

Spokane River License Implementation



Meghan Lunney

Avista

Aquatic Resource Specialist

Spokane River Forum

May 23, 2011



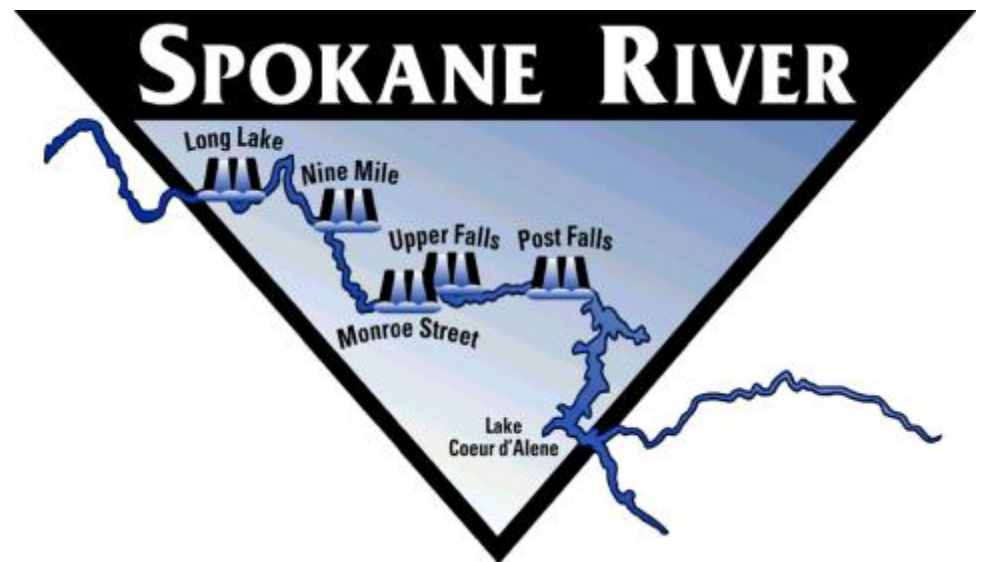
Avista's Hydroelectric Projects



Spokane River Project License

2010 & 2011 Recap

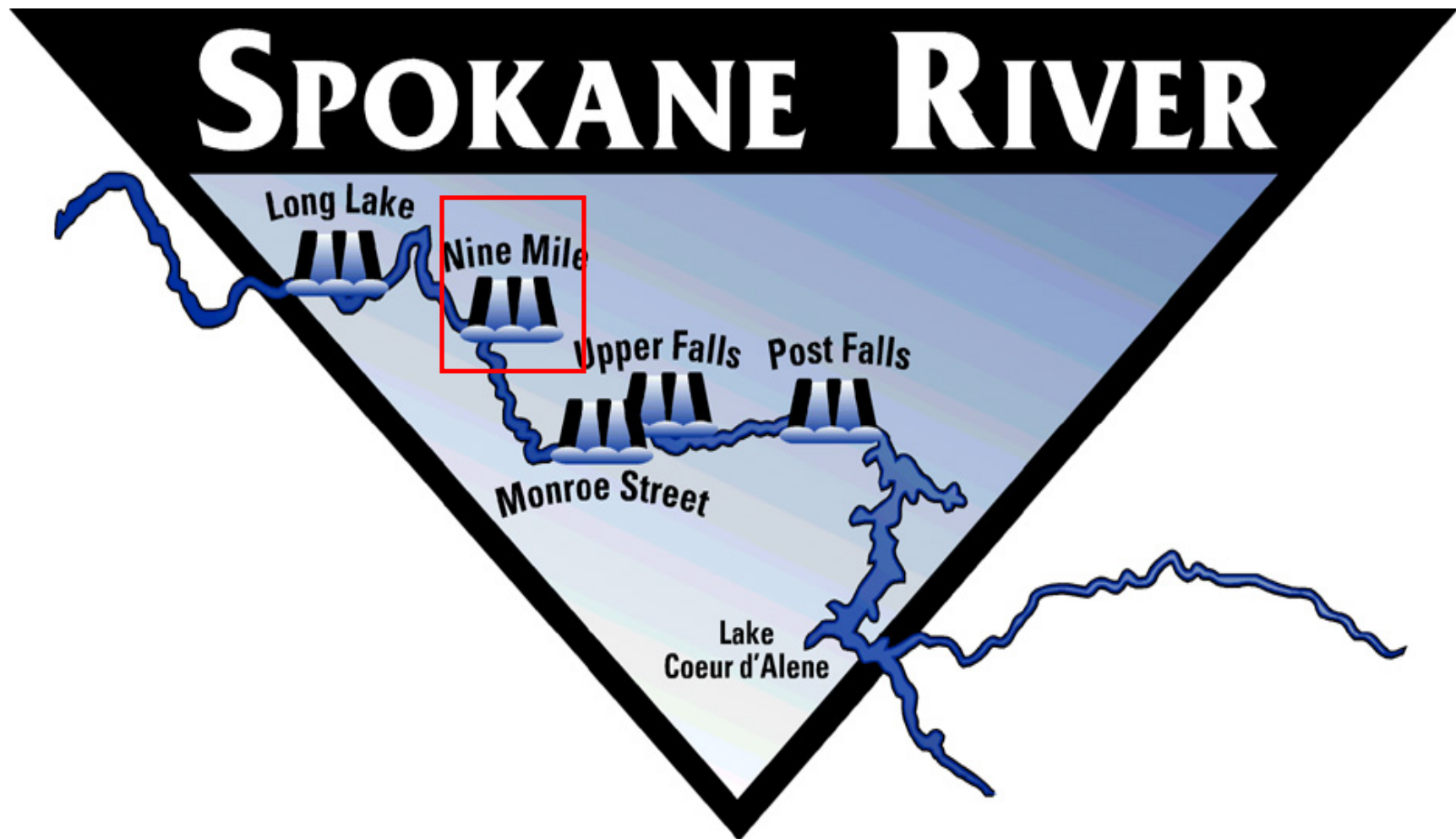
- Approx. 50 regulatory filings with FERC, Interior, WDOE, and IDEQ
- Began implementation activities of Fisheries, Water Quality, Weeds, Recreation, Erosion, Wetlands, and Cultural Resources



Spokane River Project License

- Hank Nelson
 - TDG and DO implementation activities at Long Lake Dam
- Dave Armes
 - Noxious, invasive aquatic weed control program for Lake Spokane and Nine Mile Reservoir
- Tim Vore
 - Wild rainbow trout spawning habitat in the lower Spokane River
- Avista License Website
 - <http://www.avistautilities.com/resources/relicensing/spokane/default.asp>

Water Quality Conditions, Nine Mile HED



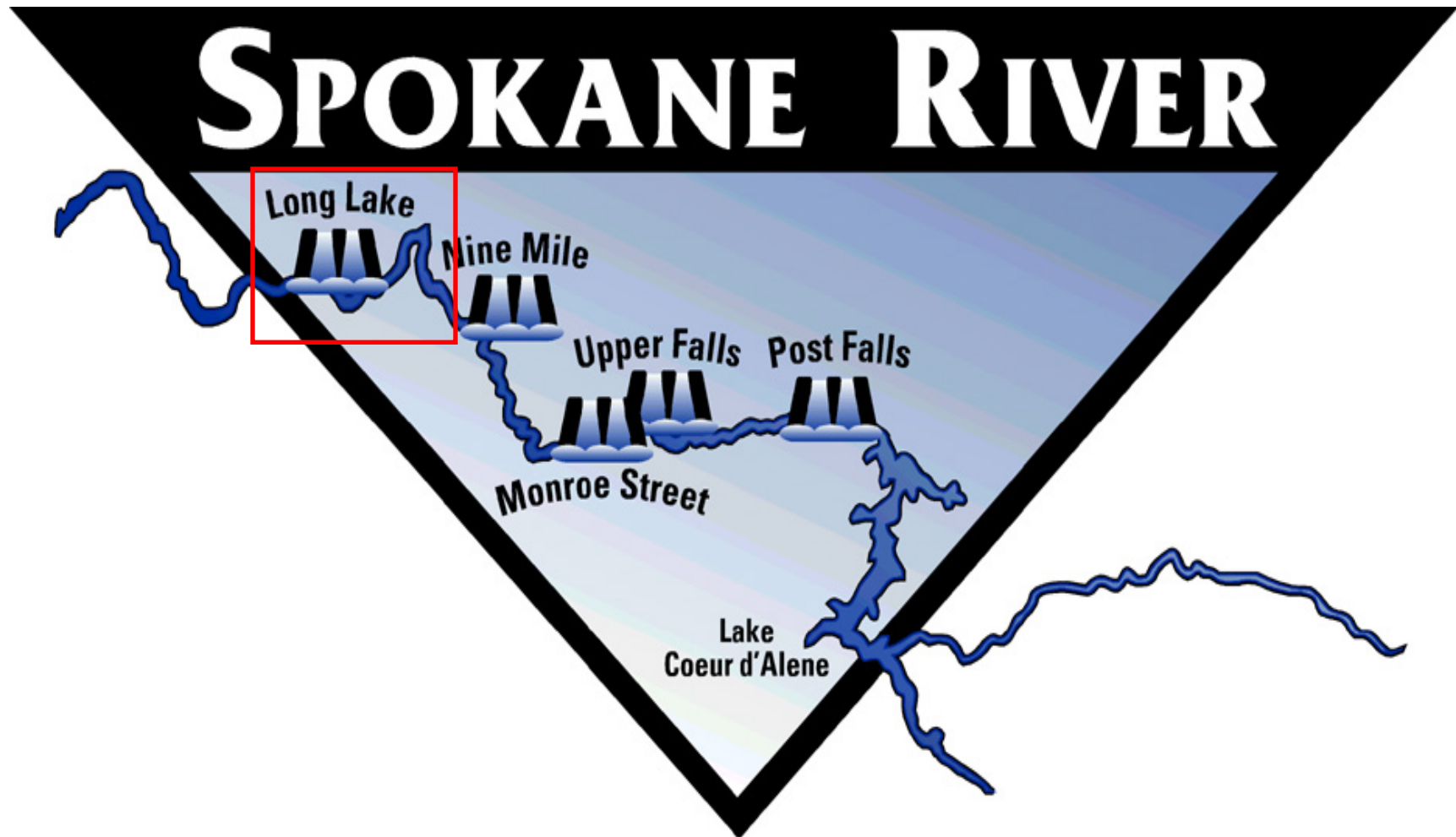
Washington Water Quality Conditions

Nine Mile HED

- Total Dissolved Gas (TDG)
 - Monitoring
 - Potential WQAP



Water Quality Conditions, Long Lake HED



Washington Water Quality Conditions

Long Lake HED

- TDG
 - WQAP
 - Evaluating Mitigation Measures
 - Monitoring



Washington Water Quality Conditions

Long Lake HED (continued)

- Dissolved Oxygen
 - Tailrace WQAP
 - Tailrace Monitoring

 - Reservoir WQAP
 - Reservoir Monitoring



Potential Reasonable & Feasible Mitigation Measures

- Wetland restoration/enhancement
- Vegetative shoreline buffer on Avista-owned property
- Reduction of size and conversion of lakeshore lawns to native vegetation
- Lower Hangman Creek shoreline stabilization and agricultural practices

Potential Reasonable & Feasible Mitigation Measures (continued)

- Conversion of grazing lands to open space
- Septic system education and improvements
- Aquatic Weed Control

Lake Spokane Data Collection

- Assisting Ecology with nutrient monitoring
- Purchased satellite imagery for 2001, 2009, and 2010 with lake-wide monitoring of chlorophyll-a and cyanobacteria
- Working with the Lake Spokane Association and Ecology to collect algae samples for the freshwater algae program
- Assess dominant aquatic habitat in Lake Spokane
- Bathymetry

Washington Water Quality Conditions

Long Lake HED (continued)

- Temperature
 - WQAP
 - Exploring Mitigation Measures
 - Monitoring

QUESTIONS?



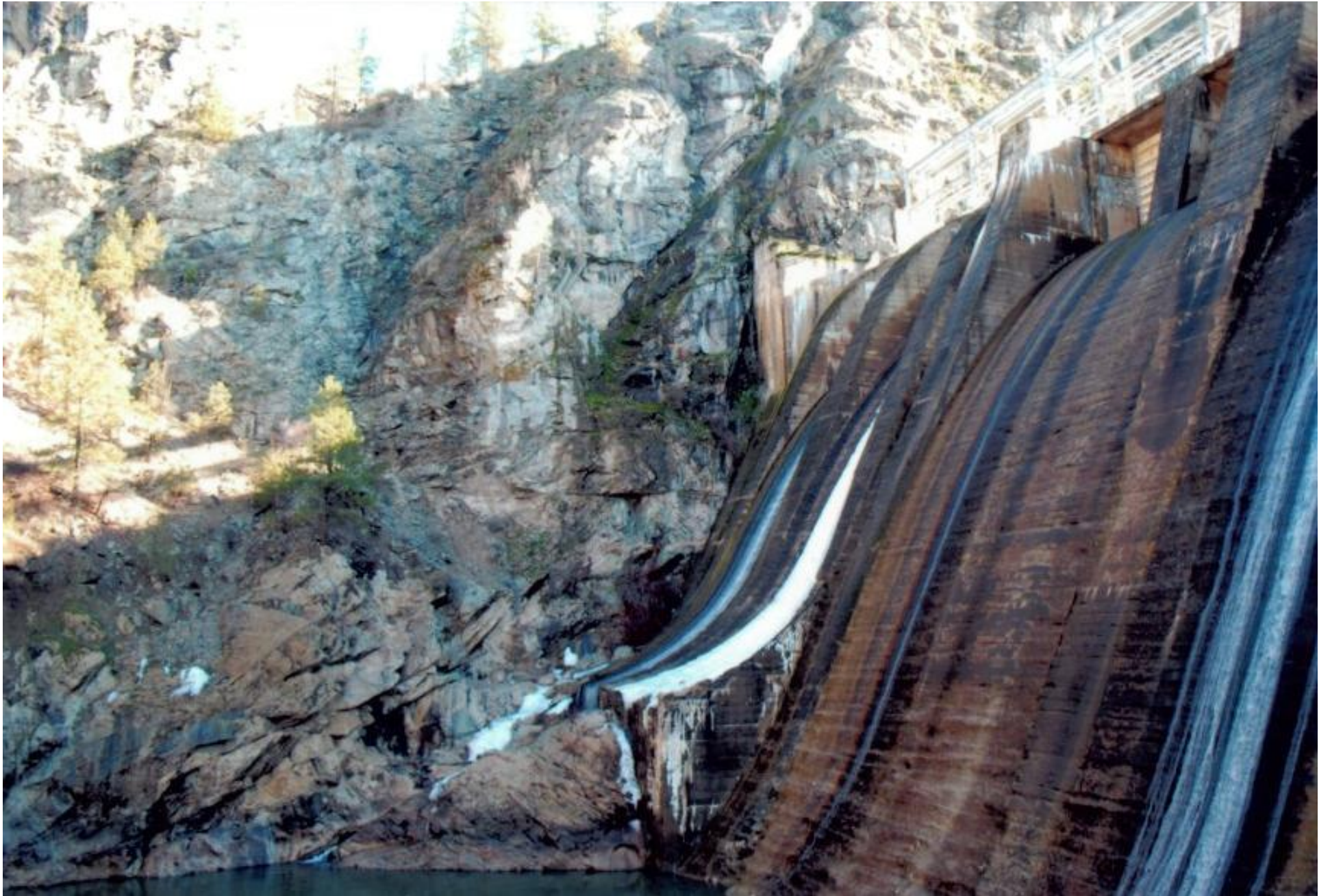
Long Lake Dam Update

Total Dissolved Gas

Dissolved Oxygen











Long Lake Hydroelectric Development

Total Dissolved Gas Abatement

Phase II Feasibility Study

Final Report

December 9, 2010

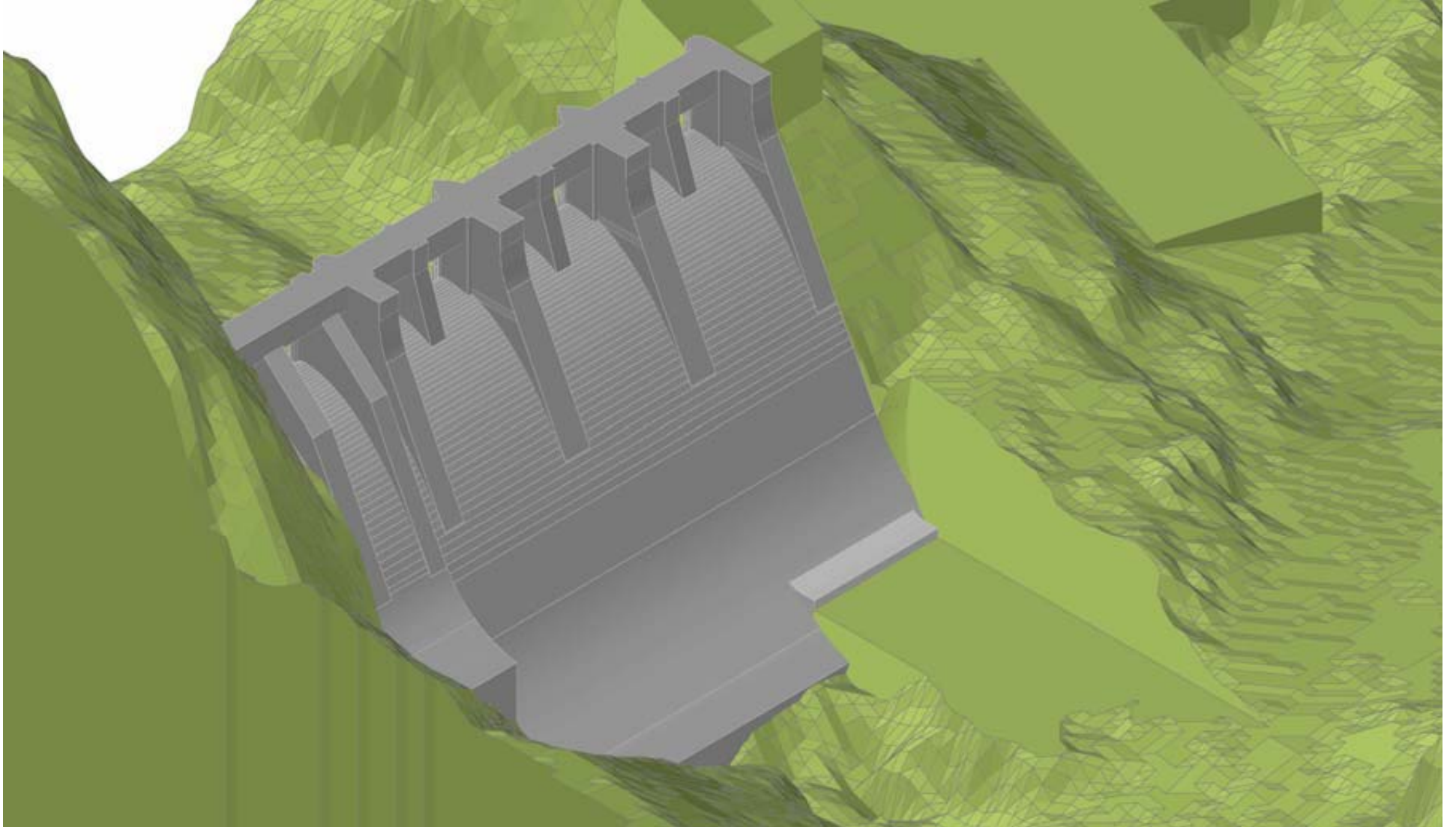
Prepared by

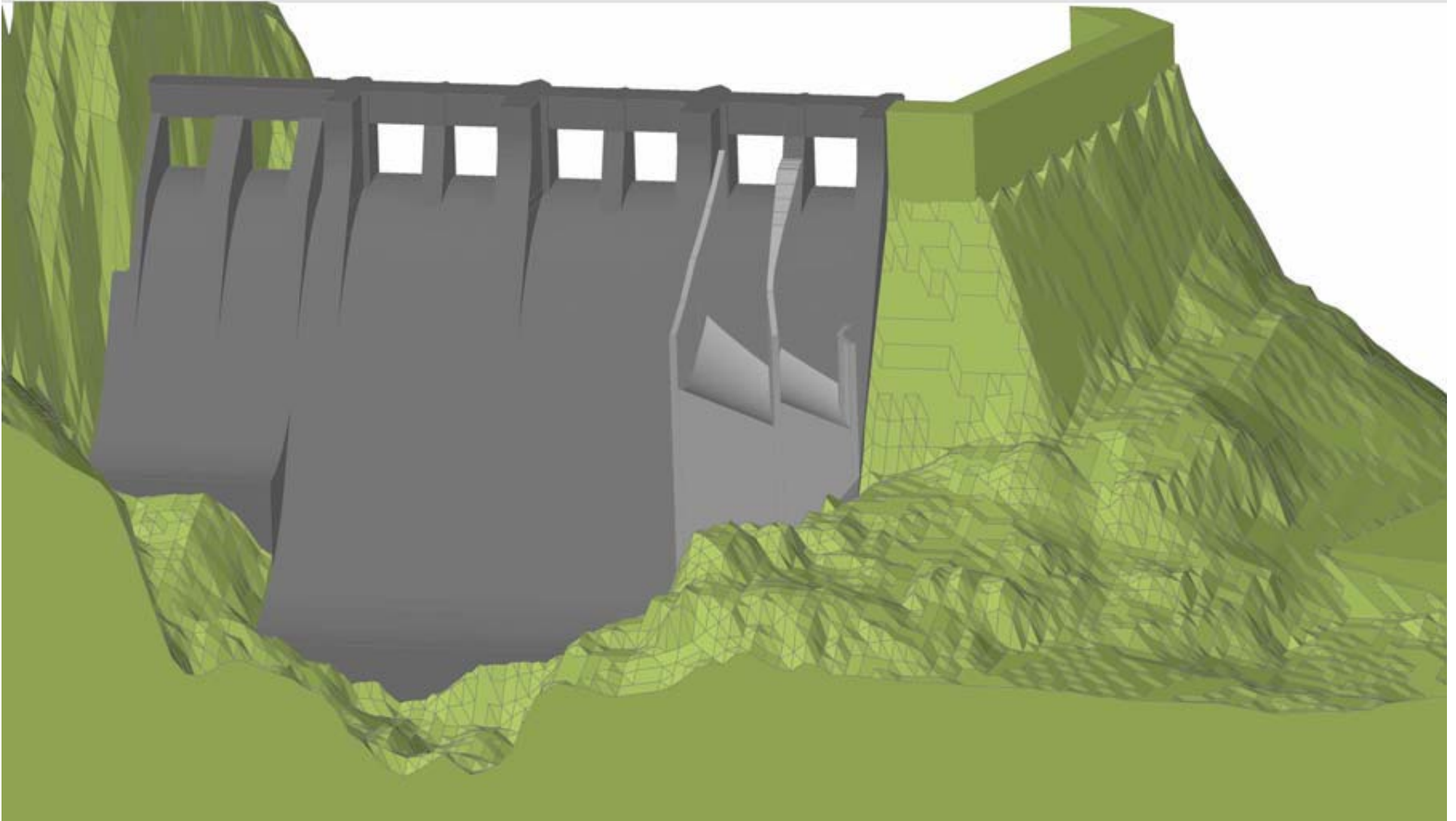
Northwest Hydraulic Consultants

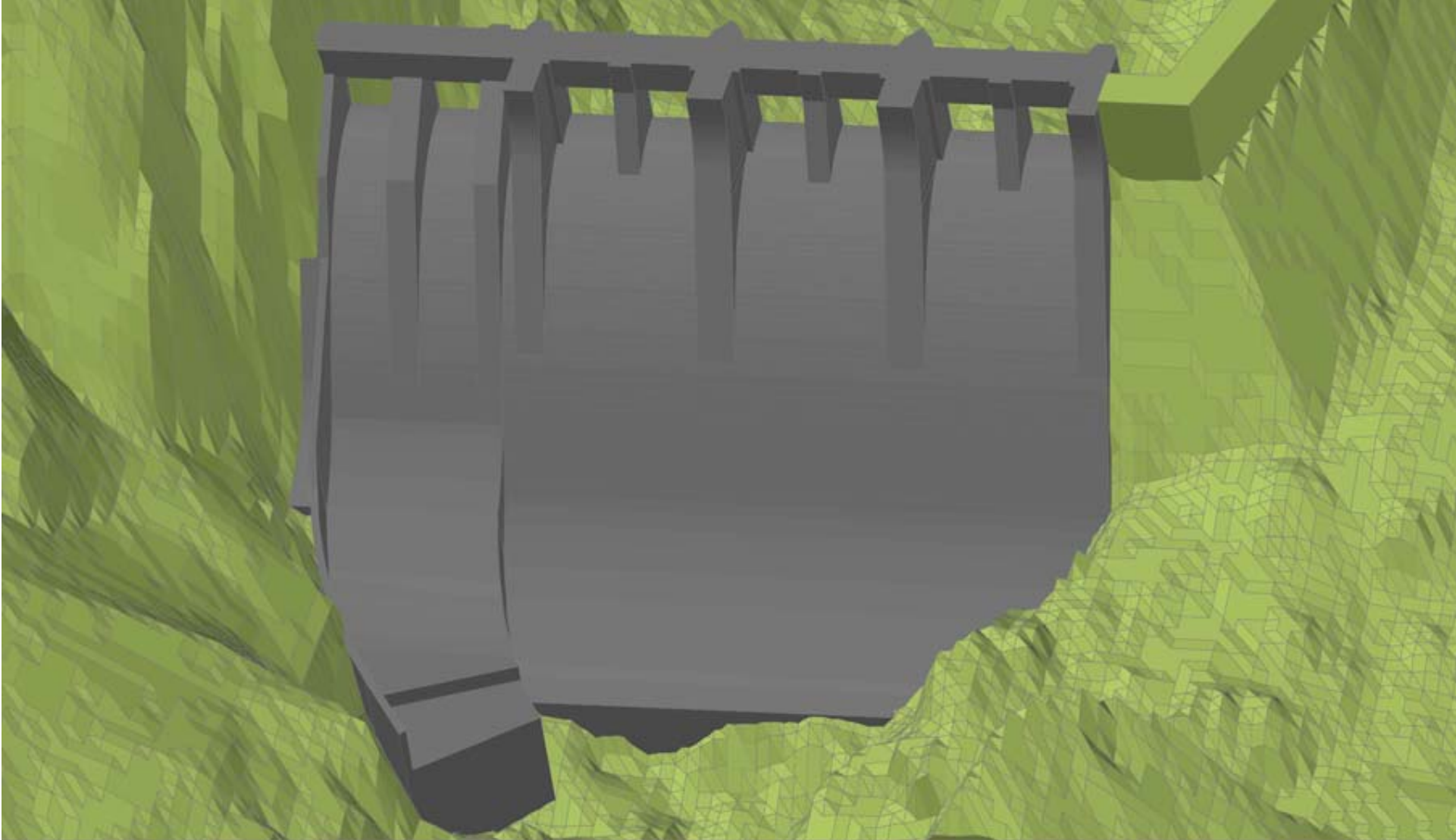
Prepared for

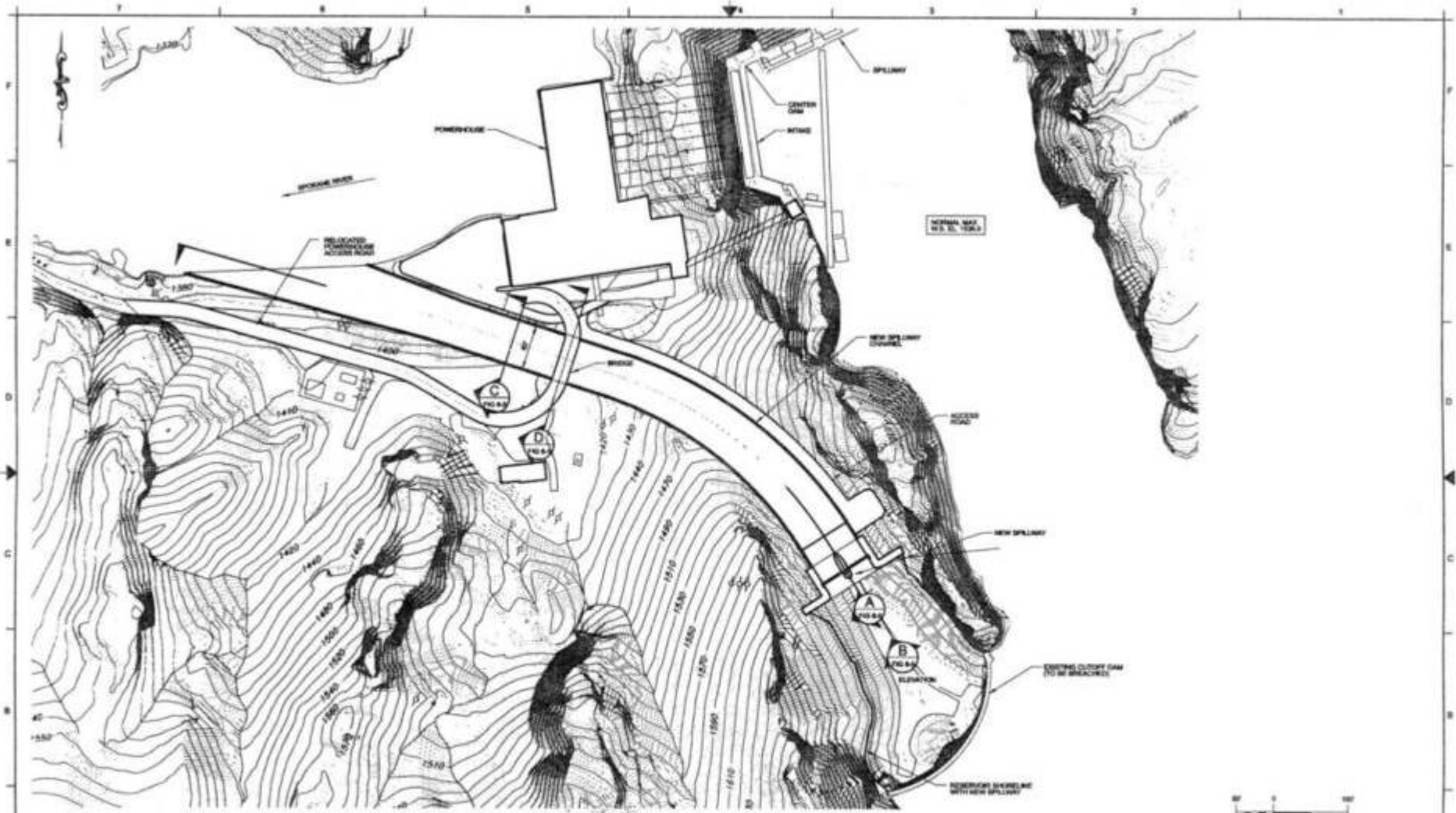
Avista Utilities, Inc.











PLAN VIEW
SCALE: 1"=100'

AVISTA
Utilities

AVISTA CORPORATION
SPOKANE, WASHINGTON

EES Consulting

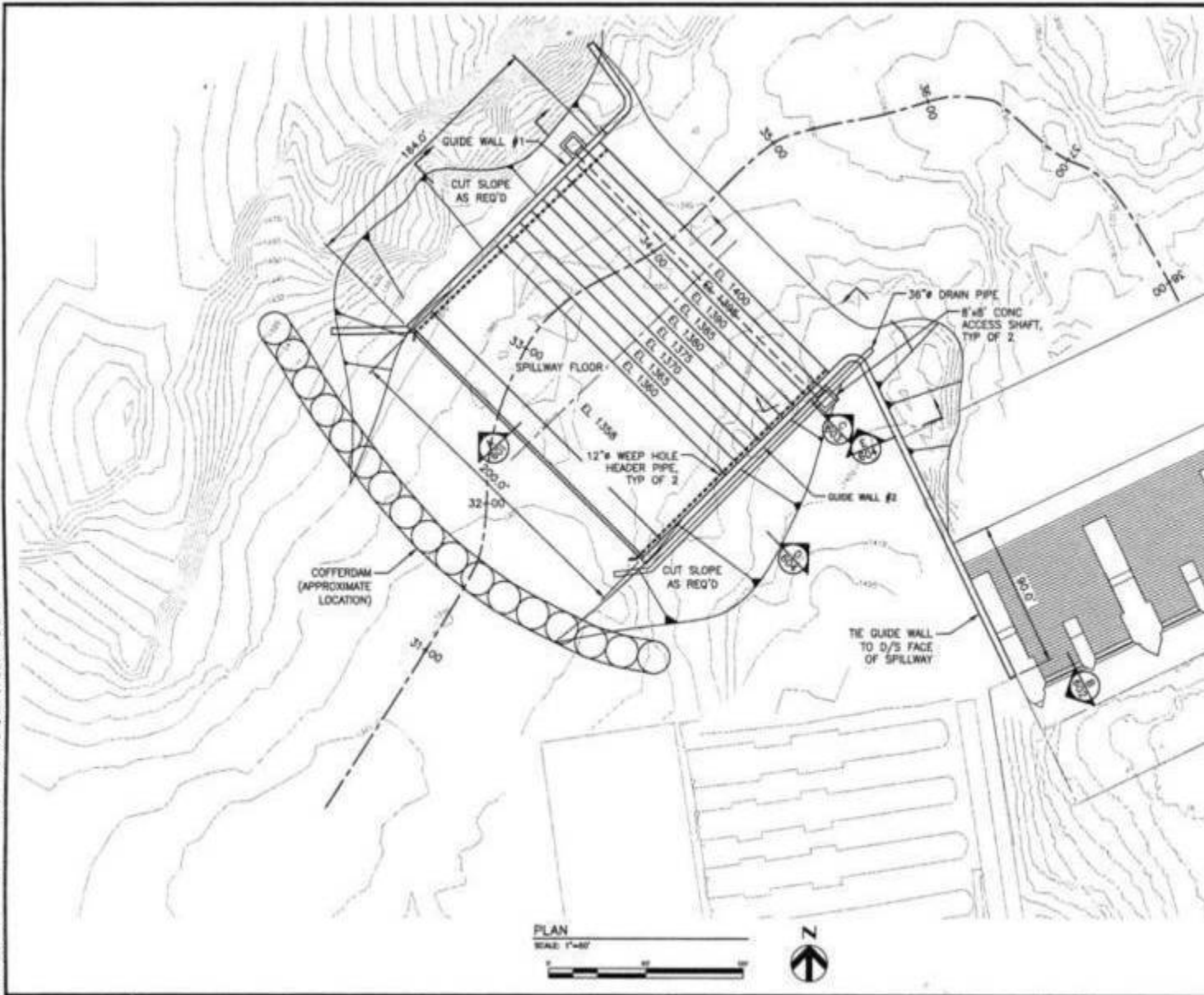
570 KIRKLAND WAY, SUITE 200 KIRKLAND, WA 98033
PH: 425.886.2700

DATE OF LINE	DESIGNED BY
BY	CHECKED BY
BY	APPROVED BY
BY	DATE
BY	SCALE
BY	SCALE
BY	SCALE

LONG LAKE TDG STUDY	
CUT-OFF DAM SPILLWAY CONCEPT ARRANGEMENT PLAN	
FIGURE 6-4	



Plot Date: 06/21/2010 11:13am Drawing File: P:\Users\lucy.cook\DWG\LD\LD_600.dwg



AVISTA UTILITIES	
LONG LAKE HYDROELECTRIC DEVELOPMENT TOTAL DISSOLVED GAS ABATEMENT - PHASE 2 FEASIBILITY STUDY	
ALTERNATIVE 6 STEPPED SPILLWAY PLAN	
21758-002	REV. NO.: 0
ORIN BY: RWW	JUNE 2010
nhc	MCMILLEN, LLC

Drawing 600

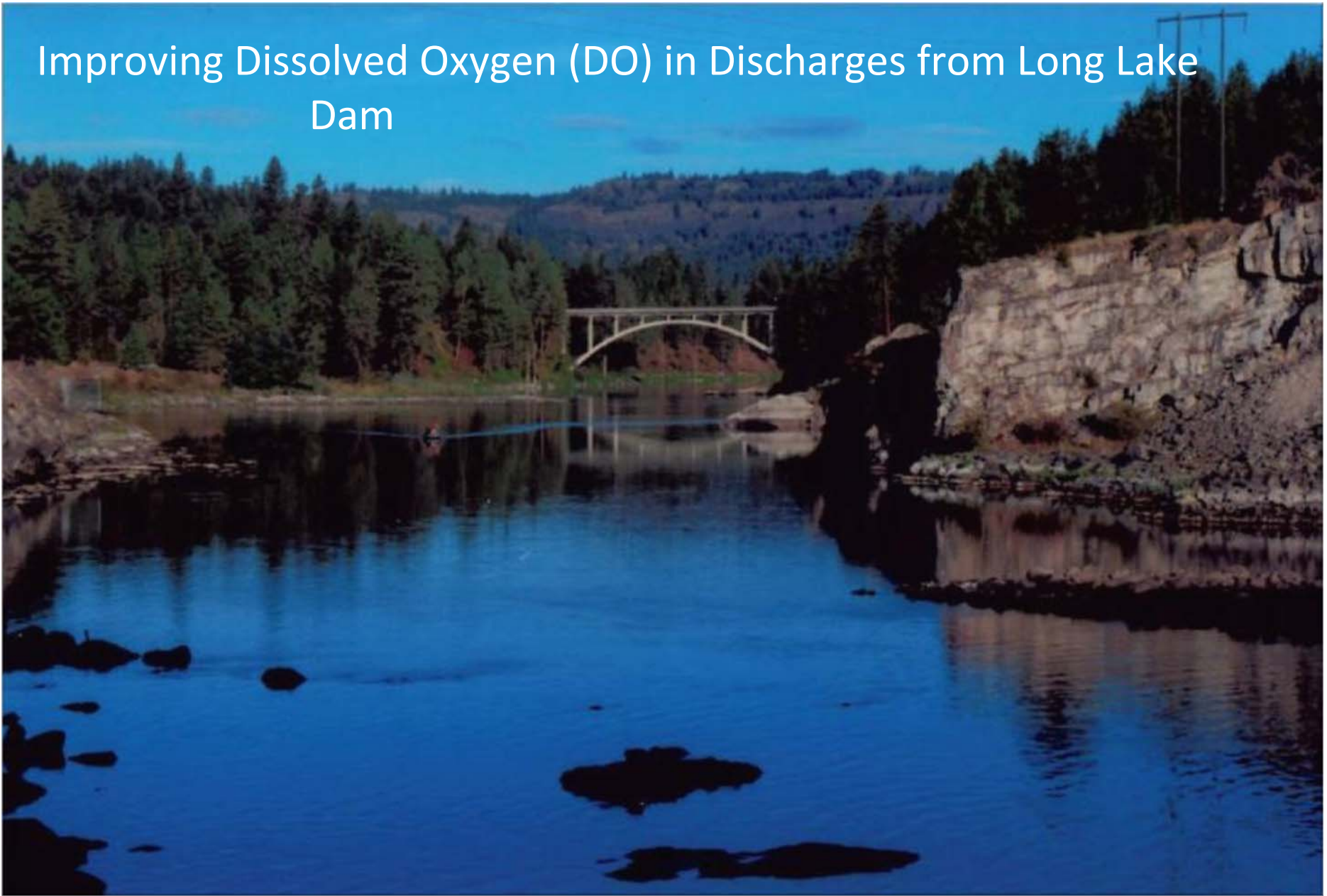




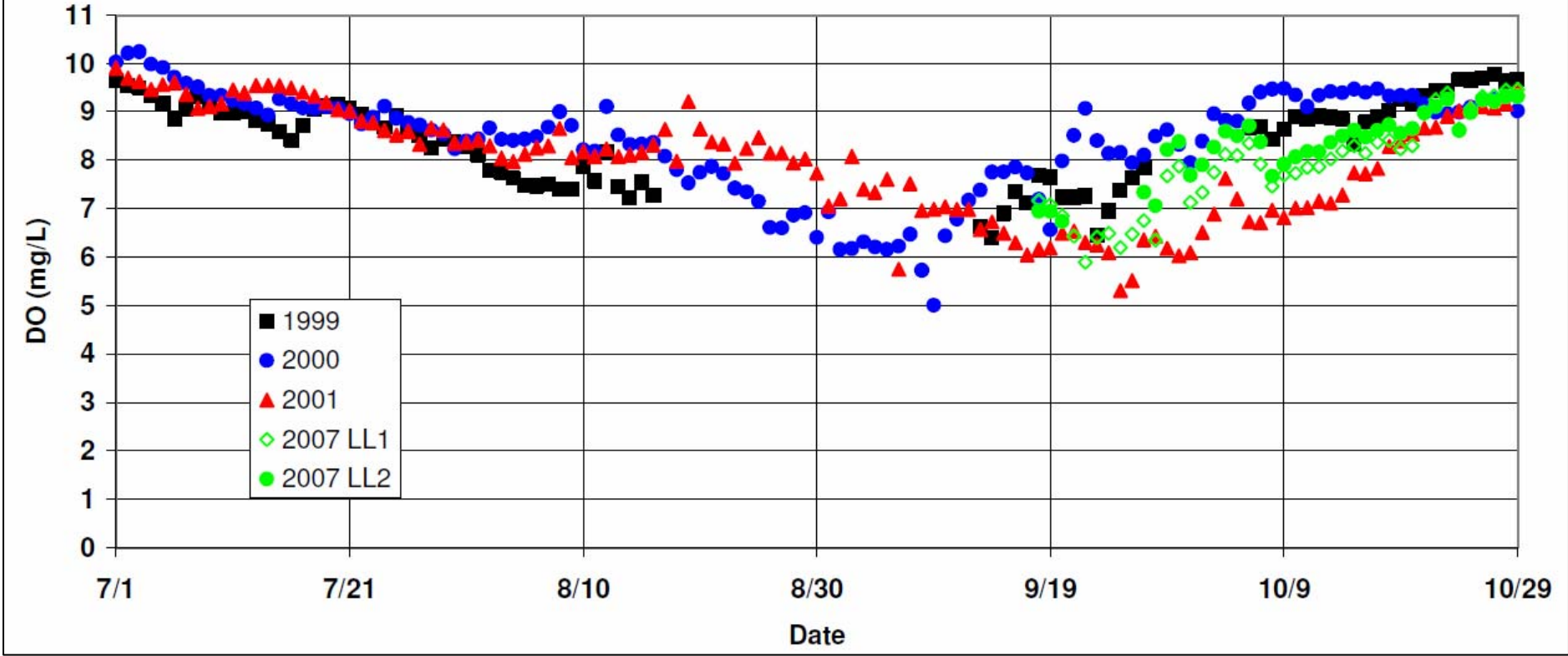
Current Project Status:

- Build a physical model, test
 1. Spill way deflectors on 7/8
 2. Stepped weir

Improving Dissolved Oxygen (DO) in Discharges from Long Lake Dam



Long Lake HED Discharge DO - Daily Average During Generation



Daily average DO (mg/L) in Long Lake HED tailrace for releases during generation for 1999-2001 and 2007





Lake Spokane forebay near penstock intake



Lake Spokane forebay near penstock intake





Upper portion of penstock entering powerhouse



Penstock, scroll cases (housing turbines), and draft chest





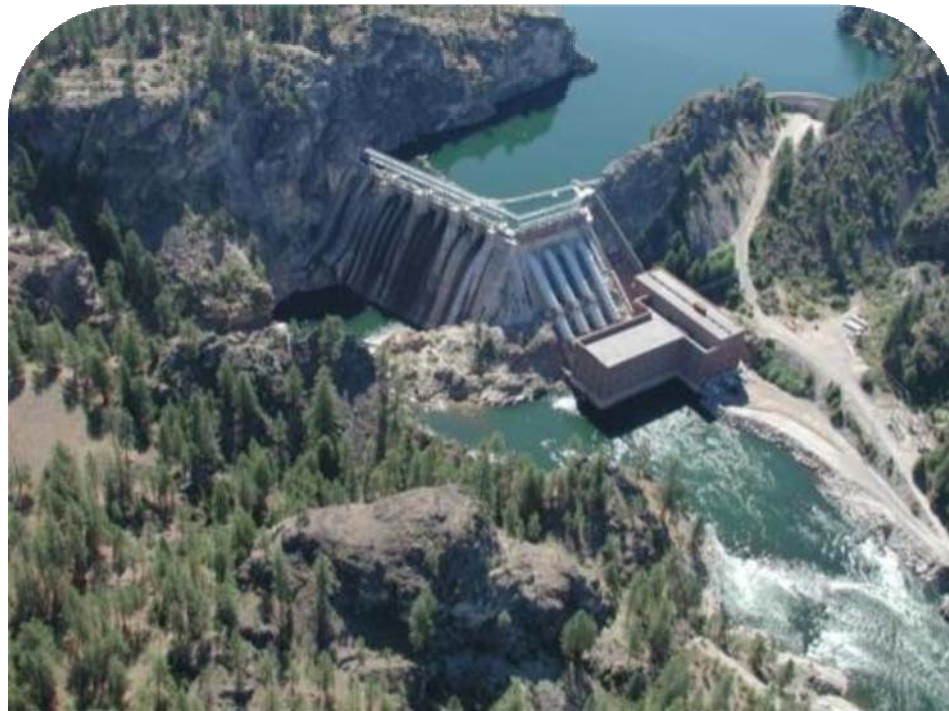
Long Lake HED tailrace pool



**Spokane River channel downstream
of tailrace**



Long Lake HED
Plant Discharge Dissolved Oxygen (DO) Evaluation
Phase II Assessment
Summer 2010 Field Study Plan
(Draft Tube Aeration)

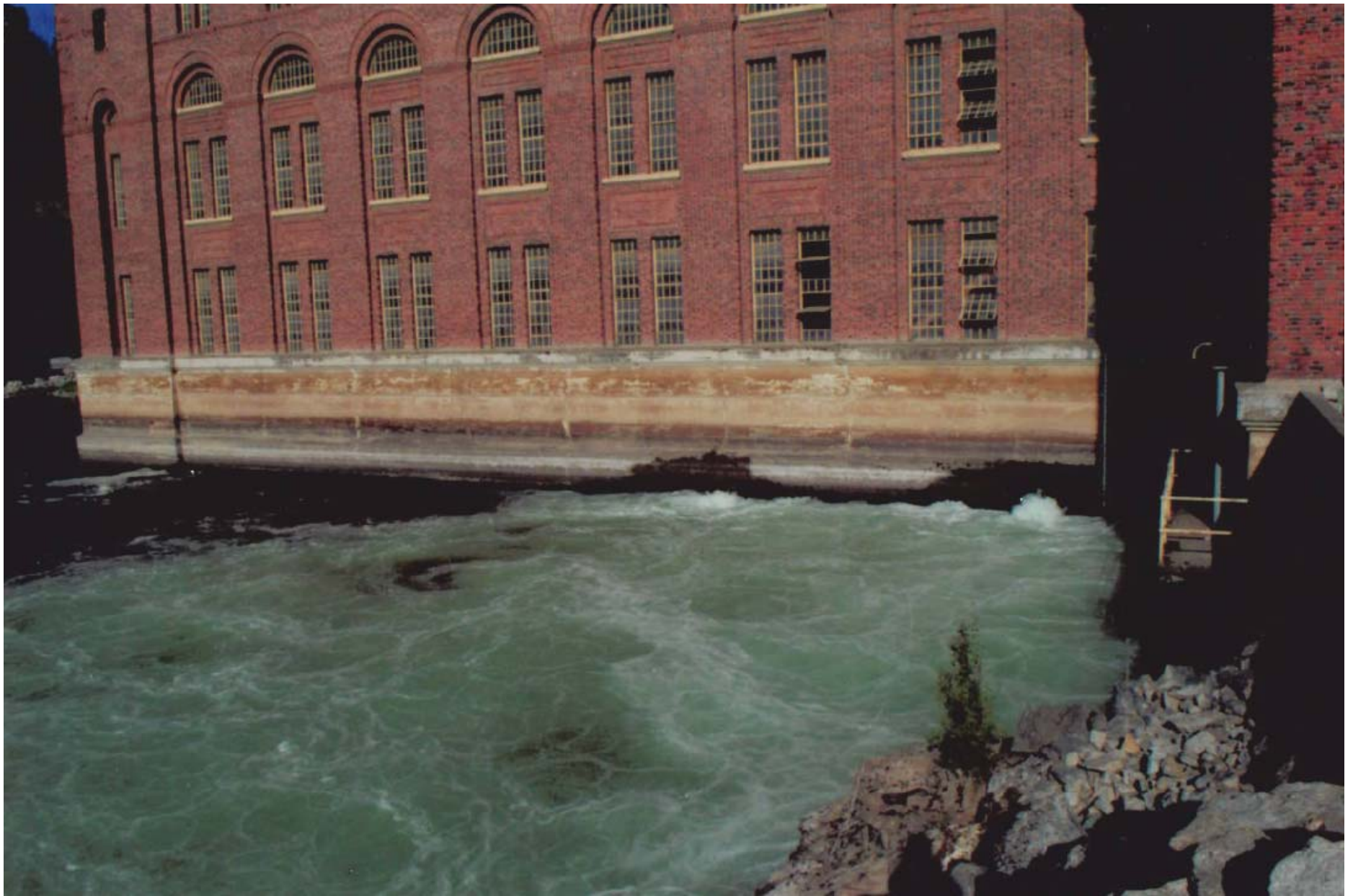




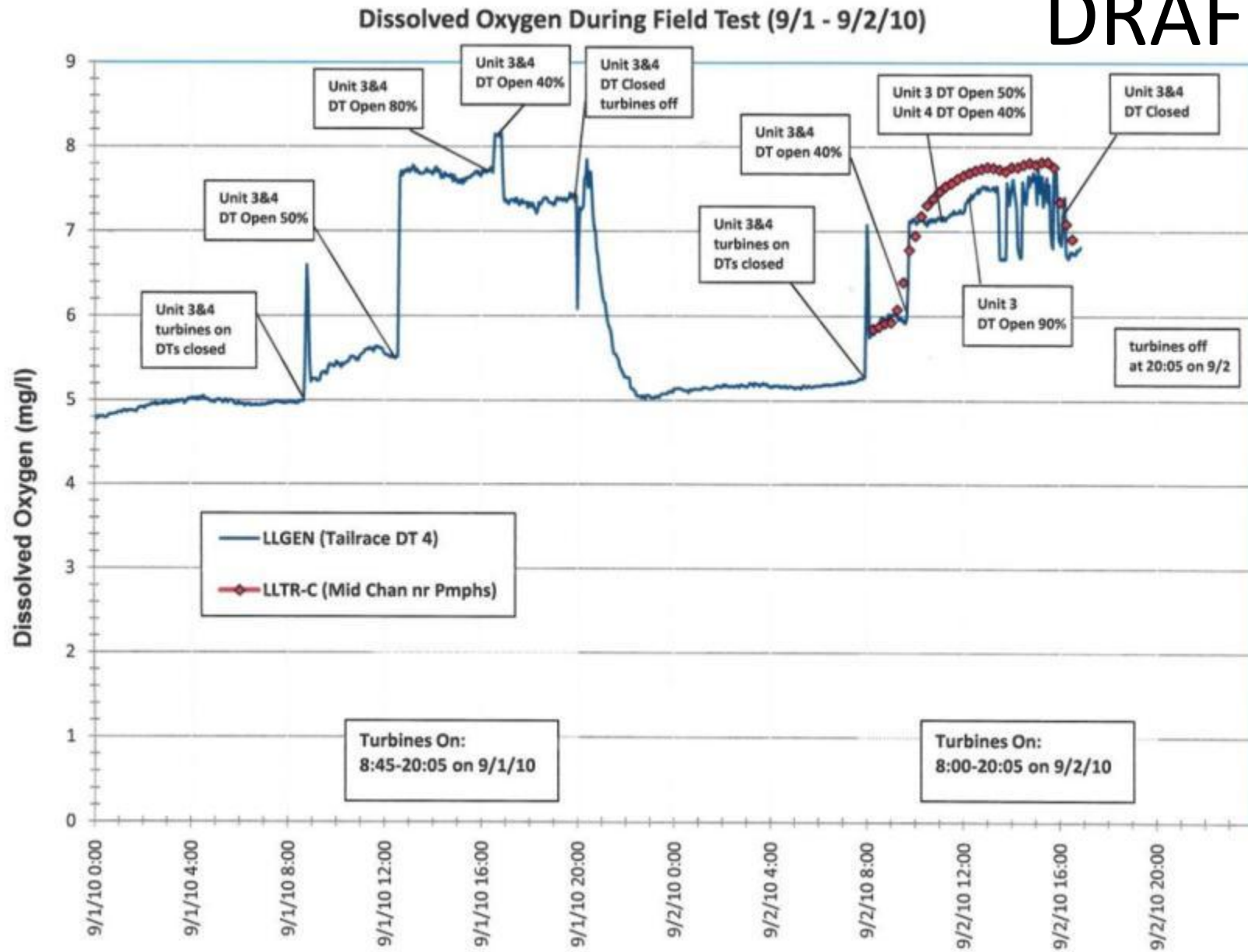






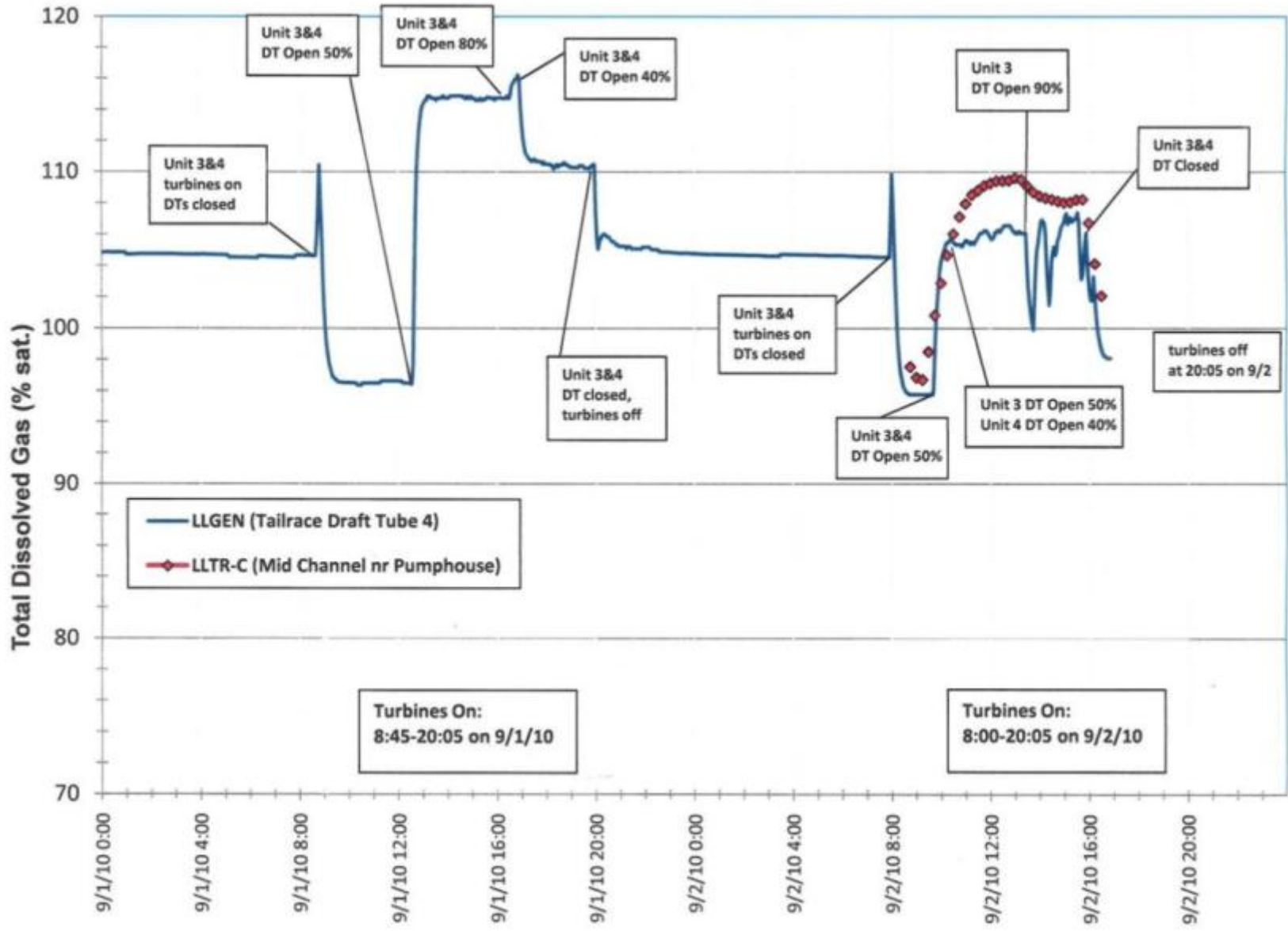


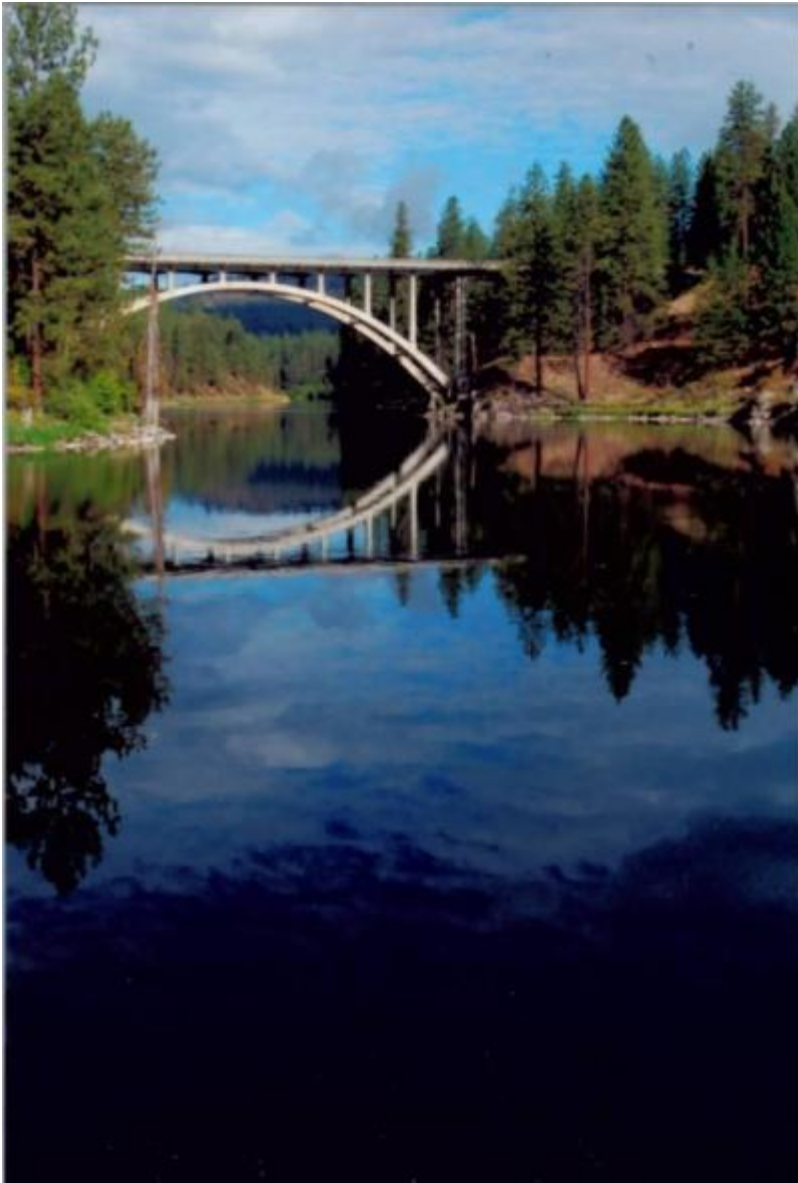
DRAFT



Total Dissolved Gas Field Test (9/1 - 9/2/10)

DRAFT





Current Project Status:

Try draft tube aeration for the 2011
low flow season, monitor results

Spokane River Project

Aquatic Weed Management Program

- **David Armes**
- Terrestrial Resource Specialist
- Avista Corporation
- office: (509) 495-2796
- cell: (509) 999-4475
- david.ames@avistacorp.com



Aquatic Weeds, Why Should You Care?

Invasive Aquatic Weeds degrade lake beneficial uses including:

- Recreation
- Fisheries, Waterfowl & Wildlife Habitat
- Water Quality
- Aesthetics

The Spokane River Project License required the development of three Aquatic Weed Management Plans:

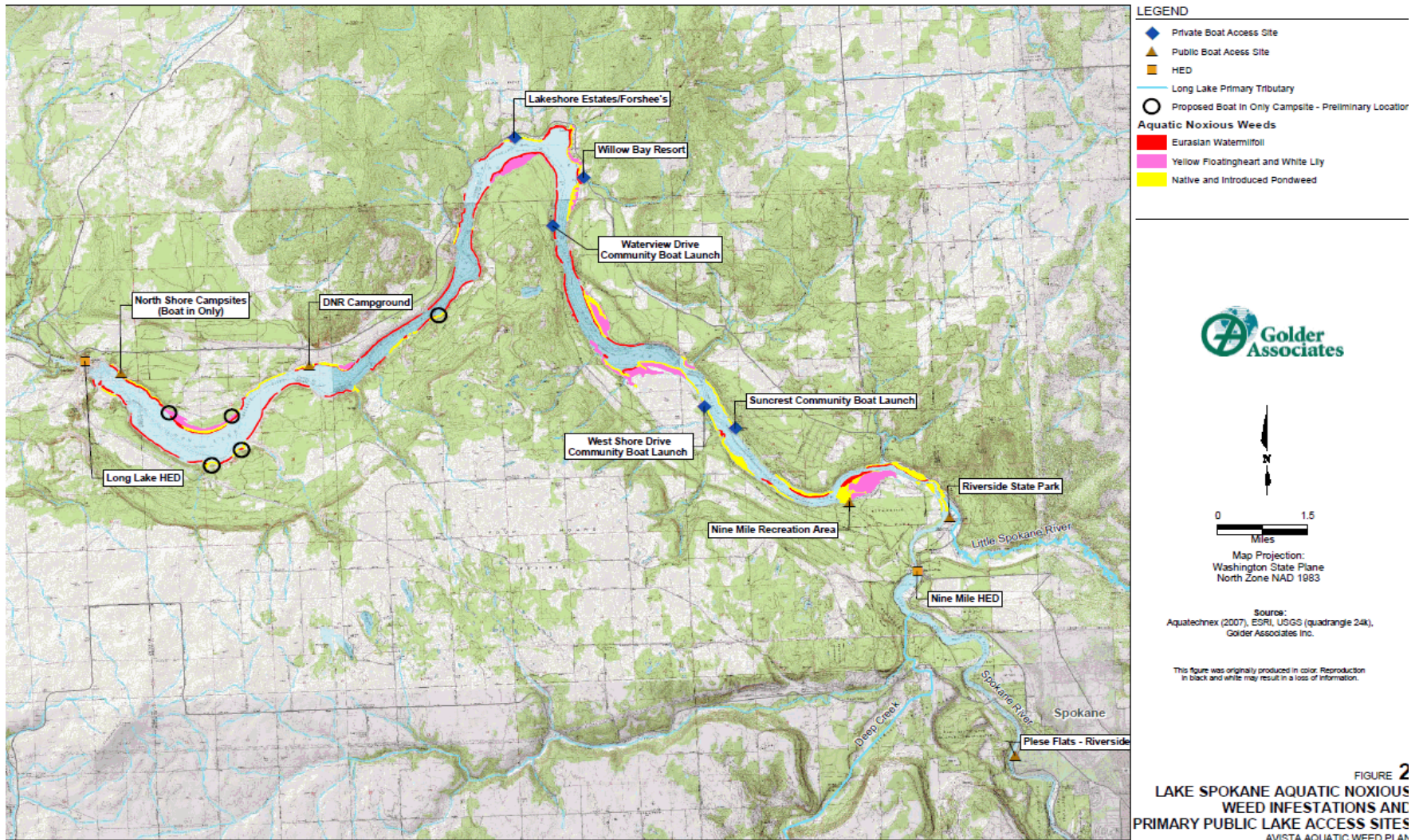
- Lake Spokane and Nine Mile Reservoir Aquatic Weed Management Program;
- Coeur d'Alene Lake Aquatic Weed Management Plan for Non-Tribal Waters; and
- Coeur d'Alene Reservation Aquatic Weed Management Plan.

The Primary Elements of All Three Aquatic Weed Management Programs

- **Education** - Establish or expand educational programs to keep the public informed of the hazards of invasive aquatic weeds.
- **Monitoring** – Monitor and/or map the distribution of invasive aquatic weeds within the Project area.
- **Management** – Develop strategies to help control invasive aquatic weeds within the Project area.

The Goals for the Lake Spokane Aquatic Weed Management Program are to:

- Reduce cover of invasive aquatic weeds at public and community boat access points;
- Maintain a moderate level of ongoing control of aquatic weeds in areas of 10-14 feet using winter reservoir draw downs; and
- Support weed control and facilitate coordination among the entities involved in aquatic weed control.



Approximate area of invasive aquatic weeds on Lake Spokane range from 634 acres (Tetra Tech, 2001) to 715 acres (AquaTechnex, 2007) survey.

Eurasian water milfoil (*Myriophyllum spicatum*)



Curly-leaf pondweed (*Potamogeton crispus*)



White Lilly (*Nymphaea odorata*)



Yellow Floating Heart (*Nymphoides peltata*)



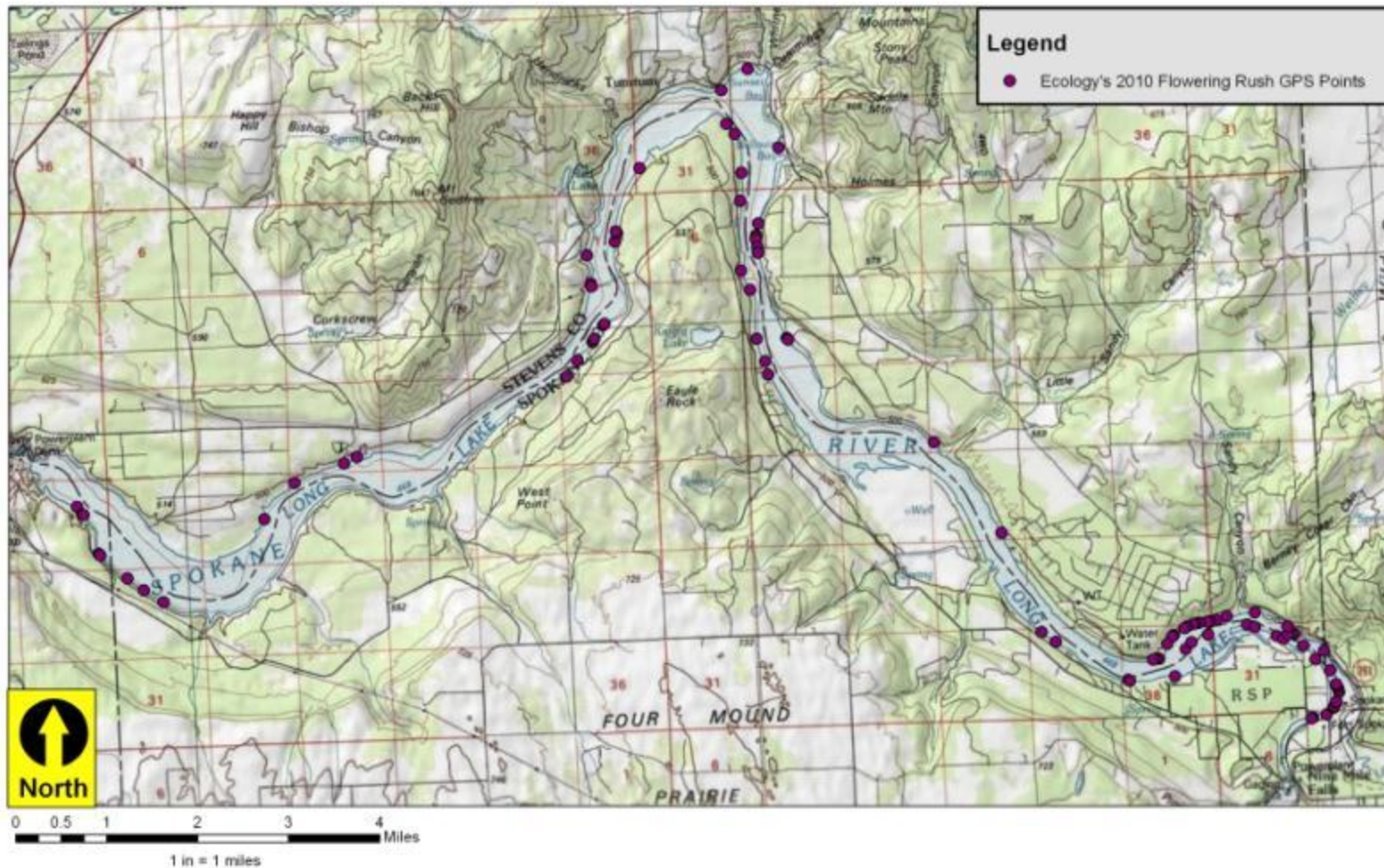
Flowering Rush (*Butomus umbellatus*)

Photos not of Lake Spokane.

Photograph of Flathead Lake, MT below;



Flowering Rush Distribution



2011 Program Task List

Avista is working with cooperating parties to develop a 2011 Program Task List. The proposed task list includes the following:

- Contacting community lake access site owners to discuss future herbicide treatments at five community boat launches (Contingent upon landowner approval and coordination)
- Treatment (herbicide) at Nine Mile Recreation Area
- Treatment (herbicide or bottom barrier) at the DNR Campground
- Plan for winter 2012 drawdown to the degree possible. The goal with this is to control weeds on a reservoir wide basis.

2011 Program Task List (continued)

- Development and distribution of brochures, educational materials and signage
- Begin flowering Rush treatments in Lake Spokane
- Monitoring efficacy of site-specific weed control actions implemented
- Develop monitoring plan for Nine-Mile Reservoir to occur during even numbered years



Thank you!

David Armes

Terrestrial Resource Specialist

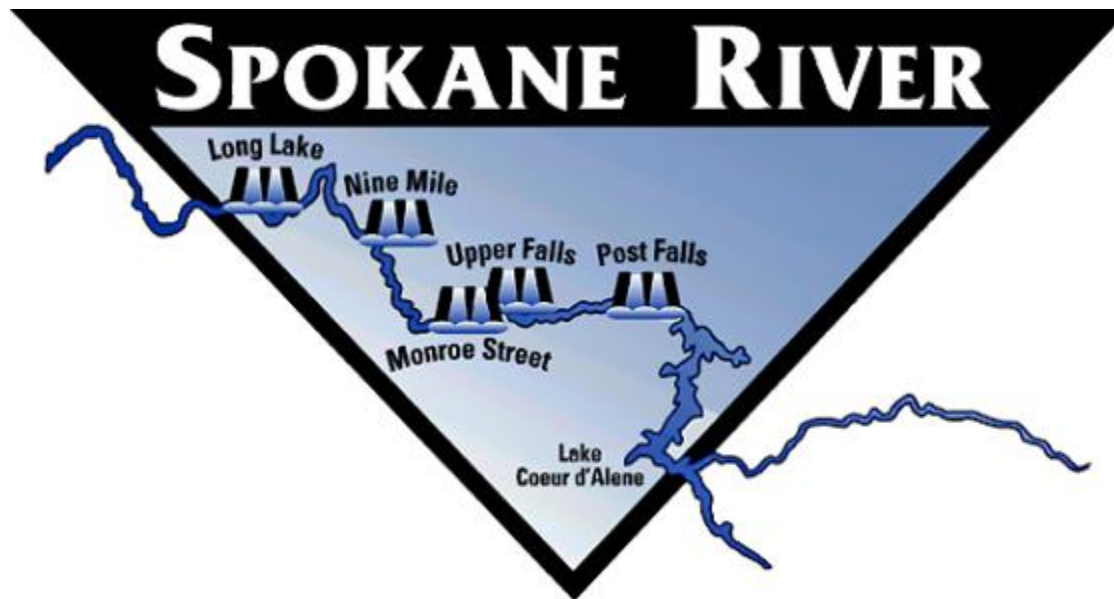
Avista Corporation

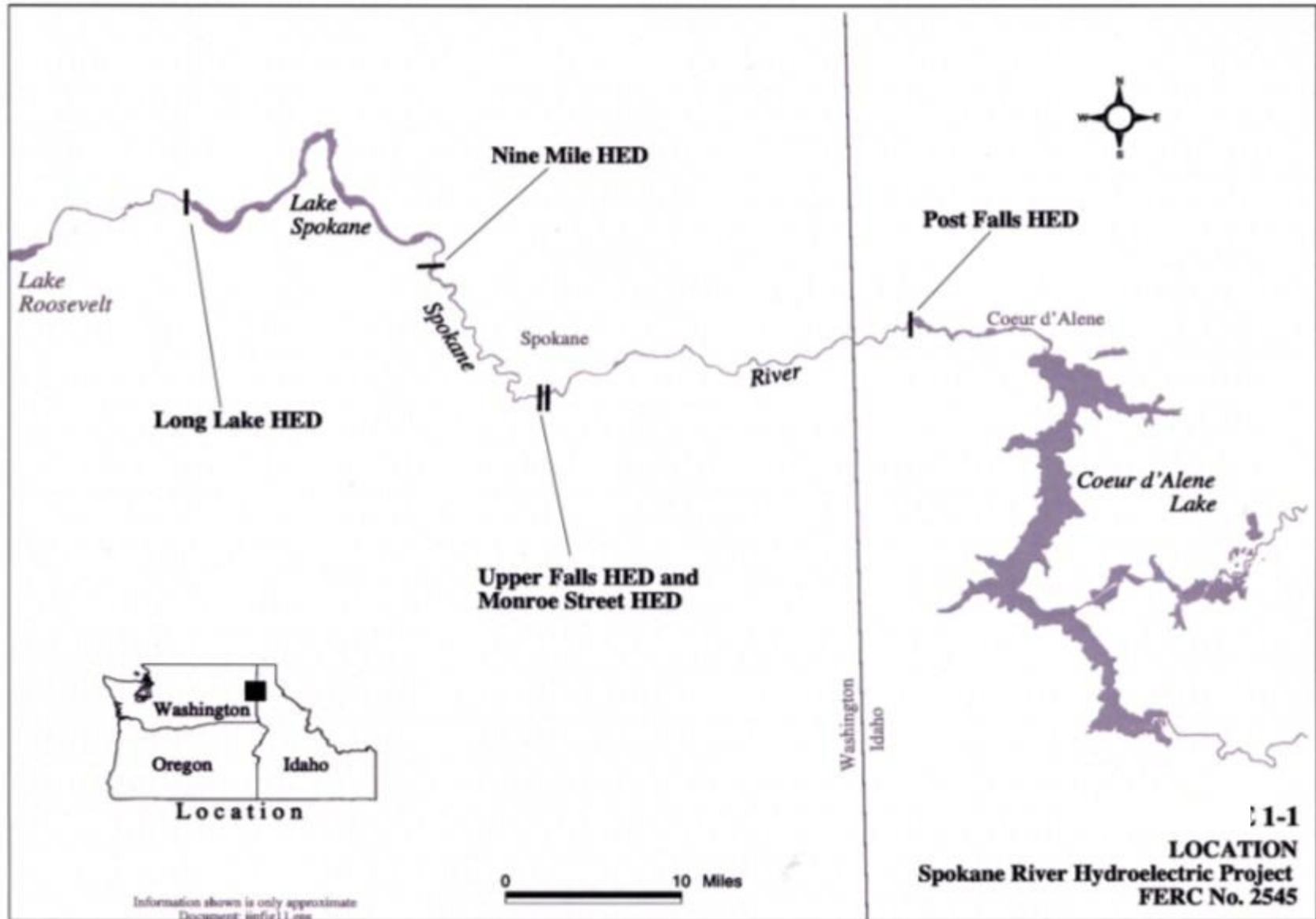
office: (509) 495-2796

cell: (509) 999-4475

david.armes@avistacorp.com

Federal Energy Regulatory Commission Hydroelectric Operations





FERC License

- Hydro Operations for 50 Years
- Measures for Wetlands, Fisheries, Recreation, Cultural Resources, and Wildlife
- Water Quality Certifications from Idaho and Washington Incorporated into New License

Fisheries Measures in Washington

- Spokane River Redband Population Assessment
- Upper Falls Fish Population Assessment
- Increased Stocking of Fin Clipped Sterile Hatchery Rainbow Trout in Upper Falls and Nine Mile Reservoirs
- Lower Spokane River Redband Spawning Habitat

Redband Spawning and Population Study Elements

- Hydrology Review
- Spawning Patch Inventory of the Study Area
- Physical Characterization of Spawning Patches
- Hydrodynamic Characterization of Spawning Patches
- Biological Spawning Characterization
- Effective Spawning/Incubation Habitat Relationships
- Redband Trout Abundance Estimates (ten years)

Wild Rainbow (Redband) Trout Have an Adipose Fin





Z:\GIS\Extern\4103802_Avista\map\LowerSpokane_Spawning\press_111111_01.mxd

Study Reach and Patch Inventory (2009)

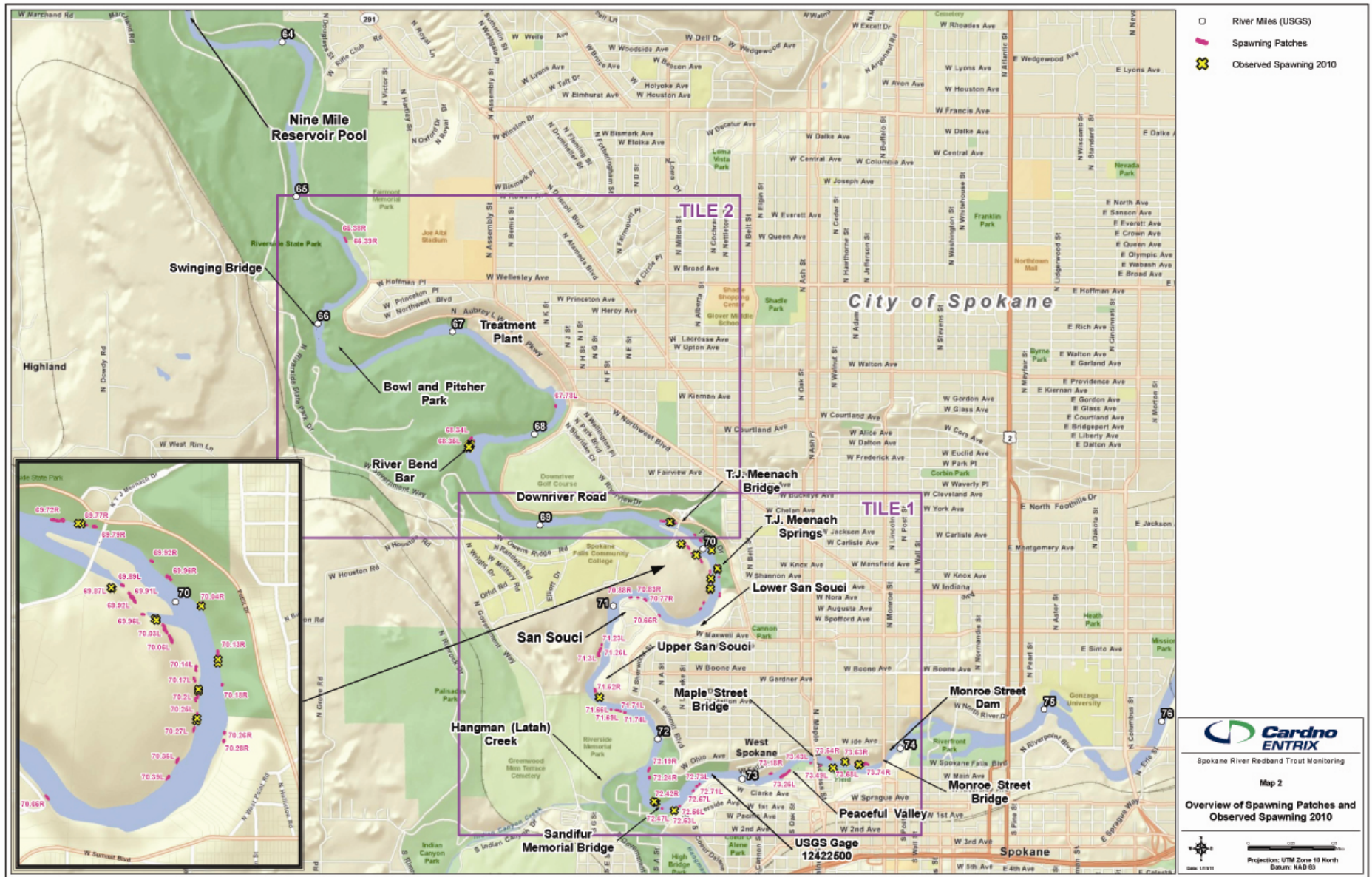




Substrate Characterization



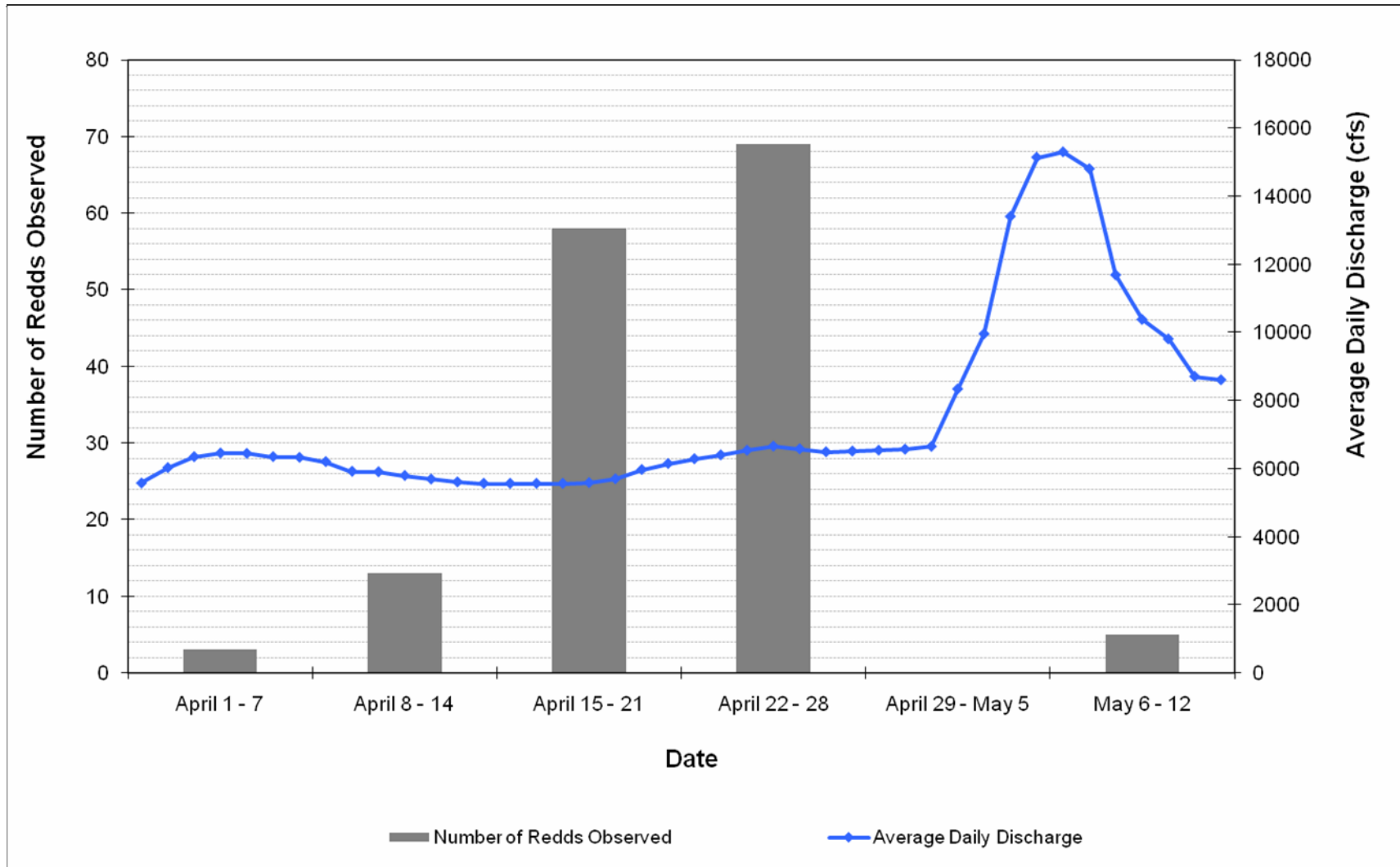
Survey Patch Area and Elevation

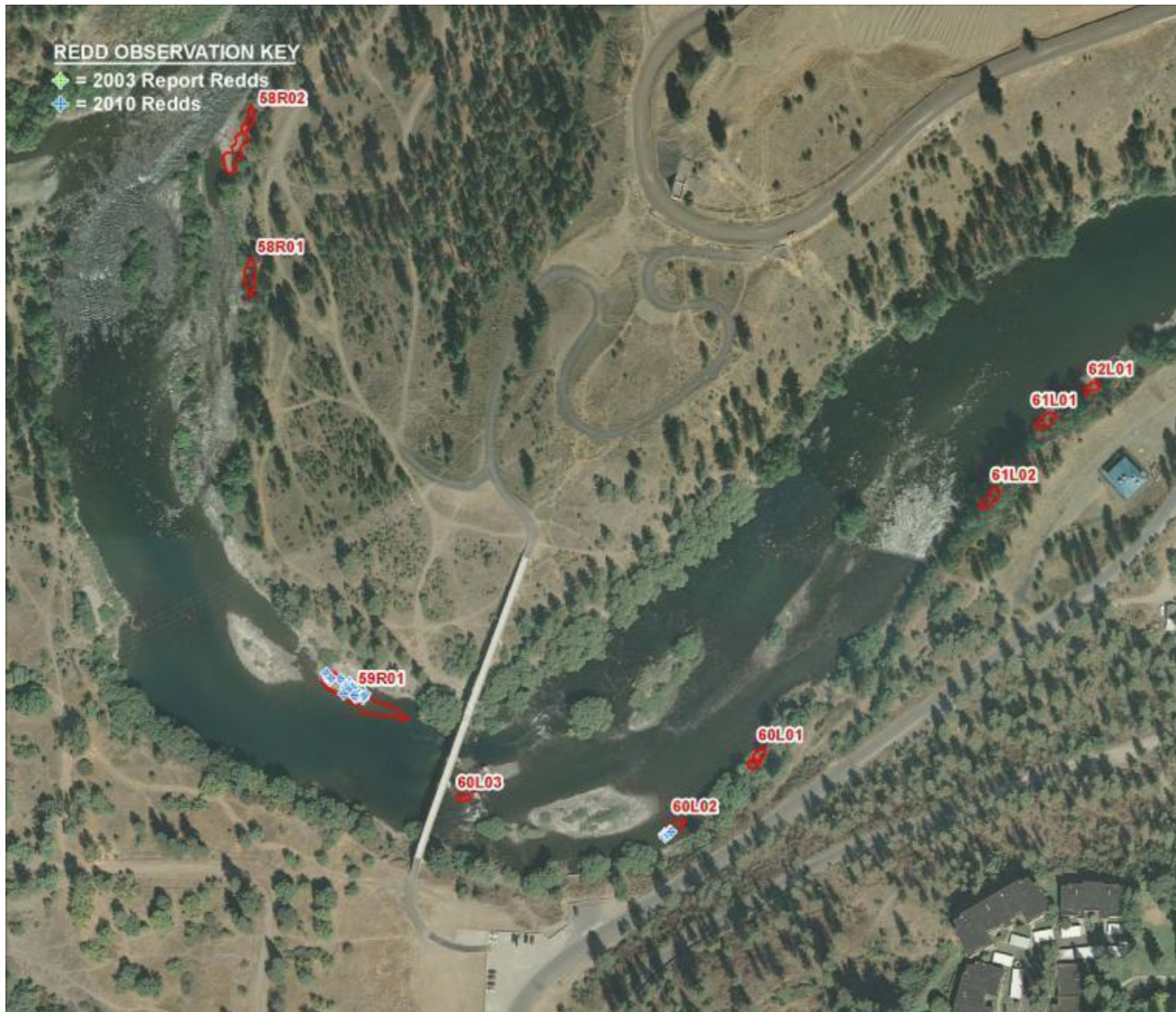


Spawning Survey (2010)



Redband Trout Spawning Period 2010

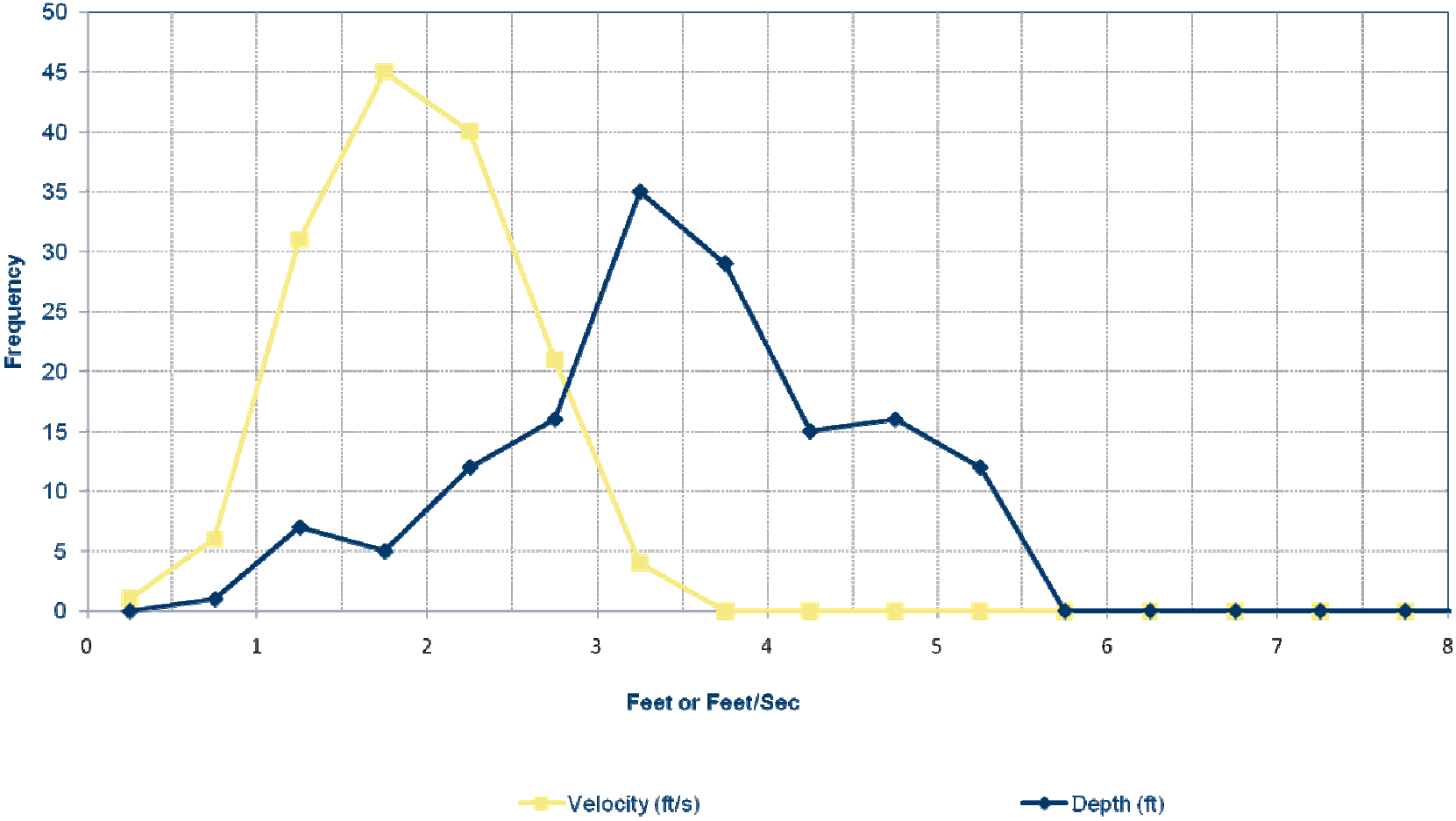




Spawning Areas Mapped



Observed Redband Trout Depth and Velocity Frequency





Artificial Redds



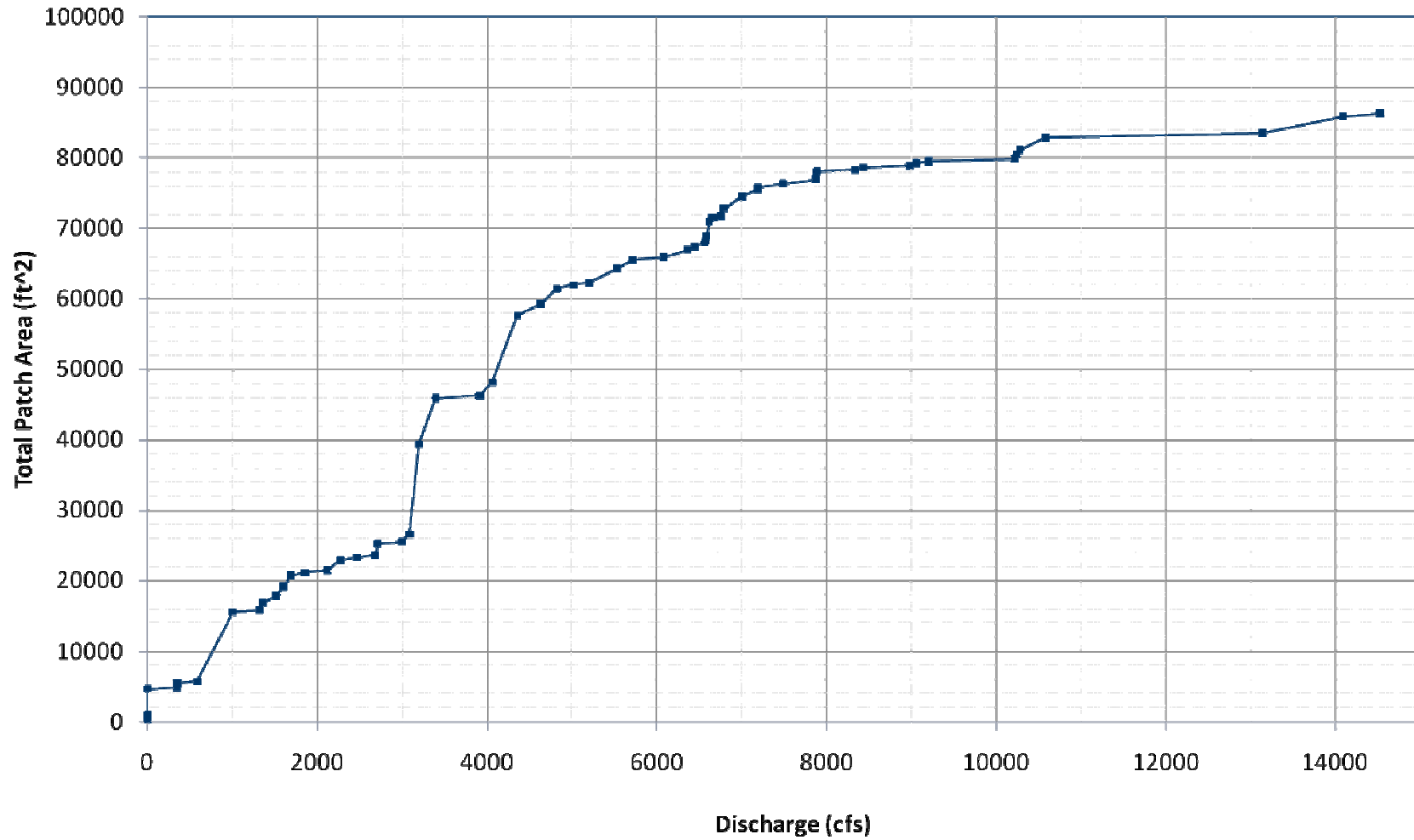
Sample Oxygen and Temperature





Trout Fry Survival

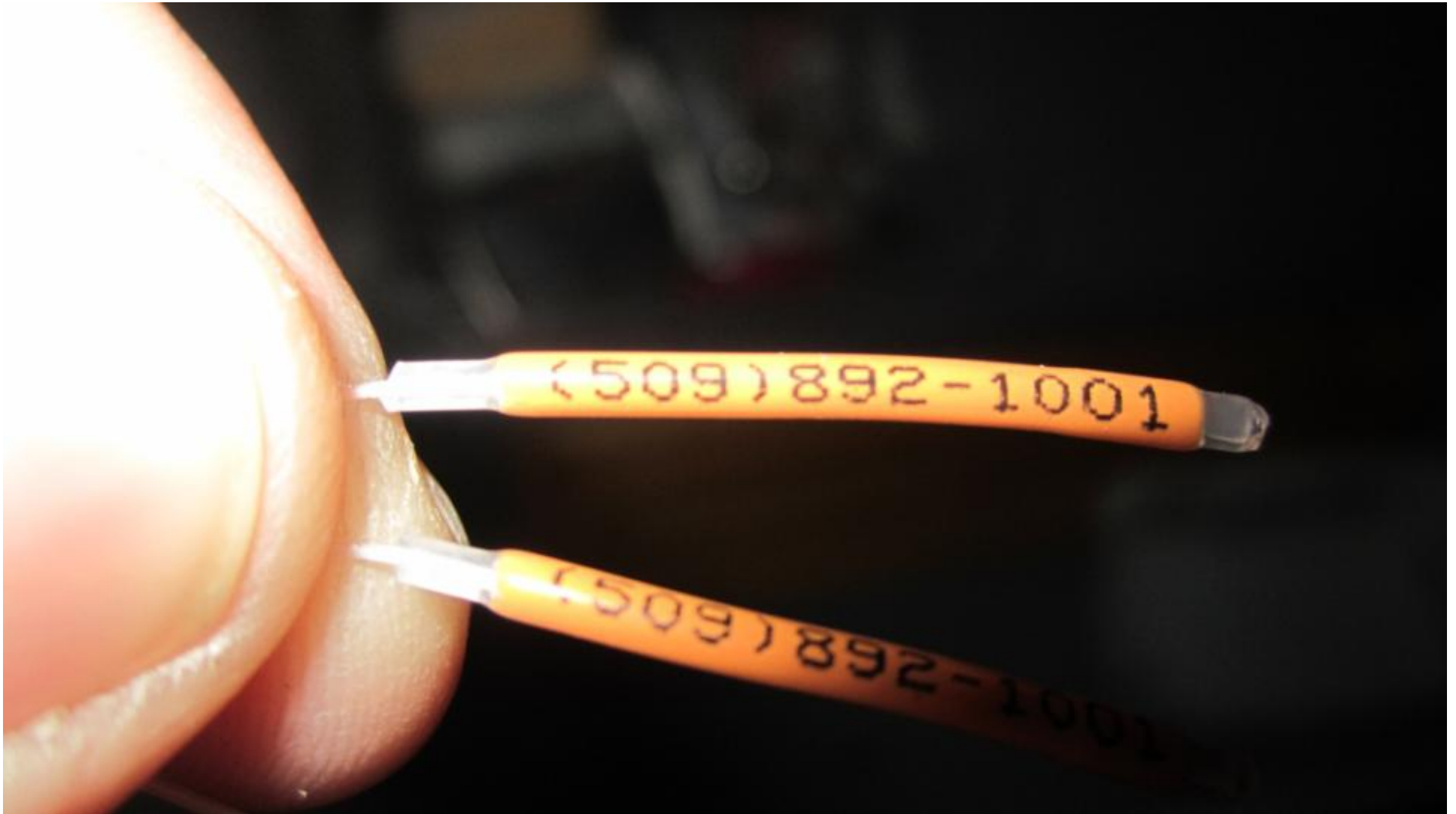
Cumulative Spawning Plot Area



Mark-Recapture Redband Population Estimate



When, Where, and Fish Number (tag #10,186)



Results 2010

- 58 Gravel Patches
- Deeper Spawning: Ave. 3.5', Max. Over 5 Feet
- 148 Redds Counted in 2010 (130 in 2003)
- Appears There is Good Intra-Gravel Survival
- Habitat Over a Range of Flows
- Effective Spawning and Incubation Habitat Tables
- Tagged Over 800 Redbands in the Spokane River

Contact:
Tim Vore
509-495-8612
tim.vore@avistacorp.com

Credits: Forest & Channel Metrics, Cardno Entrix, WDFW



Avista License Website:

<http://www.avistautilities.com/resources/relicensing/spokane/default.asp>