Jun 26th, 2:10 PM - 2:30 PM

Concurrent Sessions A: Emerging Engineering Solutions for Downstream Fish Passage at Big Dams - Cowlitz Falls North Shore Collector - Downstream Fish Passage Project

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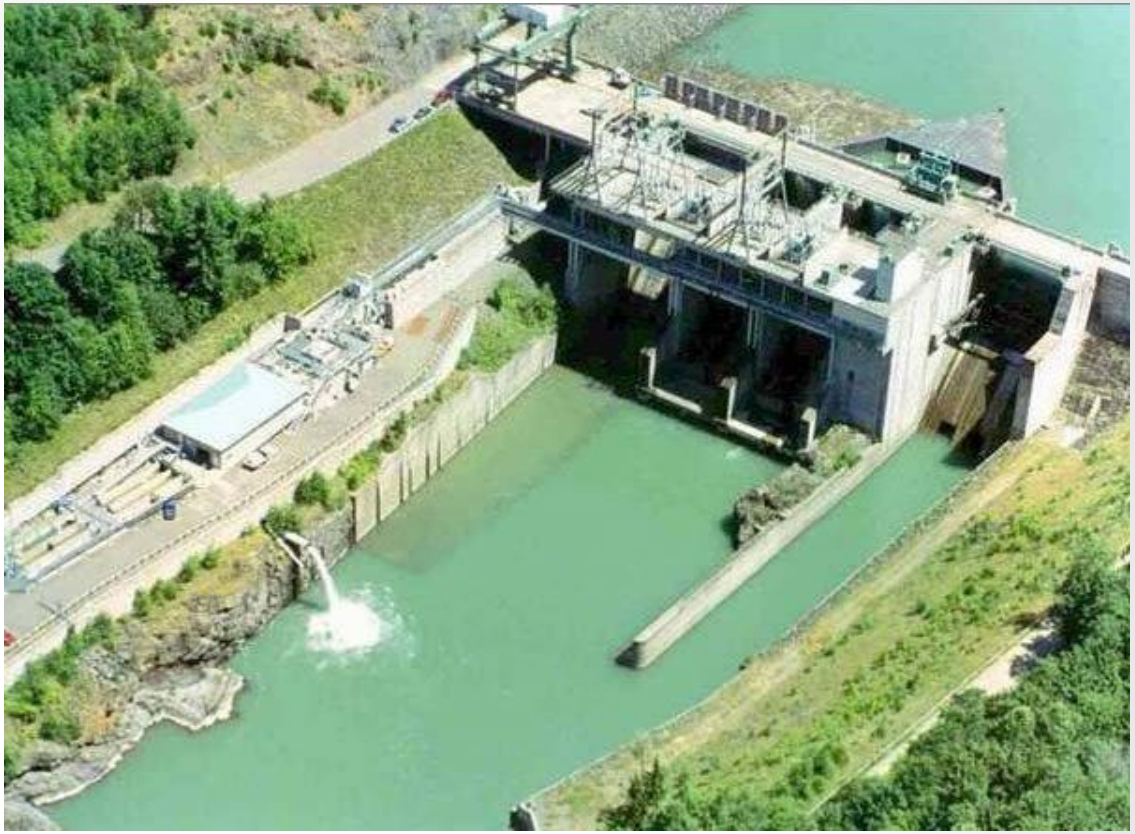

COWLITZ FALLS NORTH SHORE COLLECTOR DESIGN PROCESS

JUNE 26, 2013

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AGENDA

- Tacoma Power's Cowlitz Project Overview
- Cowlitz Falls Dam Overview
- Cowlitz Falls Fish Collection Timeline
  - BPA Efforts
  - Tacoma Power Efforts
  - Downstream Fish Passage Team
- Conceptual Design Process for the Cowlitz Falls North Shore Collector (CFNSC)
- CFNSC Schedule
- Design Process Takeaways

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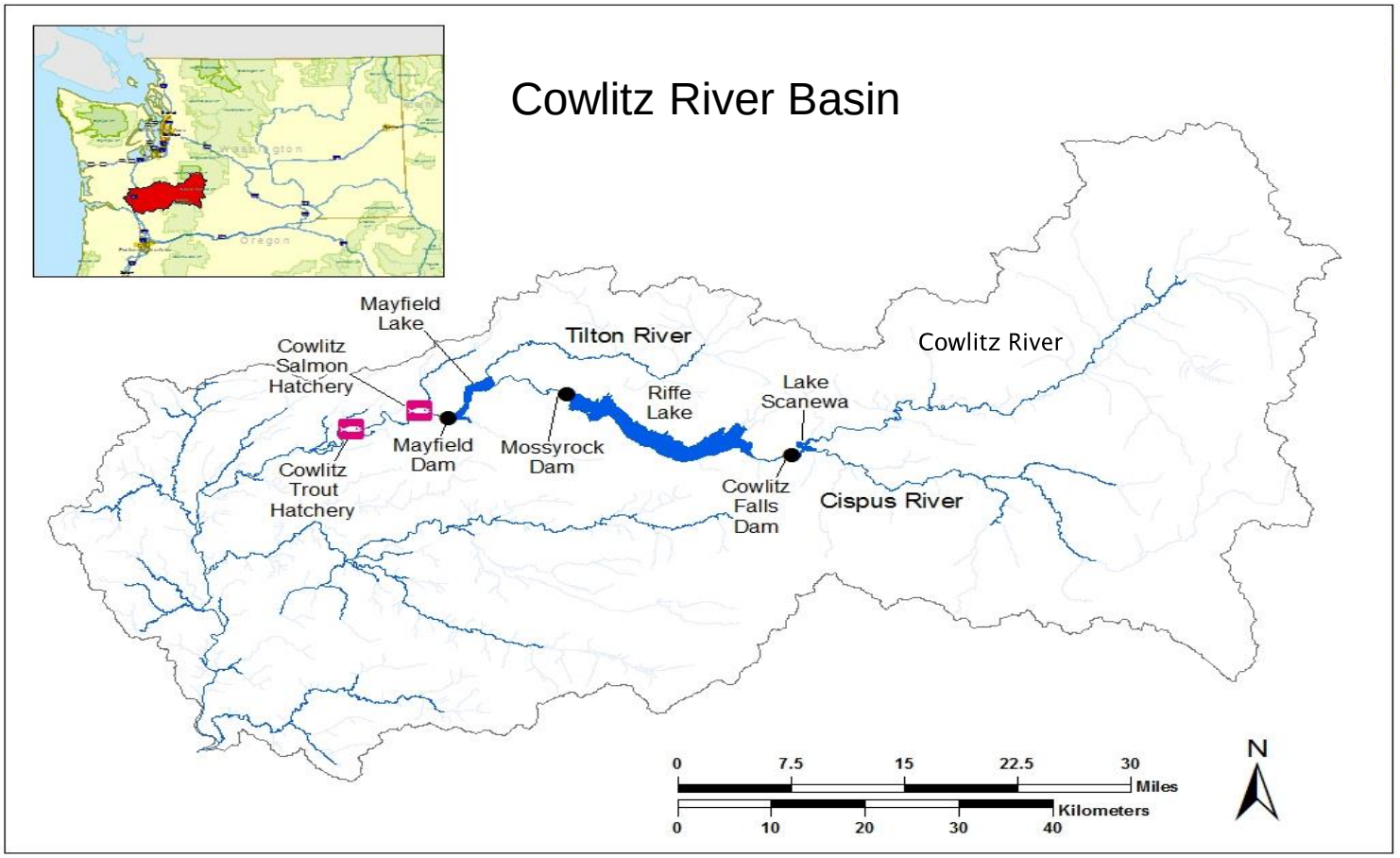
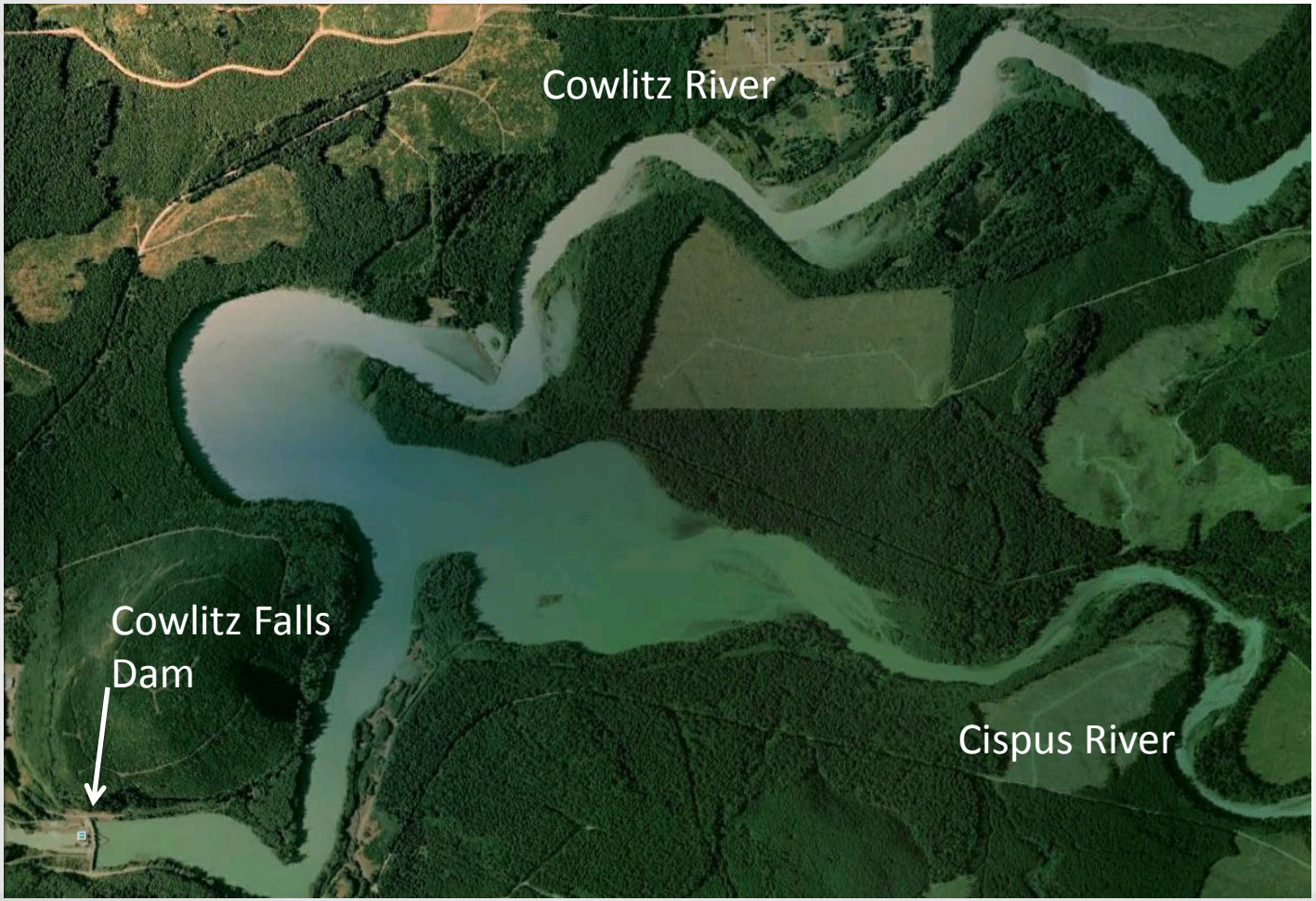
COWLITZ PROJECT OVERVIEW



LAKE SCANEWA



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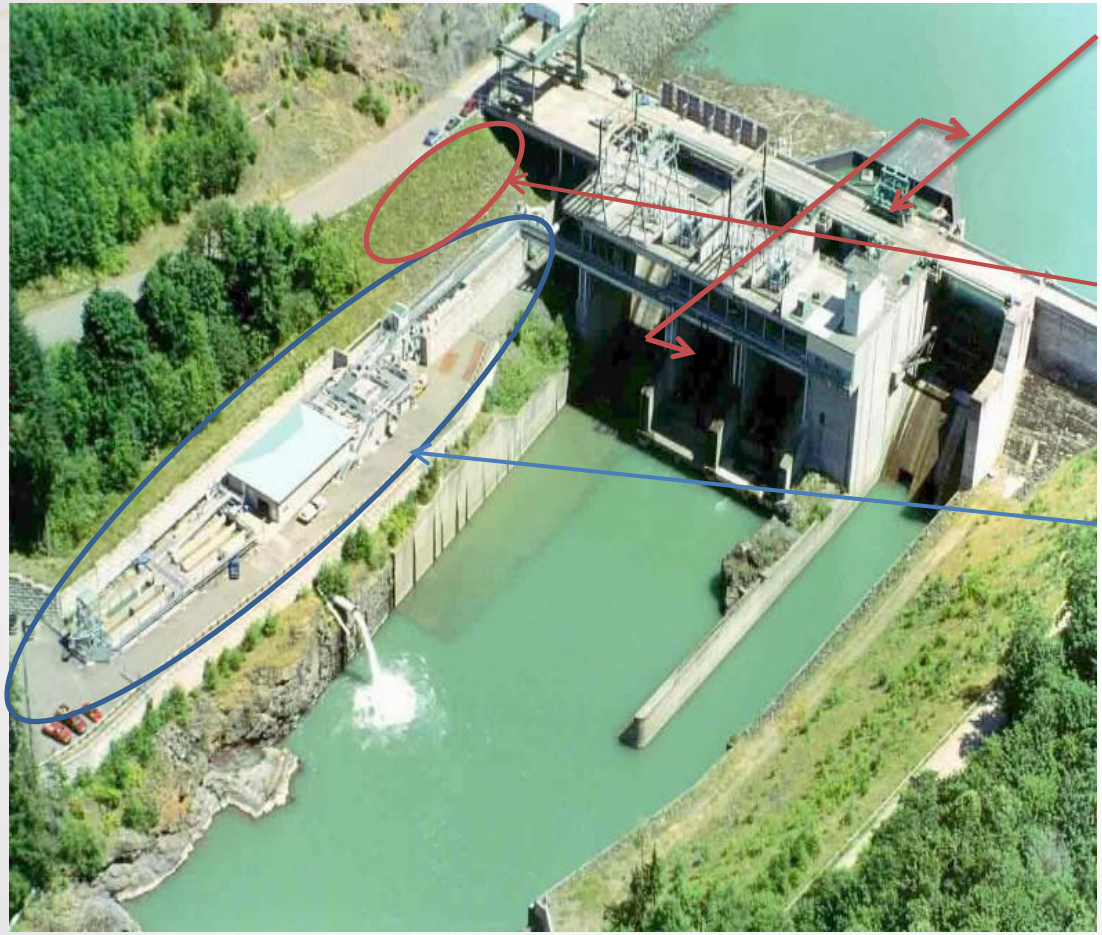
COWLITZ FALLS DAM - 1994



DAM OWNER:
LEWIS COUNTY PUD (LCPUD)

PROPOSED FISH FACILITY OWNER:
TACOMA POWER

FISH COLLECTION FACILITY OWNER:
BONNEVILLE POWER ADMINISTRATION (BPA)
OPERATED BY WDFW

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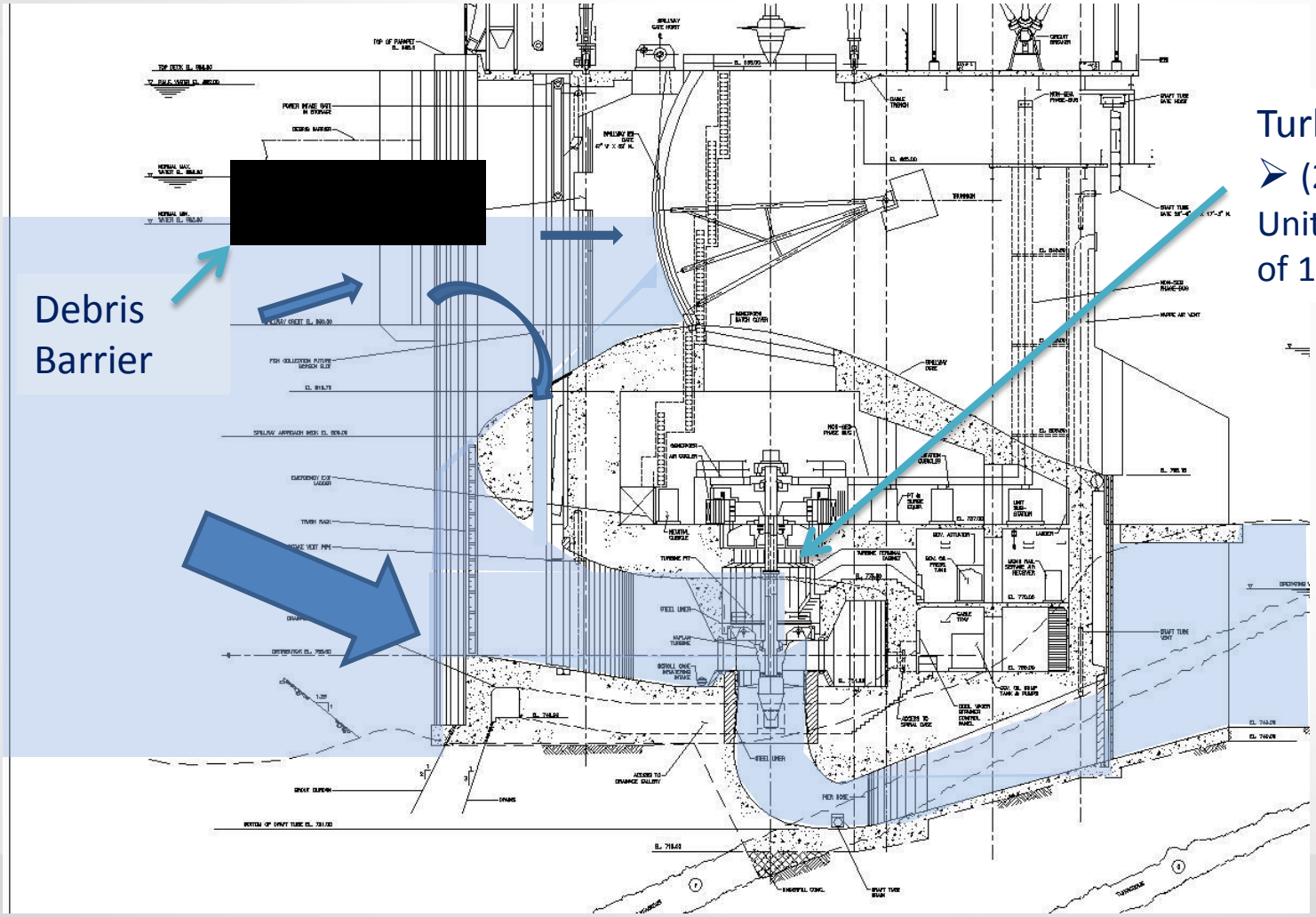
COWLITZ FALLS DAM SECTION VIEW



Debris Barrier

Turbine

- (2) Hydrocombine Units w/ total capacity of 10,500 cfs

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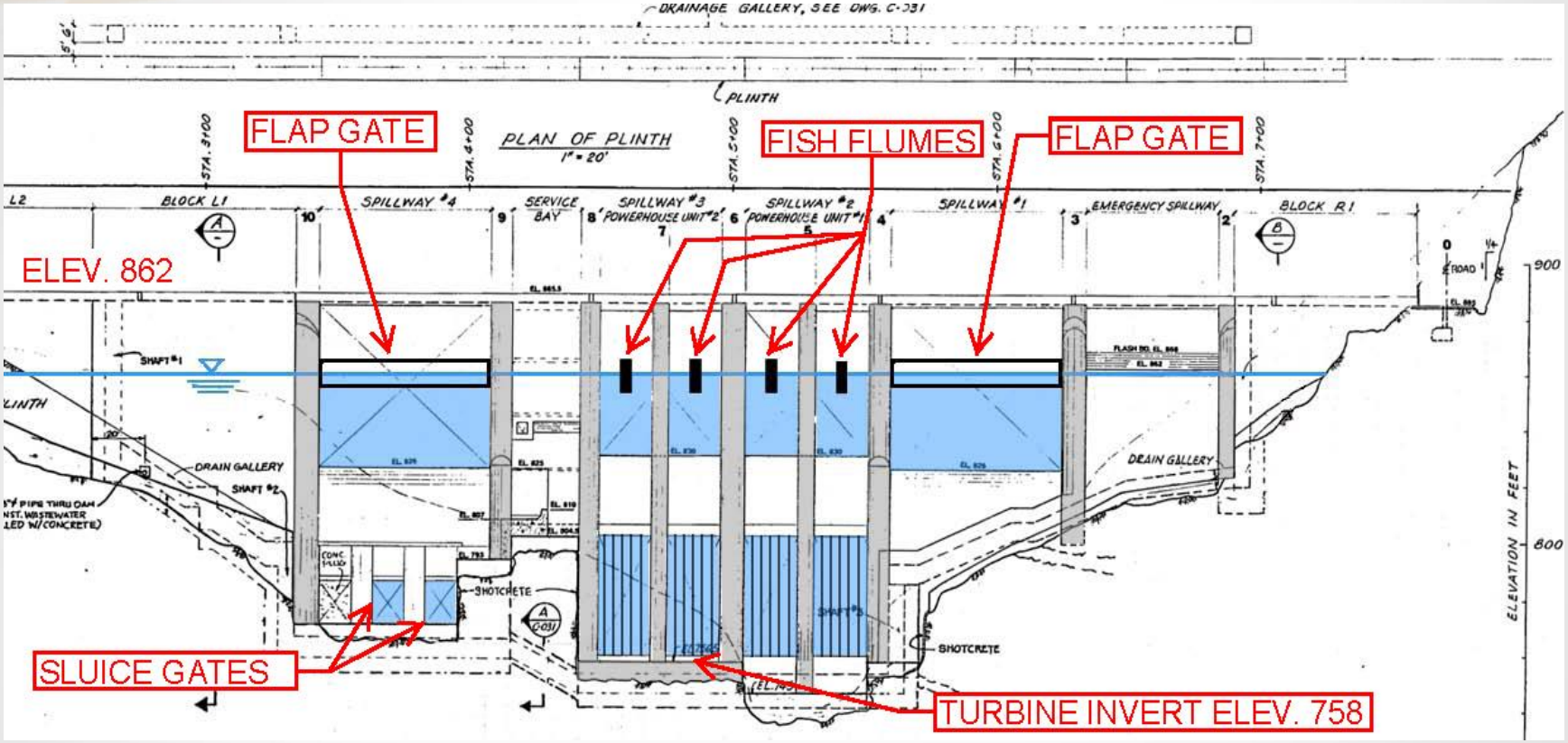
COWLITZ FALLS DAM ELEVATION VIEW



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COWLITZ FALLS FISH COLLECTION TIMELINE

1994

Dam Construction

BPA Fish Collection Efforts

2002

FERC Issues Tacoma Power new Cowlitz License

Tacoma Power Fish Collection Efforts

2009

Tacoma Power forms Downstream Fish Passage Team (DFPT)

2012

DFPT Finalizes Conceptual Design Report

Tacoma Power continues with their Fish Collection Efforts & Commences with Design of the CFNSC

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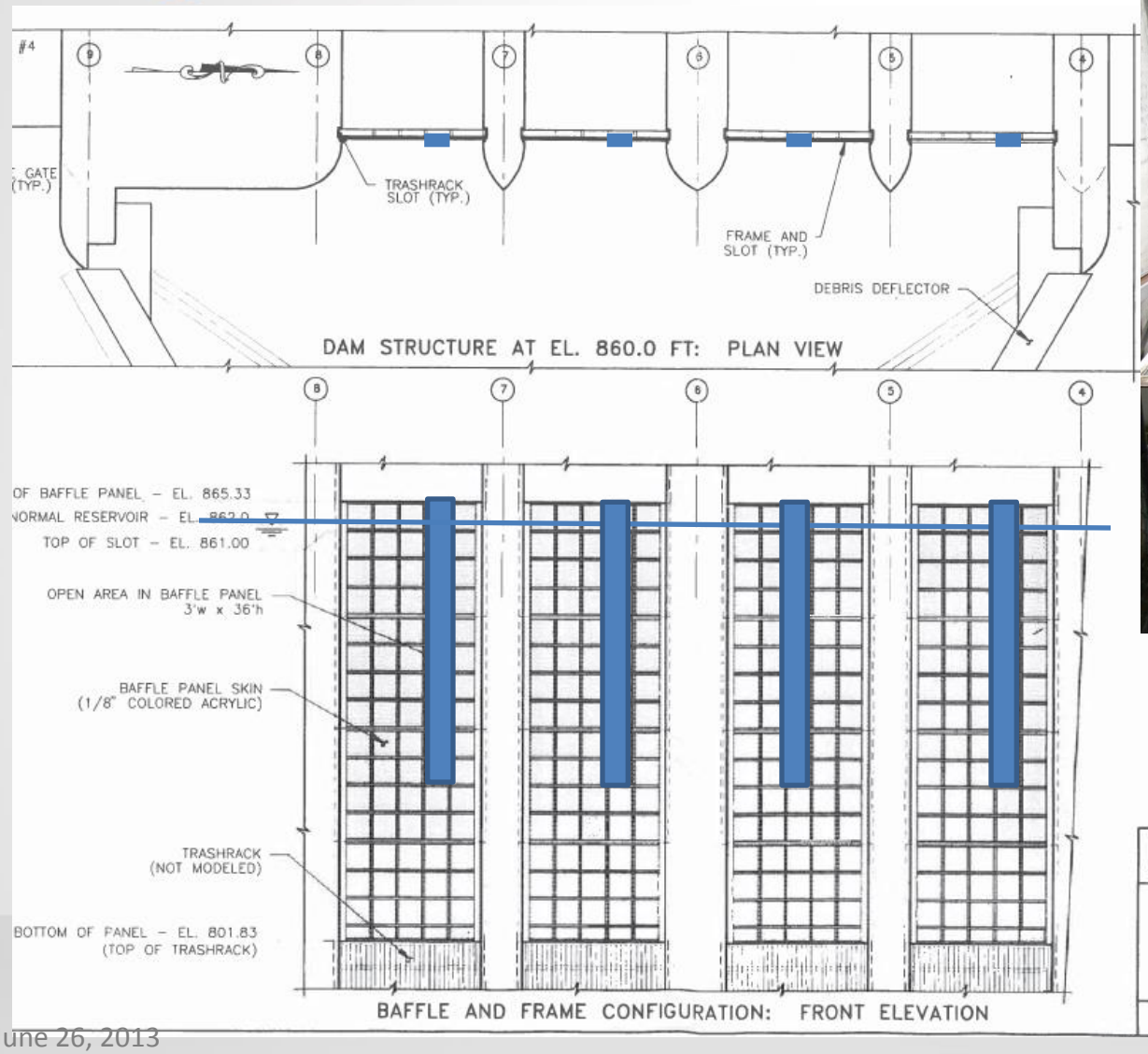
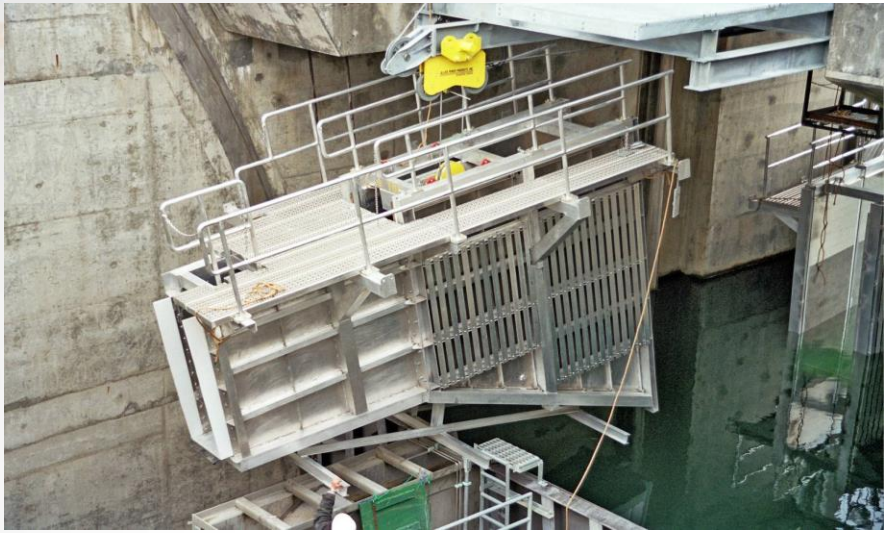
BPA FISH COLLECTION EFFORTS



TACOMA POWER FISH COLLECTION EFFORTS



2002

- Convened Fisheries Technical Committee

2003-2004

- Executed an Access Agreement with LCPUD & BPA
- Conducted Fish Studies with LCPUD & BPA

2005-2007

- Designed, Fabricated and Installed the Cowlitz Falls Fish Screen

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TACOMA POWER FISH COLLECTION EFFORTS

2008

- Modified CF Fish Screen
- Installed Merwin Traps in Lake Scanewa to supplement collection

2009

- Designed, Fabricated and Installed Siphon Flow Weir Box
- Abandoned after 1 season due to dam safety concerns
- Formed DFPT

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DOWNSTREAM FISH PASSAGE TEAM (DFPT)

- Tacoma Power convened the DFPT comprised of consulting engineers and biologists, Tacoma Power and LCPUD Staff, and state and federal agency staff.

- Goal of DFPT was to advance the most promising alternatives which considered all of the complexities at the Cowlitz Falls Project that included:

  - Variable flows
  - Net limitations, flow, bathymetry
  - Turbines
  - Debris barrier
  - Sluice Gate Operation
  - Spillway Operation

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TACOMA POWER FISH COLLECTION EFFORTS

2010-2011

- Experimented with 2 version of a Behavioral Guidance System (BGS)

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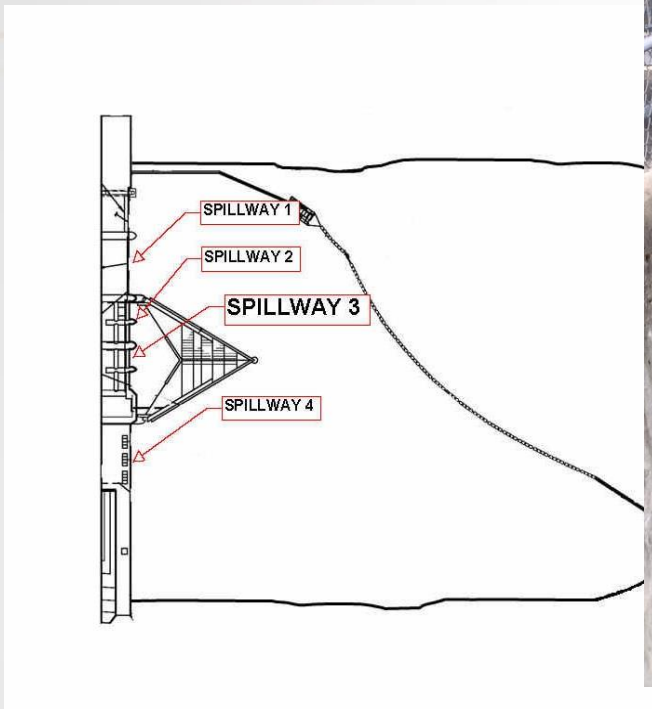
TACOMA POWER FISH COLLECTION EFFORTS



2012- Present

- Experimented with a prototype weir box
  - Overflow weir located at Spillbay #3
  - Connects to existing spillway flumes
  - Flows driven by Unit #2)

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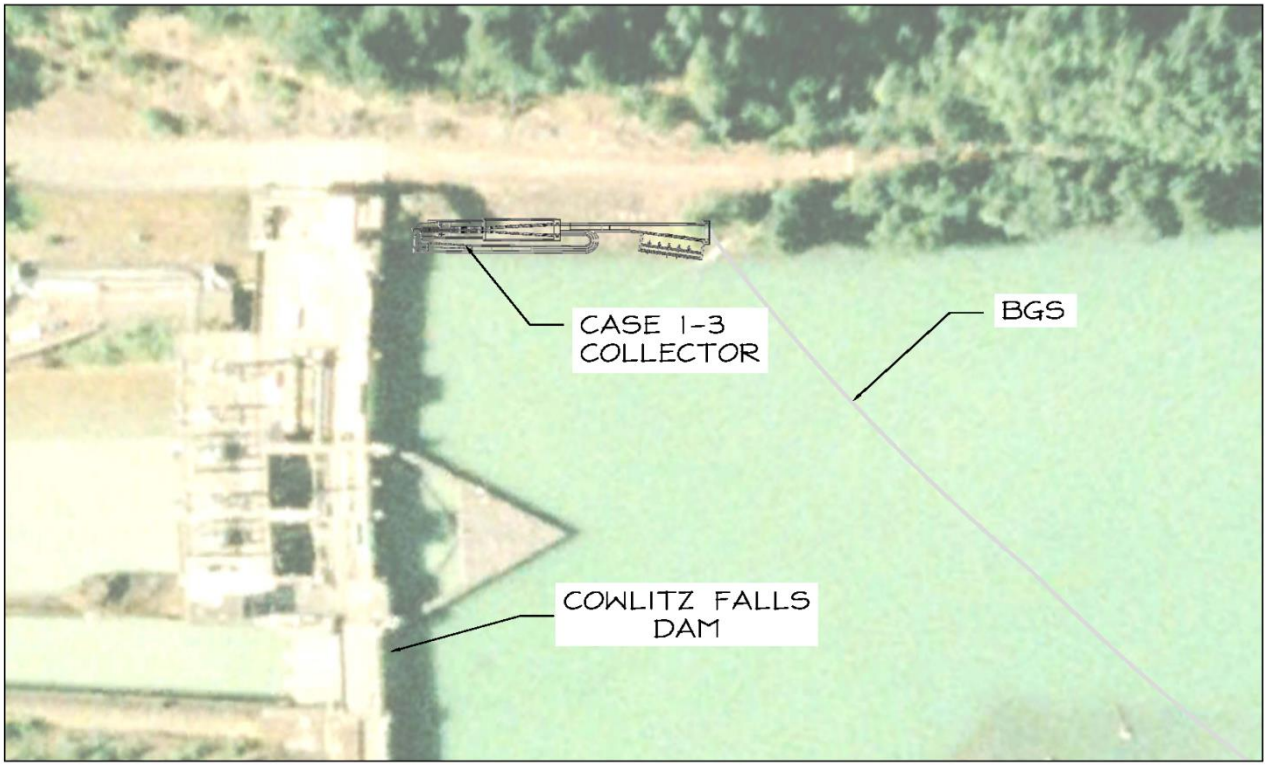
INITIAL CONCEPTUAL DESIGN CASES 1-3



Key Features:

- Shore Based
- Various Entrance Configurations
  - Case 1 – Upstream Only
  - Case 2 – Upstream & Downstream
  - Case 3 – Downstream Only
- 625cfs Base Configurations Expandable to 875cfs
- Reliant on Effective Guidance Structure

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INITIAL DESIGN STEPS

GEOTECHNICAL INVESTIGATION:

KEY TAKEAWAYS:

- DRILLED 10 BORINGS (4 FROM BARGE)
- DISCOVERED THAT ROCK CONTOURS AND PROPERTIES WERE VERY UNFAVORABLE TO CONSTRUCTION OF CASES 1-3

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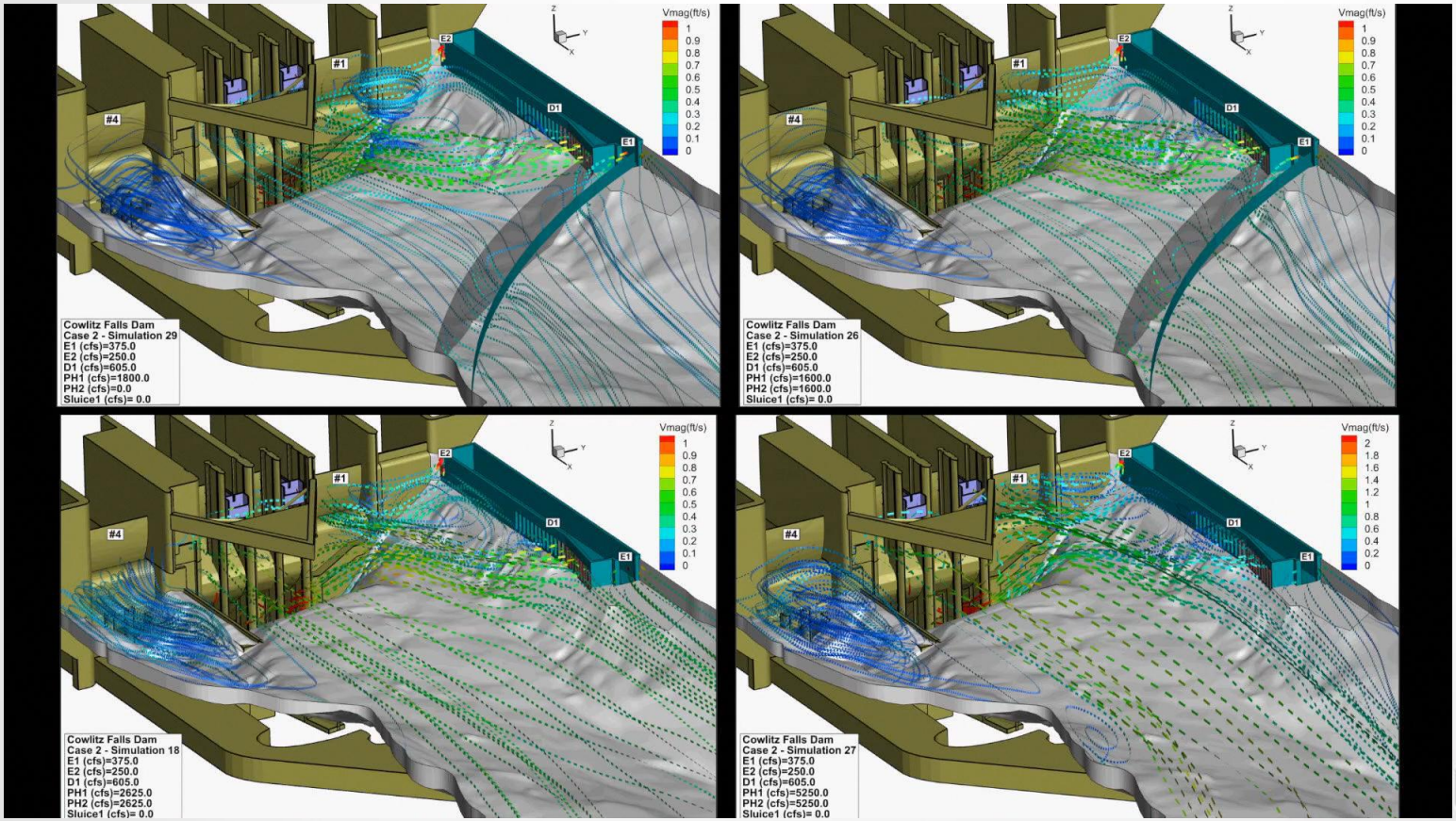
INITIAL DESIGN STEPS

HYDRAULIC MODELING STUDY:



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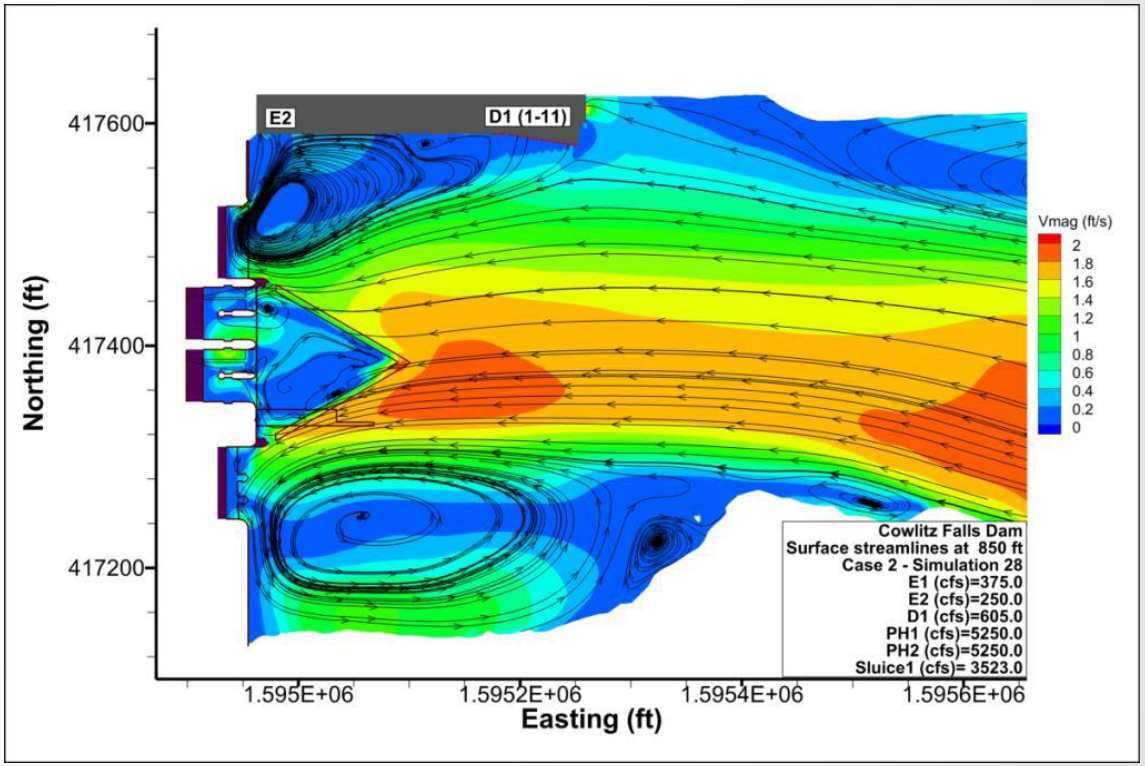
INITIAL DESIGN STEPS

HYDRAULIC MODELING STUDY

➢**IMPRESSIVE COMPUTATIONAL FLUID DYNAMICS (CFD) ANALYSIS WHICH INCLUDED:**

- Effect of BGS and Guide Net
- Effect of Sluice Gate Operation
- Various flow conditions from no generation to spill
- Velocity vectors (at surface and at depth)
- Surface streamlines
- Animated 3-D Streamlines
- Virtual Injection Analysis



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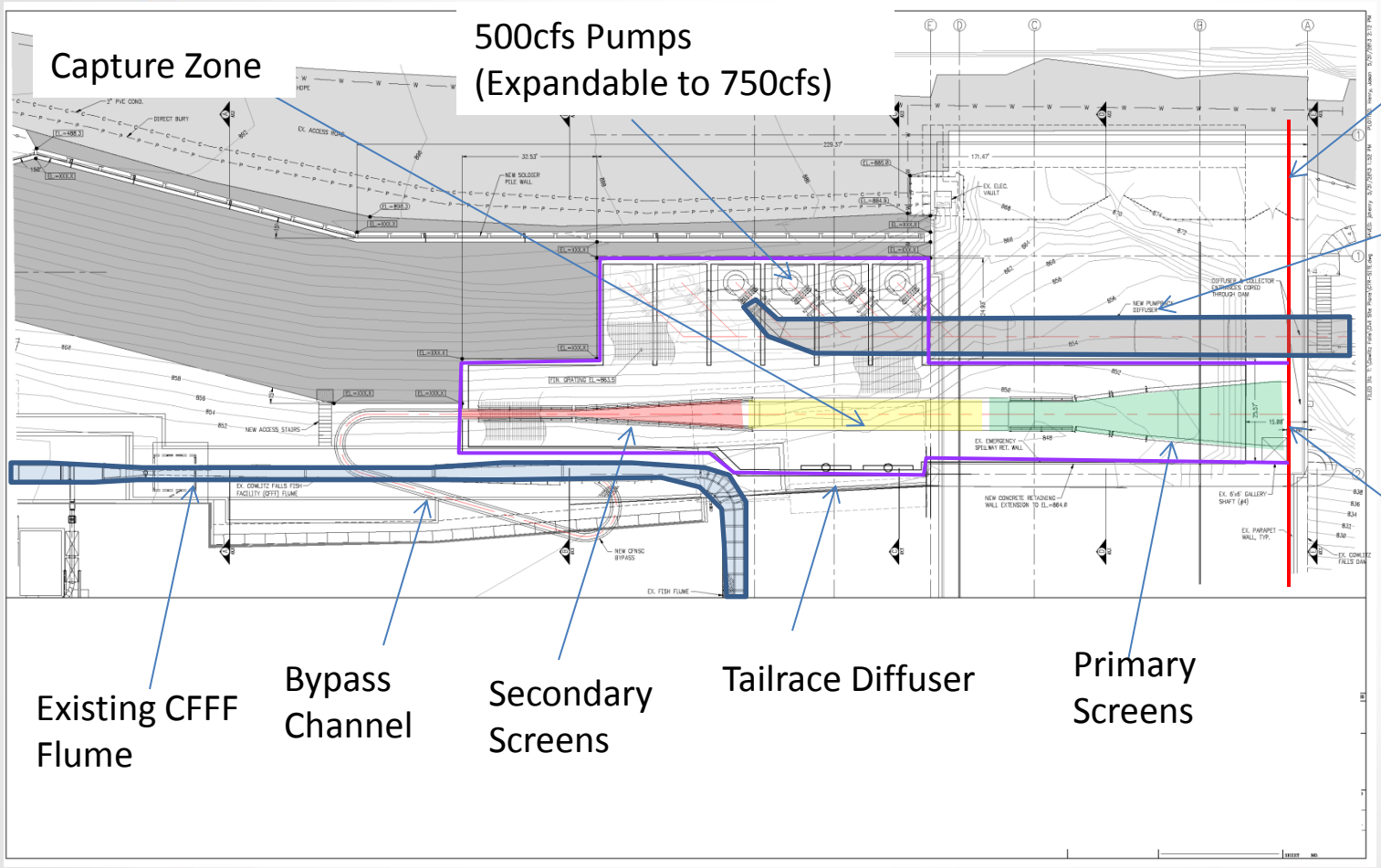
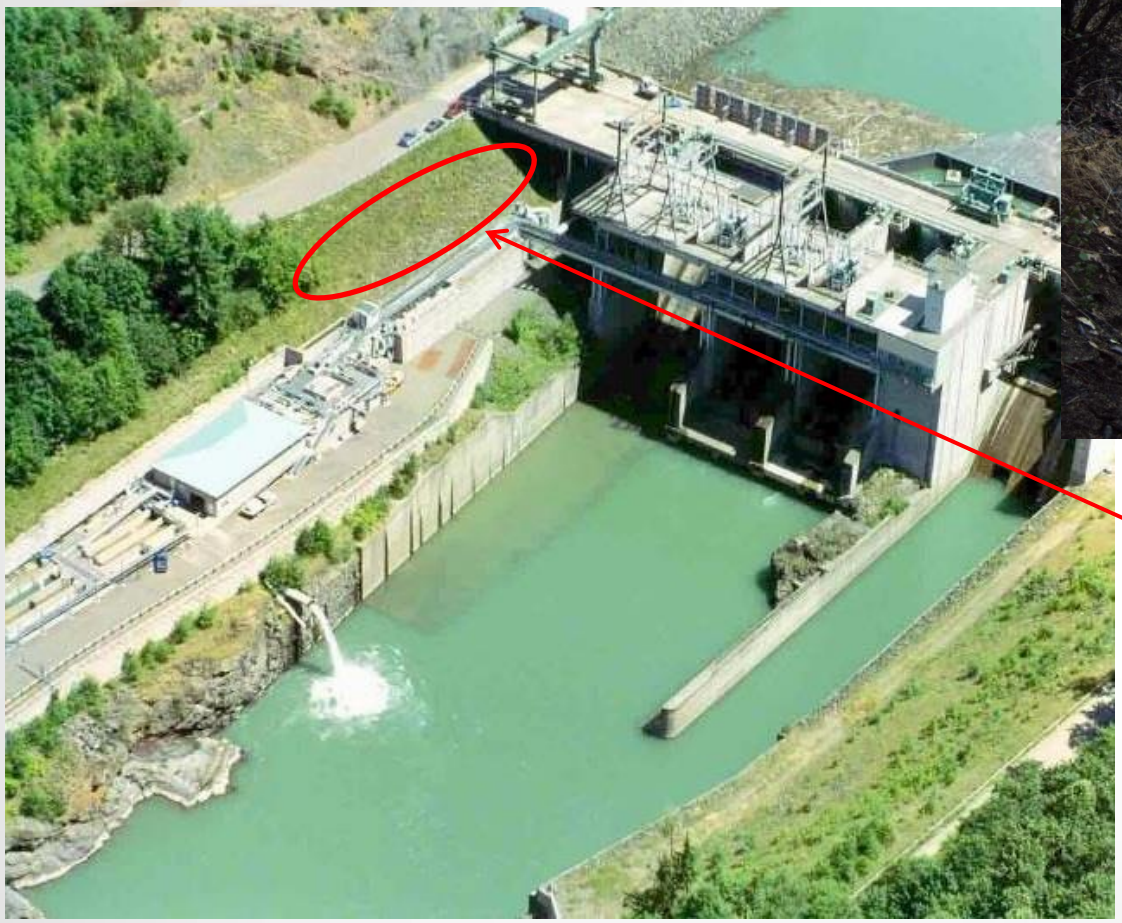
FINAL CONCEPTUAL DESIGN CASE 4



FINAL CONCEPTUAL DESIGN
CASE 4



PROPOSED LOCATION

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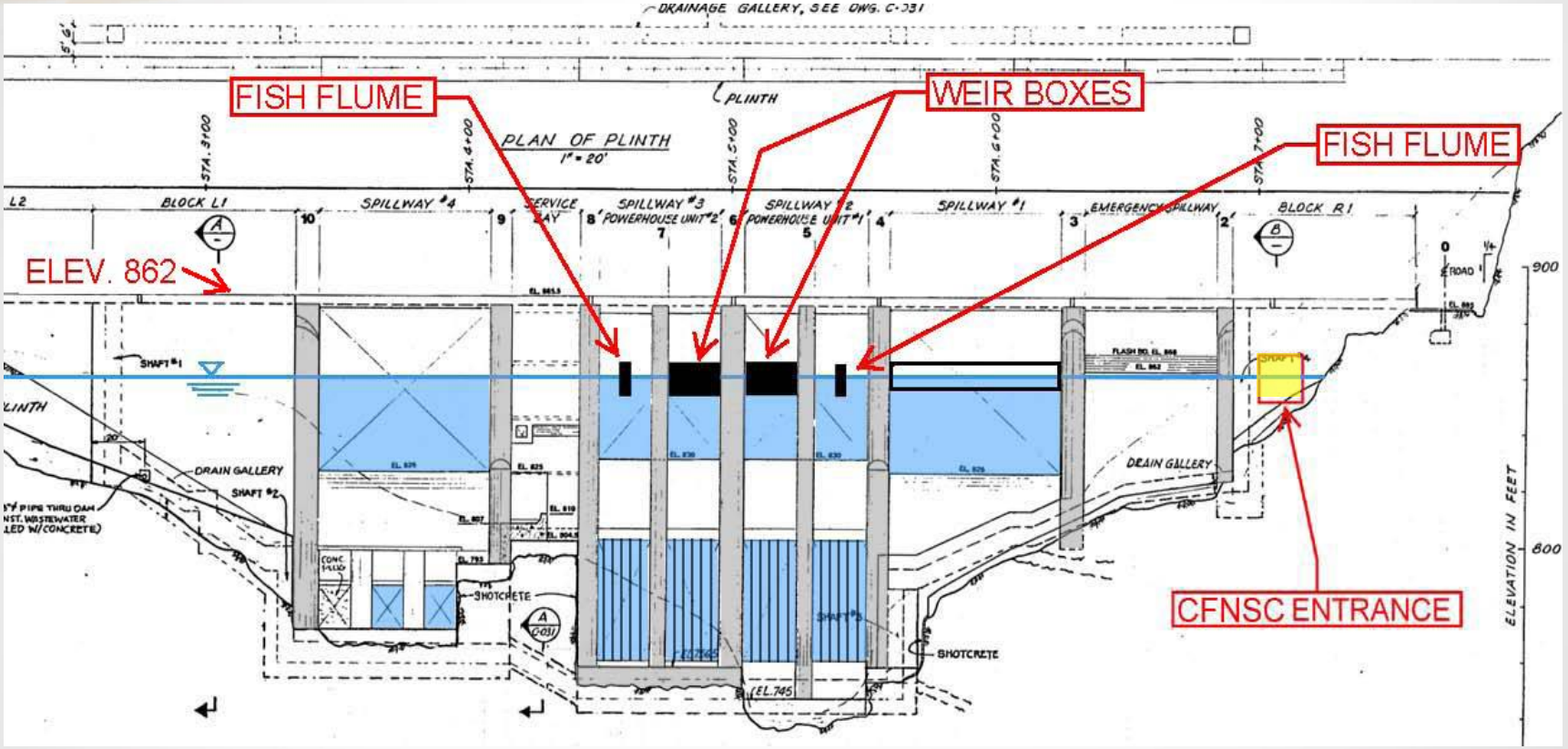
FINAL CONCEPTUAL DESIGN
CASE 4



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PROPOSED SCHEDULE

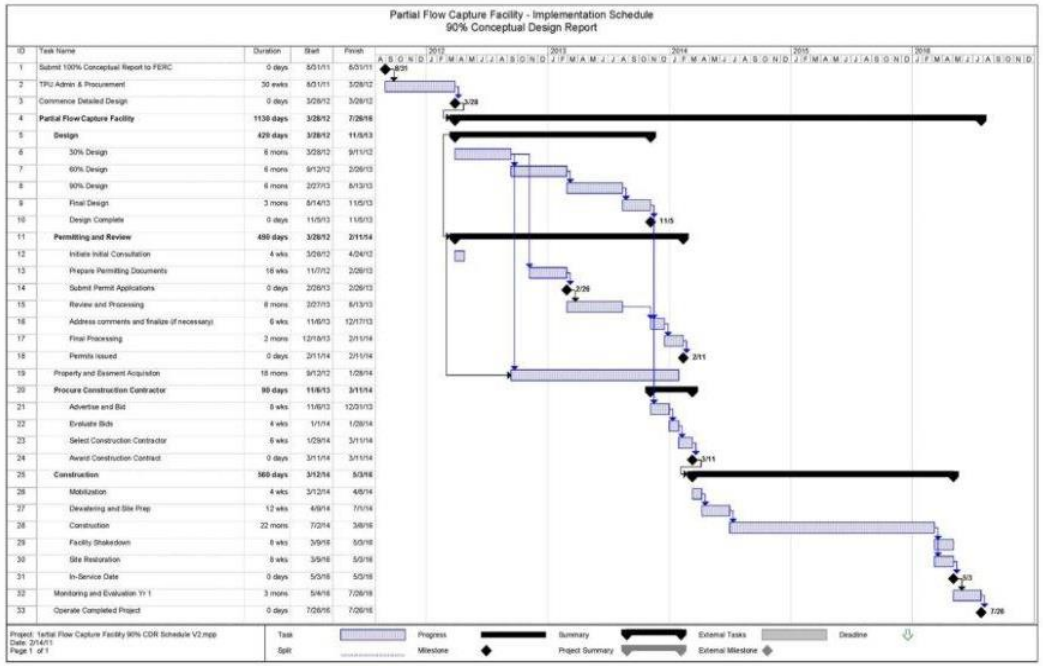

Figure 4.1-1 Partial Flow Capture Facility Implementation Schedule

Commence Detailed Design……..……..…2/23/13

Complete Design Drawings……..……8/7/14

Advertise Bid…….....…....11/12/14

Commence Construction……..…..1/12/15

Complete Construction……..12/31/16

In-Service……..……3/31/17

KEY DESIGN PROCESS TAKEAWAYS

- FISH PASSAGE DESIGN IS VERY SITE SPECIFIC
- THE PROCESS OF SELECTING A CONCEPT IS AS CHALLENGING AS THE TECHNICAL DESIGN
- BIOLOGY NEEDS TO DRIVE ENGINEERING, BUT NOT ALWAYS FEASIBLE
- GOAL OF “FAST” DESIGN AND CONSTRUCTION IS DIFFICULT
- HYDRAULIC FLOW DATA IS USEFUL IF USED CAUTIOUSLY AND AS A SUPPLEMENT TO BIOLOGICAL DATA
- DUE DILIGENCE WILL REDUCE RISKS

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QUESTIONS?