

Preliminary Design Study Fish Screening and Related Improvements



U.S. Fish & Wildlife Service
Spring Creek National Fish Hatchery
Underwood, WA

Big White Pond Facility White Salmon River July, 2005



NW ENVIRONMENTAL SERVICES



CONSULTING
ENGINEERS

**PRELIMINARY DESIGN STUDY
FISH SCREENING AND RELATED IMPROVEMENTS
BIG WHITE POND FACILITY ON THE WHITE SALMON RIVER**

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1. BACKGROUND AND STUDY DESIGN

Site Development & Historical & Future Facility Use

The Big White Salmon Pond Facility was constructed in the early 1950's on the White Salmon River approximately 1½ miles upstream from its confluence with the Columbia River in Klickitat County, Washington. The facility was built to trap and hold adult Fall Chinook salmon (*oncorhynchus tshawytscha*) prior to spawning to supply eggs for the U.S. Fish and Wildlife Service's (USFWS) then new Spring Creek Hatchery facility on the Columbia River at Underwood, Washington. Adult trapping at the "Pond" facility was discontinued in 1964 however, as sufficient numbers of returning adults became available at the hatchery to meet egg take needs. Since then the facility has been used on an occasional basis to acclimate fish prior to release in the White Salmon River. The facility was last operated in 2002 partly due to the fact the diversion intake no longer meets fish screening requirements.

Conduit Dam is located 1.8 miles upstream of the "Ponds" and is scheduled for removal in 2008. Removal of the dam will open up nearly 16 miles of additional fish habitat and provide the potential to develop self-sustaining populations of native fish species. For Spring Creek National Fish Hatchery to play an active role in restoration activities, however, the Big White Ponds need to be functional with capabilities to provide adult trapping, incubation and rearing capabilities. This will require proper fish screening and related improvements.

Preliminary Study Design

This preliminary design study provides for (1) identification of fish screening options and analysis to bring the water intake structure into fish screening compliance and (2) evaluation of the existing adult capture and holding facility to include incubation and early life stage rearing capabilities. This study is the first step of a two step design process. In the next step, one of the screen options can be selected for detailed design, budgeting and eventual construction.

Northwest Environmental Services (NWES) was engaged to provide preliminary design services for retrofitting the existing facility with a proper fish screen. NWES worked closely with its subcontractor, SJO Consulting Engineers, in completing this study and preparing the report. The specific scope of work for NWES was to develop preliminary design and cost estimates to bring the water intake structure into compliance with fish screening requirements and to identify other issues and concerns that could potential impact design or project development. Specific tasks were as follows:

- A. Describe the facility and assess its present condition for wear and remaining useful life, particularly as it relates to retrofitting an acceptable fish screening device.
- B. Assist USFWS personnel to evaluate potential uses for the facility and to determine water flow requirements for each use. This was necessary to determine the design flow for the screen facility.

- C. Develop preliminary designs and costs for several options to bring the water intake structure into compliance with NOAA Fisheries screening requirements.
- D. Investigate and identify the requirements for waste water discharge from the facility to meet State and federal regulations.
- E. Identify permitting and utility requirements necessary for project development.
- F. Complete a preliminary analysis of historical river flows and stage elevations and develop a recommendation to control periodic flooding at the facility.
- G. Prepare and submit a report summarizing the results of this study and investigation including the identification of a preferred fish screening alternative.

2. FACILITY DESCRIPTION AND CONDITION

Facility Description

The facility sits on 42 acres along the left bank of the White Salmon River in Klickitat County and consists of a submerged instream weir structure in which pickets can be installed to divert returning adult fish into a concrete raceway structure on the stream bank. Water is supplied to the two, 240 foot long, 10 foot wide raceways from a gravity diversion intake structure upstream of the raceways.



Raceways Looking Upstream



Intake Structure

The intake structure is protected by a trash rack to keep out large debris but is considered “unscreened” using the criteria developed by the fishery agencies to protect juvenile fish at water diversions. The trash rack bars are spaced about three inches apart which easily allows small juvenile fish to pass through it and enter the diversion. A 30-inch diameter steel pipeline exits the intake structure and transports water about 750 feet to the raceway ponds.

There is a 30 cfs water right for the facility even though it appears to be more water than is necessary for any proposed future operations. There is also a storage building near the raceways which has single phase electrical power serving the facility.



Access Trail to Intake Structure

Access to the intake structure is either down a steep bank to an un-caged ladder (see photo of intake structure on previous page) or along an unimproved trail along the river between the ponds and intake (photo left). The bank is very steep and unstable with recent evidence of soil movement. The condition of the access and questionable ability to improve it due to permitting and constructability concerns will have an impact on project options discussed in more detail later in the report.

Condition of Existing Facility

Supply Pipeline

The existing 30" gravity supply line is an uncoated steel line. It was not possible to determine the wall thickness of the pipe, but it was preliminarily assumed that the wall thickness was $\frac{1}{4}$ " thick. The upper portion of the pipe wall was visible along several portions of the line. The pipeline is essentially 50 years old. It is a gravity line, however, and is not subject to pressure stresses. The pipe line is installed directly at the river water line and is effectively subjected to fresh water exposure 100% of the time. The line has rusted and there has been some significant pitting of the wall in exposed locations.



Supply Pipeline

The following analysis is preliminary in nature. No laboratory or destruction testing was performed. Based on data from the American Iron & Steel Institute (AISI), however, wall thickness reduction due to corrosion could be in the range of 1-2 mils per year. Based on a 50 year historical use, it would be reasonable to expect that the corrosion effects have reduced the wall thickness approximately 50 to 100 mils. Assuming that the pipe wall originally was 250 mils, it may very well be corroded some 20 to 40 percent.

It is recommended that if the pipeline is to serve as the primary intake for the new facility, it should be replaced or lined with an HDPE inner pipe. On the other hand, if the line is left in place as a "back-up" or secondary intake, it should reasonably be expected to perform another 25 years before substantial repair, lining, or replacement is needed.

Concrete Raceway Ponds



Concrete Raceways

The existing concrete raceways were visually inspected. No laboratory or destruction testing was performed. The concrete was coated with moss and algae, but did not appear to exhibit excessive structural damage. There were several localized areas where the concrete had been damaged and rebar was exposed. In addition, there were numerous locations where joint sealants were gone. In general, however, the condition of the concrete appeared relatively good. We believe that with appropriate reconditioning, the existing raceways can function as they were intended.

The following reconditioning program is recommended:

- A. Clean ponds of organic debris, flood bed load, and sediment.
- B. Pressure wash raceway walls and floor to remove moss and algae.
- C. Repair damaged concrete locations with structural grout (mainly adult entrance).
- D. Grout joints and cracked areas.
- E. Apply new protective coating over walls and floor and reseal.
- F. Provide new guide and stoplog structures to assist new pond uses.

The estimated cost to complete this work by a contractor is about \$36,000.00 (see Appendix F for cost breakdown). This estimated amount also includes a small allowance for preparing the ponds for the wastewater treatment requirements discussed in Section 5.

3. FACILITY USE ALTERNATIVES AND WATER REQUIREMENTS

Table 1 - Facility Use and Water Requirements

Facility Use	Criteria	Analysis	Required Flow
Adult Capture	Need to accommodate approximately 1,000 adult salmon (beginning about the last week of August and complete spawning about mid week of October.	Water demand is approximately 1.5 gpm per adult. 1,500 gpm = 3.34 cfs. May need to increase this to 4 to 5 cfs to allow for future expansion.	4-5 cfs
Production of Subyearling Smolts	Need to accommodate approximately 200,000 smolts. Rearing to full term fall Chinook. Release around May.	5,000 lbs of fish. Flow Index = FI FI = (wt/gpm)(inch length) = 1.0 At 4" length, flow would need to be around 1250 gpm = 2.8 cfs	2.8 cfs
Incubation	2.5 million eggs.	60,000 eggs use 6 gpm. Q = (2.5 million/60,000)(6.0) Q = 250 gpm = 0.6 cfs	0.6 cfs
Rearing Facility for Unfed Fry or Presmolts	500 lbs of fish.	Presmolts require about the same amount of water as incubation. Around 250 to 300 gpm = 0.7 cfs	0.7 cfs

From the above analyses, it was determined through discussions with USFWS personnel that an intake design flow of approximately 4-5 cfs was appropriate and would accommodate any reasonably predicted planned use for the facility.

4. FISH SCREENING ALTERNATIVES AND COST ESTIMATES

Introduction

Five fish screening options were developed that meet or exceed fishery agency criteria. Two of the options utilize the existing gravity intake structure and three of the options are pump facilities. There are advantages and disadvantages for each option in terms of costs, operation, construction and operational access, easements, permitting, etc. There is no absolute clear winner but we believe Option E is the preferred alternative for a number of reasons explained further on. We do believe, however, that each option is functional and viable, if for some reason, Option E is not selected for detailed design.

GRAVITY INTAKES

Option A - Static Drum with Air Backwash at Existing Water Intake

This option involves retro-fitting the existing intake structure with an agency approved screen system. The intake structure would be fitted with a bulkhead over the trashrack and a new 21" diameter submerged "tee" screen would be installed to the bulkhead. The screen would be constructed out of stainless steel profile wire with 1.75 mm spacing and have internal flow modifiers to "balance" the flow through the screen. The screen would be cleaned with an internal air burst backwash system operated by an adjustable interval timer to account for seasonal changes in debris loading. New valves and controls would be installed at the raceways or storage building and at the intake.

The main advantage of this option is that it preserves the existing gravity intake system with the proven reliability of a gravity intake. There are, however, a number of disadvantages. First, a compressed air system and supply pipe would be needed from the raceway structure or storage building up to the intake to operate the self-cleaning features of the screen. This means a new access road or highly improved trail would need to be constructed along the river bank to the intake structure. This could be a permitting difficulty. And finally, the intake pipe would need to be re-lined with a 24" diameter inner pipe to serve as the primary intake.

Option B – Rotating Drum Screen at Pond Inlet



Drum Structure to be Located Behind Ponds

This concept would incorporate a new rotary drum screen facility located at the raceway site. Water would be diverted unsorted at the existing intake structure and pipeline. The new rotary drum screen would be provided with a full depth bypass to divert fish back to the river. The advantages of this option are that the existing gravity intake could be preserved and that rotary drum screen systems are a widely used technology. There are a number of disadvantages, however, with this option.

First, the existing pipe would need to be re-lined with this option (as with Option A) to serve as the primary intake. Secondly, it would be difficult to control intake flows (and corresponding water surface elevations) at the rotary drum with fluctuating river levels. An overflow bypass would be needed and a control gate at the intake might likely be required also. Lastly, this option would divert fish down the pipeline before returning them to the river. This aspect would be less favorably reviewed by the Agencies as opposed to any option that has a screen at the point of diversion and keeps fish in the river. (Option A, C, D, & E).

PUMPED INTAKES

Option C - Static Drum Screen with Water Backwash at Pond Site

The existing gravity intake would be abandoned as the primary intake for this option, and a new pumped intake would be constructed at the raceway site. A new 2000 gpm centrifugal pump system would be installed. The pump intake would be supplied with a submerged static drum screen with an internal rotating spray bar to provide a continuous high pressure water backwash cleaning system. The drum would be covered with perforated stainless steel punch plate with 3/32 inch openings. A new concrete wing wall and trash rack would be required to protect the screen. An emergency generator would be installed for reliability in case of power failure. The existing intake structure would be fitted with manually cleaned stainless steel profile wire flat screens to use as a "back-up" emergency intake.

The advantages associated with this option are that access is greatly improved and the existing pipeline would not need to be relined. The option would require upgraded power service, however, as well as corresponding utility easements from adjacent property owners. There is more structural work required in the river than most other options and an additional high pressure water pump is necessary for screen cleaning.

Option D - Vertical Fixed Panel Screen with Water Backwash at Pond Site

The fourth option is a variation of the pumped intake Option C. In lieu of a single 2000 gpm pump (requiring 3-phase power), two vertical 1200 gpm turbine pumps with single phase motors would be installed in a pump vault. This would eliminate the need (and cost) to upgrade the electrical service. Water would enter the pump vault through a flat panel screen array aligned with the stream bank parallel to the river flow. The screens would be constructed out of stainless steel profile wire with 1.75 mm spacing. A back up generator could be installed in case of power failure. The existing intake structure would be fitted with flat screen panels as in Option C and left in place for use as an emergency "back-up" intake. Because the intake diversion is relatively low (3-4 cfs), the new fixed panel screens would basically operate as a passive intake and a continuous cleaning system would not be installed. This is based on the following parameters:

- A. Screen area is increased so that approach velocity is lowered to below 0.2 fps.
- B. The screen face is located along the river bank with good sweeping flow to move debris on downstream.
- C. The existing gravity supply line would be configured and automated to open into the new intake structure and provide backwash flow to the new screen assembly, if necessary.
- D. The facility is maintained daily and the screens can be checked and cleaned manually by the hatchery personnel, if necessary.

Option E - Static Drum Screen with Air Backwash at Pond Site

This fifth option is a combination of the pumped intake in Options D with the static drum system in Option A. The pump vault would be constructed with two, 1200 gpm single phase vertical turbine pumps. The vault intake would be fitted with a bulkhead and a 21" diameter submerged "tee" screen would be installed to the bulkhead. The screen would be constructed out of stainless steel profile wire with 1.75 mm spacing and have internal flow modifiers to "balance" the flow through the screen. The screen would be cleaned with an internal air burst backwash system operated by an adjustable interval timer to account for seasonal changes in debris loading.

A compressor, receiver and controls necessary to operate the air burst cleaning system would be installed in a small shed near the pond intake. A back up generator could be installed in case of power failure. An inclined trash rack would be fitted to protect the fish screen. New walkway gratings would be provided to access the trash rack. The existing intake structure would be fitted with flat screen panels as in Option C and D and left in place for use as an emergency "back-up" intake.

Summary of Options

The following table summarizes the type, location, and method of cleaning for each of the fish screening options.

Table 2 – Summary of Fish Screening Options

	Location	Diversion	Screen Type	Cleaning
A	Existing Intake	Gravity	Static Drum (tee-screen)	Periodic Air Burst Backwash
B	Pond Inlet	Gravity	Rotating Drum	Continuous Water Backwash
C	Adjacent To Pond Site	Single Pump (2000 GPM)	Static Drum with Internal Spray Bar	Continuous Water Backwash
D	Adjacent To Pond Site	Two Pumps (1200 GPM Each)	Vertical Fixed Panel	Manual or Water Back Flush
E	Adjacent To Pond Site	Two Pumps (1200 GPM Each)	Static Drum (tee-screen)	Periodic Air Burst Backwash

Fish Screening Alternatives Analysis

Table 3 – Alternatives Analysis for Screen Options

Intake Option	Advantages	Disadvantages
<p>A</p> <p>Gravity Intake With Static Drum Screen and Air Burst Back Flush at Existing Diversion</p>	<ol style="list-style-type: none"> Utilizes existing intake structure. Maintains gravity intake. Minimal concrete work. Minimal power costs to operate (air compressor for periodic air burst). Provides automated cleaning system with air backwash. 	<ol style="list-style-type: none"> Engineering access improvements Extensive permitting for access improvements. Access improvements questionable Intake remote to Pond site. Tee screen potentially vulnerable to damage in stream. Requires relining of intake pipe. Manual screen cleaning difficult
<p>B</p> <p>Gravity Intake With Rotating Drum Screen at Pond Inlet</p>	<ol style="list-style-type: none"> Utilizes existing intake structure. Maintains gravity intake. Screen facility at Pond site...better access. Cleaning technology tested. Minimal power costs to operate (1/4 Hp electric motor) Power available for motor. 	<ol style="list-style-type: none"> More difficult to control flows. Will likely require orifice flow control at the head gate. Intake remote to Pond site. Requires relining of intake pipe. Agencies reviews not as favorable because this concepts puts fish into the pipe.
<p>C</p> <p>Pump Intake With Static Drum Screen and Water Back Wash at Pond Site</p>	<ol style="list-style-type: none"> Screen facility at Pond site...better access. Good control of flows. Intake pipe relining not required. Provides automated cleaning system with water backwash. 	<ol style="list-style-type: none"> Requires power service upgrade. Pump intake power costs. Self cleaning ability less certain at times of high leaf load. Requires more structural work in the river than Option A or B. Difficult to clean screen manually. Single pump requires generator backup for reliability.
<p>D</p> <p>Pump Intake With Vertical Fixed Panel Screen and Water Back Wash at Pond Site</p>	<ol style="list-style-type: none"> Screen facility at Pond site...better access. Good control of flows. Intake pipe relining not required. Provides extensive screen area ... lower velocities Cleaning system using existing intake water for back flush. Screens can easily be cleaned manually if necessary. Two smaller pumps ... no power upgrade required. 	<ol style="list-style-type: none"> Pump Intake has operational power costs. Requires more structural work in the river than Option A or B. Passive intake does not provide Continuous automated cleaning.
<p>E</p> <p>Pump Intake With Static Drum Screen and Air Back Flush Next To Pond Site</p>	<ol style="list-style-type: none"> Screen facility at Pond site...better access. Good control of flows. Intake pipe relining not required. Provides extensive screen area ... lower velocities. Provides automated cleaning system with air backwash. Two smaller pumps ... no power upgrade required. 	<ol style="list-style-type: none"> Pump Intake has operational power costs. Requires more structural work in the river than Option A or B.

Relative Age & Reliability of Options

Several of the proposed options make use of existing features and structures at the existing hatchery pond site. Other options provide completely new systems. As such, it should be noted that the relative age of some of the systems may differ. Although difficult to specifically quantify, this could affect the useful life and reliability of the screen system and should be considered when evaluating or comparing one option to another. The table below summarizes any existing components being used for each option.

Table 4 – Existing Components

Option	Existing Components
A & B	Utilizes existing concrete intake structure and 30" steel pipeline. These components are approximately 50 years old. The pipe would be relined, but the concrete structure could approach its useful life in the next 25 years.
C, D, & E	All new facilities No existing components used .

Due to the nature of hatchery operations, reliability of the intake is extremely important. Traditionally, gravity intakes are considered more reliable because of the mechanical, maintenance and power outage issues associated with pumped intakes. In this case, however, the reliability of the pumped intake is greatly improved due to redundant pump configurations and emergency generator backup power. Moreover, the proposed pumped intake options make use of the existing gravity intake facilities as a "secondary" intake.

Table 5 – Secondary Intake Ability

	Primary Intake	Secondary Intake
A	Existing Gravity Intake	None
B	Existing Gravity Intake	None
C	New Pumped Intake	Existing Gravity Intake
D	New Pumped Intake	Existing Gravity Intake
E	New Pumped Intake	Existing Gravity Intake

Pumping & Maintenance Costs

All of the options will require a basic amount of maintenance from hatchery personnel. An average of 4 hours per week has been assumed for each of the options. Additional time has

been added to Option A to reflect additional time to travel to the existing intake since it is the only option not at the pond site. The pumping options will also add an electrical power cost.

Table 6 – Estimated Annual Costs

	A	B	C	D	E
Basic Annual Labor Maintenance (based on 4 hours/wk)	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
Basic Annual Parts Maintenance (estimated allowance)	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000
Annual Pumping Power Costs (based on 6 months @ \$0.10/kwh)	---	---	\$3,000	\$3,000	\$3,000
Cleaning System Power Costs (estimated allowance)	\$500	\$500	\$500	---	\$500
Additional Intake Access Time (based on additional 4 hours/wk to access the upper intake)	\$10,000	---	---	---	---
Total	\$25,500	\$15,500	\$18,500	\$18,000	\$18,500

Fish Screening Cost Estimates

A cost estimate was developed for each of the fish screening options and includes design costs. These costs also include allowances for agency consultation, permitting, construction support and project evaluation. These costs are presented in Table 7. A cost summary comparison and detailed breakdown of each option is included in Appendix F.

Table 7 – Cost Estimate for Each Fish Screening Option

	Intake Option	Design & Construction Cost Estimate
A	Static Drum Screen with Air Backwash At Existing Intake	\$283,525
B	Rotary Drum Screen at Pond Inlet	\$294,410
C	Static Drum with Water Backwash at Pond Site	\$294,030
D	Vertical Fixed Panel Screen at Pond Site	\$311,530
E	Static Drum Screen with Air Backwash at Pond Site	\$328,330

5. WASTE WATER TREATMENT REQUIREMENTS

Most fish cultural operations are required to have a permit to discharge hatchery effluent back into a receiving body of water. This is necessary to be in compliance with the Federal Water Pollution Control Act. These permits are authorizations to discharge effluent under the National Pollutant Discharge Elimination System commonly referred to as NPDES Permits. In investigating the background on the Big White Ponds, it was discovered that a NPDES permit was previously issued for the facility. The permit, No. WA-002553-4, was issued in 1979 by the U.S. Environmental Protection Agency (see Appendix H). The only treatment parameter is for "Settleable Solids", with a daily maximum increase of 3.3 ml/l over the incoming value at the intake.

Given the relatively low poundage of fish that has been identified for the facility use in Table 1 (i.e. 5,000 pounds of fall chinook smolts), the Settleable Solids standard should be relatively easy to meet. This can be accomplished through a combination of effluent retention allowing the solids to settle prior to discharge and good management practices relative to limiting chemical application and not overfeeding fish. It is anticipated that no new settling or retention ponds will have to be constructed. There should be sufficient space in the existing raceways for settling purposes due to the relatively low poundage of fish to be reared and the amount of unused pond space remaining. The costs associated with preparing the ponds for settling out solids is about \$2,500 and is included with the cost estimate for reconditioning the ponds discussed in Section 2 (see also Appendix F Cost Estimates).

Typical solids loading rates for normal domestic sewage are in the order of 250 ppm while hatchery effluent loading rates are more typically in the 5-10 ppm range (Bell, P. 155). While a settling area loading rate of 1,000 gpd/sf would be more appropriate for a standard domestic waste treatment clarifier, a loading rate of 5,000 gpd/sf could be used to estimate settling pond area for a hatchery facility. Using the design hatchery flow of 2000 gpm, approximately 500 square feet of settling area would be needed. This would correspond to dedicating approximately 50 linear feet of the downstream end of the rearing ponds for effluent solids settling.

6. PERMITTING AND UTILITY REQUIREMENTS

Permitting Process and Requirements

Summary

Many reviews, permits and approvals will be needed from state, federal and local governments prior to construction of a new fish screen for the water intake. Those permits and the process to obtain them will be outlined below. It is our belief, however, based upon our experience with similar projects and after consultation with staff at the Klickitat County Planning Department who will be the lead permitting coordinator for this project, the necessary permits and approvals can be obtained for project development. Those permits though, may carry some conditions and restrictions impacting construction techniques or timing and may affect or limit the amount of improvement that can be made to some project features such as access to the existing project intake. Those conditions and impacts can only be determined after a formal application is made on a specific project proposal and the reviewing agencies have an opportunity to comment on and condition the permit.

Fishery Agencies

NOAA Fisheries does not directly issue any permits for project construction. They are, however, consulted directly by agencies who do issue permits, specifically the Army Corp of Engineers for the in-water work. The project will not be issued the necessary construction permits until NOAA Fisheries is satisfied with the project design and they have given favorable comments to the CORPS. Therefore, consultation needs to be initiated with NOAA fisheries as the detailed design process begins. This way after the design is completed and the permit applications are submitted, NOAA will have already had their input and essentially pre-approved the design. This can potentially save time and money by not having to make any design changes after it is initially completed and submitted for permits.

The same thing can be said for entering into early consultation with the Washington Department of Fish & Wildlife even though they will be issuing a construction permit (see Klickitat County section below).

Klickitat County

Any development activities in the lower White Salmon River comes under the jurisdiction and authority of the "1996 Klickitat County Shoreline Master Plan" as adopted in 1998 and amended in 2001. The goal of the plan is "to protect the unique and diverse shorelines areas against poor management and destructive usage through a sound comprehensive management program". The plan consists of goals, policies, environment designations, and use regulations; all aimed at controlling development and use of rivers, lakes and wetlands located within the floodplain of associated shorelines. In this case floodplain is defined as extending 200 feet landward from the ordinary high water line.

Prior to project construction a "Shoreline Permit" for "Substantial Development" will have to be obtained from Klickitat County. The county utilizes the "Joint Aquatic Resources Permit Application" (JARPA) process. JARPA is a consolidated permit application form that consolidates several application forms from federal, state and local permits. JARPA is designed to simplify the permit process for water development projects by allowing applicants to complete only one form to be submitted to the necessary permitting agencies. The following permits that will be necessary for project construction that can be obtained through JARPA include:

1. Section 404 permit from the U.S. Army Corp of Engineers
2. Hydraulic Project Approval (HPA) – Washington Department of Fish & Wildlife
3. Aquatic Resource Use Authorization – Washington Department of Natural Resources
4. 401 Water Quality Certificate – Washington Department of Ecology
5. Shoreline Permit - Klickitat County

Once an application has been submitted and determined to be complete, the County will submit the application to the appropriate agencies and the public for comments. If there are no problems and the process runs smoothly, the permits can be issued for construction in three to four months. Prior to Klickitat County reviewing a JARPA application and determining it is complete and ready for agency and public review, it must have a favorable sign off or approval from the Columbia River Gorge Commission (see section below).

Prior to submitting a JARPA application to Klickitat County, it is generally advisable, but not required, to attend a pre-application conference with county staff to review the proposed

project, the project schedule and any developmental alternatives to help ensure the permitting process runs smoothly with minimal delay.

US Forest Service

The lower White Salmon River was designated a "National Scenic River" by the Columbia River Gorge National Scenic Area Act of 1986. Pursuant to the Wild and Scenic Rivers Act, the USFS developed the "1991 River Management Plan" which states general principals for

land and easement acquisitions, types and the amount of use that rivers can sustain without adverse effect to river values, as well as specific measures to be used for river management and shoreline protection. Although the USFS has no ordinances and issues no permits for construction per se, consultation with the USFS on proposed project development can be completed through the JARPA process with Klickitat County.

Columbia River Gorge Commission

The project boundary is also within the jurisdiction of the Columbia River Gorge Scenic Commission. The proposed project will have to be reviewed by them and be found compliant and consistent with their appropriate rules and regulations.

Water Rights

A permit is required to divert water from a stream for any purpose. The hatchery has a water right for the existing diversion intake. If screen option A or B is selected the existing water right will be sufficient to operate the new diversion. If screen option C, D or E is selected for eventual development, it will be necessary to add an additional point of diversion to the existing water right permit. This is normally a relatively easy process.

Water rights in Washington State are administered by the Department of Ecology. The Department has a publication explaining the water rights transfer process in some detail. This publication and application to add a point of diversion are included in Appendix E. This application should not be submitted until agency consultation was sufficiently along to positively identify the screen option selected for development.

Klickitat County Electrical PUD

Klickitat County Electrical PUD was consulted during the study to confirm utility service was adequate for several of the proposed project development alternatives identified. The site is currently provided with single phase service. The PUD will allow motors up to 10 Hp capacity with single phase power. This Hp range is within several of our pump options we identified. The service could be upgraded to three phase if necessary, but additional utility easements would be required from adjacent property owners. In addition, there would be a cost from the PUD of \$17,000 to extend the three-phase service from the nearest source. The details from the PUD have been included in Appendix C.

7. RIVER FLOWS AND FLOOD PROTECTION

Historical River Flows & Preliminary Flood Elevation Evaluation

There is an existing USGS gaging station (14123500) a short distance upstream of the Big White Salmon Pond facility. The data for this station includes exceedance intervals and stage discharge relationships for stream flow which are presented in Table 8.

Table 8 – USGS Flow Data – White Salmon River near Underwood, WA

Exceedance	Flow	Stage (Gage Height)
0.1%	10,000 cfs	10.38'
1.0%	3,500 cfs	6.87'
10%	2,000 cfs	5.60'
50%	1,200 cfs	4.77'
75%	750 cfs	4.15'
90%	500 cfs	3.69'

Based on correlating stream flow gage readings to the existing Big White facility, the top of the existing ponds approximately corresponds to a gage height of 9.15'. According to the USGS gage data, that height corresponds to a flow of 7,220 cfs with an exceedance of 0.06% (19 occurrences in 88 years).

In a separate study conducted by Entrix as part of the Condit Dam removal environmental impact statement, a flood-frequency table was tabulated for the White Salmon River near Underwood based on Annual Maximum Mean Daily Flow (see Table 9 below).

Table 9 – Flood Frequency for White Salmon River near Underwood, WA

Return Period (years)	Flow (cfs)
2	3,900
5	5,900
10	7,300
25	9,100
50	10,500
100	11,900

Options to Control Flooding at the Hatchery Site

According to the flood-frequency data above, the 100 year flood flow would be 11,900 cfs. An approximate corresponding gage height for this flow, based on the USGS stage discharge model is 11.10'. The current top of the existing raceways corresponds approximately to a gage height of 9.15'. Thus the walls of the raceways would need to be raised approximately 2.0' in order to prevent being overtopped by the 100 year flood. This could be done by placing a stem wall on top of the existing pond walls. Reinforcing bar would be tied into the tops of the existing walls, formed up and then an additional 24" of concrete placed on top of the existing walls. This work could be completed by a contractor for about \$48,000.00 (see Appendix F for cost breakdown).

8. FISH SCREEN DRAWINGS

Conceptual drawings have developed for each intake option and are have been included on the following pages. Each drawing depicts a specific option as follows:

Option A – Static Drum at Existing Water Intake

Option B – Rotating Drum Screen at Pond Inlet

Option C – Pump Intake Static Drum Screen at Pond Site

Option D – Pump Intake with Vertical Fixed Panel Screen at Pond Site

Option E – Pump Intake with Static Drum Screen & Air Backwash at Pond Site

9. APPENDICES

Back-up support data for this report has been included in the following Appendices:

Appendix A - Meeting Minutes

Appendix B - Water Resources Data

Appendix C - Electrical Utility Data

Appendix D - Equipment Data Sheets

Appendix E - Water Rights

Appendix F - Cost Estimates

Appendix G - Fish Screening Criteria

Appendix H - Waste Water Discharge Permit