

Cooperation & Collaboration

How a Little Central Oregon Irrigation District
Got to See a Miracle Happen

Pamela Thalacker

Three Sisters Irrigation District

- * Ditch Loss
- * Pollution
- * Flood damage
- * Safety
- * Maintenance Nightmares
- * Operating Inefficiency



Open Ditch Liabilities



Old Aging Infrastructure



Newer Aging Infrastructure



- * Courts are tending toward combining the two
- * Court decisions can change everything
- * Litigation never helps the farmer
- * Proactive action attracts collaborative partners

The Threat of ESA and CWA

- * You have to find collaborative partners
 - * Conservancies
 - * Watershed councils
 - * Soil and water conservation districts
- * Consensus is difficult



Building
Relationships

- * Water Conservation
- * Energy Conservation
- * Carbon Footprint Reduction
- * Sustainable Agriculture
- * Anadromous Re-introduction
- * Stream restoration
- * Made possible by statute



Cooperative Partnership Goals



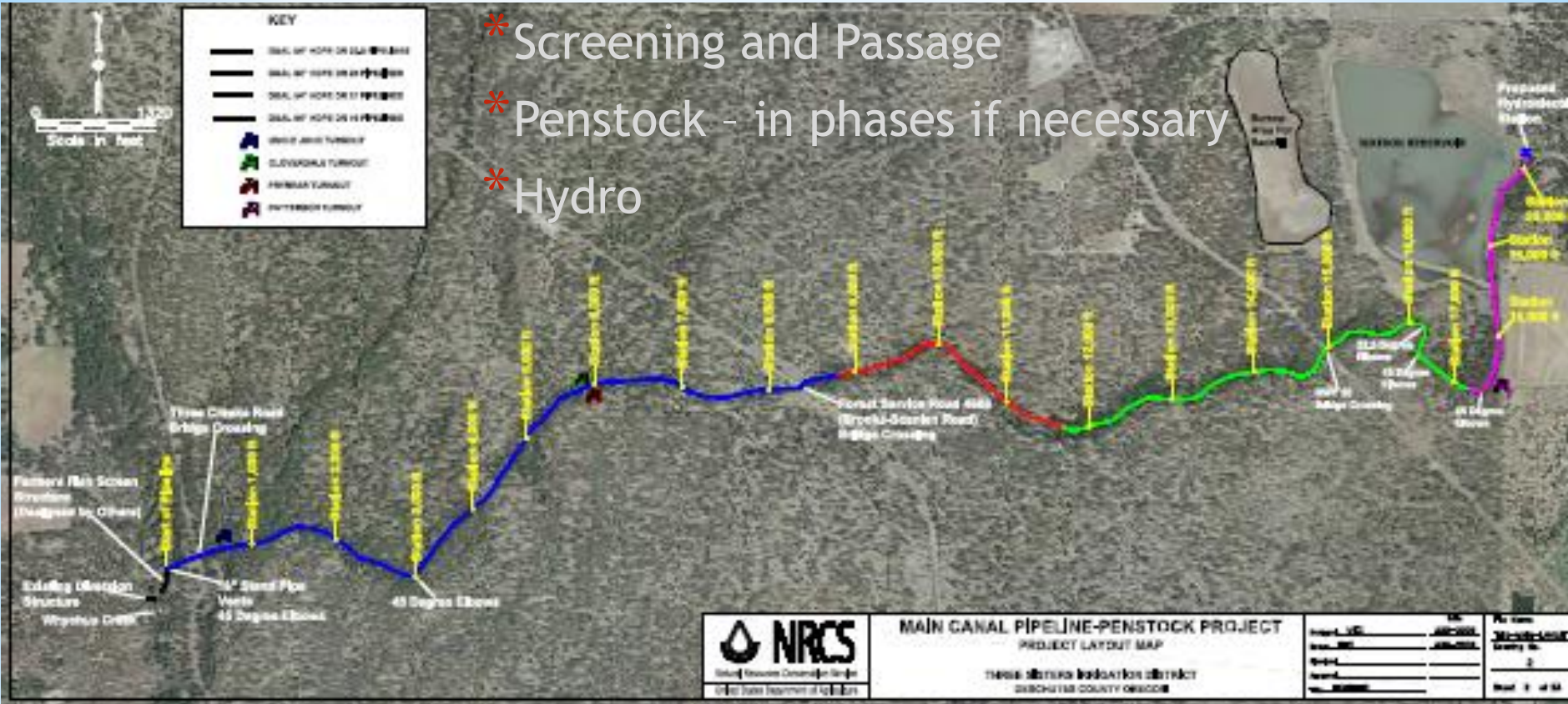
- * 1998 first started piping
- * 2001 Cloverdale Project
- * 2005 McKenzie Canyon Project starts
- * 2005 Hydro Feasibility Study - BEF
- * 2008 Hydro Feasibility Study - BOR, NRCS

Getting Started
Success Begets Success

- * 1998 Bridging the Headgates
- * 2005 Pelton Fund
- * 2008 OWEB Special Investment Partnership
- * 2008 ARRA
- * 2010 BOR WaterSMART



The Idea Grows



- * Screening and Passage
- * Penstock - in phases if necessary
- * Hydro

Eat the Elephant
One Bite at a Time

- * March 12, 2009 TSID submits DEQ loan application
- * April 2009 BOR WaterSMART FOA
- * May 19, 2009 TSID submits BOR grant application
- * August 20, 2009 BOR awarded WaterSMART grant
- * August 27, 2009 DEQ public noticed Intent
- * September 29, 2009 DEQ published IUP for public comment
- * October 9, 2009 DRC receives ARRA grant for Phase II & III
- * October 15, 2009 Forest Service Final Decision (30 days)
- * November 20, 2009 DEQ issued loan

Project Financing

- * March 2, 2009 MOU with DRC
- * April 15, 2009 survey of canal complete
- * July 2009 Biological Surveys complete
- * August 18, 2009 BOR released Categorical Exclusion
- * September 2009 NRCS engineering complete

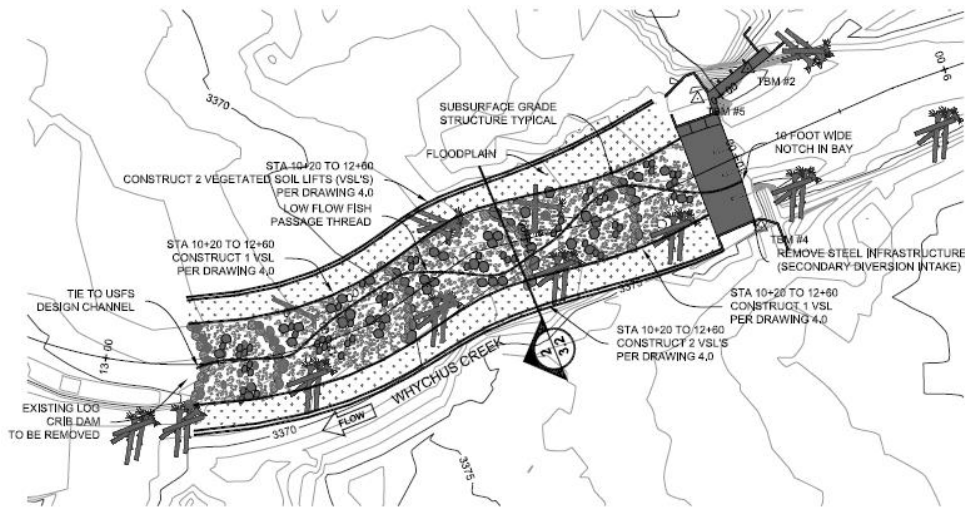
Penstock NEPA & Engineering



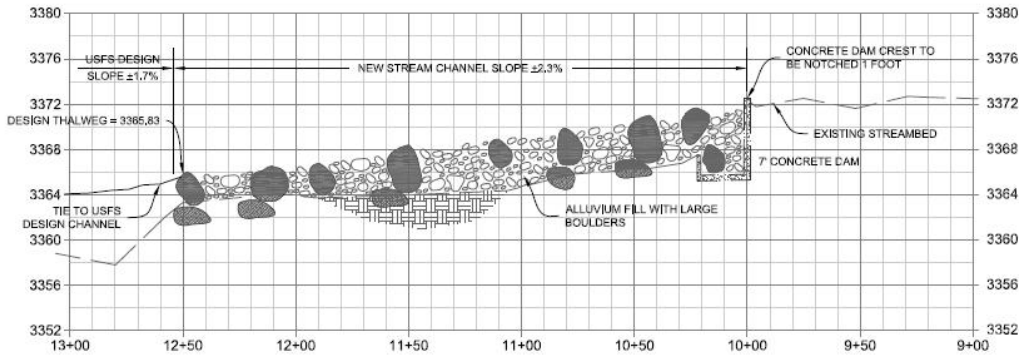
Stream Restoration



Headwall for Fish Screen



1 WHYCHUS CREEK LAYOUT
1" = 50'



2 STREAM PROFILE
HORIZ 1" = 50'
VERT 1" = 10'

DESIGN INTENT

THE DESIGN INTENT IS TO BUILD A NEW STREAMBED THAT SIMULATES A CONTINUOUS RIFFLE/RUN SECTION WITH A 'LOW FLOW' CHANNEL THAT CONSOLIDATES LOW SUMMER FLOW FOR FISH PASSAGE. HABITAT LARGE WOOD SHALL BE RANDOMLY PLACED IN THE STREAM AND BURIED 50% OF THE LENGTH TO MIMIC NATURAL PROCESSES AND CREATE BENEFICIAL FISH HABITAT.

STREAMBED GRAVELS SHALL CONFORM TO THE ROCK GRADATION SPECIFIED AND SHALL BE ROUND RIVER GRAVELS AND FINES, ON-SITE MATERIAL IS PREFERRED.

GRAVEL AND FINES SHALL BE THOROUGHLY MIXED AND PLACED IN THE STREAM TO SPECIFIED GRADE. IN ADDITION, PLACE 24" TO 48" ROCKS NEAR THE SURFACE OF THE STREAMBED (50% BURIED) FOR LARGE SCALE HYDRAULIC ROUGHNESS AND RESTING AREAS FOR FISH.

WHILE THE STREAMBED MATERIAL IS PLACED, THE SURFACE SHALL BE WASHED WITH WATER TO ALLOW THE FINES TO WORK INTO OPEN SPACES AND SEAL THE GRAVEL SUBSTRATE. CONTINUE TO ADD SAND AND WASH INTO THE GRAVEL UNTIL THE GRAVEL IS 'SEALED' AND WASH WATER FLOWS ON TOP OF THE GRAVEL STREAMBED.

CONSTRUCTION NOTES

A TEN FOOT WIDE BY ONE FOOT DEEP NOTCH WILL BE LOCATED IN THE DAM CREST IN THE SECOND CELL FROM THE LEFT STREAMBANK.

LARGE WOOD STRUCTURES WILL BE FOCUSED ON THE LEFT STREAMBANK TO PROVIDE PREFERENTIAL HABITAT AWAY FROM THE DIVERSION INTAKE.

GRADE RIGHT FLOODPLAIN BERM AS SHOWN ON 3.1.



TYPICAL ROUGHENED CHANNEL SECTION



ROUGHENED CHANNEL DESIGN
WHYCHUS CREEK IRRIGATION DIVERSION PROJECT
THREE SISTERS IRRIGATION DISTRICT - SISTERS, OREGON

Filework:	TB/CS
Date:	08/24/08
Design:	CS
Drawn:	BB
Checked:	SW
PROJECT NUMBER:	RDC-08-042
REVISION:	DATE
DRAFT	04/15/09
DRAWING NUMBER:	3.0
Drawing	4 of 10

Original Channel Design



Restoration Construction

CHANNEL CONSTRUCTION NOTES

FINISHED CHANNEL CONSTRUCTION SHALL BE IN CONFORMANCE WITH THE TYPICAL CHANNEL DESIGN TEMPLATE (DRAWING 3.1) AND DETAILED CROSS SECTIONS (DRAWING 3.1).

ESTIMATED PROJECT QUANTITIES

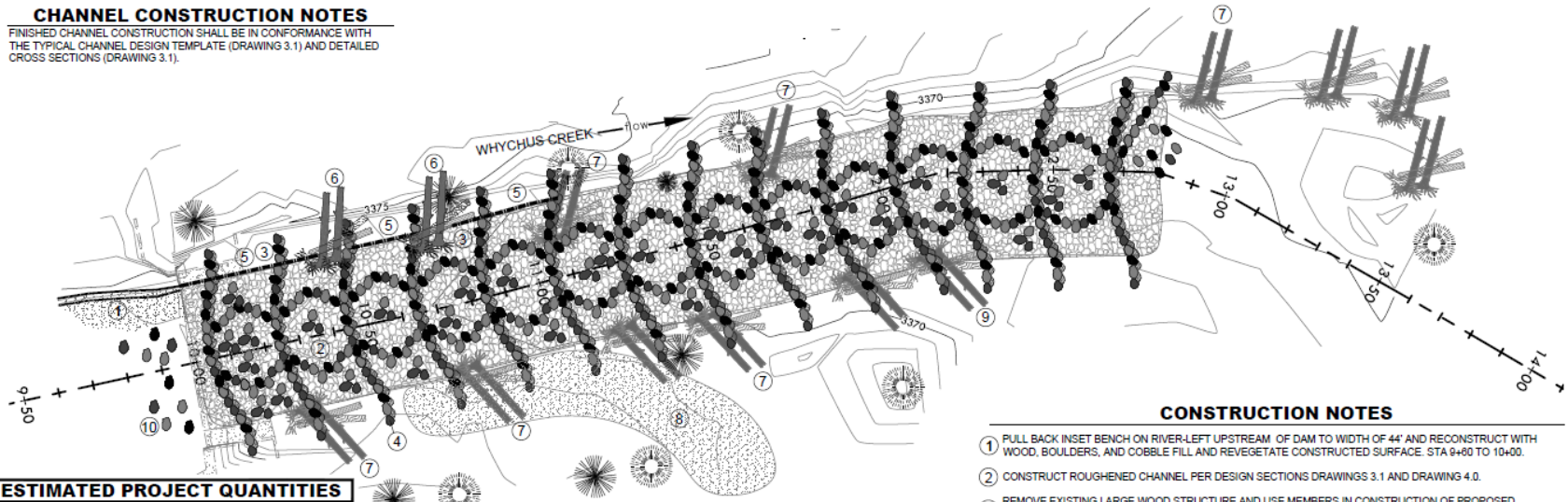
CHANNEL EXCAVATION	800 CUBIC YARDS
ENGINEERED RIFFLE MATRIX	680 CUBIC YARDS
ALLUVIUM MATRIX (0.5' DEPTH)	210 CUBIC YARDS
BOULDER STRUCTURES	340 CUBIC YARDS (680 BOULDERS)
HABITAT BOULDERS	45 CUBIC YARDS (90 BOULDERS)
VEGETATED SOIL LIFT (1 TIER)	90 FEET

PROJECT QUANTITIES ARE BASED ON ENGINEERS ESTIMATE FROM TOPOGRAPHIC SURVEY AND DESIGN DRAWINGS. CONTRACTOR SHALL REVIEW THE DRAWINGS AND SPECIFICATIONS TO CONFIRM QUANTITIES BEFORE ENTERING INTO A PROJECT CONTRACT.

1 EXISTING CHANNEL LAYOUT

DESIGN CONTOUR INTERVAL = 1'

1" = 30'

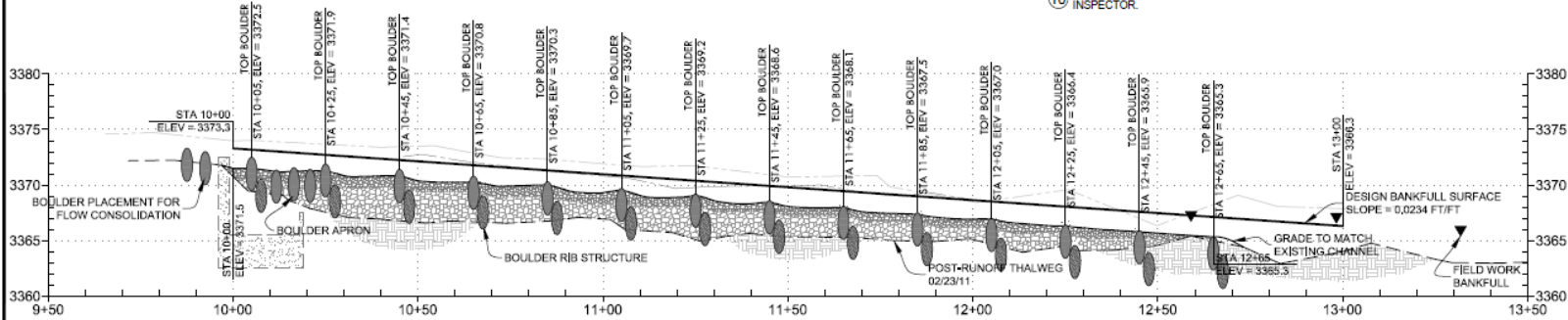


CONSTRUCTION NOTES

- 1 PULL BACK INSET BENCH ON RIVER LEFT UPSTREAM OF DAM TO WIDTH OF 44' AND RECONSTRUCT WITH WOOD, BOULDERS, AND COBBLE FILL AND REVEGETATE CONSTRUCTED SURFACE. STA 9+60 TO 10+00.
- 2 CONSTRUCT ROUGHENED CHANNEL PER DESIGN SECTIONS DRAWINGS 3.1 AND DRAWING 4.0.
- 3 REMOVE EXISTING LARGE WOOD STRUCTURE AND USE MEMBERS IN CONSTRUCTION OF PROPOSED STRUCTURES AND USFS PLUG.
- 4 CONSTRUCT TRANSVERSE BOULDER RIB STRUCTURES PER DRAWING 4.0.
- 5 CONSTRUCT SINGLE TIER VEGETATED SOIL LIFT PER DRAWING 4.1.
- 6 CONSTRUCT ENGINEERED LARGE WOOD HABITAT STRUCTURE (ELWHS) PER DRAWING 4.2.
- 7 LOWER EXISTING LARGE WOOD STRUCTURE TO BANKFULL ELEVATION AND MOVE TO ADJUSTED BANKLINE.
- 8 LOWER FLOODPLAIN HEIGHT BY REMOVING OVERLAYING COBBLE AND REVEGETATE.
- 9 ADJUST DOWNSTREAM TIE-IN LOG TO REDUCE FLOW CONFINEMENT.
- 10 PLACE FIVE 2.5 FT - 3.0 FT DIAMETER BOULDERS AT EACH SIDE OF APRON AT THE DIRECTION OF PROJECT INSPECTOR.

2 STREAM PROFILE

HORIZ 1" = 30'
VERT 1" = 10'



NO.	DATE	BY	DESCRIPTION	CHK
0	08/07/11	RB	ISSUED FOR CONSTRUCTION	TB

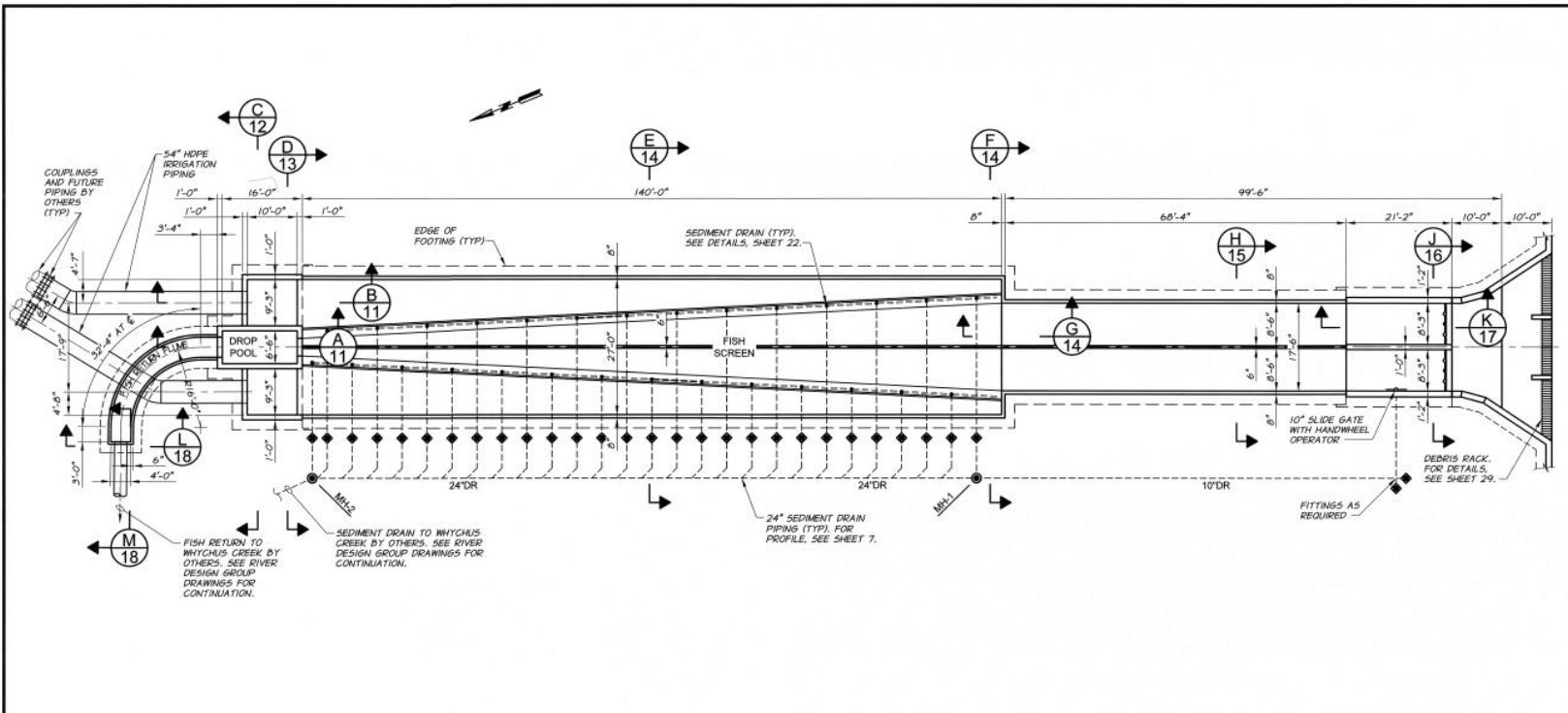
PROJECT NUMBER
RDG-08-042

DRAWING NUMBER

3.0

Drawing 4 of 8

Channel Redesign



PLAN
SCALE: 1"=10'



PROJECT:	NO.:	DATE:	SCALE:	DATE:
DESIGNED BY: R. HARRIS	XCREFS: TB-TSUD.dwg		ASB SCALE 1" = 10'	NEW SCALE
DRAWN BY: E. ARNTZ			JOB NUMBER 1199-328	DATE 2010
CHECKED BY: D. MOORE			FILE NAME ScreenFlume.dwg	
COPYRIGHT 2010 BY ANDERSON-PERRY & ASSOC., INC.				

RECORD DRAWINGS
These record drawings have been prepared in part on the basis of information compiled and furnished by others. They may contain some discrepancies and omissions, and do not necessarily represent "exact" field conditions. The Owner and the Engineer accept no responsibility for their accuracy.



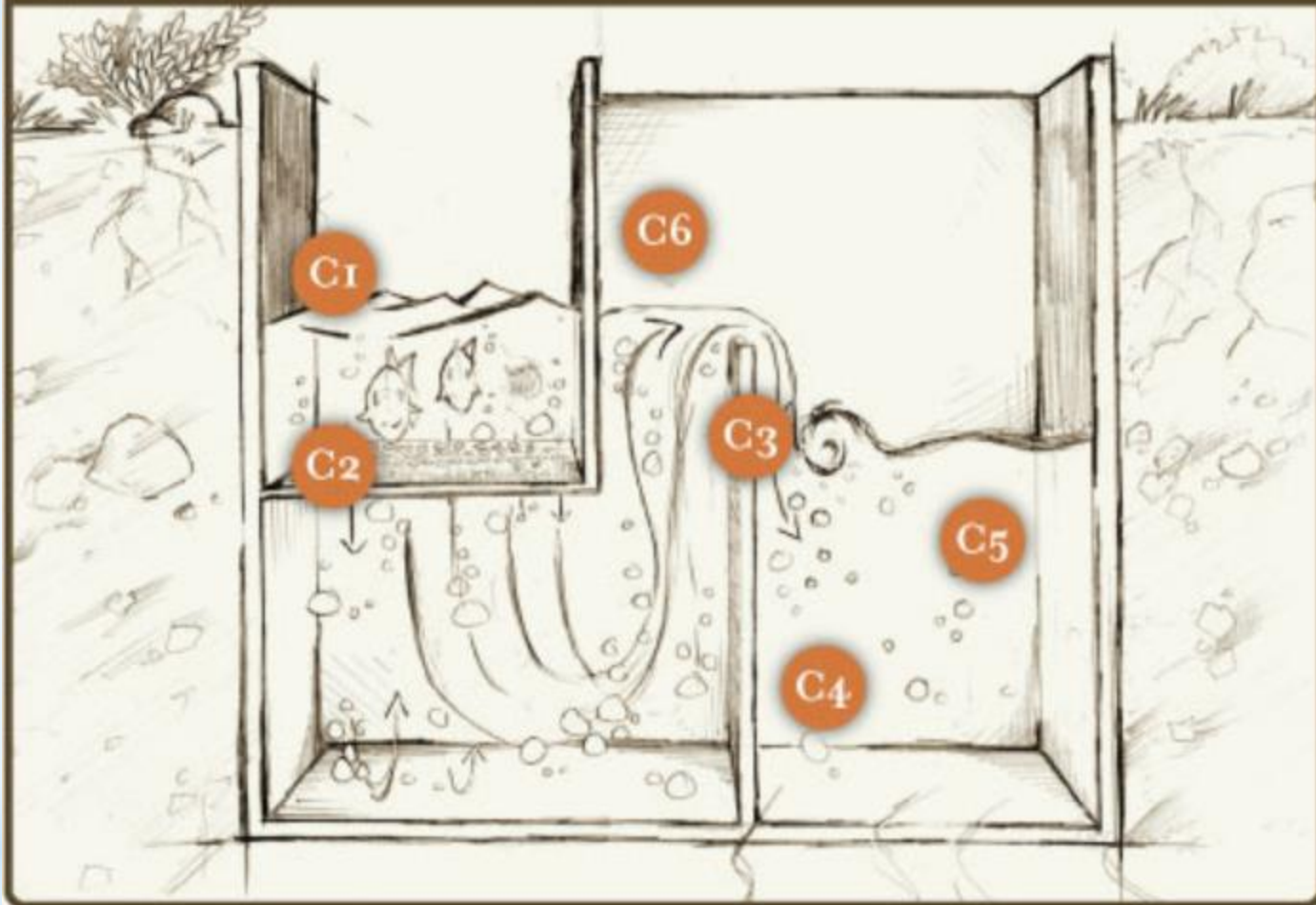
FARMERS CONSERVATION ALLIANCE
WHYCHUS CREEK FISH SCREEN IMPROVEMENTS
SCREEN STRUCTURE
STRUCTURAL PLAN

SHEET
8

ARCHIVED

FCA Fish Screen

C) Screen Cross Section View



farmerscreen.org

How it Works





Completed Fish Screen

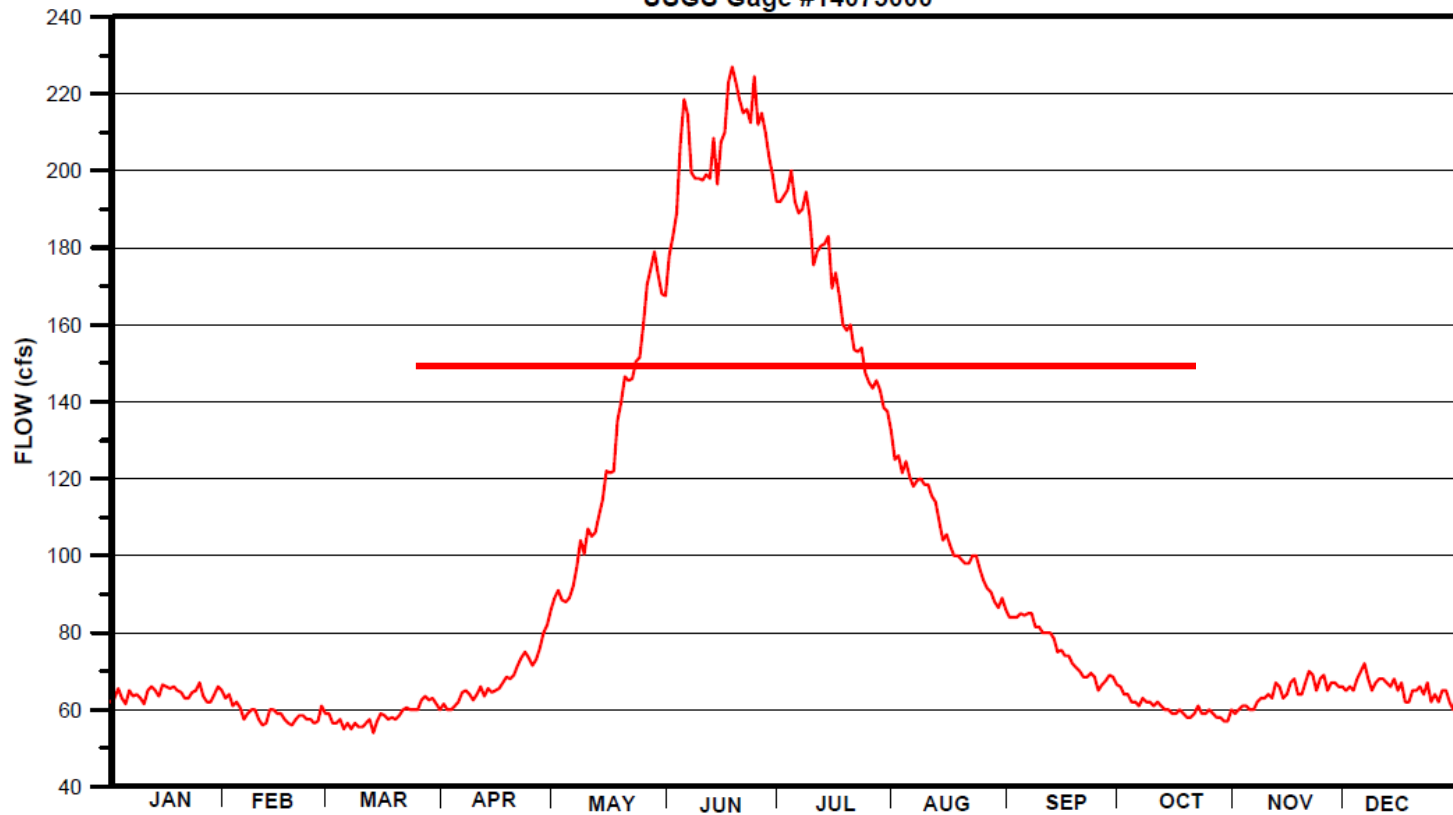


Penstock
Penstock



Penstock at Powerhouse Site

Whychus Creek nr Sisters Oregon
MEDIAN (50% Exceedance) Daily Flow Hydrograph
Period of Record: 1950-2009
USGS Gage #14075000



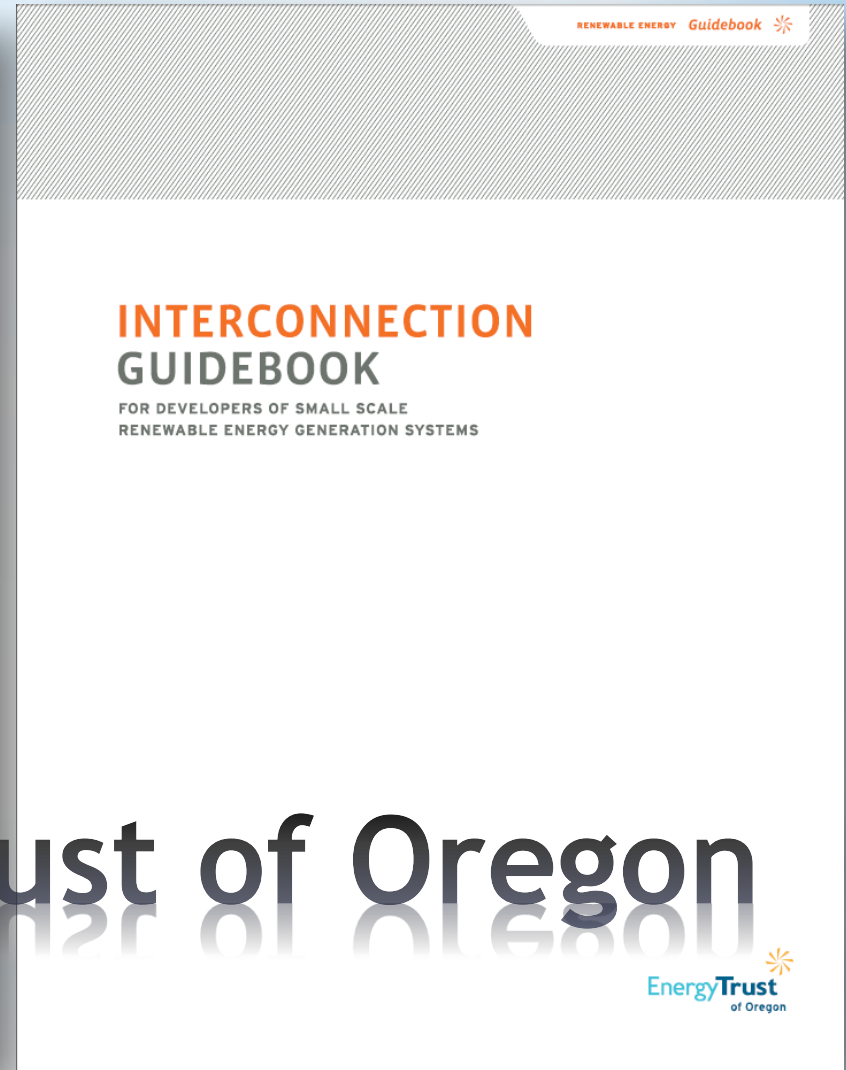
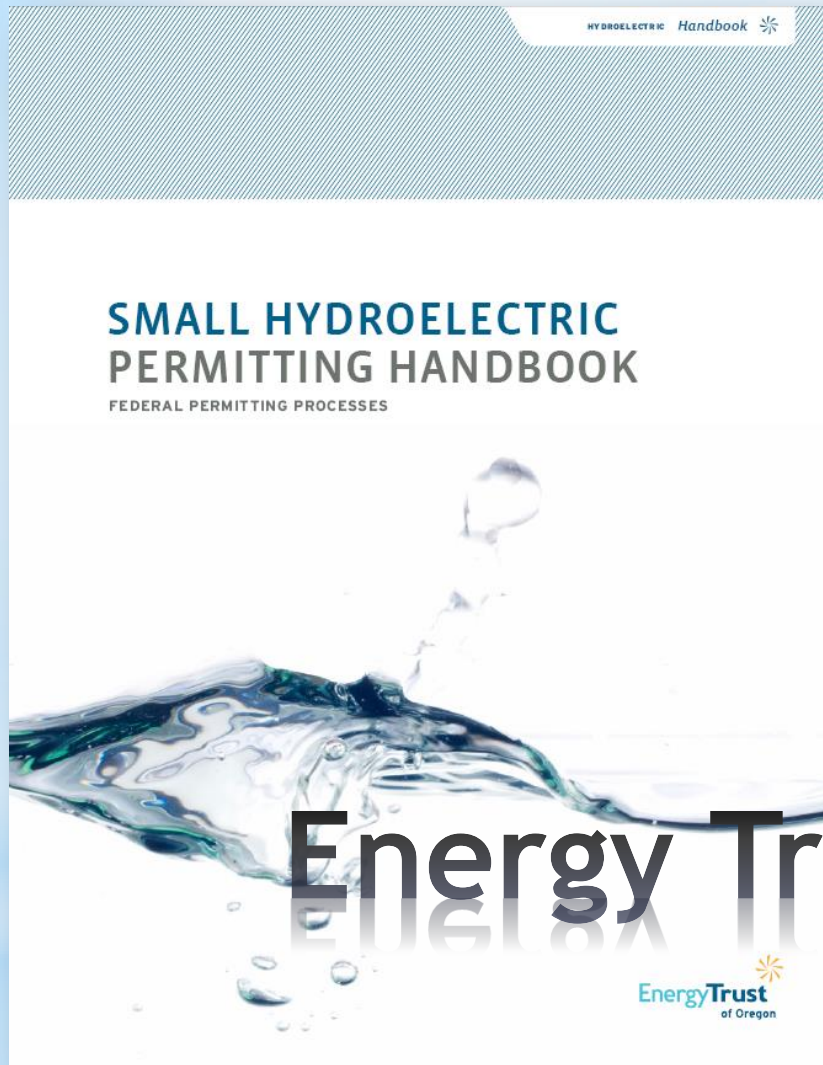
Original Financial
Model

- * Nameplate MW
- ** 1000
- ** \$6.15/month
- ** 12 months
- ** 20 years

\$2,701,080

**CEC's Wheeling
Formula**

<http://energytrust.org/hydro>



Energy Trust of Oregon

Jed Jorgensen 503-445-7611
jed.jorgensen@energytrust.org

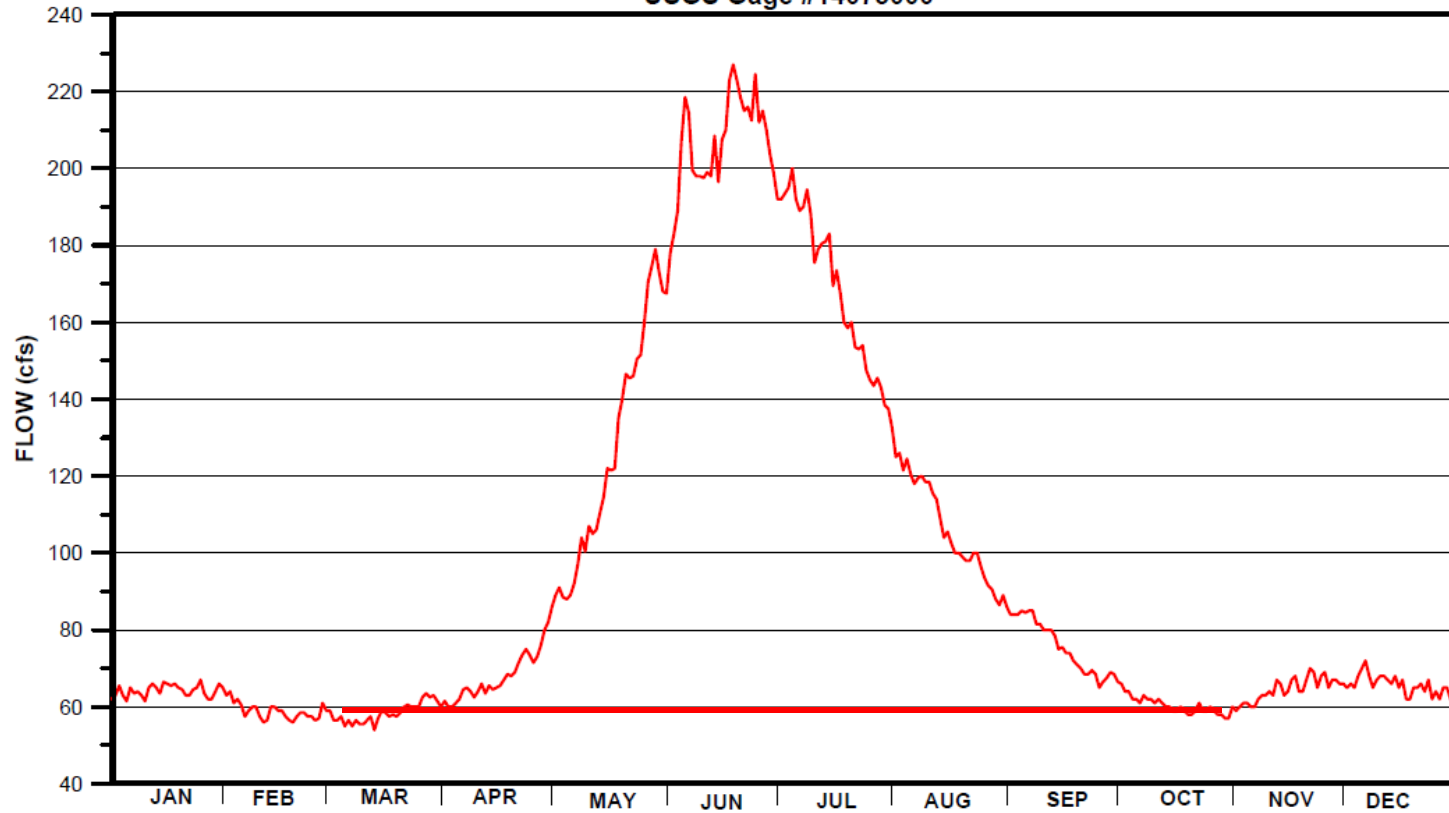
- * Channel Restoration 1 million
- * Fish screen 1.2 million
- * Penstock 10.5 million
- * Hydro 2.1 million
- * 2.5 million debt to pay over 20 years
- * 20 years revenue reduced from 5 to 4

PacifiCorp New Schedule 37

Turbine Size	Annual KWH	Income	CEC	Net
0.5	2746667	\$4,451,048	\$738,000	\$3,713,048
0.6	2927112	\$4,743,464	\$885,600	\$3,857,864
0.7	3071112	\$4,976,820	\$1,033,200	\$3,943,620
0.75	3143112	\$5,093,498	\$1,107,000	\$3,986,498
0.8	3215112	\$5,213,176	\$1,180,800	\$4,032,376
0.85	3287112	\$5,326,854	\$1,254,600	\$4,072,254
0.9	3359112	\$5,443,532	\$1,328,400	\$4,115,132
0.95	3431112	\$5,563,451	\$1,402,200	\$4,161,251

Compare Options

Whychus Creek nr Sisters Oregon
MEDIAN (50% Exceedance) Daily Flow Hydrograph
Period of Record: 1950-2009
USGS Gage #14075000



Revised Financial
Model



139 FERC ¶ 62,036
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Three Sisters Irrigation District

Project No. 14364-000

ORDER GRANTING EXEMPTION FROM LICENSING (CONDUIT)

(Issued April 12, 2012)

Introduction

1. On February 8, 2012, and supplemented March 9, 2012, the Three Sisters Irrigation District (applicant or exemptee) filed an application to exempt the proposed 700-kilowatt (kW) Three Sisters Irrigation District Hydroelectric Project from the licensing requirements set forth in Part I of the Federal Power Act.¹ The small conduit hydropower project would be located on the north pipe of the Three Sisters Irrigation District's Main Canal Pipeline in Deschutes County, Oregon. The project would not occupy any federal lands. As discussed below, a conduit exemption is being issued for the project.

Project Description

2. The Three Sisters Irrigation District Hydroelectric Project would consist of a new powerhouse containing one generating unit with an installed capacity of 700 kilowatts, a new 60-inch-diameter, 120-foot-long discharge pipe, and appurtenant facilities. The applicant estimates that the project would have an average annual generation of 3,400 megawatt-hours.

¹ Under Part I of the FPA, 16 U.S.C. §§ 792-823 (2006), the Commission issues licenses to non-federal interests authorizing the construction, operation, and maintenance of water power projects on navigable waters of the United States, on federal lands, and on streams subject to Congress' jurisdiction. Pursuant to section 30 of the FPA, 16 U.S.C. § 823, the Commission is authorized to exempt from the licensing requirements of Part I of the FPA any facility (not including a dam or other impoundment) that is constructed, operated, or maintained for the generation of electric power and is located on non-federal lands and uses for generation only the hydroelectric potential of a manmade conduit, which is operated for the distribution of water for agricultural, municipal, or industrial consumption (and not primarily for the generation of electricity).



FERC



NOAA Fisheries

National Marine Fisheries Service



ENGINEER'S CERTIFICATION

System Impact Study
Three Sisters Irrigation District
700 kW Hydroelectric Generator

Central Electric Cooperative

Installation of a 700 kW generator has been proposed by the Three Sisters Irrigation District in Sisters, Oregon. The proposed project is located south of Central Electric Cooperative's 115 to 12.47 kV Sisters Substation. Delivery of energy from this 700 kW generator into Central Electric Cooperative's 12.47 kV distribution system is proposed. Analysis is required to confirm system voltage levels, power quality, system protection and safe reliable operation can be preserved following connection of this project to Central Electric's distribution system.

D. Hittle and Associates (DHA) was granted the privilege of performing this service.

This report titled "System Impact Study Three Sisters Irrigation District 700 kW Hydroelectric Generator" dated March 6, 2012, contains the results of this analysis. Recommended system improvements are contained within the body of the report and summarized in the Executive Summary section.

D. Hittle and Associates would like to thank Central Electric Cooperative for allowing us to provide this service.

I certify that this report was prepared by me or under my direct supervision and that I am a duly registered Professional Engineer in the State of Oregon.

Sincerely,

Wallace Kelly, P.E.
Senior Engineer

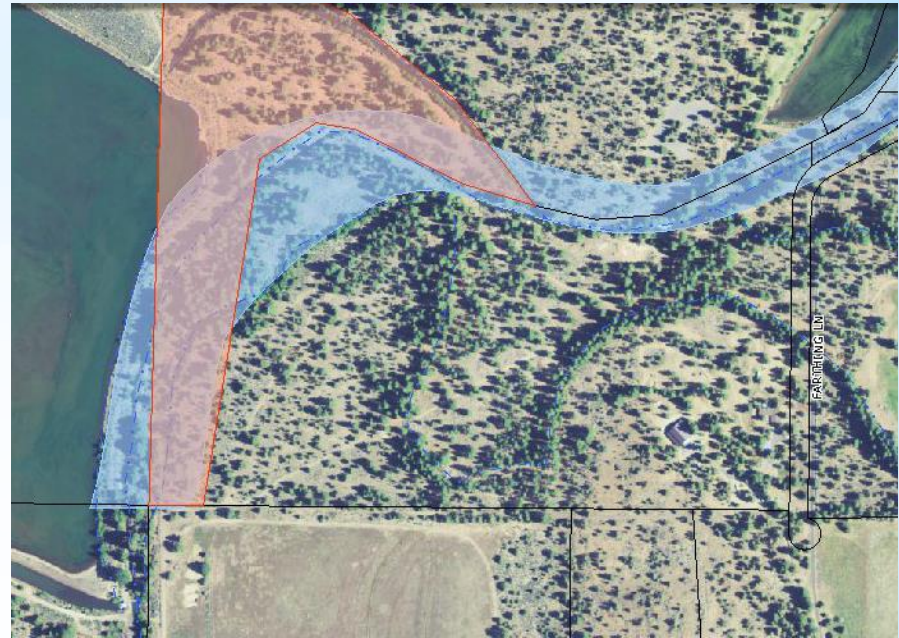


BPA & CEC Interconnection

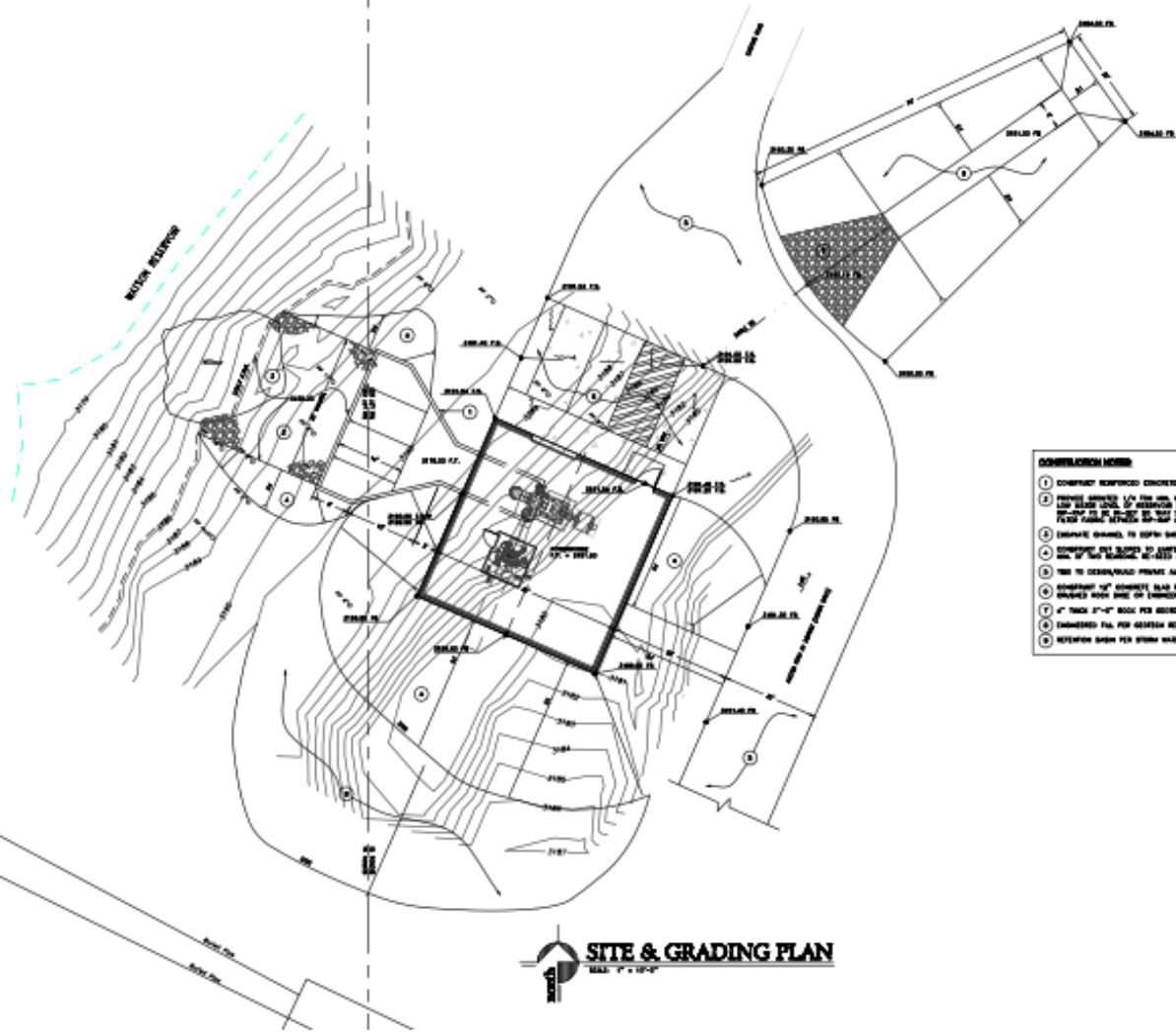
18.128.260. Hydroelectric Facilities.

A. The criteria set forth below shall apply to any construction or expansion of, or other modification to, hydroelectric facilities in zones where such facilities are permitted as a conditional use. A conditional use permit may be granted for the construction or expansion of, or other modification to, a hydroelectric facility only upon findings by the Planning Director or Hearings Body that the proposal meets each of the following criteria, where applicable:

1. The facility is located at and physically connected to an existing man-made diversion or impoundment.
 2. The facility will not increase the maximum surface area or capacity of the impoundment created by the existing dam or diversion to which the facility will be connected.
 3. The facility will maintain or enhance to the greatest extent possible the existing scenic, visual, environmental and aesthetic qualities of the affected stretch of the river.
 4. The facility will maintain or enhance the existing recreational opportunities on or adjacent to the affected stretch of the river.
 5. The facility will maintain or enhance existing fish and wildlife habitat and will have no adverse impact upon any threatened or endangered fish, wildlife or plant species or their habitat.
 6. The facility and its operation will maintain or enhance existing water quality in the affected stretch of the river except during construction of the facility when adverse impacts on water quality will be minimized. Specifically, the facility and its operation will not:
 - a. Deposit or create a zone for the deposit of sediments in the river at or adjacent to the site;
 - b. Increase the temperature of the river in the affected stretch by any means, including but not limited to removal of vegetation or reduction in streamflow; or
 - c. Create the potential for or result in spillage, leakage or discharge of oil, waste products, chemicals or other substances which could reach the river.
 7. The facility and its operation will not increase soil or bank erosion or destroy bank habitat at or on land adjacent to the site except during construction of the facility, during which time soil or bank erosion and destruction of bank habitat will be minimized.
 8. The facility and its operation will maintain existing public access to the affected stretch of the river.
 9. The facility will not be located at or immediately adjacent to any identified archaeological or historical site, national or state park, wildlife refuge, Bureau of Land Management Outstanding Natural Area or Area of Critical Environmental Concern, Federal Research Natural Area or U. S. Forest Service Special Interest Area.
 10. The facility will not be located on any stretch of the river that is being studied or recommended for inclusion in either the Federal Wild and Scenic Rivers Program or the State Scenic Waterways Program, unless location of the facility at that site would not preclude inclusion of the stretch in the state or federal program.
 11. The facility and its operation will comply with all applicable noise, water quality and pollution regulations of the Oregon Department of Environmental Quality.
 12. The facility and its operation will comply with all applicable state and local fill-and-removal statutes and regulations.
- B. The applicant for a conditional use permit for a hydroelectric facility, in addition to all other requirements, shall submit the following for approval:
1. Detailed construction plans and profiles of all facility features including building elevations of the powerhouse and other structures, excavation plans, a narrative describing where blasting will occur and where excess material will be deposited, and landscaping and reclamation plans.
 2. Detailed plans for meeting the criteria set forth in DCC 18.128.260(B)(1).
 3. Detailed plans for river enhancement documenting both on-site and off-site enhancement plans consistent with adopted river-related goals and policies, such as plans and methods for conserving water and enhancing stream flows. The plan shall identify costs, time schedules and coordination activities with affected persons and agencies for such enhancement plans.
 4. A cash deposit, performance bond or other security acceptable to Deschutes County in an amount equal to 100 percent of the estimated cost of river enhancement.



Conditional Use



- CONSTRUCTION NOTES:**
1. CONSTRUCT REINFORCED CONCRETE DRAFT PILE, PER DETAIL, SHEET 2
 2. EXPOSED REINFORCING 1/4" DIA. AND 6" ON CENTER FOR PILES TO 45" BELOW DRAFT PILE HEAD PER REQUIREMENTS IN LOW SLABE CODES. IF PROVISIONS FROM STATE ALSO APPLY, USE THE STRONGER. ALL REINFORCING SHALL BE PLACED IN PLACE BEFORE CASTING OF CONCRETE. PROVIDE 1" MIN. CLEARANCE BETWEEN REINFORCING AND ALL OTHER MATERIALS.
 3. EMBANKMENT GRASS, TO 10% SLOPE.
 4. CONSTRUCT PILE BARGE TO 100% SPREAD, PILE BARGE SHALL BE 10' DIA. AND 10' HIGH. SHALL BE 1/4" THICK GALVANNEZED STEEL SHEET PILING WITH 1/2" RIGIDITY. ALL-STEEL AND REINFORCING AS NECESSARY TO GRAB PILE, BARGE AND COVERAGE.
 5. TIME TO DEMONSTRATE PRIVATE ALL-WEATHER ACCESS ROAD.
 6. REINFORCEMENT OF CONCRETE SHALL BE REINFORCED WITH 1/4" DIA. 6" ON CENTER, SHALL BE 1/4" THICK GALVANNEZED STEEL SHEET PILING REINFORCED PER GEOTECH REPORT, SECTION 10.0 (10.0)
 7. 1" THICK 2'-0" ROCK PER GEOTECH REPORT.
 8. EMBANKMENT PILE PER GEOTECH REPORT.
 9. RETENTION BARGE PER STORM WATER PLAN, ROOF GUTTERS PILED TO BARGE TO BARGE.

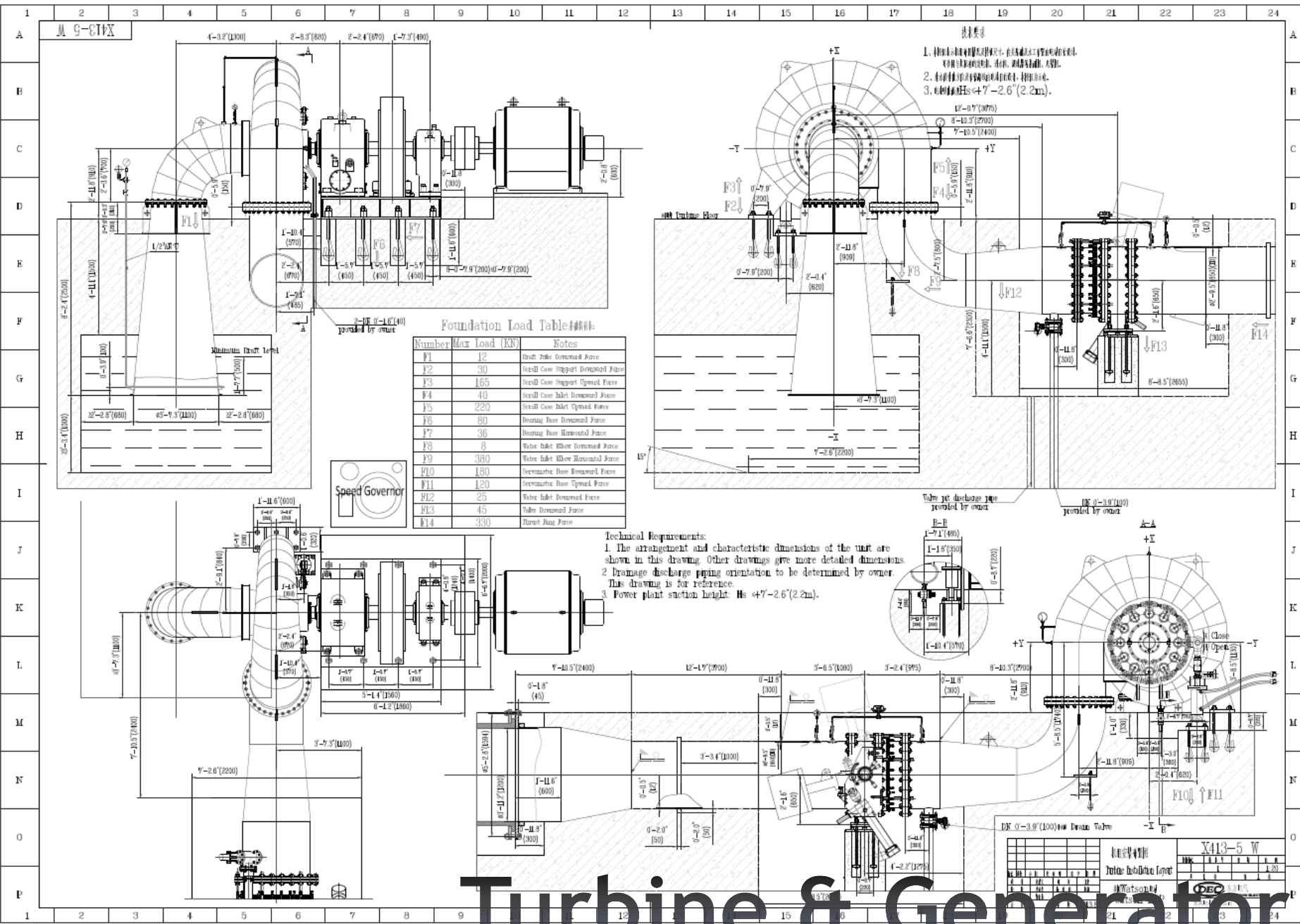
SITE & GRADING PLAN
SCALE: 1" = 10'-0"

DATE: _____
 DRAWN BY: _____
 CHECKED BY: _____
 SCALE: 1" = 10'-0"

SHEET 1 of 2



Site Plan

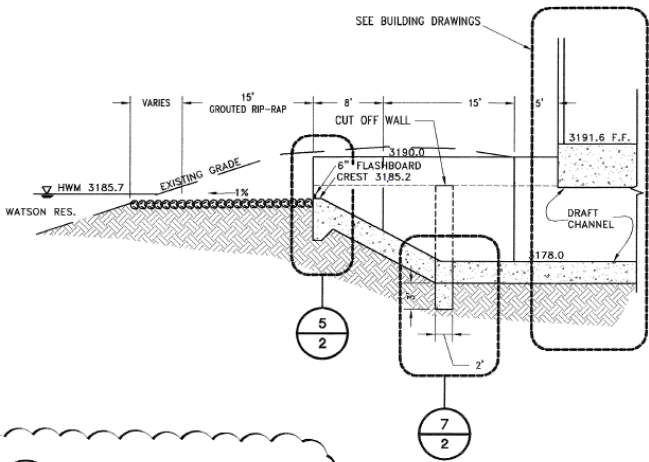


Turbine & Generator

X413-5 W	
Model	X413-5 W
Manufacturer	Watson
Year	1980
Scale	1:20
Sheet No.	1/20
Project No.	
Design	
Check	
Drawn	
Approved	



Z-Pipe



1 SECTION AA
SCALE: 1" = 10'-0"

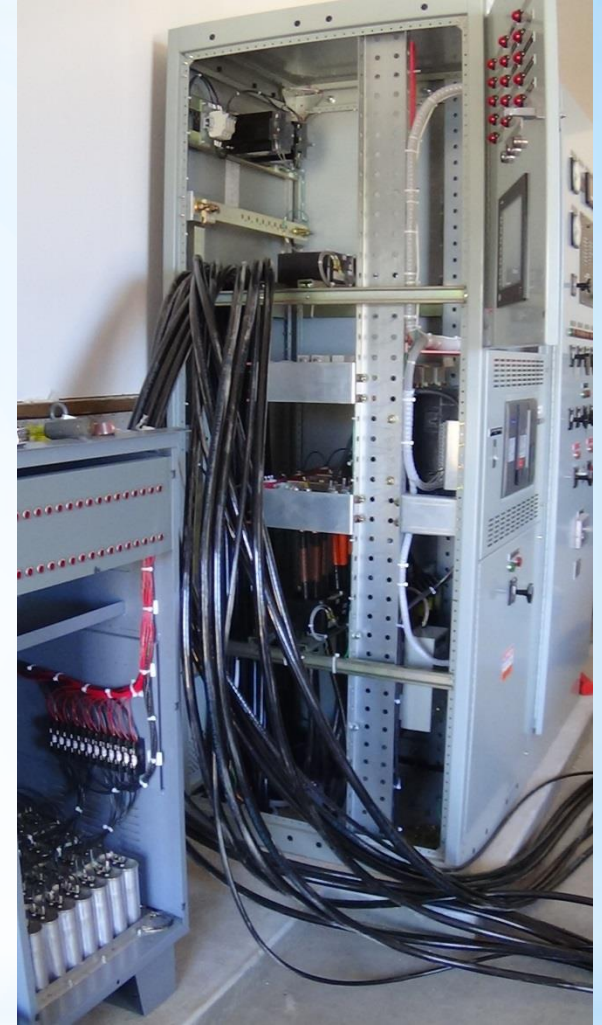
Tailrace



Embedment



Powerhouse



Electrical Controls



Mechanical Installation

- * Post Mortem
- * Net Metering Demo & Pilot Projects
- * Finish Piping and Second Hydro
- * Advocate for more Small Conduit Hydro



What's Next?