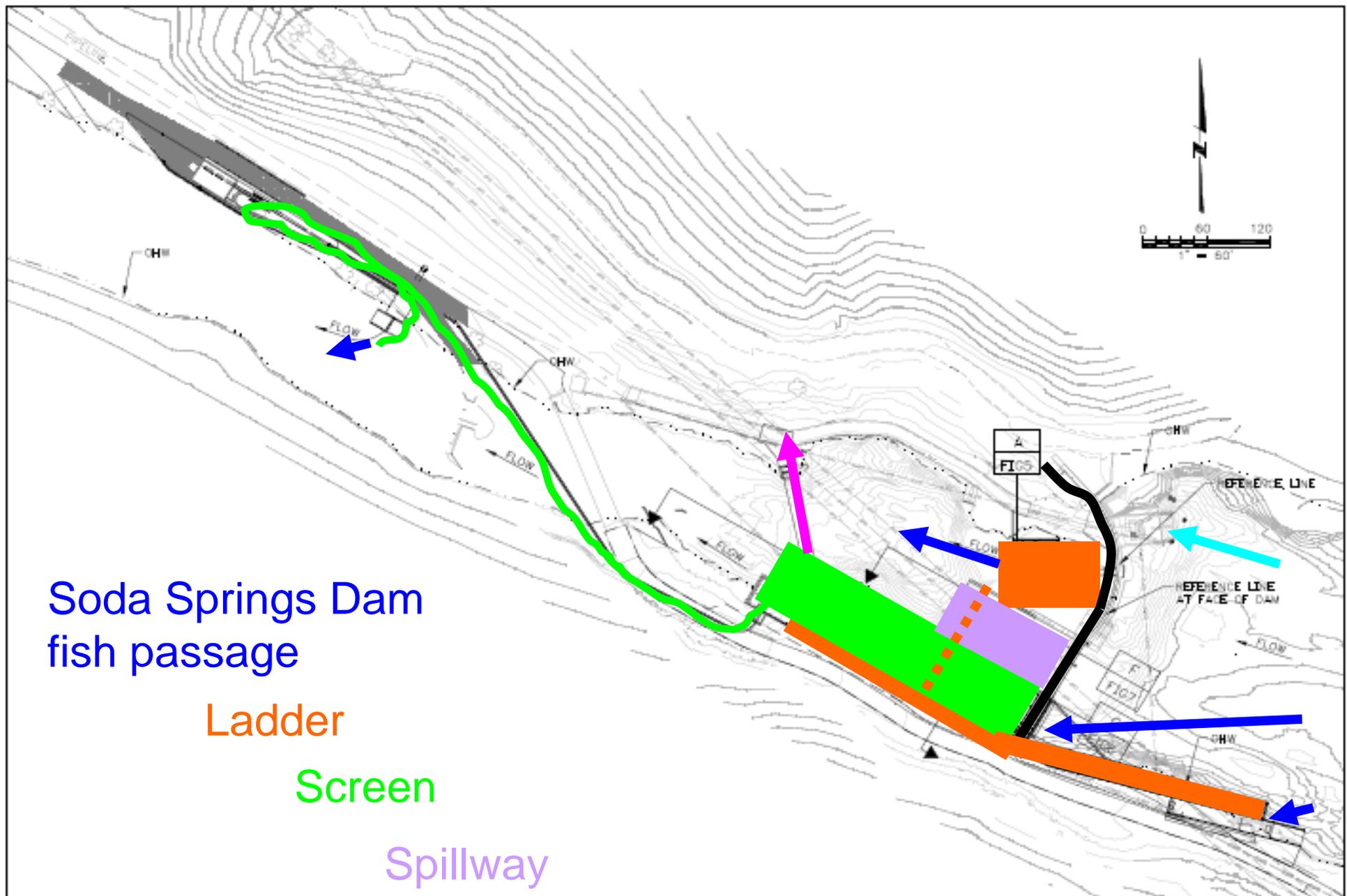


PACIFICORP  
 NORTH UMPQUA HYDROELECTRIC PROJECT  
 FERC NO. 1927-008

SCALE  
 1"=60'

SODA SPRINGS DAM - FISH PASSAGE PROJECT  
 CIVIL  
 SITE PLAN

FIGURE  
 4 of 15



Soda Springs Dam  
fish passage

Ladder

Screen

Spillway



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NORTH UMPQUA HYDROELECTRIC PROJECT  
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SCALE  
1"=60'

SODA SPRINGS DAM - FISH PASSAGE PROJECT  
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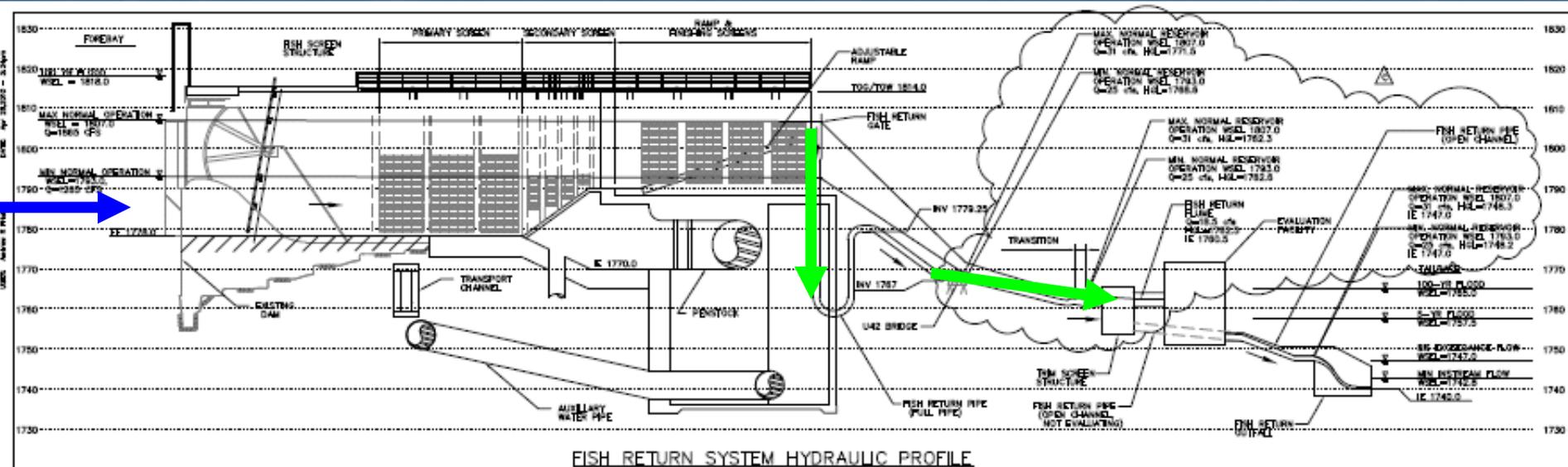
FIGURE  
4 of 15

Soda Springs fish screen,  
fish bypass flow model, 2008

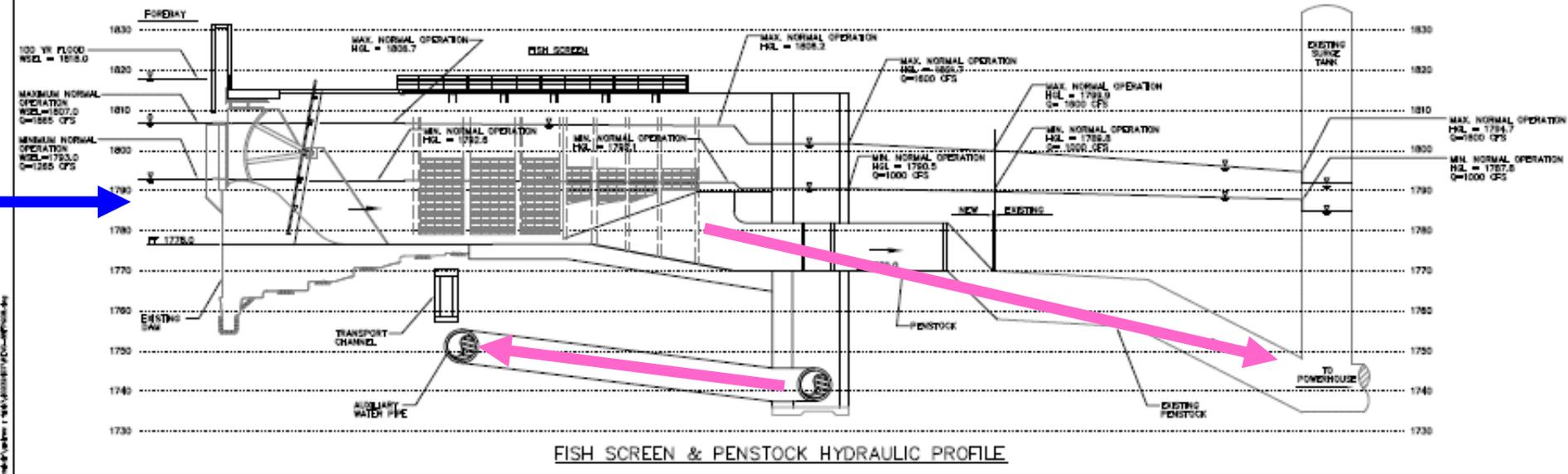




# Soda Springs fish screen profile



FISH RETURN SYSTEM HYDRAULIC PROFILE



FISH SCREEN & PENSTOCK HYDRAULIC PROFILE















