FOR OFFICIAL USE ONLY

RECLAMATION

Managing Water in the West

Value Engineering Study
Final Report

Leavenworth National Fish Hatchery Surface Water Supply

A50-5222-5653-322-02-0-2

Columbia Basin Project, Washington

Conducted in Cooperation with
U.S. Fish and Wildlife Service and
Bureau of Reclamation, Pacific Northwest Region

Department of the Interior

Bureau of Reclamation
Pacific Northwest Region
Boise Idaho

U.S. Fish and Wildlife Service
Leavenworth National Fish Hatchery
Leavenworth Washington

July 25, 2012

FOR OFFICIAL USE ONLY

Table of Contents

Executive Summary

The Value Study Team met on June 25, 2012, for a 5-day study of the Leavenworth National Fish Hatchery Surface Water Supply project. The team developed 13 proposals, which are summarized (in random order) below. Proposal Nos. 1 through 8 were identified by the Value Study Team as items that should be implemented in the "short term" or within the next 2 to 5 years. Proposal Nos. 9 through 13 were identified as long term solutions, and could be implemented within the next 5 to 10 years, depending on National Oceanic and Atmospheric Administration (NOAA) Fisheries compliance screening and passage time constraints.

Proposal No. 1. High-density polyethylene (HDPE) trashracks. The estimated cost of this proposal is $15,600.

Proposal No. 2. Improve ability to direct sediment past and away from the Intake Structure. The estimated cost of this proposal is $295,000.

Proposal No. 3. Replace clean-out valve at existing intake structure. The estimated cost of this proposal is $21,500.

Proposal No. 4. Remove and replace the two most deteriorated sections of pipeline. The estimated cost of this proposal is $150,000.

Proposal No. 5. Reline pipeline (install additional access). The estimated cost of this proposal is $2,887,500.

Proposal No. 6A. Pipe relining to bifurcation. The estimated cost of this proposal is $650,000.

Proposal No. 6B. Pipe installation to bifurcation. The estimated cost of this proposal is $310,000 for gasketed pipe or $670,000 for fused pipe.

Proposal No. 7. Initiate monitoring program to track pipe condition and metal thickness. The estimated cost of this proposal is $12,000 per year.

Proposal No. 8. Tubular trashrack. The estimated cost of this proposal is $68,500.

Proposal No. 9. Install compliant screens or increase surface area of screens (new intake/diversions). The estimated cost of this proposal cannot be determined at this time.

Proposal No. 10. Develop new well for tempering water at inlet. The estimated cost of this proposal is $48,400.

Proposal No. 11. Revisit the Jacobs Design. The estimated cost of this proposal is $5,800,000.

Proposal No. 12. Construct new intake and pipeline at different location. Initial investigations during development of this proposal indicate there are no other options for a location of the intake structure. This proposal was not developed further.

Proposal No. 13. Obtain Wenatchee River Water. The estimated cost of this proposal is $2,506,000.

Note: The cost estimates prepared for this study have been developed for the sole purpose of comparing costs of proposals. The Value Study schedule dictates the time and resources allowed for preparation of cost estimates for each proposal alternative. Therefore, these cost estimates are not recommended to be used for budgeting or construction purposes. At final specification, the Design Team will more accurately quantify costs resulting from acceptance of proposals. If, as a result of the Value Study, a cost estimate is required for appropriations, we recommend that a new total baseline cost estimate be completed.

Value Study Team Members	
Name/Title/Discipline	Address/Phone Number/E-mail
Kevin J. Kramer, PE, AVS Civil Engineer Value Study Team Leader	Bureau of Reclamation, PN-6110 1150 N. Curtis Road, Suite 100, Boise ID 83706-1234 Phone: 208-378-5242 Email: kkramer@usbr.gov
Roger W. Wright Civil Engineer	Bureau of Reclamation, PN-3419 1150 N. Curtis Road, Suite 100, Boise ID 83706-1234 Phone: 208-378-5330 Email: rwwright@usbr.gov
Ben Radchuk Civil Engineer	Bureau of Reclamation, PN-3505 1150 N. Curtis Road, Suite 100, Boise ID 83706-1234 Phone: 208-378-5116 Email: vradchuk@usbr.gov
Steve Acree Geologist	Bureau of Reclamation, PN-3611 1150 N. Curtis Road, Suite 100, Boise ID 83706-1234 Phone: 208-378-5231 Email: racree@usbr.gov
Steve Kolk Wenatchee Sub-Basin Liaison	Bureau of Reclamation 301 Yakima Street, Room 319, Wenatchee WA 98801-2966 Phone: 509-667-8494 Email: skolk@usbr.gov
Travis Collier Assistant Hatchery Manager	US Fish and Wildlife Service 12790 Fish Hatchery Rd, Leavenworth, WA 98826 Phone: 509-548-7641 Email: travis_collier@fws.gov
Greg Clarine Maintenance Leader	US Fish and Wildlife Service 12790 Fish Hatchery Rd, Leavenworth, WA 98826 Phone: 509-548-7641 Email: greg_clarine@fws.gov
Mike Kaputa Director	Chelan County Natural Resource Department 316 Washington St., Suite 401, Wenatchee WA 98801 Phone: 509-670-6935 Email: mike.kaputa@co.chelan.wa.us
Nick Clough Civil Engineer	Bureau of Reclamation, 86-68140 PO Box 25007, Denver CO 80225-0007 Phone: 303-445-3112 Email: nclough@usbr.gov
Scott Weddle Estimator Part-time Team Member	Bureau of Reclamation, PN-3447 1150 N. Curtis Road, Suite 100, Boise ID 83706-1234 Phone: 208-378-5217 Email: sweddle@usbr.gov

Acknowledgement of Consultation Assistant

The Value Study Team wishes to express thanks and appreciation to those listed on the Consultation Record of this report. Their cooperation and help contributed significantly to the technical foundation and scope of the team's investigation and final proposals.

The goal of the Value Method is to achieve the most appropriate and highest value solution for the project. It is only through the effort of a diverse, high-performing team, including all those involved, that this goal can be achieved. This study is the product of such an effort.

Value Method Process

The Value Method is a decision making process, originally developed in 1943 by Larry Miles, to creatively develop alternatives that satisfy essential functions at the highest value. It has many applications but is most often used as a management or problem-solving tool.

The study process follows a Job Plan that provides a reliable, structured approach to the conclusion. Initially, the team examined the component features of the program, project or activity, to define the critical functions (performed or desired), governing criteria and associated costs. Using creativity (brainstorming) techniques, the team suggested alternative ideas and solutions to perform those functions, consistent with the identified criteria, at a lower cost or with an increase in long-term value. The ideas were evaluated, analyzed and prioritized, and the best ideas were developed to a level suitable for comparison decision making and adoption.

This report is the result of a "formal" Value Study by a team comprised of people with the diversity, expertise, and independence needed to creatively scrutinize the issues. The team members bring a depth of experience and understanding to the discipline they represent; and an open and independent inquiry of the issues under study, to creatively solve the problems at hand. The team applied the Value Method to the issues and supporting information, and took a "fresh" look at the problems to create alternatives that fulfill the client's needs at the greatest value.

The team members in the Value Study are a diverse group from Federal and local agencies involved in the project. Further policy and/or design evaluations will be required prior to acceptance of any proposal developed during the Value Study. Decisions for acceptance or rejection of individual proposals will be made through a combined effort between the Bureau of Reclamation Designers, Managers, and various Stakeholders.

Current Description

Background:

Currently the Leavenworth Hatchery obtains their supply water from the existing diversion dam and intake at River Mile (RM) 4.5 on the Icicle Creek. This intake is a shared diversion that also provides irrigation water for the Cascade Orchard Irrigation Company (COIC). The combined water right is 54 cfs, (42 cfs to the hatchery and 12 cfs to COIC). The existing diversion dam is an across the river, cobble, and concrete weir structure with the intake channel located on river bank left. Gravity flows passes down the intake open channel through a V-shaped steel trashrack and continues downstream into the intake structure via a 30” slide gate into a 30” diameter pipeline (Station 2+76.57).

The 30” pipeline continues along the Icicle Creek left bank downstream to the bifurcation point located just upstream of the Icicle River Recreation Vehicle (RV) Park (Station 15+38.26). At this location, the flow bifurcates through a 24” diameter wedge gate valve and into a COIC 3’-8” diameter drum fishscreen with 12 cfs going to the COIC 24” steel pipe that empties eventually into an open ditch to provide water to COIC users further downstream on the system.

At this same bifurcation point (Station 15+38.26), the Leavenworth Hatchery water supply enters a 30” pipe that continues downstream to the Screen Settling Basin (approximate Station 56+91). Past examinations of this intake pipe indicate advanced deterioration of the pipe and replacement is required.

Current Conditions:

A video inspection of the pipeline was performed in 2012. This inspection revealed that the existing mortar lined steel pipeline has experienced some deterioration of the lining. In some sections, the steel pipe was visible.

It has been reported by hatchery personnel that as the creek water temperature drops to around 34-35^{o}F with concurrent air temperatures of 18^{o}F or colder, icing of the intake screen begins to be a problem. The severity of icing that is experienced is dependent on many factors, such as the duration of the cold temperatures, the corresponding creek flow when the low temperatures occur, the condition and extent of ice already in the creek when low temperatures occur, and even whether there is cloud cover or not when the low temperatures occur. But the hatchery’s experience has been that 3 to 5 times per year, during December to February typically, personnel must manually remove ice from the intake screen to maintain flow to the hatchery. During the cold weather periods the hatchery can get by with lower water flow then during normal operation. Instead of the normal 42 cfs hatchery supply flow, a flow of 20 cfs is sufficient to maintain operation on a short term basis, and a flow as low as 10 cfs can be enough to sustain hatchery operations in survival mode.

Several sources of tempering water were investigated. The initial thought was that well water would be available for use. The hatchery has seven water supply wells that normally are used to supply water to the nursery building. The hatchery has been experiencing a decline in the aquifer levels of all of these wells, but more so with the shallower wells 1, 2, 3, and 7. As a result, use of the existing wells is reserved for supplying the nursery building. Drilling of a new well for use as a tempering water well is not a viable option, as it would pull from the same aquifer and negatively impact the existing wells. Consequently, direct use of well water is not an option.

A second source of tempering water involves the use of the well water, but in a non-consumptive way. The well water could be used to heat part of the hatchery supply water in a heat exchanger. The cooled well water would be sent on to the nursery, and the warmed river water returned to the intake screen. In discussions with hatchery personnel, it was thought that using the discharge water from Wells 5 and 6 would be the best source under this scenario, as these wells are the most reliable and are used most often. 1400 to 1800 gpm is typically supplied from these two wells to the nursery building, at a temperature of about 50^oF. It was also thought that lowering the temperature of this well water to 42 – 44^oF would be a benefit to the nursery. Upon further discussion it was concluded that during the months of December to February when the tempering water may be needed, the nursery actually needs warmer water. However, for the short time periods when tempering water is needed the nursery could get by with cooler well water. If this water were to be used, it would also be necessary to bring the system on and off line slowly, over the course of 6 to 8 hours, to prevent thermal shock stress to the eggs and fish. There was also concern that over the long term this scenario ties the supply of tempering water to the continued viability of Wells 5 and 6, and there is no way of knowing if these wells will be productive in the long term. As a result of the concerns mentioned above, the use of Wells 5 and 6 water is not considered one of the better tempering water supply options, and will not be considered further at this time.

A third source of water considered is the nursery discharge water. During operation, the nursery can receive 1200 to 4000 gpm of well water that is used for the egg tray stacks and the indoor rearing troughs. During the winter months when icing is a concern, eggs have typically hatched and there are fry in the indoor troughs, so nursery flows will be in the upper end of this flow range. This water exits the nursery at around 47 – 48^oF. There is an existing reuse pump station that can pump this water to the head box at the upper end of the 10x100 raceways, and it has been used to de-ice these raceways during cold weather. An initial proposal was that this water be diverted directly to the new intake screen. During a review meeting at the hatchery, fish health personnel expressed the opinion that reuse of this water directly at the intake screen would require that the water be disinfected at a minimum, and perhaps screened prior to disinfection. Another option is to use this water to heat part of the hatchery supply water in a heat exchanger and return the warmed water to the intake screen. The nursery discharge water would be returned to either the screen chamber or a hatchery drain line. Use of the nursery discharge water appears to be the best option for generating tempering water, and will be discussed in greater detail below.

Another option considered to supply tempering water was to heat part of the hatchery supply water in propane-fired boilers and route the heated water back to the intake screen. For this option, condensing boilers were considered due to the cold temperatures of the water involved. Because of limitations on the size of condensing boilers available, multiple boilers would be needed, and because of the condensation that would occur in the boiler, a gas-fired boiler would be used. As natural gas is not available at the hatchery, propane-fired boiler would be used. This would require rather large propane tanks to store enough fuel so that frequent deliveries would not be required from the supplier in Wenatchee, and to provide adequate surface area to vaporize propane at the rate required to serve the boilers. The need for large propane tanks, and for arranging fuel deliveries, made this option undesirable for the hatchery staff, and so it was dropped from further consideration.

The existing gate house structure, located at the inlet to the pipeline at Icicle Creek, is the original construction. This gate house is structurally unsound and is in danger of collapse. Consideration should be given to replace this structure.

The trash racks located within the gate house experience icing during the winter months. Frazzle ice is prominent, and may cause problems providing the required water supply to the hatchery. The pipeline and intake operate year-round, with very short periods of time available for dewatering to conduct repairs.

Previous Value Studies:

In November 2009, a Value Engineering (VE) Study was conducted on the planned Hatchery Intake Replacement Project. This project proposed constructing a pumping plant just upstream of the intake to the Icicle Channel. This project reached the 65% final design and was abandoned (refer to VE Final Report, Leavenworth Hatchery Intake Replacement, dated December 1, 2009).

In March 2004, a Value Engineering study was conducted on the Icicle Creek Restoration Project, Phase 2. This project proposed constructing a fish ladder at Structure 2 and a fish barrier, trap, and sorting facility at Structure 5 in the historical channel for Icicle Creek. The design of this project was completed; the solicitation issued; and then put on hold pending resolution of the litigation on a separate but related project undertaking by U.S. Fish and Wildlife Service.

In November 2003, a VE Study was performed by Jacobs Engineering (Intake and Water Delivery System Rehabilitation).

The objective of this VE Study is to identify options for rehabilitating and/or re-using the existing gravity flow pipeline as much as possible to obtain an additional 10 to 20 years of use.

Figure C-1. General Arrangement

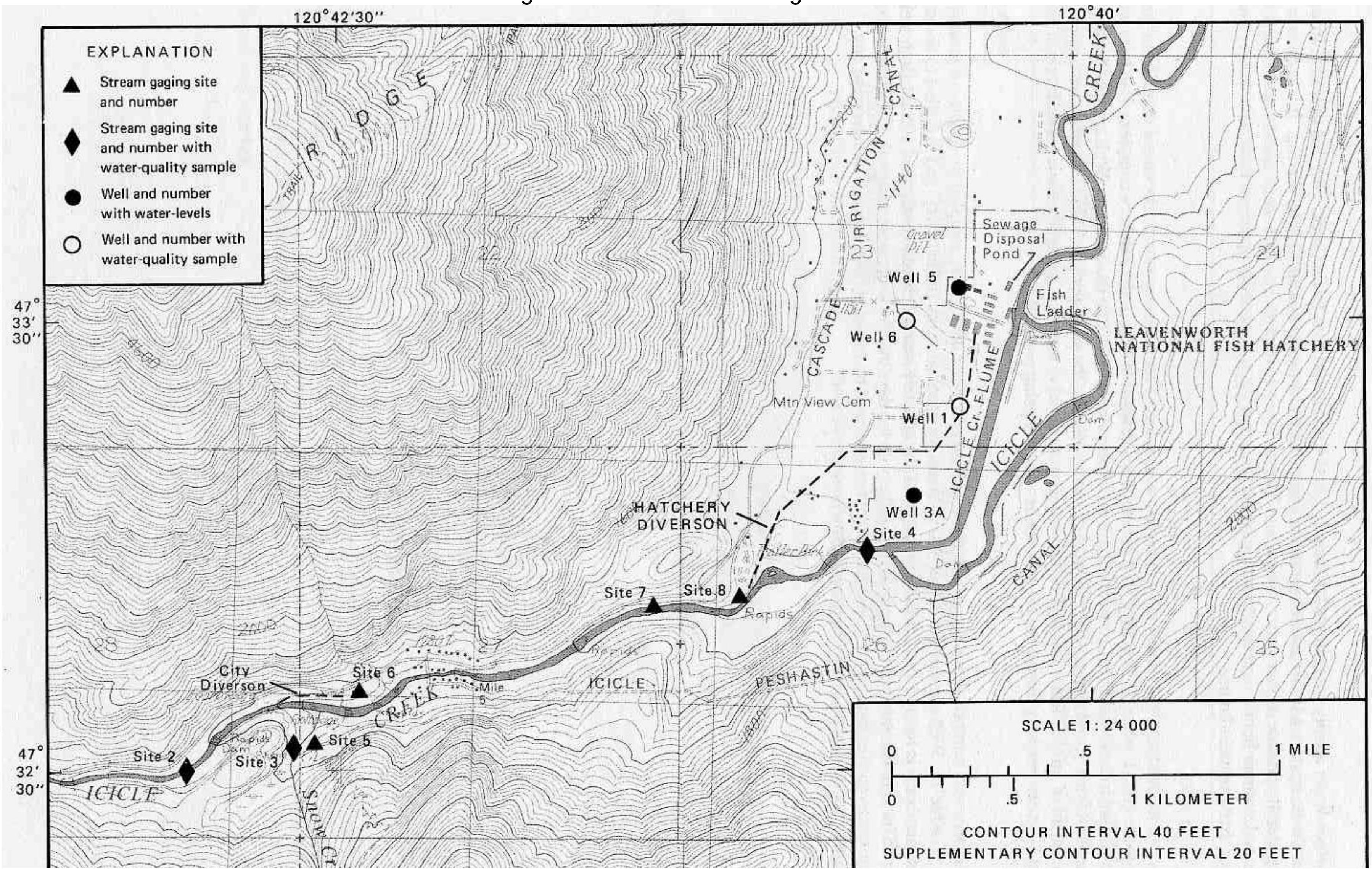


Figure C-2. Site Plan

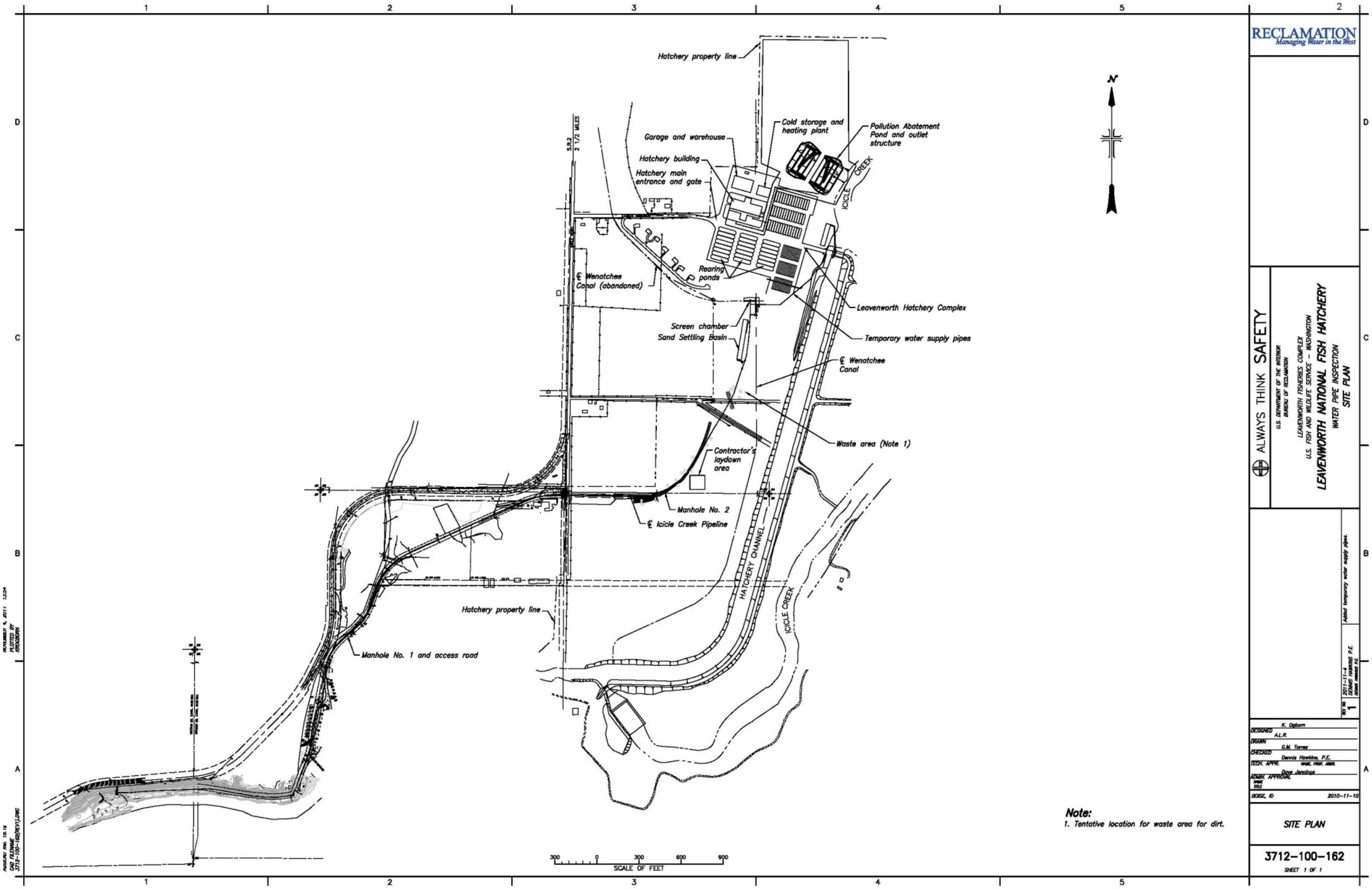


Figure C-3. Water Supply Schematic

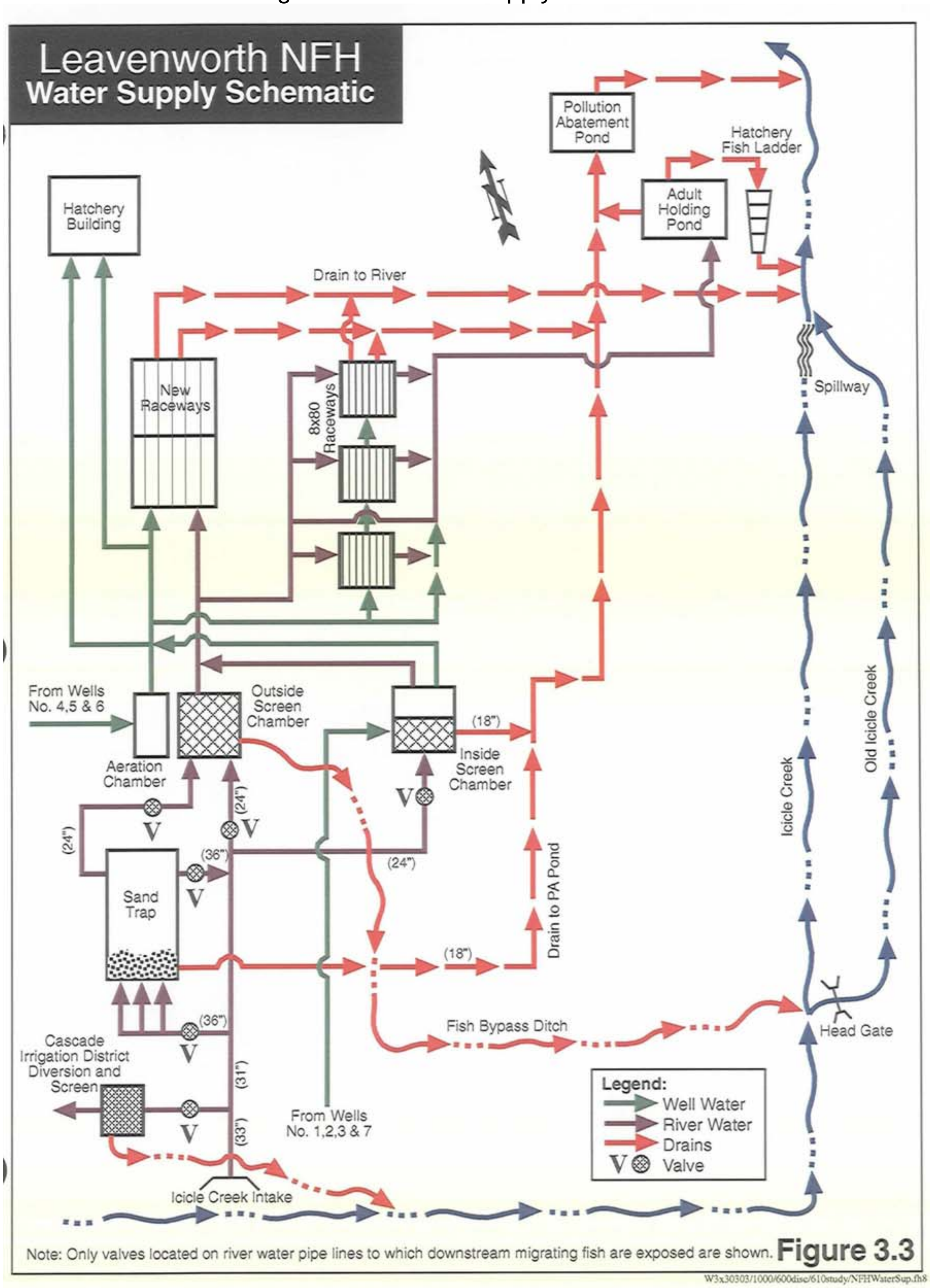
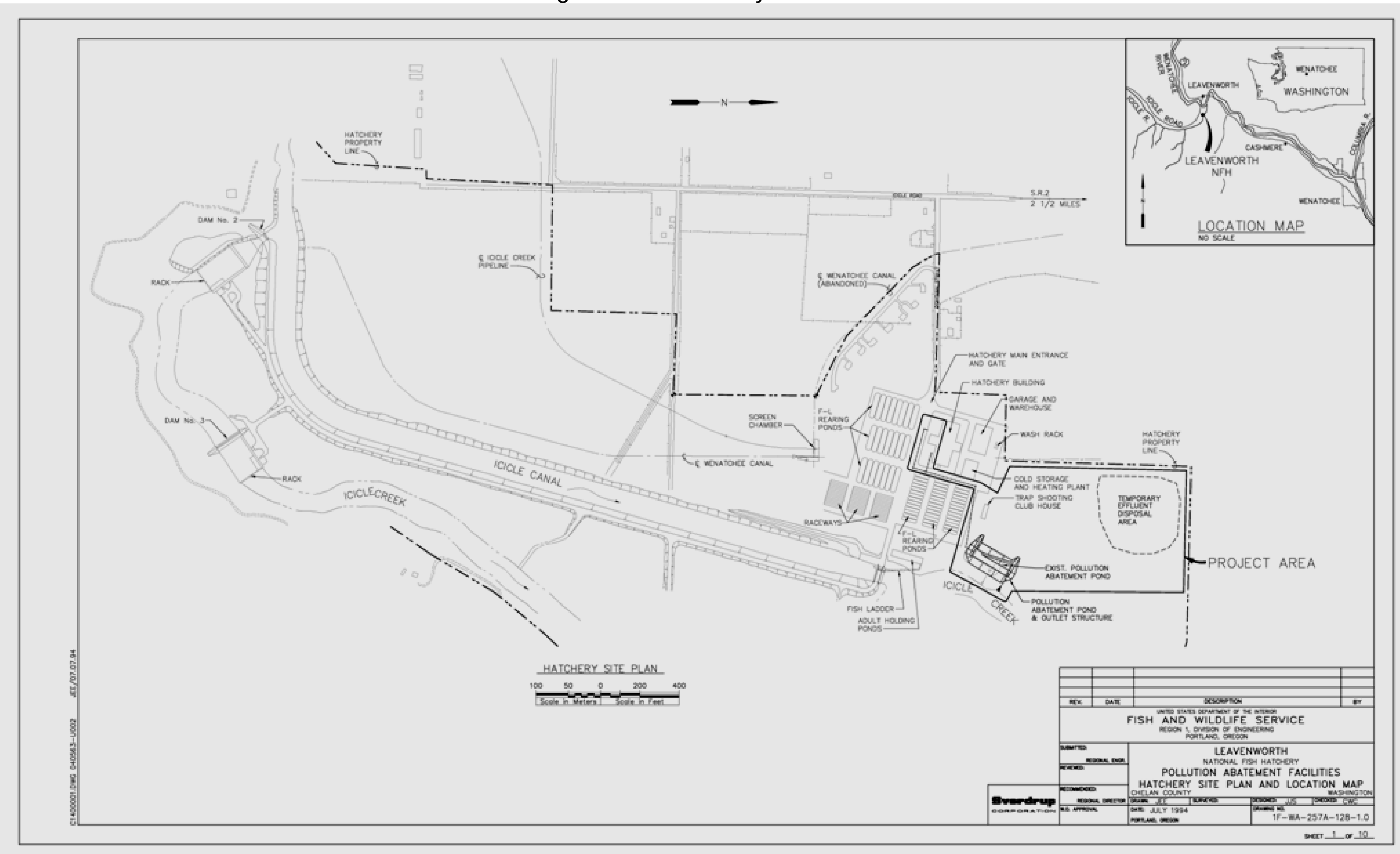


Figure C-4. Hatchery Site Plan



Restrictions and Limitations
Maintain water deliveries to the hatchery; non-irrigation season work (October – May); work in RV Park limited to October – May; Coordination with local land owners (Sleeping Lady).

Owner, Users, and Stakeholders List Identification and Issues Determination	
Owner (Identification of the owner or owners)	Owner Issues (Identification of issues important to every Owner)
U.S. Fish and Wildlife Service	Reliable water delivery system; maintain operation; meet regulatory agency requirements.
User (Identification of the user or users)	User Issues (Identification of issues important to every user)
U.S. Fish and Wildlife Service	Fish rearing; reliable water delivery.
Cascade Orchard Irrigation Company	Water deliveries.
Yakama Nation	Subsistence and ceremonial fishing; fish production.
Colville Confederated Tribes	Subsistence and ceremonial fishing; fish production.
General public/special use permitees	Recreational opportunities; educational opportunities.
Stakeholder (Identify of the stakeholder or stakeholders)	Stakeholder Issues (Identification of issues important to every Stakeholder)
U.S. Fish and Wildlife Service	Reliable water deliveries; fish rearing; continued operation; fish harvest; public education.
Bureau of Reclamation	Continued operation; mitigation for Grand Coulee Dam.
Yakama Nation	Subsistence and ceremonial fishing; fish production.
Colville Confederated Tribes	Subsistence and ceremonial fishing; fish production.
Sleeping Lady Resort	Minimize property disturbance; continued sharing of information; minimize disruption to operation.
Icicle River RV Resort	Minimize property disturbance; continued sharing of information; minimize disruption to operation.

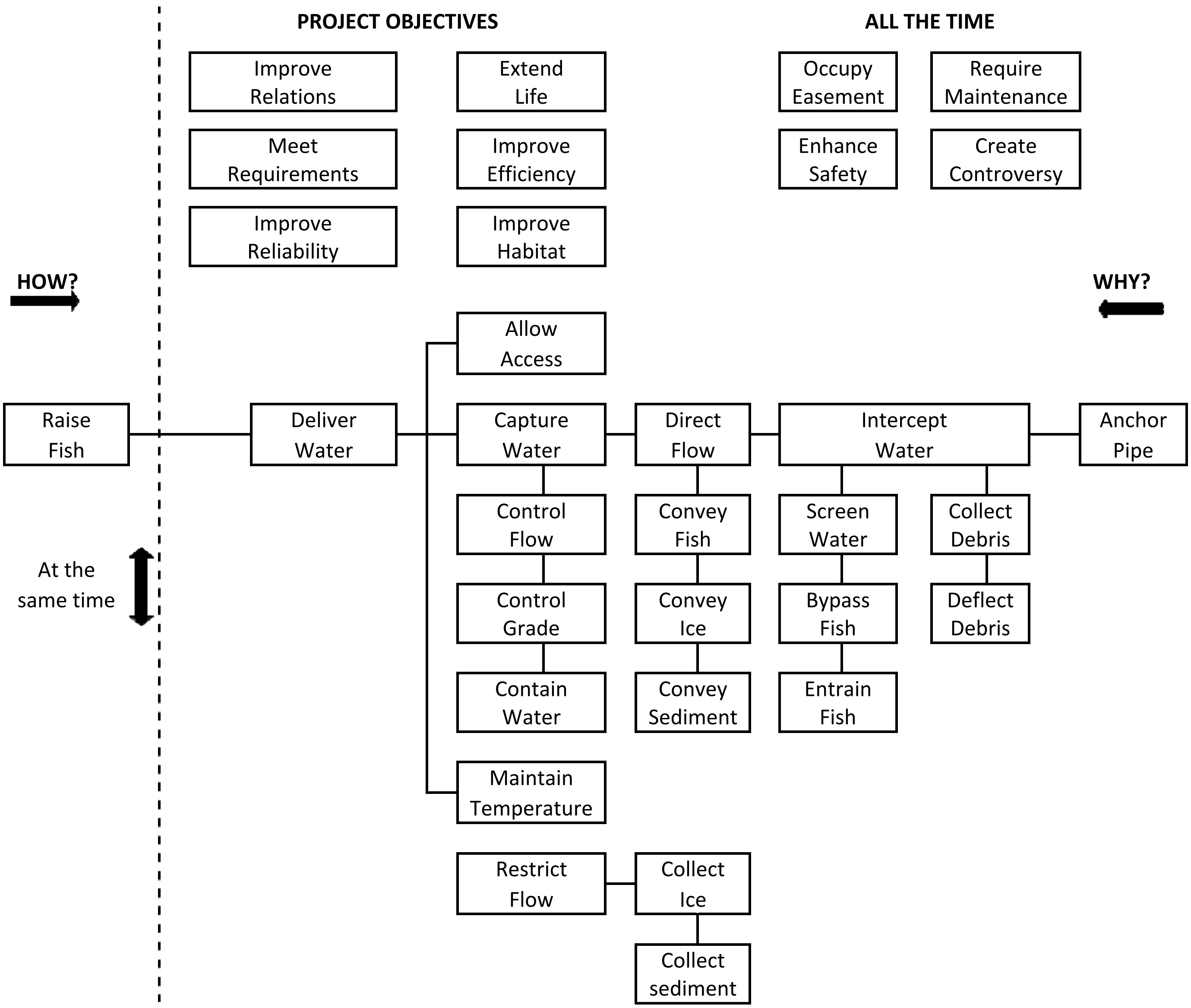
Function Analysis System Technique (FAST)

The Value Study Team used the function analysis process to generate a Function Analysis System Technique (FAST) diagram, designed to describe the present solution from a function point of view. The FAST diagram helped the team identify those design features that support critical functions and those that satisfy noncritical objectives. The FAST diagram helped the team focus on a common understanding of how project objectives are met by the present solution.

Component	Active Verb	Measurable Noun
Intake	Intercept	Water
	Screen	Water
	Entrain	Fish
	Bypass	Fish
	Capture	Water
	Deflect	Debris
	Collect	Ice
	Anchor	Pipe
	Require	Maintenance
	Control	Flow
	Control	Grade
	Allow	Access
	Collect	Sediment
	Restrict	Flow
	Create	Controversy
Pipeline (from intake to 1st valve above sand settling basin	Direct	Flow
	Convey	Sediment
	Convey	Fish
	Convey	Ice
	Occupy	Easement
	Create	Controversy
	Allow	Access
	Contain	Water
	Maintain	Temperature
Complete gravity flow delivery system	Delivery	Water
Project Objectives	Improve	Reliability
	Extend	Life
	Meet	Requirements
	Improve	Relations

Component	Active Verb	Measurable Noun
	Improve	Efficiency
	Enhance	Safety

F.A.S.T. Diagram



Proposal No. 1. HDPE Trashracks

- Proposal Description: Replace current intake trash racks with plastic HDPE trashracks to alleviate icing on existing metal trash racks. Currently, Leavenworth National Fish Hatchery (LNFH) experiences periods of extreme cold weather, lasting an average of 1-3 days and occurring an average of 3-5 times per winter, which result in the accumulation of frazil and anchor ice on the intake trashracks. Manual removal of the ice is necessary to keep water supplied to the LNFH and is accomplished using LNFH staff. This task requires two personnel constantly for the duration of the cold weather episode.

- Critical Items to Consider: To be successful, a new trashrack would need to screen trash and debris under normal operating conditions and resist formation of frazil and anchor ice during extreme cold weather events. Manufacturer's specifications claim elimination of anchor and frazil ice formation and brittleness resistance to -100 F.

- Ways to Implement: Current configuration includes two trashracks, one outside at the head of the intake and one inside the intake building at the entrance to the pipeline. The outside trashrack is approximately 10' wide by 15' high. The inside trashrack is approximately 8' wide by 11' high. Bars on the outside trashrack are on 6" spacing while on the inside trashrack the gaps between bars are 1 1/4". This proposal assumes replacing the two racks with similarly configured HDPE trashracks, but it may be possible to utilize only one trashrack in the future. Estimate below is for both trashracks. Due to lightweight nature of HDPE, the trashrack must be well anchored. Replacing only one trashrack is a conservative approach that would allow removal of the HDPE trashrack if icing occurs.

Advantages	Disadvantages
• Cost effective way to reduce maintenance costs. • Proven durability at Reclamation facilities (20 yrs at Black Canyon, 9 yrs at Boise River Diversion).	• PN Region experience with this type of product does not include the extreme cold weather experienced at LNFH. • If ice forms on new trashrack, manual removal of ice is likely to damage the HDPE trashrack.

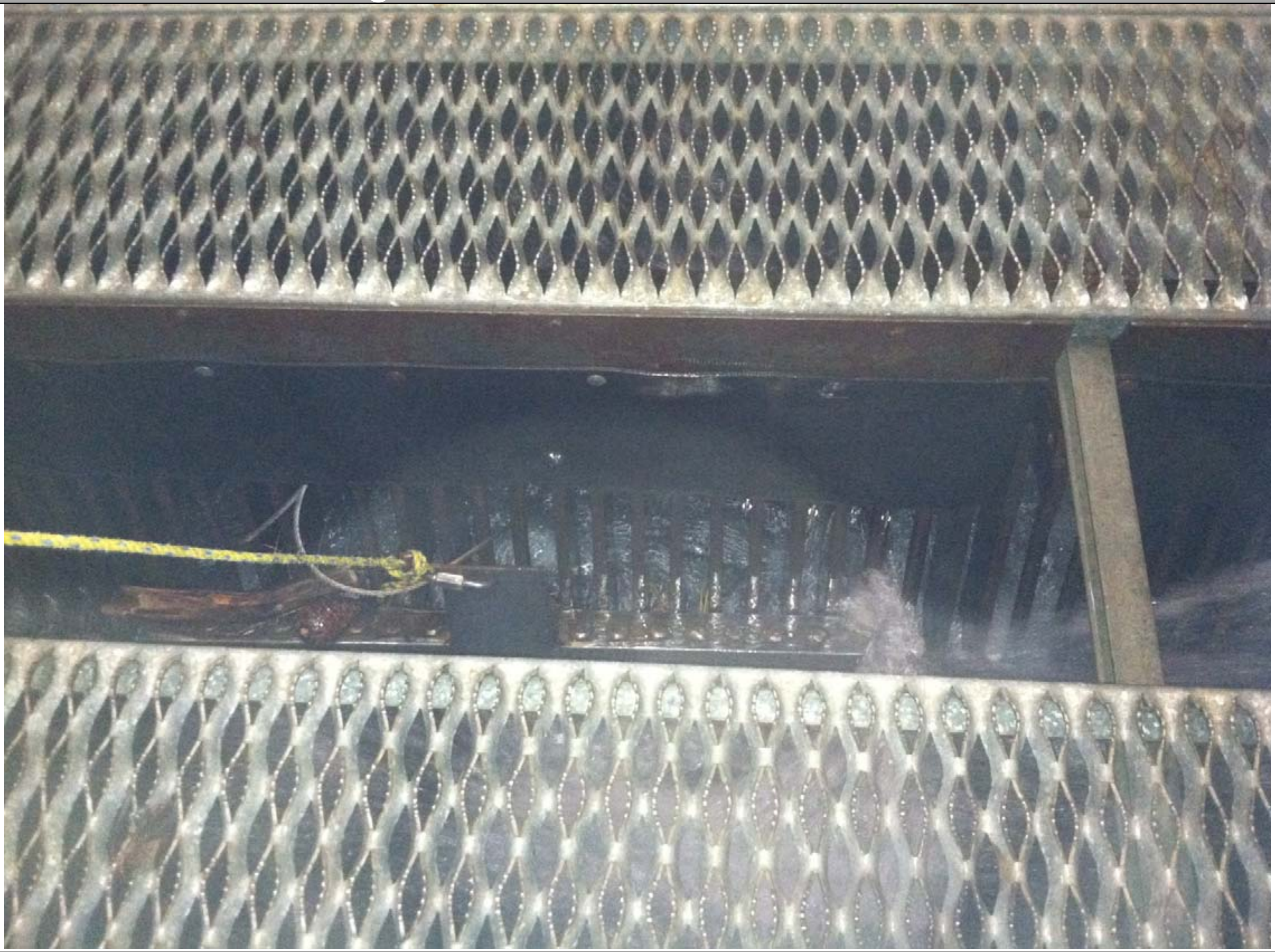
Potential Risks

Failure to meet performance regarding ice formation.

Cost Item	Initial Costs
Value Concept	$15,600

Figure 1-1. Exterior Trashrack

Figure 1-2. Interior Trashrack



Proposal No. 2. Improve Ability to Direct Sediment Past and Away From the Intake Structure

- Proposal Description: Construct wall at the intake to direct bed-load sediment away from intake opening and improve the ability to sluice downstream.

- Critical Items to Consider: The existing sediment load is substantial and presently settles out in the sand-sedimentation basin. This sediment load is the major cause of the deterioration of the existing concrete cylinder pipe and is a continuous maintenance cost. At high flows the sand-sediment basin can receive a lot of sediment in a short period of time according to Hatchery Staff. A large pile of sediment is stockpiled next to the building. The need to cofferdam a portion of Icicle Creek for construction could be a permitting problem.

- Ways to Implement: Perform a numerical model of the proposed configuration of the wall necessary to divert and sluice the sediment as part of design. Cofferdam the area near the intake and dewater a portion of Icicle Creek. Build the necessary wall and sluicing structure when the flows are low in the Creek. Consider the maintenance needed to operate the sluice and fish ladder as part of the design. Existing fish ladder can act as a sluice when the boards are pulled, but if the boards are left in, the ladder can build up with sediment. Existing gate used for sluicing is not functioning and should be fixed or replaced.

Advantages	Disadvantages
• Remove the continued abrasion from the sediment on the concrete cylinder pipe. • Reduce removal of sediment at the sand-sedimentation basin and intake building structure. • Will bypass the bed-load sediment.	• Need to temporarily dewater a portion of Icicle Creek during construction. • Will not capture the suspended sediment load. • Potential rock excavation.

Potential Risks

- High flows during construction.
- Inability to obtain permits for construction for dewatering and cofferdam.

Cost Item	Costs
Value Concept	$295,000

Figure 2-1. Intake Structure and Fish Ladder

Figure 2-2. Sediment Extracted From Sand Settling Basin

Proposal No. 3. Replace Clean-Out Valve at Existing Intake Structure

- Proposal Description: This is a personnel safety issue. Over time the valve stem has been bent, straightened, re-bent and the stem has fatigued to the point that it bends more easily each time some debris becomes stuck in the area of operation causing improper operation. At present, when the water conveyance channel to the intake structure fills with sediment, we have to flush the sediment through the channel in the intake structure by shutting the valve to the supply pipeline and removing dam boards we use to control the amount of water going to the supply pipeline forebay to allow water to flush sediment freely through the channel on downstream. In this operation with the clean-out valve closed, the sump in the bottom of the channel that directs water to the supply pipeline forebay fills with sediment if we don’t open the clean-out valve. The forebay is approximately 10’ deep and a ladder is used to access it to clean out the sediment blockage, usually two crew members with shovels. When the sediment blockage is freed, the forebay fills quickly and presents a dangerous situation with crew members scrambling up the ladder to escape the in rushing water. It is imperative that this be addressed immediately.

- Critical Items to Consider: To have the capability to de-water the delivery channel and the intake structure to install a new valve, stem, and actuator, channels for stop logs (dam boards) must be installed on the upstream face of the concrete structure that contains the trashrack next to the fish ladder and diversion dam. Currently the sediment blockage is relied upon to hold while the forebay is de-watered. Relying on the blockage to accomplish any work done on the valve creates the risk of injury. Replacement of the valve and installation of stoplogs will enhance the safety of the employees.

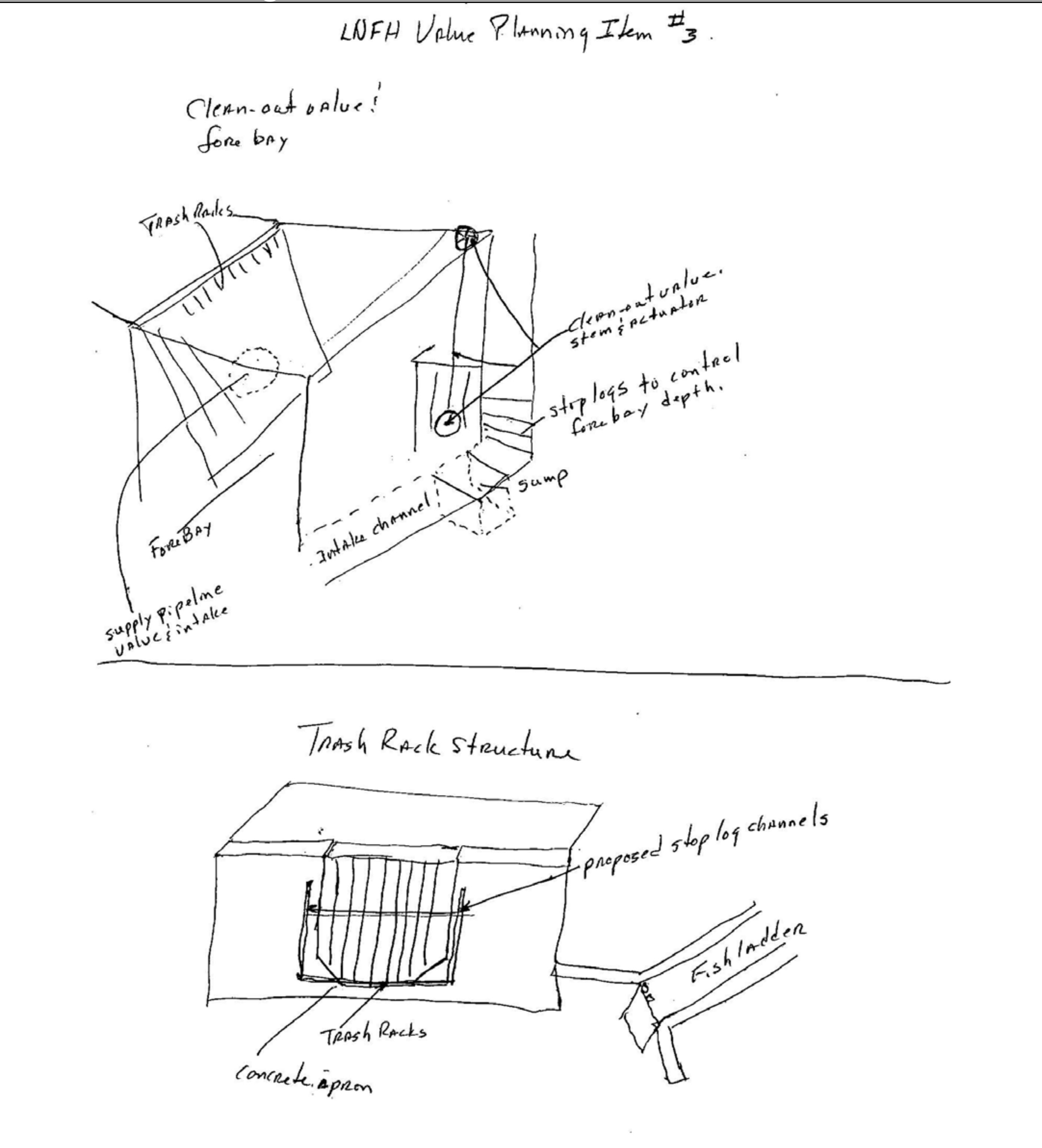
- Ways to Implement: The slide gate itself may not have to be replaced, but complete replacement would be ideal. At the least, the valve stem needs to be replaced and a valve stem support attached to the wall to maintain the integrity of the valve stem by preventing bending and maintaining smoother operation. The cost for the stoplogs is an approximation and the costs for the clean-out valve replacement or repair were done by Five Rivers Construction in the spring of 2011.

Advantages	Disadvantages
• Reduce the risk to crew members safety. • Reduce sediment in the forebay, thus reducing scouring effects on the supply pipeline.	• None Identified.

Potential Risks
None Identified.

Cost Item	Initial Costs
Value Concept	$28,000

Figure 3-1. New Clean-Out Valve



Proposal No. 4. Remove and Replace the Two Most Deteriorated Sections of Pipeline

- Proposal Description: In 2008 and 2012 video inspections of the existing concrete cylinder pipe (CCP), which supplies water to the hatchery from Icicle Creek, were performed. The inspections showed continuous steel liner exposure of approximately 1" to 4" wide along the invert where the interior mortar lining had deteriorated or broken off. Cracking of the remaining mortar lining was present, as well as metal exposure in the pipe joints. Although all of these conditions will eventually need to be addressed, they are likely non-critical at this time. There were, however, two areas of the pipe where the rebar mat was exposed indicating a much more serious condition that could eventually result in pipe failure. An 8' section of pipe was found near the sand settling basin approximately 2' upstream of where the manifold pipe intersects the main pipe. The other location was at the bifurcation point where the irrigation pipe intersects the main pipe downstream of the intake. This 6' section also showed exposed rebar and is on the main pipe directly at the intersection point of the two CCPs. The proposal consists of excavating pipe in these two locations, removal of bad pipe sections, and installing new pipe. New pipe to be on the same alignment of existing pipe.

- Critical Items to Consider:
  1. The exposed rebar mats do not seem to match the wrapped-wire reinforcement spacing of the CCP (the 2012 inspection required coring of the pipe, which showed the CCP cross section). There are also no reliable as-builts, which describe the pipe configuration and construction at the bifurcation and manifold intersection points. This variation may indicate that a different pipe section was used in these two locations and is significant because proper sizing of the replacement pipe and required joints may be difficult to achieve without further investigation of current conditions and as-built drawings.
  2. It will also be necessary to determine if any other current pipe conditions require repair at this time to minimize mobilization costs and community impacts. Our review was based on the assumption that only those two sections of pipe are in need of immediate repair, but does not mean this is necessarily true.
  3. Replacement pipe material. CCP may or may not be the best option, and this decision will also influence overall costs.
  4. Dewatering may be required for access to existing pipe and new installations. Geological investigations may be necessary to determine current groundwater levels.
  5. Existing utilities or pipelines in vicinity of two replacement sections. Unaccounted for items may result in differing site conditions and increased costs or project delays. Only a 1-week period at the end of April is allowed for pipeline shutdown, so delays would endanger necessary hatchery operations.
  6. Most practical construction access to bifurcation point (sand settling basin on hatchery property so access not an issue). Although an easement is currently in place, recent manhole installation project demonstrated that designed manhole access points were not practical and required modification.

  7. Locations of existing CCP joints which may require slightly more pipe replacement than

Proposal No. 4. Remove and Replace the Two Most Deteriorated Sections of Pipeline

just the deteriorated sections. It will not be practical to replace only the 6' or 8' sections if an existing joint is nearby, due to uncertain conditions or stability of CCP joints.

- Ways to Implement: Research and investigate to confirm unknowns, including dimensions of adjacent pipes in satisfactory condition to be sure of required tie-ins when replacing two pipe sections, groundwater levels, and other pertinent existing conditions which may influence design or construction. Design replacement sections with tie-ins. Perform work required to replace two bad pipe sections: most likely a straight 8' long pipe section near the sand settling basin and full replacement of the CCP intersection at the bifurcation point (location of existing pipe joints may influence exact quantities).

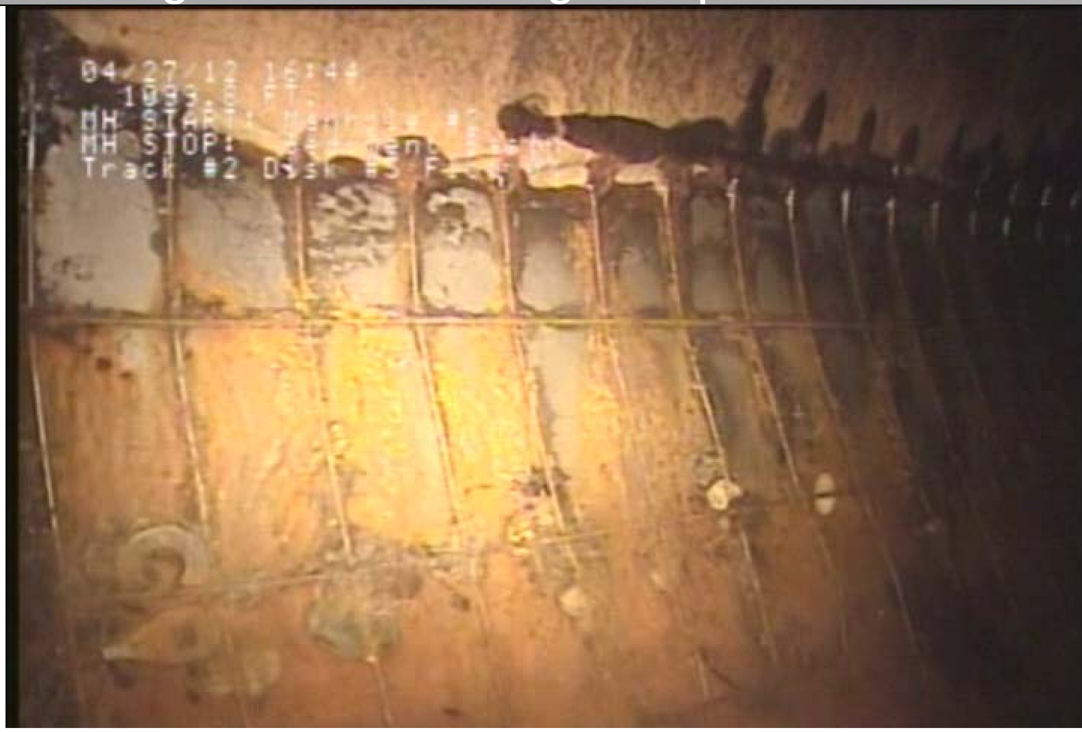
Advantages	Disadvantages
• Prevent pipe failure. • Buys more time to address more extensive hatchery water supply needs. • Relatively low cost. • No need to obtain land easements as replacement pipe will be on existing pipe easement. • Proposal likely supported by community. • May not require lengthy environmental compliance process required for larger projects (NEPA).	• Unknown existing pipe dimensions and sections. • Does not address other CCP sections which may require repair in future. Monitoring of remaining pipe recommended. • Does not address other water supply concerns, such as intake modification or replacement. • Initial Cost based on reinforced concrete pipe as replacement material. Other material likely to influence cost further.

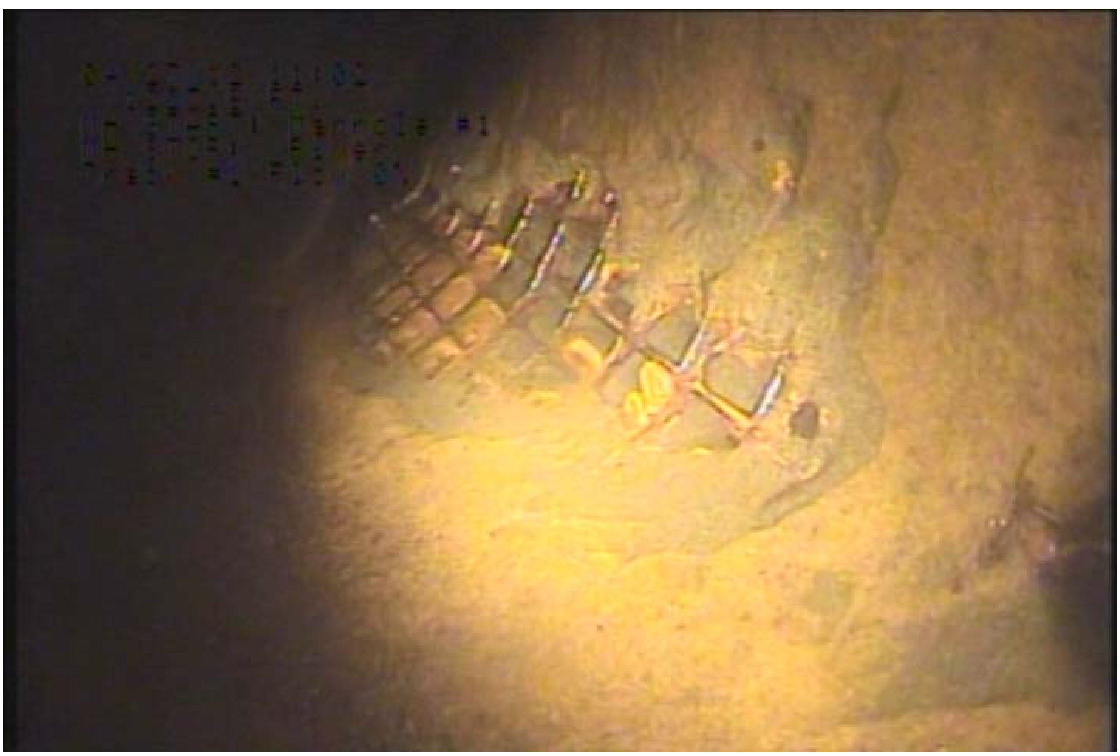
Potential Risks

None Identified.

Cost Item	Initial Costs
Value Concept	$150,000

Figure 4-1. Damaged Pipe Sections





Proposal No. 5. Reline Pipeline (Install Additional Access).

- Proposal Description: Reline existing 7,000' of CCP (no-dig solution). Addition of five manholes for access would be required. The relining effort could be accomplished with a balloon type of installation (deflated to place in existing pipe, then inflated to adhere the lining material to the pipeline). Refer to Figure 6A-1. The diameter of the existing pipeline has to be determined to ensure the manholes will fit.

- Critical Items to Consider: Requires access approximately every 1,000' with 24" diameter opening. Longer distance between accesses requires different install procedure (more expense). Cost compare with installing less manholes.

- Ways to Implement: Install up to five manholes; contract with a "no-dig solution" company. Three potential companies exist in Northwest (WA, OR, MT).

Advantages	Disadvantages
• Following manhole installation no other excavations needed along easement. • 50 year life in sewer applications.	• None Identified.

Potential Risks

None Identified.

Cost Item	Initial Costs
Value Concept	$2,887,500

Proposal No. 6A. Pipe relining to bifurcation.

- Proposal Description: Cured in-place pipe (CIPP) (1,300 LF) from intake to COIC bifurcation. This concept is to reline the existing pipe using the cured in-place pipe technique. This section of pipe is considered to be in poorer condition than the rest of the pipe possibly as a result of the sediment and frazil ice intercepted from the nearby intake structure.

- Critical Items to Consider: This proposal only addresses the section of the pipeline from the intake to the COIC bifurcation. The overall pipeline may include sections that re-lining would benefit (see proposal 5 above). Installation of additional manholes may be necessary for access.

- Ways to Implement: Contractor installed.

Advantages	Disadvantages
• Improves reliability of the pipeline. • Extends pipeline life. • Improves pipe hydraulics. • Low impact to hatchery operations. • Relatively simple and quick installation.	• Negative public perception of retaining outdated system. • Unknown bend locations and angles of existing pipe may affect installation. • Temporary water source during construction would be required. • Access to the pipe at the intake may be difficult.

Potential Risks

Dewatering at the intake structure is an unknown cost.

Cost Item	Initial Costs
Value Concept	$650,000

Figure 6A-1. Cured in-place pipe explanation

This method restores the structural integrity of the pipe, eliminates infiltration and in many cases, increases the hydraulic capacity of the original pipe. The technology can be used of complete manhole-to-manhole-repairs or located point repairs.

Once steam is applied, a cured-in-place liner forms a thin, high strength, protective wall around the inside of a deteriorating pipe.

Materials and Technology

The composite materials used are comprised of Polyethylene mat and/or fiberglass strand reinforcements impregnated with a thermosetting resin. Installation of the un-cured liner can be by the Pull-in-Place method or by Water Inversion method.

Pull-in-Place Installation

When using the Pull-in-Place method for installation, the liner is drawn into the existing pipe by means of a winch cable. With the ends of the liner sealed, the liner will be expanded by air and/or steam pressure for curing the composite. Pressure is maintained until the liner cure is complete.

Water Inversion Installation

For installation by Water Inversion, the liner is inserted through an existing manhole by means of an inversion process using water with an application of hydrostatic head sufficient to fully extend it to the next designated manhole or termination point.

The liner is inserted in the vertical inversion standpipe so that a leak proof seal is created. The inversion head is adjusted to a sufficient height to cause the impregnated liner to invert from the point of termination, and hold the liner tight to the existing pipe wall. The water is then heated to a temperature to commence the exothermic reaction of the resin as determined by the catalyst system employed. If there are service connections in the lines, they are reinstated by cutting out the liner material at the point of connection. The connection area is then chemically pressure grouted.

Proposal No. 6B. Pipe installation to bifurcation.

- Proposal Description: Install 42" HDPE Pipe (1300 LF) from intake to COIC bifurcation. This concept is to replace 1300 LF of existing pipe from the intake structure to the bifurcation. This section of pipe is considered to be in poorer condition than the rest of the pipe, possibly as a result of the sediment and frazil ice intercepted from the nearby intake structure. This option could also be considered as modification of the proposed Jacobs engineering design (2004).

- Critical Items to Consider: By using Controlled Low Strength Material (CLSM) as bedding and embedment in this location, sufficient support for flexible pipe such as HDPE would be provided. CLSM could be compacted with vibratory stingers vs. hand compaction necessary for other embedment materials. In addition, HDPE material is corrosion resistant and does not have the problem of ductile iron pipe (DIP) which is the concern of the plastic bag covering the pipe being torn during installation. This plastic bag provides the corrosion resistance for DIP.

- Ways to Implement: Excavate and remove existing pipe, install new 42" HDPE pipe with CLSM. Evaluate keeping existing pipeline in operation during installation of new HDPE pipe and minimize temporary water supply.

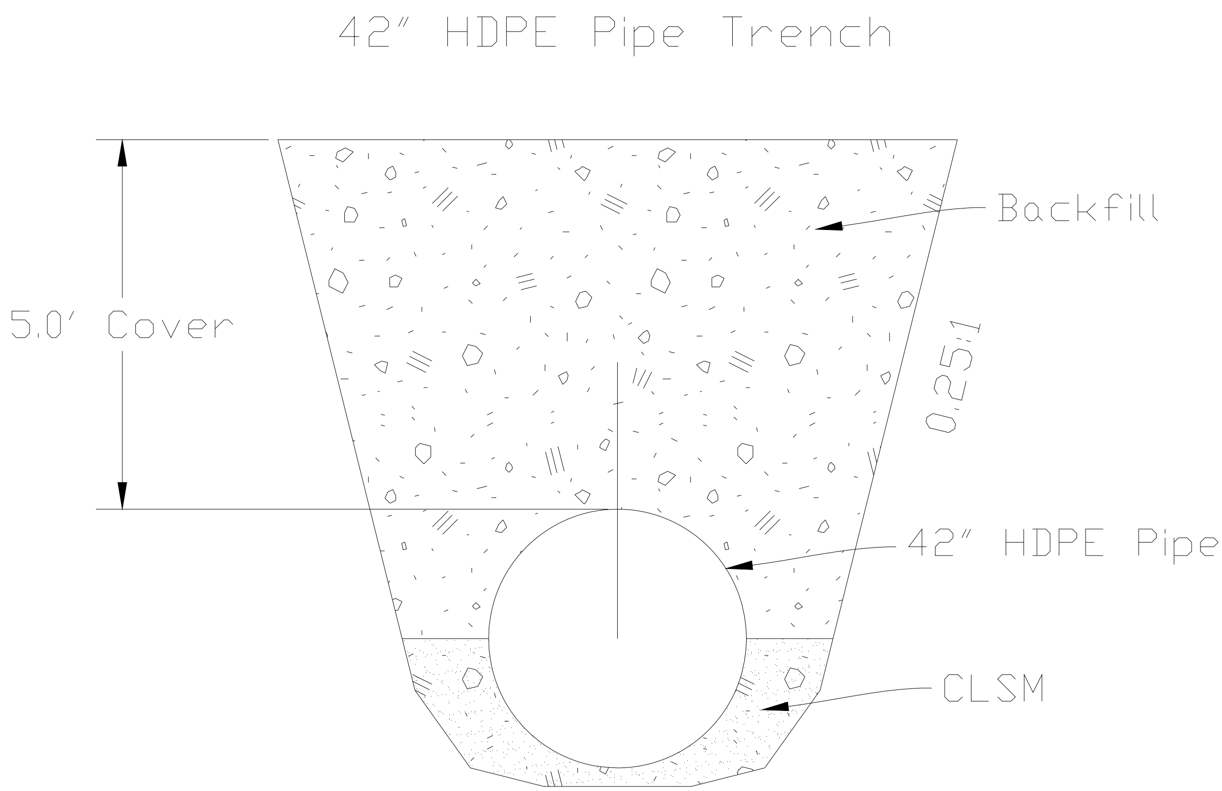
Advantages	Disadvantages
• Improves reliability of the pipeline. • Extends pipeline life. • Improves pipe hydraulics. • Low impact to hatchery operation. • Easier installation than ductile iron pipe (lighter weight) on steep terrain. • Easier to construct since there is no compaction w/CLSM. • No issues using plastic bags as corrosion protection unlike ductile iron pipe.	• Negative perception of retaining outdated system. • Earthwork on steep terrain. • Difficult access to pipe due to steep stream bed sides. • Providing temporary water sources during construction.

Potential Risks

Dewatering at the intake structure is an unknown quantity.

Cost Item	Initial Costs
Value Concept	$310,000 (gasketed) $670,000 (fused)

Figure 6B-1. HDPE Pipe Trench with CLSM



Proposal No. 7 Initiate monitoring program to track pipe condition and metal thickness

- Proposal Description: Recent pipeline inspections identified exposure and erosion of the current 14 gauge lining. Further erosion of the metal lining will compromise the integrity of the pipe and potentially fail. Annual inspections of designated sites need to be conducted to evaluate metal thickness and pipe condition. A video inspection should be performed on an annual basis for the short term.

- Critical Items to Consider: Methodology to evaluate or inspect materials must be accurate. Sample points must be consistent to evaluate wear over time. Requires shut down of water system. Acquiring funding and logistical planning when the need to replace is identified. Set some form of predetermined mark or trigger when it's necessary to replace the pipe.

- Ways to Implement: Develop a sound protocol. Deploy specialized staff to inspect and evaluate pipe condition and metal thickness.

Advantages	Disadvantages
• Provides a tool to evaluate the pipes condition on a yearly basis. • Access points now available at multiple locations. • Low cost associated with this activity	• Requires shut down of water supply, including irrigation district. • With the current intake systems condition, shut down of the water supply is someplace between difficult and impossible based on the water year and sediment load. • Requires expertise and evaluation of condition. • Difficult to plan funding wise if you're surprised 1year by the rate of erosion.

Potential Risks

Sample points may not be a good representation of the pipes condition.

Cost Item	Recurring Costs
Value Concept	$12,000/year

Figure 7-1. One of the two new manholes installed on the existing hatchery water pipeline

Proposal No. 8. Tubular Trashrack

- Proposal Description: The current intake structure includes an 8' x 11' steel trashrack on the interior. Refer to Figure 8-1. This trashrack has bars approximately ½" x 3" with spacing of approximately 1 ½" centers. This proposal is to replace the interior trashracks with hollow tubular trashracks filled with a heated chemical system inside of the bars to keep them above freezing temperatures and prevent the buildup of ice on the bars. The exterior trashrack would not be modified or replaced in this proposal. It is not known if this proposal would provide sufficient heat exchange to the tubes, so only the interior trashrack is proposed at this time as a test. If this method works satisfactorily, the exterior trashrack could be replaced as well.

  This proposal is to replace the existing trashrack with one that has hollow tubular bars. These bars would be filled with an anti-freeze compound (similar to what is used in cars). The anti-freeze would be heated to provide some heat transfer to the bars so they don't get below freezing temperatures and keep the frazil ice from accumulating on the bars.

- Critical Items to Consider: The trashrack will require periodic inspections to ensure there are no leaks allowing the anti-freeze to escape. The installation would require to be timed during periods of the lowest flows across the trashrack to prevent the water pressure from holding the existing trashrack in place.

- Ways to Implement: A new trashrack of the same dimensions as the existing interior trashrack would be constructed with hollow tubular steel bars. These bars would be filled with anti-freeze, then the filling points welded closed. The existing trashrack would be removed and the new trashrack installed during periods of lowest flows.

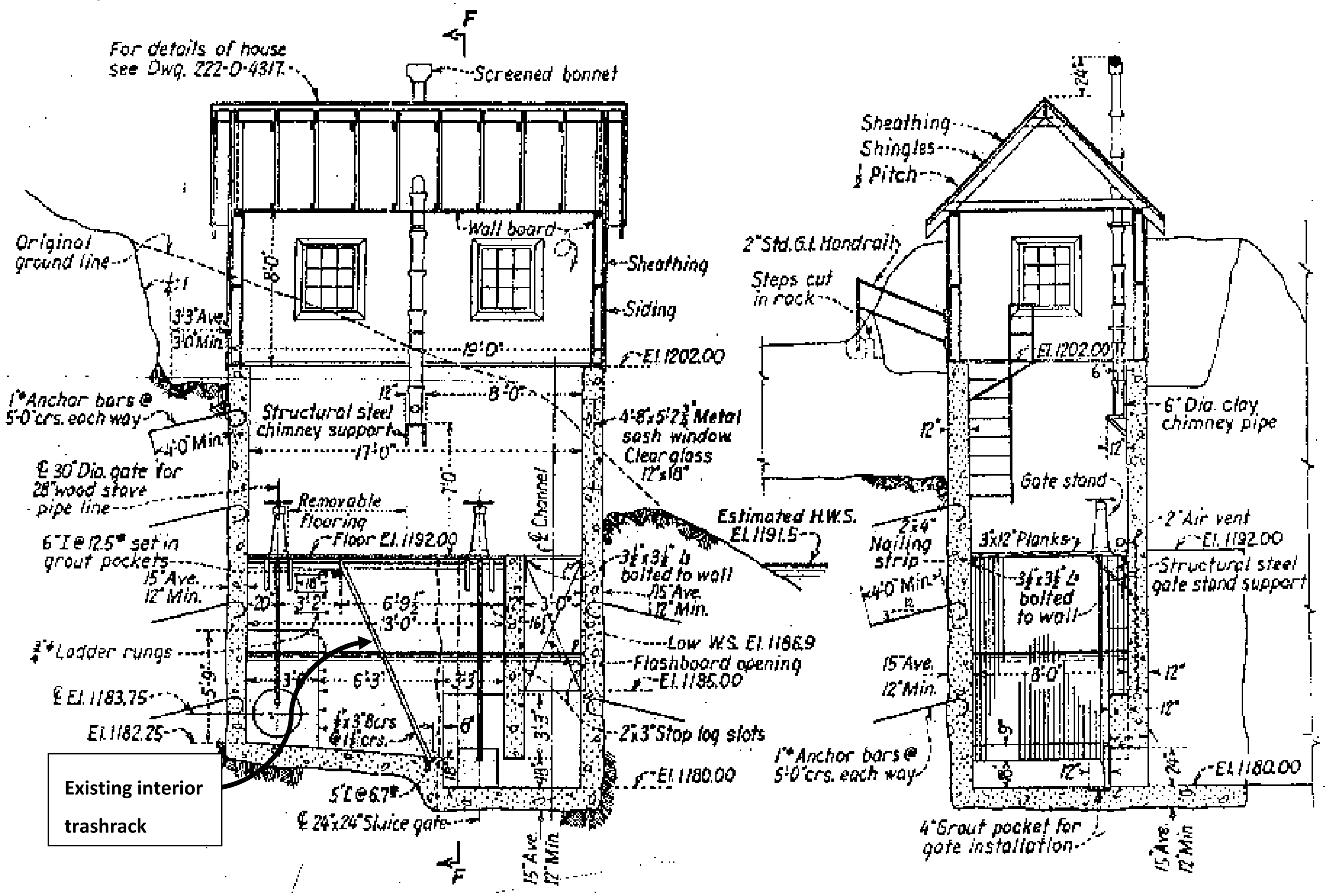
Advantages	Disadvantages
• May prevent buildup of frazil and anchor ice on the trashrack. • Would reduce the need for employees to scrape off ice that has built up on the rack. • Enhances safety and comfort of the employees. • Replaces an old, existing piece of equipment.	• Will require periodic inspections to ensure no leaks develop. • May require dewatering of the intake for installation.

Potential Risks

Care must be taken to ensure non-toxic anti-freeze is utilized.

Cost Item	Initial Costs
Value Concept	$68,500

Figure 8-1. Existing Intake Structure



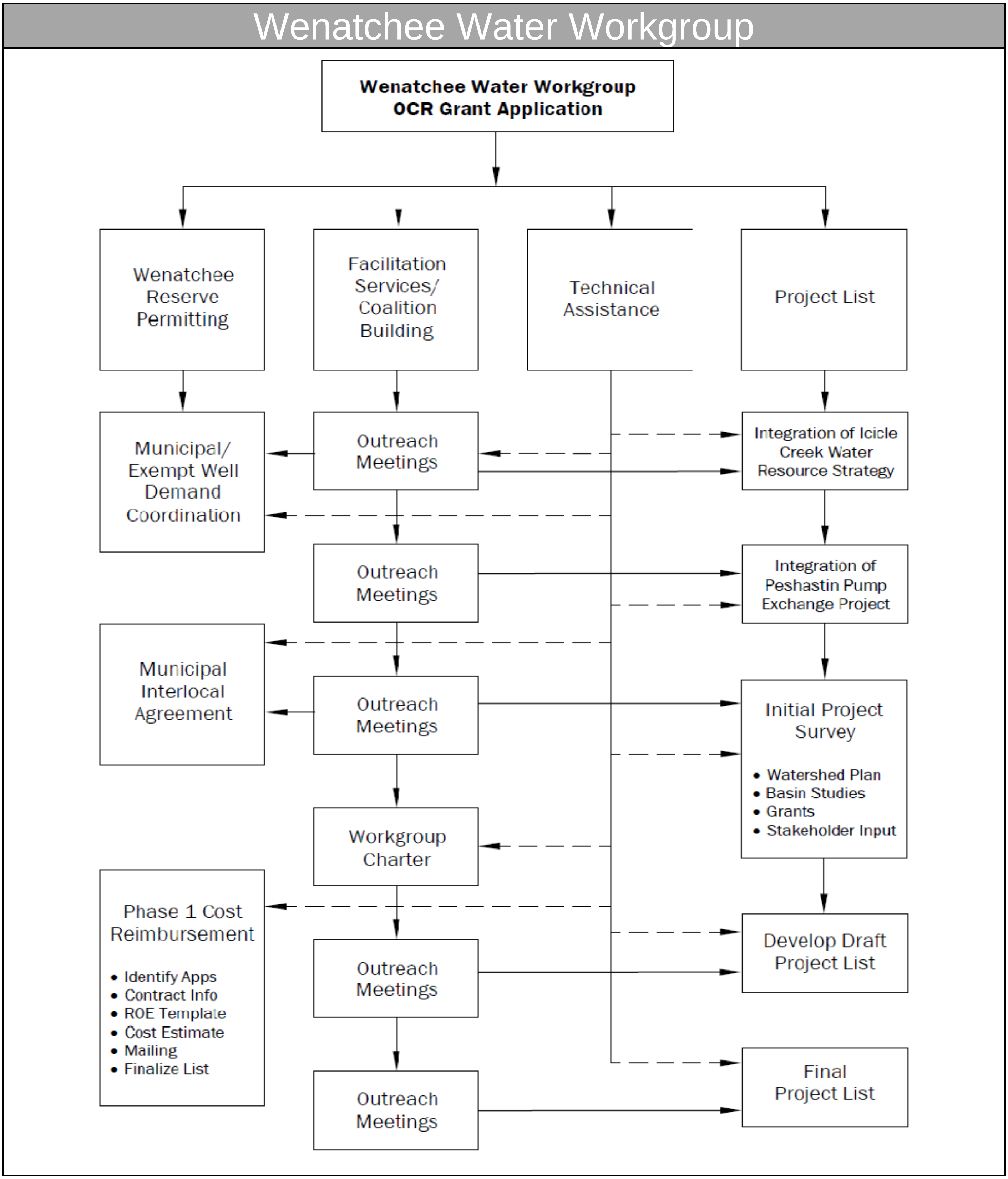
Long-Term Implementation Plan

- Proposal Description: While many of the short-term actions identified in this VE Study could be implemented successfully, it is unlikely that any of the long-term actions could be implemented without a comprehensive long-term implementation plan in place. Previous and ongoing litigation around LNFH activities and the relatively limited involvement of Icicle Creek stakeholders has resulted in few improvements to LNFH facilities and even fewer benefits to Icicle Creek. The Wenatchee Water Work Group has recently been established to build on the successful multi-party Wenatchee Watershed Planning effort and develop comprehensive approaches to water resource management across all tributaries to the Wenatchee River with a special emphasis on Icicle Creek. The Value Study Team strongly recommends integration of LNFH actions with this larger, comprehensive effort and facilitation of a Project Alternatives Solution Study (PASS) process to establish high-priority projects across all Icicle Creek water users within the context of the Wenatchee watershed. This long term plan contributes greatly to basin-oriented solutions to the instream flow issues, but it does not address the surface water supply to the hatchery.

- Critical Items to Consider: Funding for development of a comprehensive Icicle Creek water resource management plan has already been allocated by the Washington Department of Ecology, Office of the Columbia River, and substantial outreach to initiate this effort has already occurred. The historic and current parties involved in LNFH litigation are key stakeholders in the development of a comprehensive Icicle Creek plan and must be engaged. Short-term litigation agreements may determine the extent of some components of a long-term plan.

- Ways to Implement: (1) Integrate LNFH and litigants into current Icicle Creek comprehensive effort, (2) characterize water resource situation in Icicle Creek for both in-stream and out-of-stream uses, (3) identify water management alternatives and related projects, and (4) develop implementation plan with financing plan.

Advantages	Disadvantages
• Comprehensive and lasting water resource solutions for Icicle Creek • High likelihood of implementation of actions due to broad-based support. • Lower transaction costs due to litigation.	• Difficult to manage. • Extended timeline for development of alternatives. • Facilitation costs.


Wenatchee Water Workgroup
Wenatchee Water Workgroup OCR Grant Application
Wenatchee Reserve Permitting
Facilitation Services/ Coalition Building
Technical Assistance
Project List
Municipal/ Exempt Well Demand Coordination
Outreach Meetings
Integration of Icicle Creek Water Resource Strategy
Outreach Meetings
Integration of Peshastin Pump Exchange Project
Municipal Interlocal Agreement
Outreach Meetings
Initial Project Survey
• Watershed Plan
• Basin Studies
• Grants
• Stakeholder Input
Workgroup Charter
Phase 1 Cost Reimbursement
• Identify Apps
• Contract Info
• ROE Template
• Cost Estimate
• Mailing
• Finalize List
Outreach Meetings
Develop Draft Project List
Outreach Meetings
Final Project List

Proposal No. 9 Install Compliant Screens

- Proposal Description: To install vibrating or other self-cleaning traveling or drum screens that meet NOAA screening compliance standards and obtain a waiver from NOAA to allow the removal of a section or sections of screen during extreme icing events to provide the delivery of adequate surface water to the hatchery to prevent the loss of production stock.

- Critical Items to Consider: Due to screening requirements and lack of screening area, a retrofit of the existing intake structure would not provide enough screening area to meet the surface water demand of the hatchery and COIC. A new intake structure with NOAA compliant screening capable of delivering a minimum of 54 cfs year round, the surface water rights for the hatchery and COIC would have to be constructed. If the existing water delivery pipeline cannot be repaired to extend its life significantly, a new pipeline would have to be constructed as well. Any new compliant screens would have to be self-cleaning year round. Water jets capable of removing organic debris, such as needles, algae, fine sediment during the non-winter months would be necessary. Delivering tempered water to or having heated screens during the winter months to prevent icing and ensure the ability to provide adequate flows year round would be necessary. A waiver would have to be granted in NOAA, permitting to allow the removal of a section or sections of screen in the event of extreme icing events that overwhelm any self-cleaning system. These occur on a yearly basis. If water supply to the hatchery is interrupted for any extended period of time, to prevent the loss of a year class of production fish, production stock would have to be moved to other sites if space can be found. The cost of moving the production to other sites and back to the hatchery for acclimation could be significant. In the event of an extended interruption in water supply, a temporary water supply would have to be provided.

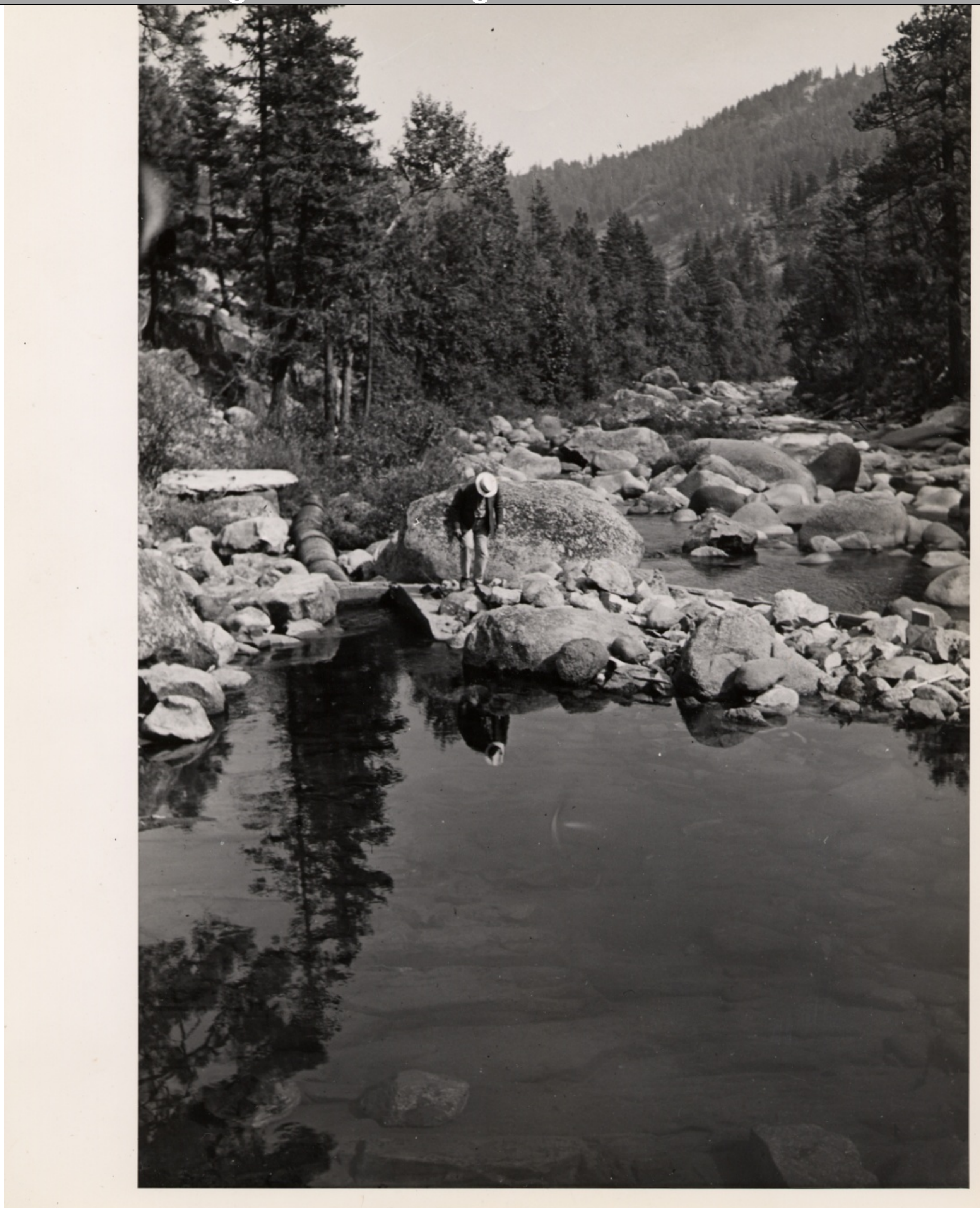
- New design requires an increase in the surface area for screening to accommodate the combined water right of 54 cfs for the hatchery and COIC. Sweeping flows and Coanda style screens should be incorporated in design. To aid in the fish passage process, a roughen channel should be incorporated in this design as well as reducing the in river foot print. This proposal should incorporate or consider other proposal components for screen design planning. Incorporate shared design ideas from the 2009 Intake Modification Project meeting provided by Ben Taylor with Reclamation (see appendix).

- Ways to Implement: Build a new intake structure next to the existing intake structure to maintain water delivery to the hatchery through the existing intake structure until the new intake is ready to go online. If the water delivery pipeline has to be replaced, the new pipeline would have to be constructed next to the existing pipeline to reduce the connection time to the new intake structure. During the change-over process from the old system to the new system, a temporary water supply may be necessary. If possible, incorporate the existing water delivery channel upstream of the existing intake structure to deliver water to the new intake structure. Our permitting specialist (Malenna Cappellini) thinks a request for a waiver from NOAA in the permitting process to remove a section or sections of compliant screen during extreme icing events is reasonable and attainable. An Environmental Impact Statement would have to be prepared.

Proposal No. 9 Install Compliant Screens	
Advantages	**Disadvantages**
• Meet NOAA screening requirements. • Reduce litigation and associated costs. • Reduce or eliminate the entrainment of resident species within the water delivery system and improve fish passage. • Reduce overtime costs in the winter months due to icing. • Long term fix. • Appears to be the preferred solution from local residents and stakeholders.	• Cost of constructing new intake and pipeline. • Potential impact to hatchery operations. • Required in-water work during the winter months.
Potential Risks	
None Identified.	
Cost Item	**Initial Costs**
New intake structure	$$$$
Repair/rehab existing water delivery pipeline	$$$$
New water delivery pipeline	$$$$

Figure 9-1. Current intake icing issues

Figure 9-2. Original COIC Intake



Proposal No. 10. Develop New Well for Tempering Water at Inlet.

- Proposal Description: Drill new well near inlet structure to provide tempering water for the intake to minimize the buildup of frazil and anchor ice on the trashracks. It was felt that the well water would be warm enough to heat the water in the inlet sufficiently to prevent the buildup of ice and reduce the times the employees were required to scrape the ice off of the trashracks. Drilling a well could be accomplished relatively quickly and would not disrupt hatchery operations or irrigation deliveries.

- Critical Items to Consider: The location of the well and the volume of water necessary to prevent the buildup of ice would need to be determined. The well could be located near the river bank, but permitting may be an issue. The new well would be utilized only during the winter months to provide tempering water, but surface water rights may need to be transferred or exchanged for groundwater rights during the period of time of operation. Electrical power for the pump may need to be upgraded since the intake only has 110V power available.

- Ways to Implement: Contract with local driller.

Advantages	Disadvantages
• Tempered water available to de-ice screen intake without pumping from hatchery.	• New cost of Operation and Maintenance (Electrical & Plumbing)

Potential Risks

- Well may not yield required volume of water.
- Pump may require higher voltage.

Cost Item	Initial Costs
Value Concept	$48,400

Proposal No. 11. Revisit the Jacobs Design.

- Proposal Description:
  A. Intake Structure/Fish Ladder/Sediment Sluice
  B. Screen Structure and Outlet Works
  C. Pipeline from Intake to Hatchery
  D. Improvements at Hatchery
  * Pumphouse
  * Interceptor Drain Manhole
  * Tempering Water Pipeline
  E. Temporary Water Supply During Construction

- Critical Items to Consider: Tempering water from hatchery re-use was an unresolved concern by some stakeholders. Other sources for tempering water should be considered.

- Ways to Implement: Reconsider all features from the 2004 Design.

Advantages	Disadvantages
• Complete stamped design that would be good to use as a basis to start an updated design for a gravity system.	• Includes the pump back system that met resistance from stakeholders. • Completed in 2004.

Potential Risks
None identified

Cost Item	Costs
Value Concept	$5,800,000

Proposal No. 12. Construct New Intake and Pipeline at Different Location

- Proposal Description: This proposal was intended to provide an alternative location for the intake structure and a different alignment of the water supply pipeline. After reviewing topography and visiting the site, the gravity intake location would be difficult to move closer to the fish hatchery due to a significant hill downstream of the existing RV park. In addition, the pipeline alignment was not modified due to the existing development in the surrounding area. Minor adjustments to the alignment are possible and recommended. However, significant realignment would not generate enough savings to offset expenses and time needed to acquire new right-of-way.

  THIS PROPOSAL IS NOT FEASIBLE AND WAS NOT DEVELOPED FURTHER.

- Critical Items to Consider:

- Ways to Implement:

Advantages	Disadvantages
•	•

Potential Risks

None Identified.

Cost Item	Initial Costs
Value Concept	$0

Proposal No. 13. Obtain Wenatchee River Water

- Proposal Description: Obtain Wenatchee River water (other than via open channel) for LNFH winter operations. In anticipation of a compliant screening and diversion installation for LNFH, warmer water is required to operate a compliant fish screen during extreme cold weather conditions. One solution for providing either tempering water or the entire quantity needed by LNFH for winter operations (estimated at 10 CFS) is to take surface water from the Wenatchee River, which is about 2 degrees warmer than Icicle Creek water during cold weather events. Few cost-effective options exist for delivering water from the Wenatchee River to LNFH. The original Wenatchee Canal, and associated ROW, is no longer intact. Significant private land and development exists between the hatchery and the Wenatchee River. Utilization of an existing easement or ROW is preferable. Diversion of Wenatchee River water is currently undesirable during non-winter months because of high temperatures and waterborne disease issues. Obvious easements/ROW includes two county roads (East Leavenworth and Icicle Roads) and COIC canal.

- Critical Items to Consider: Partnering with COIC can create benefits to listed species in Icicle Creek and as such Reclamation could leverage outside funds to support the project. The COIC canal currently discharges into the Wenatchee River.

- Ways to Implement: A 20" HDPE pressure rated pipe could be installed in COIC's current canal alignment for use by COIC during the irrigation season (approx. May 1 to Oct. 1). This would be predicated upon a new diversion works near or at the present location. The new COIC system would be a closed pressurized system. During winter months or limited to periods of extreme cold, the same pipe could be used to deliver the warmer Wenatchee River water to the existing or similarly located bifurcation structure. This would require installation of a pumping plant at the current location of the COIC discharge to the Wenatchee River.

Advantages	Disadvantages
• Direct route, uses existing ROW to minimize costs. • Instream flow improvement to Icicle Creek. • Enables NOAA/WDFW screen compliance during cold weather events. • Opportunities for pipe cost share due to ESA benefits.	• Cost of pumping plant. • Reliance on pump vs gravity during cold periods. • Requires agreement or negotiations with COIC. • Possible reliance on others for O&M during irrigation season.

Potential Risks

Mechanical failure of pumping plant.

Cost Item	Initial Costs
Value Concept	$2,506,000

Disposition of Ideas

Value Study Elements Considered as Potential Proposals and Their Disposition

Idea	Disposition
Do nothing – continue operation without any changes.	Not developed into a proposal. Due to the condition of the existing pipeline, this does not appear to be an option.
Replace only the section of existing pipeline in the RV Park – leave the rest as is.	Not developed in favor of other proposals.
Construct a wall at the inlet to re-direct sediment.	Developed into Proposal No. 2.
Mount a pipe on the side of the intake structure to allow for flushing flows to clean intake.	Not developed into a proposal. Currently, Hatchery personnel use a pump with a movable hose, which appears to work satisfactorily.
Transfer/exchange surface water rights to ground water rights.	Not developed into a proposal due to lack of expertise on the Value Study Team. This may be considered if a new well is developed for tempering water.
Replace the existing interior trashrack with one that has hollow bars and circulate anti-freeze to keep ice from building up on the trashrack.	Developed into Proposal No. 8.
Install a bubbler system to reduce ice buildup.	Not developed into a proposal. The water is currently fairly turbulent and a bubbler system may not have any benefits.
Install heat wrap (heat trace) on trashracks to prevent ice buildup.	Not developed into a proposal. This may require a power source that is not available.
Install vibrating screens to shake ice off.	Developed into Proposal No. 9.
Develop a new well near the intake to provide tempering water for intake.	Developed into Proposal No. 10.
Obtain a waiver from NOAA Fisheries to allow pulling the screens in the winter months.	Included in Proposal No. 9.
Construct a heated enclosure around the intake.	Not developed into a proposal. Currently, the building around the intake is piped for a wood burning stove that has been removed.
Increase the surface area of the screens (construct a completely new intake structure).	Developed into Proposal No. 11.
Recirculate effluent water to the intake to provide tempering water.	Not developed into a proposal. This was included in the Jacobs design, which was not constructed due to litigation.
Revisit the Jacobs design, but remove the pump-back of effluent water.	Developed into Proposal No. 12.
Install HDPE trashrack to prevent ice from building up.	Developed into Proposal No. 1.
Construct an additional storage reservoir to provide tempering water.	Not developed due to feasibility and cost.
Install a heated water storage tank to provide tempering water.	Not developed into a proposal due to the size of the tank and the expense of heating.
Install louvers at the intake to re-direct sediment.	Could be included if Proposal No. 2 is accepted.

Disposition of Ideas

Value Study Elements Considered as Potential Proposals and Their Disposition	
Idea	**Disposition**
Replace the clean-out valve at the intake building.	Developed into Proposal No. 3.
Install stoplogs and guides at u/s side of intake to provide for dewatering for cleaning.	Included in Proposal No. 3.
Remove and replace the two deteriorated sections of pipeline (one at the sand settling basin and one near the bifurcation for COIC).	Developed into Proposal No. 4.
Reline the pipeline – install two additional manholes for access.	Developed into Proposal No. 5.
Install an HDPE liner in the existing pipeline.	Not developed into a proposal due to the curves in the pipe alignment.
Construct and open channel and abandon the pipeline.	Not developed due to safety issues.
Install a new pipeline in a different alignment and relocate the intake.	Developed into Proposal No. 13.
Replace/reline the pipe from the intake to the bifurcation to COIC only.	Developed into Proposal No. 6A and 6B.
Install a new pipeline/open channel combination.	Not developed due to safety issues.
Resurrect the Wenatchee ditch to provide tempering water.	Not developed into a proposal. Right-of-way does not exist for this ditch.
Obtain Wenatchee water (pumping) to provide tempering water.	Developed into Proposal No. 14.
Use directional drilling to install a new pipeline.	This construction method could be included in Proposal No. 13.
Initiate a monitoring program to track pipeline condition and metal thickness.	Developed into Proposal No. 7.

List of Consultants	
Consultant or Contact	**Topic or Information**
Ernie Bachman, Bureau of Reclamation, 208-383-2270	HDPE Trashracks.
Hanson Pre-cast pipe of Tacoma, WA 253-475-8888	Pre-cast concrete pipe.
Scott Wendling, VP, Pipeline Inspection Services, Inc. 208-941-9424.	Pipeline re-lining procedures and results.

Data and Documents Consulted	
Title, Author, and Date	**Information**
Final VE Report, Icicle Creek Restoration Project, Phase 2, Bureau of Reclamation, April 20, 2004.	General project information.
Final VE Report, Leavenworth Fish Hatchery Intake Replacement, Bureau of Reclamation, December 1, 2009	General project information.
Technical Specifications for Construction of Intake System Rehabilitation at the Leavenworth National Fish Hatcher, Leavenworth WA, Jacobs Civil Inc., October 28, 2004	General project information.

Design Team Presentation Attendance List Monday, June 25, 2012	
Name/Title/Discipline	**Address/Phone Number**
Kevin J. Kramer, PE, AVS Civil Engineer Value Study Team Leader	Bureau of Reclamation, PN-6110 1150 N. Curtis Road, Suite 100, Boise ID 83706-1234 Phone: 208-378-5242 Email: kkramer@usbr.gov
Roger W. Wright Civil Engineer Team Member	Bureau of Reclamation, PN-3400 1150 N. Curtis Road, Suite 100, Boise ID 83706-1234 Phone: 208-378-5330 Email: rwwright@usbr.gov
Ben Radchuk Civil Engineer Team Member	Bureau of Reclamation, PN-3505 1150 N. Curtis Road, Suite 100, Boise ID 83706-1234 Phone: 208-378-5116 Email: vradchuk@usbr.gov
Steve Acree Geologist Team Member	Bureau of Reclamation, PN-3611 1150 N. Curtis Road, Suite 100, Boise ID 83706-1234 Phone: 208-378-5231 Email: racree@usbr.gov
Steve Kolk Wenatchee Sub-Basin Liaison Team Member	Bureau of Reclamation 301 Yakima Street, Wenatchee WA 98801-2966 Phone: 509-667-8494 Email: skolk@usbr.gov
Al Jensen Hatchery Manager Team Member	US Fish and Wildlife Service 12790 Fish Hatchery Rd, Leavenworth, WA 98826 Phone: 509-548-7641 Email: al_jensen@fws.gov
Greg Clarine Assistant Hatchery Manager Team Member	US Fish and Wildlife Service 12790 Fish Hatchery Rd, Leavenworth, WA 98826 Phone: 509-548-7641 Email: greg_clarine@fws.gov
Mike Kaputa Director Team Member	Chelan County Natural Resource Department 316 Washington St., Suite 401, Wenatchee WA 98801 Phone: 509-670-6935 Email: mike.kaputa@co.chelan.wa.us
Nick Clough Civil Engineer Team Member	Bureau of Reclamation, 86-68140 PO Box 25007, Denver CO 80225-0007 Phone: 303-445-3112 Email: nclough@usbr.gov

Value Study Team Presentation Attendance List Friday, June 29, 2012	
Name/Title/Discipline	**Address/Phone Number**
Kevin J. Kramer, PE, AVS Civil Engineer Value Study Team Leader	Bureau of Reclamation, PN-6110 1150 N. Curtis Road, Suite 100, Boise ID 83706-1234 Phone: 208-378-5242 Email: kkramer@usbr.gov
Roger W. Wright Civil Engineer Team Member	Bureau of Reclamation, PN-3400 1150 N. Curtis Road, Suite 100, Boise ID 83706-1234 Phone: 208-378-5330 Email: rwwright@usbr.gov
Ben Radchuk Civil Engineer Team Member	Bureau of Reclamation, PN-3505 1150 N. Curtis Road, Suite 100, Boise ID 83706-1234 Phone: 208-378-5116 Email: vradchuk@usbr.gov
Steve Acree Geologist Team Member	Bureau of Reclamation, PN-3611 1150 N. Curtis Road, Suite 100, Boise ID 83706-1234 Phone: 208-378-5231 Email: racree@usbr.gov
Steve Kolk Wenatchee Sub-Basin Liaison Team Member	Bureau of Reclamation 301 Yakima Street, Wenatchee WA 98801-2966 Phone: 509-667-8494 Email: skolk@usbr.gov
Travis Collier Assistant Hatchery Manager Team Member	US Fish and Wildlife Service 12790 Fish Hatchery Rd, Leavenworth, WA 98826 Phone: 509-548-7641 Email: travis_collier@fws.gov
Greg Clarine Assistant Hatchery Manager Team Member	US Fish and Wildlife Service 12790 Fish Hatchery Rd, Leavenworth, WA 98826 Phone: 509-548-7641 Email: greg_clarine@fws.gov
Mike Kaputa Director Team Member	Chelan County Natural Resource Department 316 Washington St., Suite 401, Wenatchee WA 98801 Phone: 509-670-6935 Email: mike.kaputa@co.chelan.wa.us
Nick Clough Civil Engineer Team Member	Bureau of Reclamation, 86-68140 PO Box 25007, Denver CO 80225-0007 Phone: 303-445-3112 Email: nclough@usbr.gov
Mona Blount	Cascade Orchard Irrigation Company 2325 Icicle Road, Leavenworth WA 98826 Phone: 206-799-2923
Patricia Staudt	Cascade Orchard Irrigation Company 2325 Icicle Road, Leavenworth WA 98826 Phone: 509-548-5679

Value Study Team Presentation Attendance List Friday, June 29, 2012	
Name/Title/Discipline	**Address/Phone Number**
Steve Croci	US Fish and Wildlife Service 12790 Fish Hatchery Rd, Leavenworth, WA 98826 Phone: 509-548-7641 Email: steve_croci@fws.gov
Dave Irving Manager, Leavenworth Fisheries Complex	US Fish and Wildlife Service 12790 Fish Hatchery Rd, Leavenworth, WA 98826 Phone: 509-548-2912 Email: dave_irving@fws.gov
Bob Hamilton Activity Manager	Bureau of Reclamation, PN-3829 1150 N. Curtis Road, Suite 100, Boise ID 83706-1234 Phone: 208-378-5087 Email: rhamilton@usbr.gov
Sharon Parkinson Program Manager, Design	Bureau of Reclamation, PN-3400 1150 N. Curtis Road, Suite 100, Boise ID 83706-1234 Phone: 208-378-5210 Email: sparkinson@usbr.gov
Lynn Brougher Public Affairs Officer	Bureau of Reclamation, GCP-1400 PO Box 620, Grand Coulee WA 99133-0620 Phone: 509-633-9503 Email: lbrougher@usbr.gov