



**APPENDIX C.3**  
**WENATCHEE ACCLIMATION FACILITIES**  
**PROPOSED PLAN SITE DESCRIPTIONS AND CAPITAL COSTS**  
***Yakama Nation Fisheries Resource Management***

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## **I. INTRODUCTION**

This report presents site information for proposed Mid-Columbia Coho Reintroduction Plan (MCCRP) acclimation facilities that are located in the Wenatchee watershed. A general discussion of the acclimation component of the MCCRP, information about the criteria used to select the acclimation systems and the specific sites, and brief descriptions of those sites are included in Appendix B.2: Acclimation Facilities Alternatives. More detailed site information, designs, and capital costs are presented in this appendix. Appendix C.4 describes proposed Methow watershed acclimation facilities. The following is a list of master plan facility appendices, with this appendix highlighted.

- A. FISH CULTURE GUIDELINES
- B. ALTERNATIVE AND PROPOSED PLAN EVALUATIONS
  - B.1 REARING FACILITIES
  - B.2 ACCLIMATION FACILITIES
- C. PROPOSED PLAN SITE DESCRIPTIONS AND CAPITAL COSTS
  - C.1. WENATCHEE REARING FACILITIES
  - C.2. METHOW REARING FACILITIES
  - C.3. WENATCHEE ACCLIMATION FACILITIES**
  - C.4. METHOW ACCLIMATION FACILITIES
- D. PROJECT SCHEDULE AND COSTS

Smolts are proposed to be released from a total of 9 locations in the Wenatchee watershed. Six of these sites currently exist and 3 require substantial amounts of construction. Most of the proposed acclimation sites in the Wenatchee subbasin have been used in the past by the MCCRP. The map below shows the locations of the sites that form the proposed plan for the Wenatchee.

As described in Appendix B.2, the identification of back-up sites is critical. Many factors can result in a preferred location not being available for use. In all the watersheds, back-ups to the proposed sites discussed below have been identified. These alternatives are listed in Appendix B.2.

# PROPOSED WENATCHEE BASIN ACCLIMATION SITES

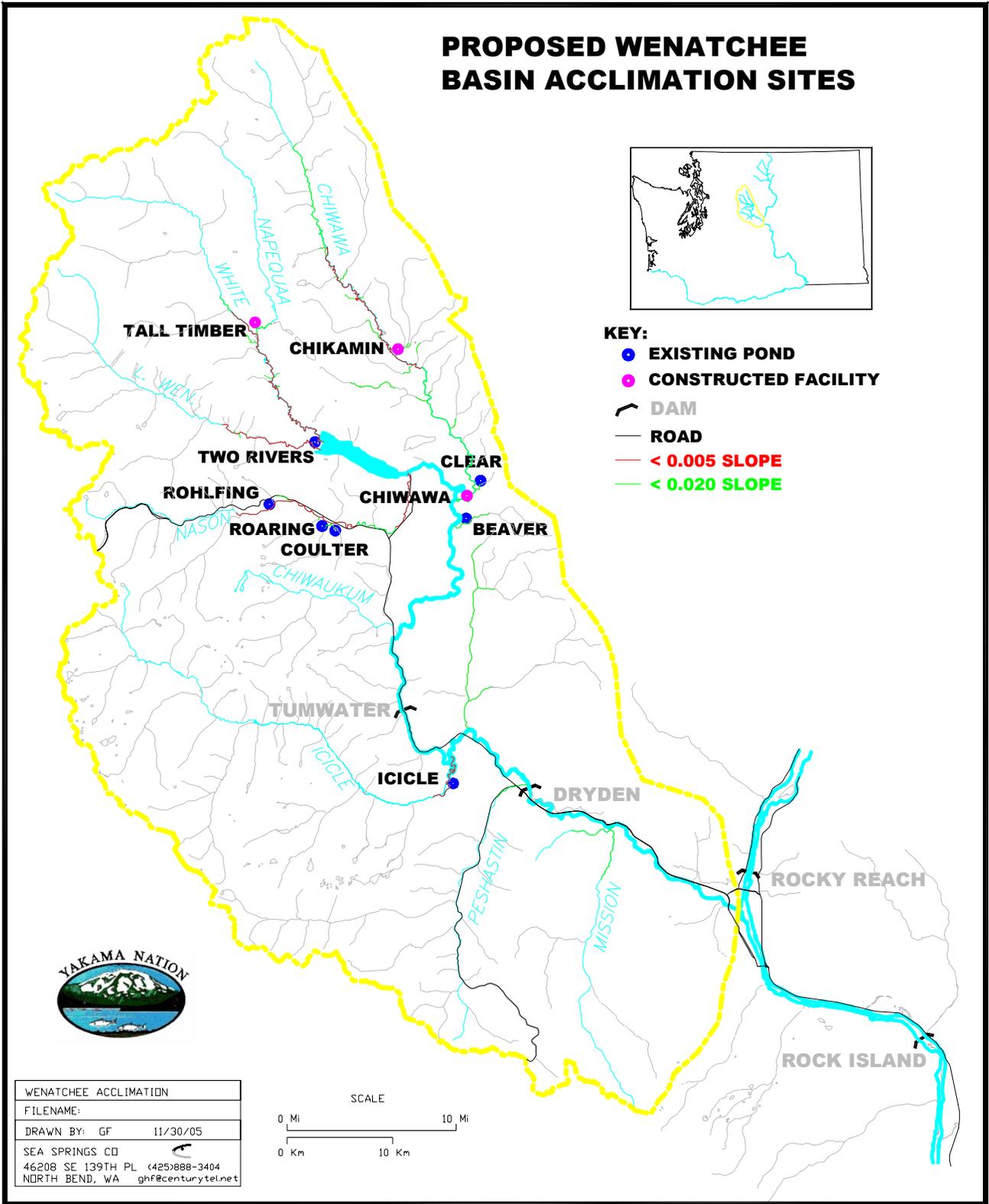


Figure 1. Site Map

## II. SITE DESCRIPTIONS

### A. General Information

Information about the location of the sites, their purpose, their type, their accessibility, and the presence of utilities is summarized in Table 1. In the location section, the tributary column lists the stream that the acclimation ponds drain into. River miles and elevation give a rough indication of the migratory difficulty for each proposed site.

The purpose section of the table provides some information about the proximity to habitat and about the main purpose of the site. Some locations function to release smolts so that returning adults are imprinted on spawning habitat located near the release site, some sites are used mainly for broodstock development (with adults returning to downstream locations), and some sites are intended to distribute adults widely within the targeted stream. The slope data (for the approximately one mile of stream below the release point) is a rough approximation of the quality of nearby habitat. Slopes less than 0.5% have been identified on watershed maps as approximating low gradient habitat.

The site type section indicates whether ponds currently exist or must be constructed and the type of facility proposed. The site type section also lists whether the locations have reasonable potential for over winter acclimation. In all of the following tables, the sites in red require significant amounts of construction. This includes the construction of ponds and pumped water supply systems at Tall Timber, ponds and a gravity water intake at Chikamin, and construction of both ponds at Chiwawa.

**Table 1. General Information**

	LOCATION							PURPOSE				SITE TYPE				OTHER		
	MAIN TRIBUTARY	RIVER MI. TO MOUTH OF WEN.	TOWNSHIP	RANGE	SECTION	1/4 SECTION	ELEVATION	LOCAL SPAWNING	BROOD DEVELOPMENT	WIDE ADULT DISTRIBUTION	DOWNSTREAM SLOPE (%)	WINTER USE	EXISTING NATURAL POND	EXISTING MANMADE POND	CONSTRUCTED POND	CONSTRUCTED FACILITY	PLOWED ACCESS	UTILITIES
Rohlfing	Nason	68	26	16	5	NE	2,240			✓	0.29	✓		✓			✓	✓
Coulter/Roaring	Nason	64	26	16	11	SE	2,170	✓			0.32		✓				✓	✓
Tall Timber	White	70	28	16	18	SW	1,930			✓	0.21	✓				✓	✓	✓
Beaver	Wenatchee	47	26	17	12	NE	1,900	✓	✓		1.33			✓			✓	
Chikamin	Chikamin	62	28	17	21	SW	2,400	✓			0.12				✓			
Clear	Chiwawa	50	27	18	31	NE	2,000			✓	0.85	✓		✓			✓	✓
Chiwawa	Chiwawa	48	27	17	36	SE	1,860			✓	0.90	✓				✓	✓	✓
Two Rivers	L. Wen.	60	27	16	21	SW	1,880			✓	0.16	✓		✓			✓	✓

## B. Water and Space

Minimum water requirements were calculated based on a flow density of 6 pounds of fish per gallon/minute of flow, with an average release size of 18 fish per pound (see Appendix A Fish Culture Guidelines, for more detail and references). This is an average minimum value based on approximate spring-time water temperatures and assumes saturated inflow. Flow rates should be higher than the values indicated above, to provide a safety margin. Space requirements were calculated using 0.3 pounds of fish per cubic foot of water at sites with 24 hour security and 0.1 lbs/cft at all other sites. The land requirement assumes that the water surface covers half of the site.

Table 2 describes the water source and provides some flow data. These are preliminary measurements; more flow data will be collected. In general, locations that have either gravity or pumped ground water supplies are capable of operating through the winter. Sites with intakes require a high degree of security.

**Table 2. Water and Space**

	REQUIREMENTS									WATER SUPPLY						SPACE	
	PROPOSED RELEASE NUMBER	CURRENT CAPACITY	WATER NEEDED (CFS)	REARING SPACE RQRT (CFT)	WATER SURFACE RQRT (ACRES)	Number of Ponds	POND LENGTH	POND WIDTH	LAND SURFACE RQRT (ACRES)	WATER SOURCE	APRIL FLOW (CFS)	GRAVITY, GROUND	GRAVITY, SURFACE	INTAKE REQUIRED	PUMPED, GROUND	PUMPED SURFACE	CURRENT POND SIZE (CFT)
Rohlfing	105,000	105,000	2.2	19,000	0.1					Unnamed			✓		✓		36,000
Coulter/Roaring	105,000	200,000	2.2	19,000	0.1					Coulter			✓				32,400
Tall Timber	210,000		4.3	39,000	0.3	2.0	139.6	46.5	0.6	Napeequa				✓		✓	
Beaver	100,000	75,000	2.1	19,000	0.1					Beaver	2.0		✓	✓			25,120
Chikamin	100,000		2.1	19,000	0.1	1.0	137.8	45.9	0.3	Minnow	30.0		✓	✓			
Clear	170,000	170,000	3.5	31,000	0.2					Clear	2.0	✓					NA
Chiwawa	170,000		3.5	31,000	0.2	2.0	124.5	41.5	0.5	Chiwawa	Large						
Two Rivers	120,000	120,000	2.5	22,000	0.2					Lake	1.3				✓	✓	30,000

### C. Environmental Conditions

Table 3 shows land use designations, ESA-listed fish species that might be near the sites, and other potential development risks for proposed Wenatchee basin sites. These and other impacts will be evaluated in more detail during permit and decision processes, including the National Environmental Policy Act (NEPA) analysis.

Chelan County zoning designations are defined as follows: RR5, rural residential with a limit of one dwelling per 5 acres; RR10, rural residential with a limit of one dwelling per 10 acres; RR20, rural residential with a limit of one dwelling per 20 acres; RRR, rural residential recreational; and FC, commercial forest. Flood designations have the following meanings: X500 is between the 100-year and 500-year flood elevations; A is within the 100-year floodplain and possibly in a floodway; and X is out of the floodplain.

Check marks under the species listed in the Environmental Impacts column indicate that they are likely to be present near the intake or pond. The main impacts to listed fish are barriers or intakes which impede migration around or through acclimation sites. Site designs aim to minimize these impacts.

Development risks list some of the major issues that may prevent construction and/or operation of the sites and affect the facility development process. They include: local opposition during construction permit application; low flow volumes; water rights issues; waste discharge addressed through the National Pollutant Discharge Elimination System (NPDES) process; the availability (lease, purchase, or use agreement) of land and access. A check mark in these columns means that preliminary analysis indicates the issue might be a problem at that site.

**Table 3. Environmental Conditions**

	LAND USE				ENV. IMPACTS				DEV. RISKS					
	ZONING	FLOOD DESIGNATION	LAND USE	OWNERSHIP	MINIMAL FISH IMPACTS	BULL TROUT LIKELY	STEELHEAD LIKELY	SPRING CHINOOK LIKELY	LOCAL OPPOSITION	FLOW QUANTITIES	WATER RIGHTS	DISCHARGE IMPACTS	LAND OWNERSHIP	ACCESS
Rohlfing	RR5	X	Rural residential	Private		✓	✓			✓		✓		
Coulter/Roaring	RR5	X	Rural residential	Private		✓	✓					✓		
Tall Timber	RR20	X	Guest ranch	Private	✓				✓		✓		✓	
Beaver	RR5	X	Guest ranch	Private			✓			✓		✓		
Chikamin	FC	X	Private forestry	Private		✓	✓	✓		✓		✓	✓	✓
Clear	RRR	X	Private campground	Private	✓					✓		✓	✓	
Chiwawa	RR20		Acclimation	Public	✓						✓		✓	
Two Rivers	RR20	A	Gravel mine	Private	✓								✓	

## D. Additional Site Information

Water effluent treatment systems that are separate from acclimation ponds are not planned. Relatively small numbers of fish will be held at low densities in large ponds. The minimum retention time for water flowing through the pond will be 2.5 hours and in most cases will be several times longer than this. Fish wastes will settle at low densities in the ponds and will be effectively treated during the long periods of time through the summer and fall when coho are not being acclimated. Most acclimation ponds developed for other species in the region do not include off-line effluent treatment systems.

Avian and mammalian predation is a major consideration for remote acclimation sites. At some locations, chain link fences and overhead bird netting will be installed. At other sites, electric fences and overhead wires could be used. Deterrence of predation through human presence has been used effectively at sites currently operated by the MCCRCP as well as at federal and state hatcheries and will be employed at locations where no structures are possible.

Many of the ponds at proposed sites could become inundated during floods, which can occur in the spring during coho acclimation/migration periods. For that reason, the program will not prevent the unplanned release of fish due to flooding.

### 1. Existing Sites

- *Rohlfing*. This site is currently being used by the MCCRCP. The recent addition of a well will allow it to be used for over-winter acclimation. Low flows in this intermittent stream that supplies surface water limit the number of fish that can be acclimated. Installation of fencing has been approved by the landowner to reduce predation. The site is located near the upstream end of accessible habitat on Nason Creek.
- *Coulter/Roaring*. These sites are very close together and will be managed as one. Coulter is a beaver pond that is currently being used by the MCCRCP. The Roaring wetland complex (much of which is owned by Yakama Nation) has several large beaver ponds that can be used for acclimation. Steelhead are known to migrate through the complex and to spawn in Roaring Creek. Net enclosures for coho in the beaver ponds would allow the free passage of other species through the system. These sites will introduce smolts into one of the important habitat areas of Nason Creek.
- *Beaver*. This site is currently being used by the MCCRCP. The pond has an existing intake that allows free passage of migrants throughout Beaver Creek while coho are acclimating. Bird predation is limited to some extent by the surrounding tree cover, but otters are present. Beaver Creek has similar habitat attributes as many streams used by coastal coho salmon; however, to date it has seen limited spawning activity. Use may be limited by obstructions to migration including culverts and an irrigation diversion. Improvements to migration will be addressed during the habitat improvement phase of the proposed reintroduction program.
- *Clear*. This pond is on property owned by a private campground. Owners have been approached in the past about coho acclimation and have been receptive. The large pond volume and secure water supply will allow large numbers of fish to be acclimated through the winter. An acclimation site on Clear Creek would introduce smolts into the lower Chiwawa, downstream of low-gradient, high-quality habitat.
- *Two Rivers*. This site previously has been used by the MCCRCP. Water was pumped from a lake formed by a gravel mine operation to an existing pond. Gravel excavation through the winter and spring creates relatively high turbidity in the lake. To minimize sediment discharge, water was returned to the lake rather than to the Little Wenatchee River. The site introduces coho into the lower section of the Little Wenatchee.

## 2. New Facilities

- *Tall Timber.* There are no accessible, existing ponds on the White that can be used for acclimation and few tributary streams that would allow gravity fed ponds to be constructed. For this reason, a conventional pumped water acclimation site is proposed. The proposed location is in the upper part of the low-gradient section of the White River. Plans are to drill a well and to construct a surface water intake and two ponds. Groundwater from the well will be spread over the river water intake to reduce icing impacts and allow use of the site through the winter. Predation control will include fences and overhead nets. The operation of a pumped surface water intake will require effective alarm systems and 24-hour security. Recent attempts to build a spring chinook acclimation facility on the site have been met with public opposition. We believe the coho project may be more acceptable because the purpose is reintroduction rather than supplementation of an existing population, and because the proposed facility will be temporary.
- *Chikamin.* An existing pond on private property exists where Minnow Creek enters the Chikamin. The pond is likely important habitat for other species and is not large enough to segregate with net enclosures. As a result, an off-channel pond is proposed for construction near the mouth of Minnow Creek, on land to be purchased. Water from a gravity flow intake on Chikamin would feed the ponds. The Chikamin itself, and the low-gradient section of the Chiwawa where it enters, are likely high-quality coho habitat.
- *Chiwawa.* Construction of an earthen pond adjacent to the Chiwawa Spring Chinook Acclimation Facility is proposed. Second-use water from the facility would supply the coho pond. No new water systems are constructed and it is assumed that land would not need to be purchased. Over-winter operation, good site security and predation control will be possible. The site reintroduces smolts into the lower section of the Chiwawa.

E. Conceptual Design Drawings

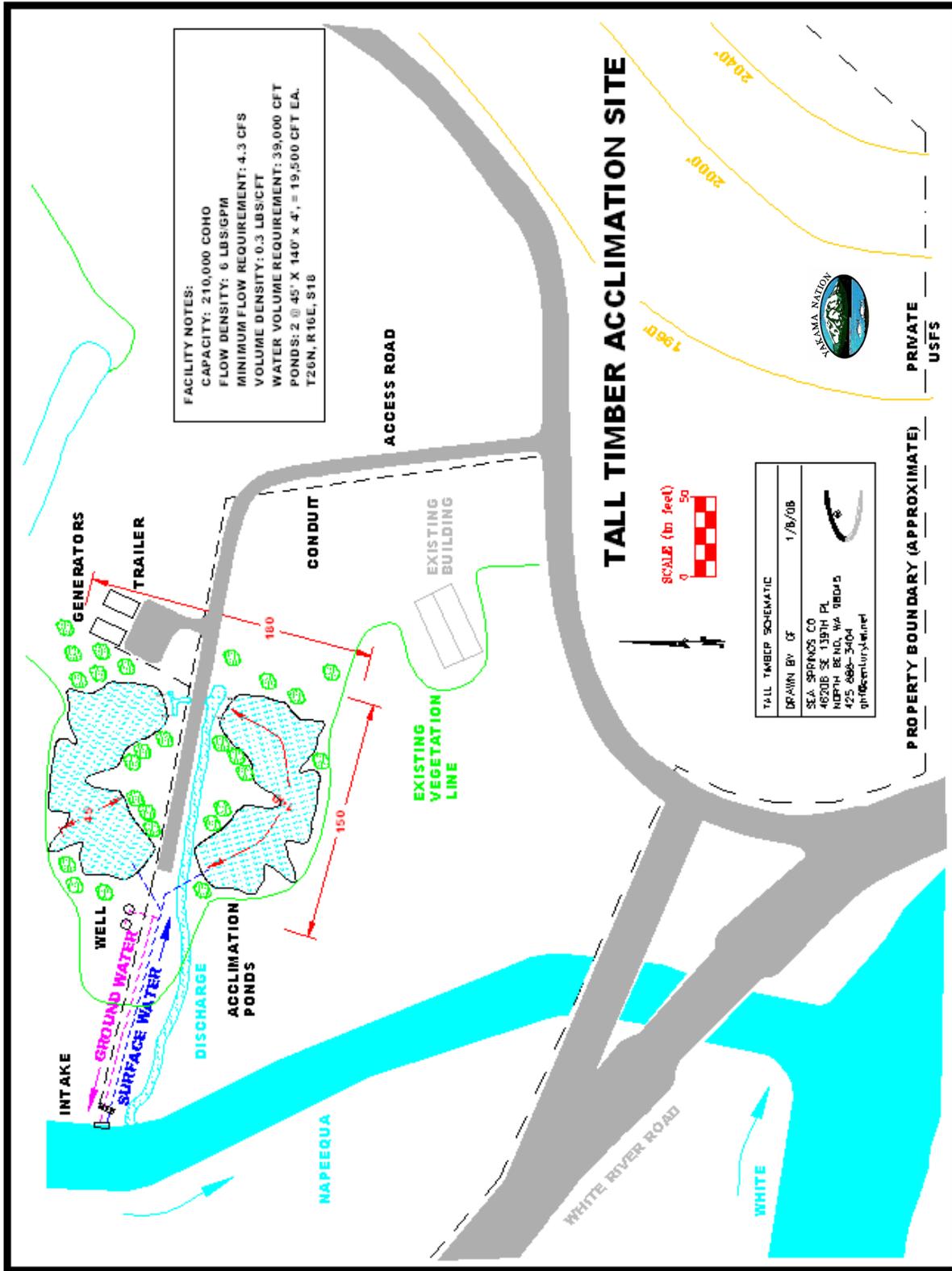


Figure 2. Tall Timber Conceptual Design

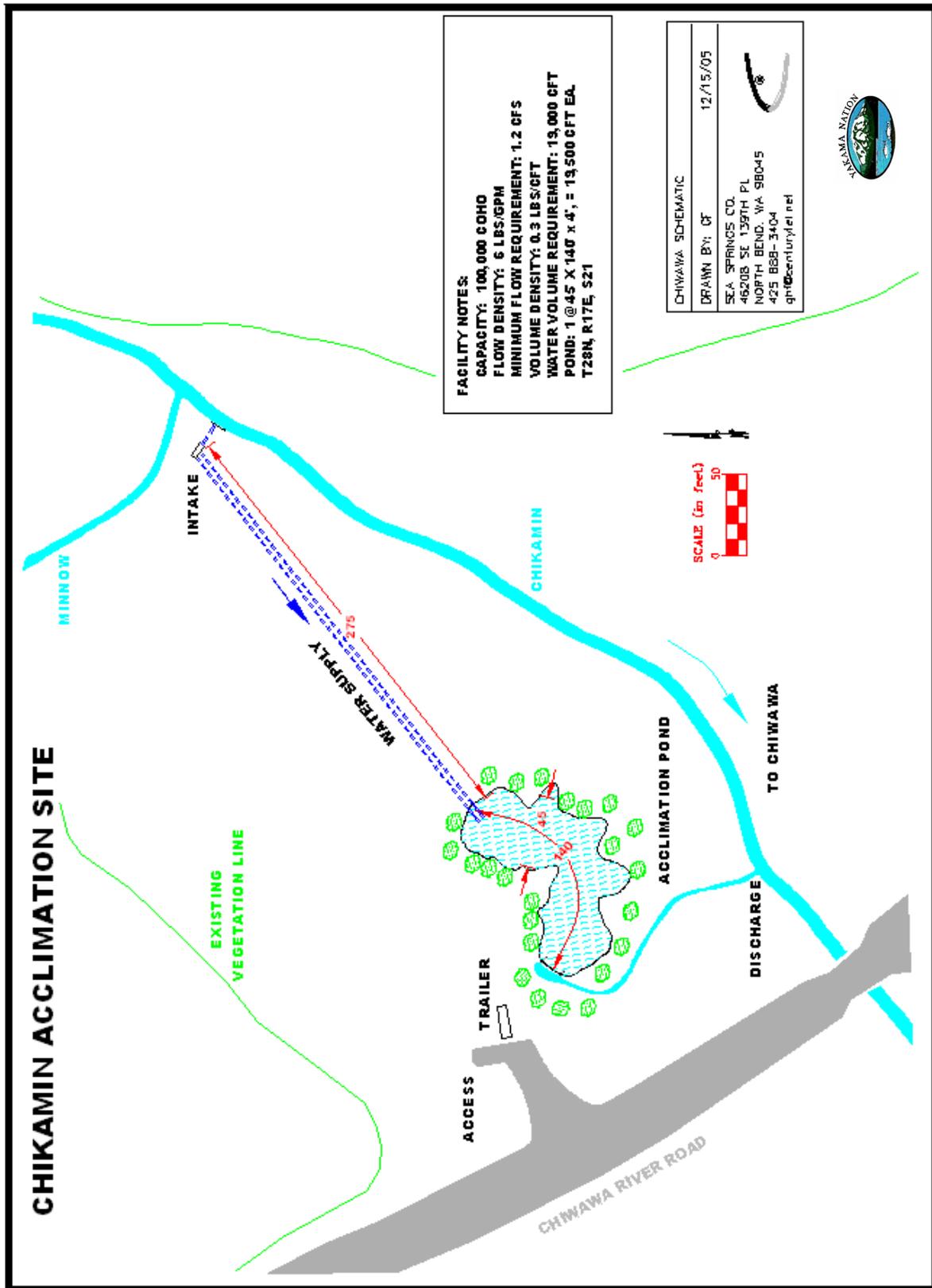


Figure 3. Chikamin Conceptual Design

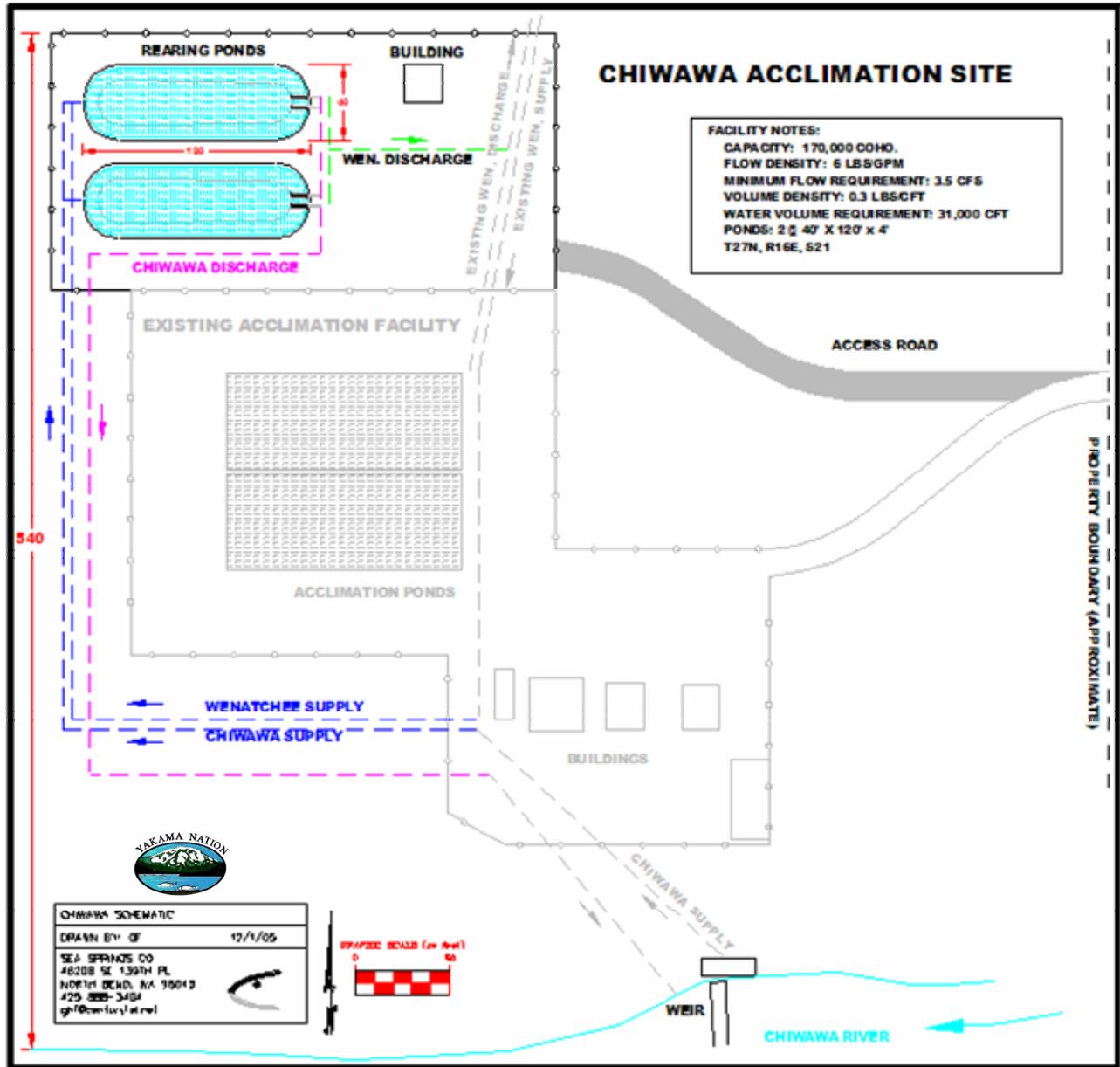


Figure 4. Chiwawa Conceptual Design

### III. FACILITY CAPITAL COSTS

Following are construction, capital equipment, and land purchase costs for the proposed acclimation sites. Table 4 summarizes these costs which are detailed in the following sections. All prices are 2005 dollars.

**Table 4. Wenatchee Acclimation Site Capital Cost Summary**

	Construction	Capital Equipment	Land Cost	Total
Tall Timber	\$854,008	\$117,700	\$290,500	\$1,262,208
Chikamin	\$273,047	\$16,050	\$460,000	\$749,097
Chiwawa	\$459,603	\$0	\$0	\$459,603
Existing	\$93,600	\$0	\$0	\$93,600
<b>TOTAL</b>	<b>\$1,680,258</b>	<b>\$133,750</b>	<b>\$750,500</b>	<b>\$2,564,508</b>

#### A. Existing Sites

Relatively minor capital improvements are proposed for sites with existing ponds. The only new barrier nets required are at the Roaring site. Adding new gravel to existing roads is included at 3 of the 5 sites. An improved water intake screen is planned for Beaver Creek. Predator control measures include stringing overhead wires and electric fences. At sites where it is possible, chain link fence will surround acclimation ponds. None of these existing sites will require land purchase or significant construction.

**Table 5. Existing Wenatchee Acclimation Site Capital Costs**

	Net barriers	Roads (\$18/ft)	Water intake	Predator Control	Fencing (\$24/ft)	Unlisted items allowance (30%)	TOTAL
Rohlfing	\$0	\$3,600	\$0	\$3,000	\$7,200	\$4,140	\$17,940
Coulter/Roaring	\$1,000	\$1,800	\$0	\$3,000	\$0	\$1,740	\$7,540
Beaver	\$0	\$14,400	\$5,000	\$3,000	\$0	\$6,720	\$29,120
Clear	\$0	\$0	\$0	\$3,000	\$0	\$900	\$3,900
Two Rivers	\$0	\$0	\$0	\$3,000	\$24,000	\$8,100	\$35,100
<b>TOTAL</b>	<b>\$1,000</b>	<b>\$19,800</b>	<b>\$5,000</b>	<b>\$15,000</b>	<b>\$31,200</b>	<b>\$21,600</b>	<b>\$93,600</b>

## B. New Facilities

**Table 6. Tall Timber Capital Costs**

TALL TIMBER	Description	Quan.	Units	Unit Cost	Cost	Totals
<b>CONSTRUCTION</b>						
SITE WORK		1.0	acres			\$ 56,781
Mobilization/demobilization	Equipment delivery, removal	1	ea	\$ 40,000	\$ 40,000	
Roads	Gravel access roads	460	lft	\$ 18	\$ 8,281	
Erosion Control	Silt fences, vegetation mats	1	ls	\$ 3,500	\$ 3,500	
Earthwork	Grub, clear, grade site	1.0	acre	\$ 5,000	\$ 5,000	
<b>SURFACE WATER SUPPLY</b>						
4.3 cfs						
Intake screen structure	Precast concrete screen base, screens (12 sft)	1	ea	\$ 30,000	\$ 30,000	
Intake installation	Sheet pile, dewatering, structure placement	1	ea	\$ 60,000	\$ 60,000	
Riprap	Intake stabilization, 800 sft	120	tons	\$ 90	\$ 10,800	
Pump/settling chamber	Poured in place, 30' x20' x20'	81	cy	\$ 800	\$ 65,185	
Airblast/groundwater systems	Compressor, piping, timer, groundwater manifold	1	ls	\$ 20,000	\$ 20,000	
Piping	18" PVC SDR35, sand bedding, fittings	200	ft	\$ 69	\$ 13,800	
Pond supply manifolds	Manifold, control valves	2	ea	\$ 5,000	\$ 10,000	
<b>GROUND WATER SUPPLY</b>						
1.0 cfs						
Well	8" diameter, 100' deep	1	ea	\$ 25,000	\$ 25,000	
Aeration tower	Packed columns	1	ea	\$ 2,000	\$ 2,000	
Piping	10" PVC SDR35, sand bedding, fittings	200	ft	\$ 61	\$ 12,200	
<b>ELECTRICAL/GENERATORS</b>						
\$ 64,509						
Power delivery	Poles, lines to deliver power to site	410	ft	\$ 4.90	\$ 2,009	
Site electrical	Water pumps, generators, service drop, alarms	1	ls	\$ 50,000	\$ 50,000	
Conduit	To surface water intake and well	500	lft	\$ 15	\$ 7,500	
Alarm system	Alarms, conduit, autodialer	1	ls	\$ 5,000	\$ 5,000	
<b>PONDS</b>						
2 @ 45'x140'x4'						
Pond construction	Excavate, form berms	1,806	cy	\$ 6.60	\$ 11,917	
Bottom drain system	Water removal system under ponds	650	lft	\$ 10	\$ 6,500	
Bottom preparation	4" of sand spread and compacted	179	cy	\$ 50	\$ 8,967	
Outlet structures	Pre-fabricated steel, with screens	4	ea	\$ 2,000	\$ 8,000	
Liners	Hypalon, installed	16,250	sft	\$ 0.90	\$ 14,625	
Predator net system	Supports with nets	24,375	sft	\$ 2.00	\$ 48,750	
<b>MISC</b>						
\$ 74,920						
Water discharge channel	Channel construction, rock	1,500	cy	\$ 7.00	\$ 10,500	
Site building	Generators, storage	400	sft	\$ 120	\$ 48,000	
Fencing	8' chain link	660	lft	\$ 22	\$ 14,520	
Overhead cover	Tree plantings	30	ea	\$ 30	\$ 900	
Site revegetation		1.0	acres	\$ 1,000	\$ 1,000	
<b>CONSTRUCTION SUBTOTAL</b>						
\$ 543,954						
Unlisted item allowance	Contingencies	30%				\$ 163,186
Contractor overhead	Construction management, profit	20%				\$ 108,791
Sales tax		7.0%				\$ 38,077
<b>CONSTRUCTION SUBTOTAL</b>						
\$ 854,008						
<b>CAPITAL EQUIPMENT</b>						
Trailer	Office, storage, living quarters	1	ea	\$ 15,000	\$ 15,000	
Surface water pumps, controls	3 cfs ea, 10' head, 5 hp each, sequential start, over	2	ea	\$ 5,000	\$ 10,000	
Ground water pump, controls	Well pump, 40' head, 8 hp, sequential start, over	1	ea	\$ 5,000	\$ 5,000	
Generators	50 Kw, 48 hour fuel tank	2	ea	\$ 40,000	\$ 80,000	
Sales tax		7.0%				\$ 7,700
<b>CAPITAL EQUIPMENT SUBTOTAL</b>						
\$ 117,700						
<b>LAND PURCHASE</b>						
Real estate appraisal		1	ea	\$ 5,000	\$ 5,000	
Land audit	Environmental appraisal	1	ea	\$ 3,000	\$ 3,000	
Land purchase	Purchase from private owner	5	acre	\$ 50,000	\$ 250,000	
Real estate tax		13%				\$ 32,500
<b>LAND PURCHASE SUBTOTAL</b>						
\$ 290,500						
<b>TOTAL</b>						
\$ 1,262,200						

**Table 7. Chikamin Capital Costs**

<b>CHIKAMIN</b>	<b>Description</b>	<b>Quan.</b>	<b>Units</b>	<b>Unit Cost</b>	<b>Cost</b>	<b>Totals</b>
<b>CONSTRUCTION</b>						
SITE WORK		1.0	acres			\$ 19,940
Mobilization/demobilization	Equipment delivery, removal	1	ea	\$ 10,000	\$ 10,000	
Roads	Gravel access roads	80	lft	\$ 18	\$ 1,440	
Erosion Control	Silt fences, vegetation mats	1	ls	\$ 3,500	\$ 3,500	
Earthwork	Grub, clear, grade site	1.0	acre	\$ 5,000	\$ 5,000	
<b>SURFACE WATER SUPPLY</b>						
		2.1	cfs			\$ 124,970
Intake screen structure	Precast concrete screen base, screens (6 sft)	1	ea	\$ 20,000	\$ 20,000	
Intake installation	Dewatering, structure placement	1	ea	\$ 50,000	\$ 50,000	
Riprap	Intake stabilization, 800 sft	80	tons	\$ 90	\$ 7,200	
Piping	18" PVC SDR35, sand bedding, fittings, 2 lines	550	ft	\$ 78	\$ 42,770	
Pond supply manifolds	Manifold, control valves	1	ea	\$ 5,000	\$ 5,000	
<b>ELECTRICAL/GENERATORS</b>						
						\$ 6,000
Alarm system	Alarms, conduit, cellular autodialer	1	ls	\$ 6,000	\$ 6,000	
<b>POND</b>						
		880	cy			\$ 14,806
Pond construction	Excavate, form berms	880	cy	\$ 6.60	\$ 5,806	
Outlet structures	Pre-fabricated steel, with screens	2	ea	\$ 2,000	\$ 4,000	
Predator net system	Supports with nets	1	ls	\$5,000.00	\$ 5,000	
<b>MISC</b>						
						\$ 8,200
Water discharge channel	Channel construction, rock	900	cy	\$ 7.00	\$ 6,300	
Overhead cover	Tree plantings	30	ea	\$ 30	\$ 900	
Site revegetation		1.0	acres	\$ 1,000	\$ 1,000	
<b>CONSTRUCTION SUBTOTAL</b>						
						\$ 173,916
Unlisted item allowance	Contingencies	30%				\$ 52,175
Contractor overhead	Construction management, profit	20%				\$ 34,783
Sales tax		7.0%				\$ 12,174
<b>CONSTRUCTION SUBTOTAL</b>						
						\$ 273,047
<b>CAPITAL EQUIPMENT</b>						
Trailer	Office, storage, living quarters	1	ea	\$ 15,000	\$ 15,000	
Sales tax		7.0%			\$ 1,050	
<b>CAPITAL EQUIPMENT SUBTOTAL</b>						
						\$ 16,050
<b>LAND PURCHASE</b>						
Real estate appraisal		1	ea	\$ 5,000	\$ 5,000	
Land audit	Environmental appraisal	1	ea	\$ 3,000	\$ 3,000	
Land purchase	Purchase from private owner	20	acre	\$ 20,000	\$ 400,000	
Real estate tax		13%			\$ 52,000	
<b>LAND PURCHASE SUBTOTAL</b>						
						\$ 460,000
<b>TOTAL</b>						
						\$ 749,097

KEY: LS = Lump Sum, EA = Each, LFT = Linear Feet, SFT = square feet, CFT = cubic feet, CY = Cubic Yards, MO = month, HRS = hours

**Table 8. Chiwawa Capital Costs**

CHIWAWA	Description	Quan.	Units	Unit Cost	Cost	Totals
<b>CONSTRUCTION</b>						
SITE WORK		1.0	acres			\$ 25,700
Mobilization/demobilization	Equipment delivery, removal	1	ea	\$ 10,000	\$ 10,000	
Roads	Gravel access roads	400	lft	\$ 18	\$ 7,200	
Erosion Control	Silt fences, vegetation mats	1	ls	\$ 3,500	\$ 3,500	
Earthwork	Grub, clear, grade site	1.0	acre	\$ 5,000	\$ 5,000	
<b>SURFACE WATER SUPPLY</b>						
Piping	18" PVC SDR35, sand bedding, fittings	1,100	ft	\$ 69	\$ 75,900	
Pond supply manifolds	Manifold, control valves	2	ea	\$ 5,000	\$ 10,000	
<b>PONDS</b>						
	2 @ 40'x120'x4'	1,435	cy			\$ 71,190
Pond construction	Excavate, form berms	1,435	cy	\$ 6.60	\$ 9,472	
Bottom drain system	Water removal system under ponds	650	lft	\$ 10	\$ 6,500	
Bottom preparation	4" of sand spread and compacted	144	cy	\$ 50	\$ 7,176	
Outlet structures	Pre-fabricated steel, with screens	4	ea	\$ 2,000	\$ 8,000	
Liners	Hypalon, installed	12,917	sft	\$ 0.90	\$ 11,625	
Predator net system	Supports with nets	14,208	sft	\$ 2.00	\$ 28,417	
<b>MISC</b>						
						\$ 109,951
Discharge piping	18" PVC SDR35, sand bedding, fittings	700	ft	\$ 69	\$ 48,300	
Site building	Storage	400	sft	\$ 120	\$ 48,000	
Fencing	8' chain link	575	lft	\$ 22	\$ 12,651	
Site revegetation		1.0	acres	\$ 1,000	\$ 1,000	
<b>CONSTRUCTION SUBTOTAL</b>						
						<b>\$ 292,741</b>
Unlisted item allowance	Contingencies	30%				\$ 87,822
Contractor overhead	Construction management, profit	20%				\$ 58,548
Sales tax		7.0%				\$ 20,492
<b>TOTAL</b>						
						<b>\$ 459,603</b>

KEY: LS = Lump Sum, EA = Each, LFT = Linear Feet, SFT = square feet, CFT = cubic feet, CY = Cubic Yards, MO = month, HRS = hours

### C. Basis for the Cost Estimates

In as many cases as possible, estimates for capital equipment and construction costs are based on the actual costs for recent fish facility projects completed by the MCCRCP and Yakama Nation coho programs. These projects are listed in Appendix C1. In addition, the 2006 Heavy Construction Costs Estimating Software was used to confirm these costs and to produce estimates where needed.

Land costs were based on a review of recent real estate listings of property for sale in the area. Averages of values for comparable property were used to estimate the Chikamin and Tall Timber land costs.

**IV. PHOTOS**



Beaver.jpg



Coulter.jpg



Roaring.jpg



Rolfing.jpg

**Figure 5. Group 1 Photos**



Chikamin.jpg



Chiwawa.jpg



Clear Creek.jpg



Two Rivers.jpg

**Figure 6. Group 2 Photos**