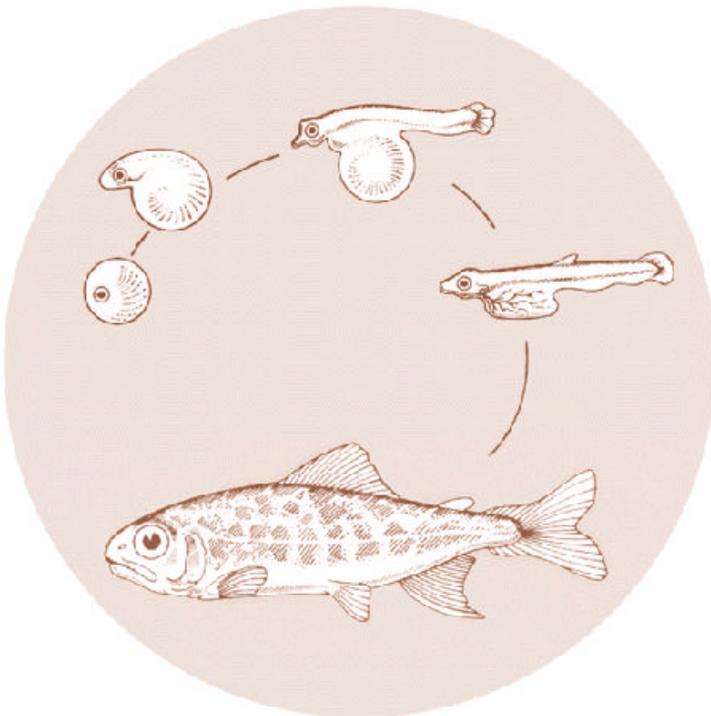


March 1995

NORTHEAST OREGON HATCHERY PROJECT

Final Siting Report



DOE/BP-11466-2



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NORTHEAST OREGON HATCHERY PROJECT
FINAL SITING REPORT

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EXECUTIVE SUMMARY

This report presents the results of site analysis for the Bonneville Power Administration Northeast Oregon Hatchery Project. The purpose of this project is to provide engineering services for the siting and conceptual design of hatchery facilities for the Bonneville Power Administration. The hatchery project consists of artificial production facilities for salmon and steelhead to enhance production in three adjacent tributaries to the Columbia River in northeast Oregon: the Grande Ronde, Walla Walla, and Imnaha River drainage basins. Facilities identified in the master plan include adult capture and holding facilities; spawning incubation, and early rearing facilities; full-term rearing facilities; and direct release or acclimation facilities. The evaluation includes consideration of a main production facility for one or more of the basins or several smaller satellite production facilities to be located within major subbasins.

The historic and current distribution of spring and fall chinook salmon and steelhead was summarized for the Columbia River tributaries. Current and future production and release objectives were reviewed. Among the three tributaries, forty seven sites were evaluated and compared to facility requirements for water and space. Site screening was conducted to identify the sites with the most potential for facility development. Alternative sites were selected for conceptual design of each facility type. A proposed program for adult holding facilities, final rearing/acclimation, and direct release facilities was developed.

INTRODUCTION

This report presents the results of work carried out under Tasks 1 and 2 of the contract between Bonneville Power Administration (BPA) and Montgomery Watson for the Northeast Oregon Hatchery Project (NEOH). The report is divided into 10 sections and an appendix which contain the following information:

Introduction

Current and Historic Distribution of Species

Production and Release Objectives

Fish Propagation Criteria

Water and Space Requirements

Surface Water and Groundwater Availability and Quality

Review of Existing Facilities and Assessment of Expansion Capabilities

Site Evaluation and Screening

Program Development

Literature Cited

Appendices.

The majority of the information contained in these sections has been previously presented to BPA and the NEOH Technical Work Group (TWG), which is comprised of BPA, Oregon Department of Fish and Wildlife (ODF&W), the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), and the Nez Perce Tribe (NPT). The information was presented in a number of working papers which were subsequently reviewed and discussed by the TWG, then revised as necessary by Montgomery Watson.

This report includes discussions of production goals, the bioengineering criteria for various facility types, reviews available data on surface water and groundwater availability and quality, discusses existing facilities and their potential for expansion, and documents the site/facility screening process carried out to arrive at a proposed program to be carried forward into conceptual design.

The project study area includes three adjacent tributaries to the Columbia River: the Grande Ronde, Walla Walla, and Imnaha River drainage basins in northeastern Oregon. Basin master planning for production goals has been carried out previously by affected tribes, state resource agencies, and the federal government. The purpose of this project is to evaluate site locations and provide conceptual design for fish production facilities designed to enhance and/or reestablish salmon stocks in these river basins and meet the production goals identified in the basin master plans.

Salmonid stocks under consideration include spring and fall chinook salmon and steelhead. Facilities required include adult capture and holding facilities; spawning, incubation, and early rearing facilities; full-term rearing facilities; and direct release or acclimation facilities. The

evaluation includes consideration of a main production facility for one or more of the basins or several smaller satellite production facilities to be located within major subbasins.

Site evaluation for these facilities is conducted in several phases. The first phase involved a review of available water quality and water quantity data, definition of fish propagation criteria specific to the program, definition of production and release objectives specific to the program, and definition of water and space requirements. Once these criteria were defined, site evaluations were carried out by project team field visits. The site reconnaissance teams included project staff with training in engineering and biology. Sites were evaluated for physical and environmental characteristics and a site data base developed. Following the site visits, site screening was conducted based on the project criteria and the site evaluations in order to identify a prioritized listing of sites for development of a program to meet basin production goals.

Conceptual design will be carried out for those facilities and sites that comprise the proposed program for each basin.

CURRENT AND HISTORIC DISTRIBUTION OF SPECIES

GRANDE RONDE BASIN

The following information on the current and historic distribution of salmon in the Grande Ronde Basin has been obtained from CBFWA (1990). The major spawning and rearing areas for spring and fall chinook are shown on Figure 1.

Spring Chinook

The Grand Ronde drainage historically produced large runs of spring chinook salmon. Prior to dam construction on the Snake River, a spawning escapement of than 12,200 fish was estimated.

Spring chinook are widely distributed throughout the basin. Twenty-one streams historically supported spring chinook. The Wenaha River, Catherine Creek, Minam River, Lookingglass Creek, Lostine River, and upper Grande Ronde were highly productive streams in the past. Riparian and instream habitat degradation has severely impacted spring chinook production potential. This is due to livestock overgrazing, mountain pine beetle damage, limited quality rearing habitat, low stream flows, logging activities, road construction, mining and unscreened diversion ditches. The current escapement is in the range of 300 to 1,700 fish. Return goals for spring chinook in the Grande Ronde Basin are 16,400.

Fall Chinook

Early and late fall chinook were historically distributed throughout the lower part of the river system. Currently only a few fish spawn in the lower Grande Ronde River, primarily below the Wenaha River. The current low spawning escapement is attributed to the Columbia River harvest, passage mortality at Columbia and Snake River dams, and habitat degradation within the basin. Return goals for fall chinook in the Grande Ronde Basin are an annual average return of 10,000.

Summer Steelhead

The Grande Ronde basin historically produced large runs of summer steelhead. The size of the historical runs are unknown, but an estimate 15,900 to the mouth of the Grande Ronde was given prior to the construction of the Snake River Dams.

Summer steelhead spawn and rear throughout the basin. Principal spawning areas include: middle and upper mainstem tributaries, Joseph Creek, Wenaha River, Wallowa River, Minam River, Deer Creek, Bear Creek, and Lostine River. The current run is estimated to be 11,000. Return goals for summer steelhead in the Grande Ronde Basin are 27,500.

IMNAHA BASIN

The following information on the current and historic distribution of salmon in the Imnaha basin has been obtained from CBFWA (1990). The major spawning and rearing areas for spring and fall chinook are shown on Figure 2.

Spring Chinook

Spring chinook spawn in the mainstem (Freezeout Creek to the Blue Hole), Big Sheep Creek (Coyote Creek to 0.25 miles above Lick Creek), and Lick Creek (from the confluence to the crossing of Forest Service Road 39). Spawning historically occurred in Little Sheep Creek and was documented for the first time in the South Fork Imnaha River in 1988. The historical run size is believed to be in the range of 4,000-7,000 fish. The current run is in the range of 132 to 1,400 fish. Return goals for spring chinook in the Imnaha River Basin are 5,700.

Fall Chinook

The Imnaha River fall chinook is extinct. The historic distribution of fall chinook in the subbasin is not known, but probably extended upstream as far as the town of Imnaha. Snake River stock is the preferred stock for re-introduction of fall chinook into the Imnaha Basin.

Summer Steelhead

The Imnaha River was historically an important producer of summer steelhead. Prior to the construction of the four lower Snake River dams in the late 1960s, adult escapement was approximately 4,000. Steelhead spawn throughout the basin. Low flows could be a problem in the the upper Big and Little Sheep Creeks due primarily to irrigation withdrawals for the Wallowa Valley Improvement Canal.

WALLA WALLA BASIN

The following information on the current and historic distribution of salmon in the Walla Walla Basin has been obtained from CBFWA (1990). The major spawning and rearing areas for spring chinook and steelhead are shown on Figure 3.

Spring Chinook

Although once abundant in the Walla Walla Basin, this species has been eliminated as a result of passage blocks, dewatering of the Walla Walla and Touchet rivers, and degradation of headwater habitat and mortalities at mainstem Columbia River Dams. An estimated 61 stream miles of spring chinook spawning and rearing habitat exists in the Walla Walla Basin including the upper mainstem Walla Walla River in Washington, and the South Fork in Oregon, and upper mainstem Touchet River, North and South Fork Touchet rivers, and the Wolf, Burnt, and Griffin forks in Washington. Return goals for spring chinook salmon in the Walla Walla River Basin are 5,000 (2,000 natural production + 3000 hatchery production).

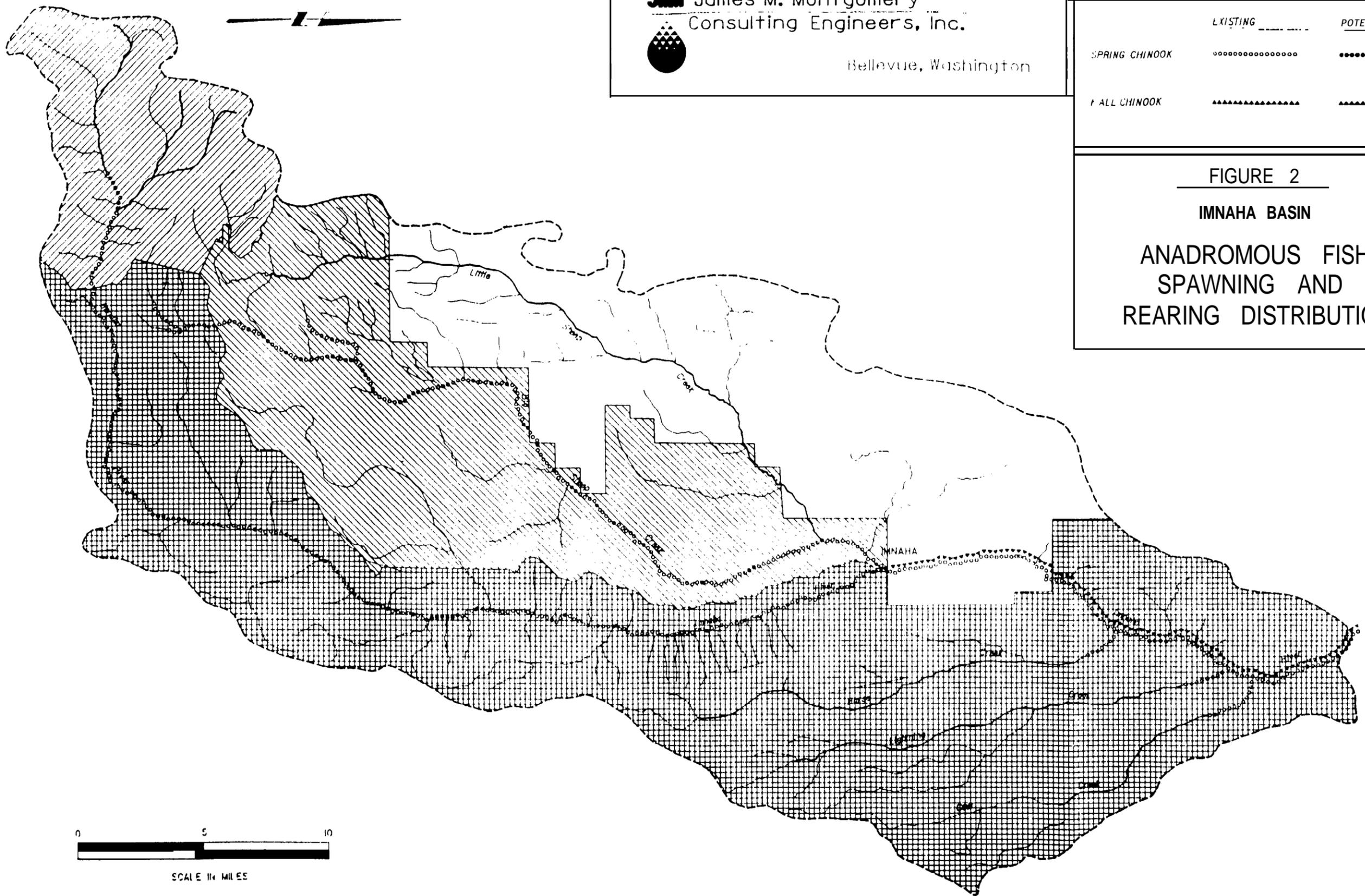
Summer Steelhead

Historically, summer steelhead spawned and reared throughout a large area of the middle and upper reaches of the mainstem Walla Walla and Touchet rivers and their tributaries. Widespread habitat degradation resulting from irrigation, dryland farming, livestock grazing and logging has reduced usable spawning habitat by approximately 50%. The historical run size is believed to be in the range of 4,000-5,000 fish. The current run is in the range of 1,000 to 2,000 fish. Return goals for summer steelhead in the Walla Walla River Basin are 11,000 (3,000 natural production + 8,000 hatchery production).


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LEGEND	
EXISTING	POTENTIAL
SPRING CHINOOK
FALL CHINOOK

FIGURE 2
IMNAHA BASIN
ANADROMOUS FISH
SPAWNING AND
REARING DISTRIBUTION



PRODUCTION AND RELEASE OBJECTIVES

INTRODUCTION

A broad range of policy **issues** that are under discussion will affect the eventual design of the fisheries program for the NEOH project area. These issues include:

- 1) Direct release vs acclimation
- 2) Out-basin rearing of fry and fingerlings
- 3) Impact of other fish released in the basin
- 4) Impact on other fish in the basin

PRODUCTION AND FACILITY NEEDS

Production goals for the NEOH Project are summarized below (Table 1).

TABLE 1
SUMMARY OF NEOH PRODUCTION GOALS

Species	No. of Broodstock	No. & Size	Lbs. of Fish	Group (See Tables 2 to 5)
Spring Chinook	559	550,000@10/lb	55,000	1 - 2
	400	544,150@15/lb 150,000@150/lb	32,277 1,000	4,6 5
	296	401,000@15/lb	26,733	7-10
	392	392,500@15/lb 230,000@150/lb	26,167 1,533	14-15
	548	589,000@10/#	58,900	17
	2,195 (Total)		201,610 (Total)	
Fall Chinook	640	1,350,000@40/ lb	31,250	11
	66	120,000@70/lb	1,714	16
	706 (Total)		32,964 (Total)	
Steelhead	80	100,000@10/lb	10,000	3
	80 (Total)		10,000 (Total)	
All Species	2981		244,574	

Long-term production goals and facility needs are presented in detail on Tables 2 through 5.

CURRENT PRODUCTION WITHIN THE NEOH PROJECT AREA

The following hatcheries and satellite facilities are within the boundaries of the NEOH Project or are used for fisheries programs within the basin:

Irrigon Hatchery

Lyons Ferry Hatchery

Lookingglass Hatchery

Wallowa Hatchery and Acclimation Ponds

Imnaha River Satellite and Acclimation Ponds

Little Sheep Creek Satellite and Acclimation Ponds

Big Canyon Satellite and Acclimation Ponds

Cottonwood Acclimation Ponds

Dayton Conditioning Ponds

These facilities have been funded totally or in part by the Lower Snake River Compensation Plan (LSRCP). Fish produced or released by the LSRCP were not included in Tables 2 through 5. A review of these facilities and their expansion potential is presented in a later section.

TABLE 3
LONG TERM PRODUCTION GOALS IN THE IMNAHA BASIN

Species	Group	Basis	Number of Adults Needed	Broodstock Source	Adult Holding	Incubation and Rearing	Production Goals	Purpose & Objectives	Release Date	Release Sites	Acclimation Sites
CHS Full-term Smolt program	Group 14	NBOH	260	Imnaha Wild Natural Stock	Facility needed for adult trapping and holding	Facility needed	392,500 @ 25/lb	fish	Mar 15- May 1		2-3 sites on main stem of Imnaha (Precasout to Indian Crossing), 392,500 for 30 days
CHS Sub-smolt program timed release	Group 15	NBOH	132	Imnaha Wild Natural Stock	Use same facility as for Group 14	Facility needed	230,000 @ 150/lb	fish	Jun-Jul-Sept	Direct release with trucks or chopper	
CHP	Group 16	NBOH	66	Snake River Stock (extinct in Imnaha)	Facility need for adult trapping; may use same facility for adult holding as Group 14	Facility needed	120,000 @ 70/lb	fish	May 1	Direct release on Lower Imnaha at Marr Site	

TABLE 4
LONG TERM PRODUCTION GOALS IN THE WALLA WALLA BASIN

Species	Group	Basis	Number of Adults Needed	Broodstock Source	Adult Holding	Incubation and Rearing	Production Goals	Purpose & Objectives	Release Date	Release Sites	Acclimation Sites
CHS	Group 1	NEOH	559	Carson stock initially (extinct in basin), Walla Walla River when fish start to return	Adult collection and holding will be required when stocks return to river.	Facility needed	450,000 -500,000@ 10/lb Prefer in-basin rearing on South Fork of Walla Walla.	fish	Mar-Apr	May need additional release sites	1 site on South Fork Walla Walla
CHS	Group 2	NEOH	Included with Group 1	Carson stock initially (extinct in basin), Walla Walla River when fish start to return	Adult collection and holding will be required when stocks return to river.	Facility needed	100,000- 150,000 @ 10/lb	fish	Mar-Apr	May need additional release sites	1-2 sites high on the Touchet
STS	Group 3	NEOH	80 More broodstock will be required if WA uses Walla Walla broodstock	Walla Walla River (600-800 currently)	Adult collection and holding needed Nursery Bridge Ladder near Milton- Preewater could be a site	May be able to use Irrigon or Umatilla for Incubation and rearing.	100,000 @ 10 lb Prefer final in-basin rearing on South Fork of Walla Walla.	fish	Mar-Apr	May need additional release sites	1 on South Fork Walla Walla If fish are reared out of basin, 1-3 months of final in-basin rearing will be needed May be possible to use the acclimation sites for CHS

TABLE 5
LONG TERM PRODUCTION GOALS IN THE UMATILLA BASIN
(NEOH COMPONENT)

Species	Group	Basis	Number of Adults Needed	Broodstock Source	Adult Holding	Incubation and Rearing	Production Goals	Purpose & Objectives	Release Date	Release Sites	Acclimation Sites
CHS	Group 17	NEOH	548	Umatilla River	Facility needed for adult holding	Facility needed	389,000 @ 10/lb	fish	Spring (Mar-Apr)	Upper Umatilla mainstem	4 needed 400,000 for 30 days

FISH PROPAGATION CRITERIA

INTRODUCTION

The biocriteria proposed for salmon culture for the NEOH Project are based on similar projects in the Pacific Northwest and discussion with agency and tribal personnel. These criteria will be used for planning level process design and facility layout.

WATER CHEMISTRY

Fundamental to facility planning is an understanding of various aspects of water chemistry, in both a general and site-specific sense.

Oxygen

The oxygen content of water used in fish rearing is important because the fish will consume varying amounts of oxygen as they develop and also, a certain minimum concentration of dissolved oxygen is required in order to provide an acceptable environment. For these reasons it is desirable to know the approximate dissolved oxygen concentration of the water supply and how it may vary with the degree of gas saturation, temperature, salinity, and site elevation.

The maximum amount of oxygen that can be dissolved in water is referred to as the saturation concentration. The saturation concentration depends on temperature, elevation (or barometric pressure), and salinity. Increasing temperature decreases the saturation concentration of oxygen (Table 6). Salinity (total dissolved solids) will have an insignificant effect on oxygen solubility at the NEOH sites.

Ammonia

Ammonia is produced by fish as a metabolic byproduct. In addition, water supplies often contain ammonia from pollution or natural sources. Fish have a limited tolerance to ammonia under certain conditions. Ammonia is a weak base, and occurs as ionized (NH_4^+) and un-ionized forms (NH_3). Unionized ammonia moves easily across biological membranes and is generally considered the most toxic of the two forms. The concentration of un-ionized ammonia in freshwater is primarily a function of pH and temperature (Table 7).

Carbon Dioxide

Fish have limited tolerance to carbon dioxide. Carbon dioxide is produced by fish as a respiratory byproduct, and water supplies often contain high concentrations of carbon dioxide. Under typical conditions, 1.375 mg of carbon dioxide is produced per 1 mg of oxygen consumed. The excretion of carbon dioxide by fish in intensive culture situations (a) increases the dissolved carbon dioxide concentration, (b) reduces the pH, and (c) reduces the concentration of un-ionized ammonia due to the decrease in pH. The reduction of pH depends on the initial carbon dioxide concentration, alkalinity of the water, and amount of carbon dioxide produced.

TABLE 6

DISSOLVED OXYGEN AS A FUNCTION OF TEMPERATURE
(2,000 FEET ELEVATION)

Temp (F)	DT (F)									
	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
32	13.61	13.59	13.57	13.55	13.53	13.51	13.49	13.46	13.44	13.42
33	13.40	13.38	13.36	13.34	13.32	13.30	13.28	13.26	13.24	13.22
34	13.20	13.17	13.15	13.13	13.11	13.09	13.07	13.05	13.03	13.01
35	12.99	12.97	12.95	12.93	12.91	AL.90	12.88	12.86	12.84	12.82
36	12.80	12.78	12.76	12.74	12.72	12.70	12.68	12.66	12.64	12.63
37	12.61	12.59	12.57	12.55	12.53	12.51	12.49	12.48	12.46	12.44
38	12.42	12.40	12.38	12.37	12.35	12.33	12.31	12.29	12.27	12.26
39	12.24	12.22	12.20	12.18	12.17	12.15	12.13	12.11	12.10	12.08
40	12.06	12.04	12.03	12.01	11.99	11.97	11.96	11.94	11.92	11.91
41	11.89	11.87	11.85	11.84	11.82	11.80	11.79	11.77	11.75	11.74
42	11.72	11.70	11.69	11.67	11.65	11.64	11.62	11.60	11.59	11.57
43	11.55	11.54	11.52	11.51	11.49	11.47	11.46	11.44	11.43	11.41
44	11.39	11.38	11.36	11.35	11.33	11.31	11.30	11.28	11.27	11.25
45	11.24	11.22	11.21	11.19	11.17	11.16	11.14	11.13	11.11	11.10
46	11.08	11.07	11.05	11.04	11.02	11.01	10.99	10.98	10.96	10.95
47	10.93	10.92	10.90	10.89	10.87	10.86	10.85	10.83	10.82	10.80
48	10.79	10.77	10.76	10.74	10.73	10.72	10.70	10.69	10.67	10.66
49	10.64	10.63	10.62	10.60	10.59	10.57	10.56	10.55	10.53	10.52
50	10.50	10.49	10.48	10.46	10.45	10.44	10.42	10.41	10.40	10.38
51	10.37	10.35	10.34	10.32	10.31	10.30	10.29	10.27	10.26	10.25
52	10.24	10.22	10.21	10.20	10.18	10.17	10.16	10.14	10.13	10.12
53	10.10	10.09	10.08	10.07	10.05	10.04	10.03	10.02	10.00	9.99
54	9.98	9.96	9.95	9.94	9.93	9.91	9.90	9.89	9.88	9.87
55	9.85	9.84	9.83	9.82	9.80	9.79	9.78	9.77	9.76	9.74
56	9.73	9.72	9.71	9.69	9.68	9.67	9.66	9.65	9.64	9.62
57	9.61	9.60	9.59	9.58	9.56	9.55	9.54	9.53	9.52	9.51
58	9.50	9.48	9.47	9.46	9.45	9.44	9.43	9.41	9.40	9.39
59	9.38	9.37	9.36	9.35	9.34	9.32	9.31	9.30	9.29	9.28
60	9.27	9.26	9.25	9.24	9.23	9.21	9.20	9.19	9.18	9.17
61	9.16	9.15	9.14	9.13	9.12	9.11	9.10	9.08	9.07	9.06
62	9.05	9.04	9.03	9.02	9.01	9.00	8.99	8.98	8.97	8.96
63	8.95	8.94	8.93	8.92	8.91	8.90	8.89	8.88	8.87	8.86
64	8.85	8.83	8.82	8.81	8.80	8.79	8.78	8.77	8.76	8.75
65	8.74	8.73	8.72	8.71	8.70	8.69	8.69	8.68	8.67	8.66
66	8.65	8.64	8.63	8.62	8.61	8.60	8.59	8.58	8.57	8.56
67	8.55	8.54	8.53	8.52	8.51	8.50	8.49	8.48	8.47	8.46
68	8.45	8.44	8.44	8.43	8.42	8.41	8.40	8.39	8.38	8.37
70	8.35	8.35	8.34	8.34	8.33	8.33	8.32	8.31	8.29	8.28
								8.20	8.20	8.19

TABLE 7

UN-IONIZED AMMONIA AS A PERCENTAGE OF TOTAL AMMONIA IN FRESHWATER AT VARIOUS TEMPERATURES AND PH

Temp. C	Temp. F	pH@ 6.9	pH@ 7.0	pH@ 7.1	pH@ 7.2	pH@ 7.3	pH@ 7.4	pH@ 7.5	pH@ 7.6	pH@ 7.7	pH@ 7.8	pH@ 7.9	pH@ 8.0	pH@ 8.1
4.44	40.0	0.09%	0.12%	0.15%	0.19%	0.24%	0.30%	0.37%	0.47%	0.59%	0.75%	0.94%	1.18%	1.48%
5.00	41.0	0.10%	0.12%	0.16%	0.20%	0.25%	0.31%	0.39%	0.49%	0.62%	0.78%	0.98%	1.23%	1.54%
5.56	42.0	0.10%	0.13%	0.16%	0.21%	0.26%	0.33%	0.41%	0.52%	0.65%	0.82%	1.02%	1.29%	1.61%
6.11	43.0	0.11%	0.14%	0.17%	0.22%	0.27%	0.34%	0.43%	0.54%	0.68%	0.85%	1.07%	1.34%	1.69%
6.67	44.0	0.11%	0.14%	0.18%	0.23%	0.28%	0.36%	0.45%	0.56%	0.71%	0.89%	1.12%	1.40%	1.76%
7.22	45.0	0.12%	0.15%	0.19%	0.24%	0.30%	0.37%	0.47%	0.59%	0.74%	0.93%	1.17%	1.47%	1.84%
7.78	46.0	0.12%	0.16%	0.20%	0.25%	0.31%	0.39%	0.49%	0.62%	0.77%	0.97%	1.22%	1.53%	1.92%
8.33	47.0	0.13%	0.16%	0.20%	0.26%	0.32%	0.41%	0.51%	0.64%	0.81%	1.02%	1.28%	1.60%	2.01%
8.89	48.0	0.13%	0.17%	0.21%	0.27%	0.34%	0.43%	0.53%	0.67%	0.85%	1.06%	1.33%	1.67%	2.10%
9.44	49.0	0.14%	0.18%	0.22%	0.28%	0.35%	0.44%	0.56%	0.70%	0.88%	1.11%	1.39%	1.75%	2.19%
10.00	50.0	0.15%	0.19%	0.23%	0.29%	0.37%	0.46%	0.58%	0.73%	0.92%	1.16%	1.45%	1.82%	2.28%
10.56	51.0	0.15%	0.19%	0.24%	0.31%	0.39%	0.48%	0.61%	0.77%	0.96%	1.21%	1.52%	1.90%	2.38%
11.11	52.0	0.16%	0.20%	0.25%	0.32%	0.40%	0.51%	0.64%	0.80%	1.00%	1.26%	1.58%	1.98%	2.49%
11.67	53.0	0.17%	0.21%	0.27%	0.33%	0.42%	0.53%	0.66%	0.83%	1.05%	1.32%	1.65%	2.07%	2.59%
12.22	54.0	0.17%	0.22%	0.28%	0.35%	0.44%	0.55%	0.69%	0.87%	1.09%	1.37%	1.72%	2.16%	2.70%
12.78	55.0	0.18%	0.23%	0.29%	0.36%	0.46%	0.58%	0.72%	0.91%	1.14%	1.43%	1.80%	2.25%	2.82%
13.33	56.0	0.19%	0.24%	0.30%	0.38%	0.48%	0.60%	0.75%	0.95%	1.19%	1.49%	1.87%	2.35%	2.94%
13.89	57.0	0.20%	0.25%	0.31%	0.40%	0.50%	0.63%	0.79%	0.99%	1.24%	1.56%	1.95%	2.45%	3.06%
14.44	58.0	0.21%	0.26%	0.33%	0.41%	0.52%	0.65%	0.82%	1.03%	1.29%	1.62%	2.04%	2.55%	3.19%
15.44	59.0	0.22%	0.28%	0.35%	0.45%	0.56%	0.70%	0.88%	1.11%	1.39%	1.75%	2.19%	2.74%	3.43%
16.44	60.0	0.24%	0.30%	0.38%	0.48%	0.60%	0.76%	0.95%	1.20%	1.50%	1.88%	2.36%	2.95%	3.69%
17.44	61.0	0.26%	0.33%	0.41%	0.52%	0.65%	0.82%	1.03%	1.29%	1.62%	2.03%	2.54%	3.17%	3.96%
18.44	62.0	0.28%	0.35%	0.44%	0.56%	0.70%	0.88%	1.10%	1.39%	1.74%	2.18%	2.73%	3.41%	4.25%

PH

pH has a major role in determining the toxicity of ammonia, heavy metals, and hydrogen sulfide. The pH of the process water can be changed due to the metabolic activity of the fish and biological filters.

WATER QUALITY CRITERIA FOR SALMONID REARING

Water quality criteria that provide general guidance in salmonid aquaculture planning are shown on Table 8.

Minimum Oxygen Levels

The minimum criterion for acceptable dissolved oxygen levels for salmonid culture (as the water leaves the raceways) is:

Fry & Fingerlings	7.0 mg/l
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As the incubation temperature increases, dissolved oxygen problems may occur just prior to hatching when dissolved oxygen demand is highest. The critical dissolved oxygen level may be above the local saturation concentration at those times.

Ammonia Criteria

Ammonia is a weak base and exists in ionized (NH_4^+) and un-ionized (NH_3) form. Un-ionized ammonia is more toxic to fish because it can move across biological membranes much faster than the ionized form. Chemical tests measure the amount of total ammonia ($\text{NH}_4^+ + \text{NH}_3$) which is generally expressed as nitrogen (molecular weight = 14.00 g/mol). The concentration of un-ionized ammonia depends on total ammonia, pH, and temperature. High pH and temperature favor the un-ionized form. Various criteria for the maximum allowable un-ionized ammonia concentration for salmonids range from 0.006 to 0.015 mg/L as $\text{NH}_3\text{-N}$ (Table 8). A recent review of ammonia toxicity (Meade, 1985) concluded that un-ionized ammonia is probably not the cause of gill hyperplasia, as previously assumed. He also stated that "A truly safe, maximum acceptable concentration of un-ionized, or total, ammonia for fish culture systems is not known". For this project, un-ionized ammonia criteria will be set at a concentration not to exceed 0.015 mg/l.

Carbon Dioxide

To determine carbon dioxide water quality criteria, it is also necessary to define critical levels. Recently, Piper et al. (1982) proposed an upper limit concentration of 10 mg/l, although others have suggested up to 20 mg/l (SECL, 1983). For NEOH planning 10 mg/l will be used as the carbon dioxide criterion. The carbon dioxide criteria may also depend on the relationship between carbon dioxide, alkalinity, and pH.

PH

Criteria for pH depend on species, life stage, and ionic composition of the water. For incubation and early fry rearing, SECL (1983) recommended that the pH be maintained between 6.5 - 8.5. This range will be used for NEOH planning.

TABLE 8
WATER QUALITY CRITERIA FOR SALMONIDS

Parameter	ADF&G ¹	SEP ²	WDF ³	USFWS ⁴
Alkalinity	undetermined	>15		10-400
Aluminium	<0.01	<0.10	<0.01	
Ammonia (total as N)		<0.05		
Ammonia (un-ionized as N)	<0.010		0.010	<0.010
Arsenic	<0.05		<0.05	<0.05
Barium	<5.0		<5	<5
Cadmium < 100 mg/L Alkalinity	<0.0005	<0.0003	<0.0002	<0.0004
> 100 mg/L Alkalinity	<0.005			<0.003
Carbon Dioxide	<1.0	<10	<1	0-10
Chloride	<4.0			<4
Chlorine	<0.03			<0.03
Chromium	<0.03	<0.04	<0.01	<0.03
Copper < 100 mg/L Alkalinity	<0.006	<0.0002	<0.05	<0.006
> 100 mg/L Alkalinity	<0.03			
Dissolved Oxygen - mg/L (%)	>7.0	(>95)		(95-100)
Fluoride	<0.5		<0.5	<0.5
Hydrogen Sulfide	<0.003	<0.002	<0.003	<0.002
Hardness		>20	<200	10-400
Iron	<0.1	<0.3	<0.1	<0.15
Lead	<0.02	<0.004	<0.02	<0.03
Magnesium	<15		<15	needed
Manganese	<0.01	<0.1	<0.01	<0.01
Mercury	<0.0002	<0.0002	<0.0002	<0.00005
Nickel	<0.01	<0.045	<0.01	<0.01
Nitrogen Gas (%)	<103		<110	<110
Nitrate as N	<0.2		<0.2	0-0.7
Nitrite as N	<0.03	<0.015	<0.03	<0.03
Ozone				<0.005
PCBs				<0.002
Petroleum (Oil)	<0.001			
pH (units)	6.5-8.0	7.2-8.5	6.5-8.0	6.5-8.0
Potassium	<5.0		<5	<5
Salinity (mg/kg)	<5.0			
Selenium	<0.01	<0.050	<0.002	<0.01
Silver	<0.003	<0.0001	<0.003	<0.003
Zinc	<0.005		<0.005	<0.03
Sodium	<75		<75	<75
Sulfate	<50		<50	<50
Suspended Solids		<3		
Temperature (°C)	0-15	5-10		
Total Dissolved Solids	<400			
Total Settleable Solids	<80			<80
Total Gas Pressure (%)	<110	<103		

All units mg/L unless otherwise noted

- (1) ADF&G 1983.
- (2) Shepherd 1984.
- (3) Schroeder 1984.
- (4) Piper et al. 1982.

PROCESS CRITERIA

Process criteria serve as the basis for conceptual design and layout. They will change as site- or program-specific information is developed.

General Process Criteria

General process criteria for NEOH are shown on Table 9.

Table 9
Process Criteria for NEOH (Adult Hauling - Incubation)

Parameter	Spring Chinook	Fall Chinook	Summer Steelhead
Adult Hauling			
Date	Apr 15-Jul 15	Sep-Dec	Oct-May
Weight (lb)	13	15	6
Adult Holding			
Date	Apr 15-Sep 15	Sep-Dec	Oct-May
Weight (lb)	13	15	6
Temperature (F)			
Optimum	50	50	50
Average Monthly Range	45-55	45-55	40-55
Maximum Daily Temperature ^a	63 (Apr-Jul) 60 (Aug-Sep)	63	60
Density (cf/fish)	8	7	2.5
Flow (gpm/fish)	-1.5 + 0.05xT	-1.5 + 0.05xT	-0.5 + 0.05xT
Survival (%) (Capture-Spawning)	75	80	75
Spawning			
Date	Aug 5-Sep 15	Oct 15-Dec	Mar 15-May
Female/Male Ratio	1:1	1:1	1:1
Eggs/female	4,200	4,500	5,200
Incubation			
Date	Aug-Dec	Oct 15-Feb	Mar 15-Jun
Eggs/Tray (1 female/tray)	4,200	4,500	5,200
Flow/8 trays (gpm)	6	6	6
Time to Hatch 50F(d)	93	93	54
Temperature (F)			
Optimum	42->39->42 ^b	52	52
Average Monthly Range	45-55	45-55	45-55
Maximum Daily Temperature ^a	60	60	60
Survival (green egg to feeding)	90	90	90
DD to Feeding	1665	1665	975
Length at Feeding (inches))	1.34	1.45	1.02
Weight at Feeding (#/lb)	1100	1100	2800

(a) Maximum Daily Temperatures are based on 75 percentile values

(b) This temperature profile may be used to delay the development of the eggs

Table 9 (Continued)

Process Criteria for NEOH (**Rearing**)

Parameter	Spring Chinook	Fall Chinook	Summer Steelhead
Length-Weight ($W = CL^n$, inches, lb)			
C	$2,959 \times 10^{-7}$	$2,959 \times 10^{-7}$	$3,405 \times 10^{-7}$
n	3.00	3.00	3.00
Early Rearing (Feeding to 200/lb)			
Date	Nov-Jan	Jan-Mar	May-Jul
Length at Start (inches)	1.34	1.45	1.02
Weight at Start (#/lb)	1100	1100	2800
Duration (d) @ 50F	32	32	64
Temperature (F)			
River-Well Water Mix	46		50
Average Monthly	35-60	35-60	35-60
Maximum Daily Temperature ^a	65	65	65
DI	1.00	1.00 ^b	1.00
FI (based on Table 8)	Table 8	Table 8	Table 8
Survival (%)	98	90	90
DD/inch	840	840	810
Length at End (inches)	2.57	2.57	2.45
Weight at End (#/lb)	200	200	200
Rearing (200/lb to Transport)			
Date	Feb	Jan-May 15	May-Apr
Length at Start (inches)	2.57	2.57	2.45
Weight at Start (#/lb)	200	200	200
Duration (d) @ 50F	12-205	50-85	189
Temperature (F)			
Optimum	55	55	55
Average Monthly	40.5	35-65	35-65
Maximum Daily Temperature ^a	70	70	70
DI	0.18	0.18	0.18
FI (based on Table 8)	Table 8/1.25	Table 8/1.25	Table 8/1.25
Survival (%)	98	92	92
DD/inch	840	840	810
Length at End (inches)	2.82-6.97	3.64-4.39	6.65
Weight at End (#/lb)	150-10	70-40	10

a Maximum Daily Temperatures are based on 75 percentile values

b DI - lbs/cu ft./in length no greater than 0.3

Table 9 (Continued)

Process Criteria for NEOH (Direct Release and Acclimation)

Parameter	Spring Chinook	Fall Chinook	Summer Steelhead
Fry Hauling for Direct Release			
Date	Jun-Sept	May	
Length (inches)	2.82	3.64-4.39	
Weight (#/lb)	150	70-40	
Survival (%)	99.7	99.7	
Direct Release			
Distance between sites	5-10	5-10	
Number of Fish/Release Site/Mile/Week	varies	varies	
Smolt Hauling for Acclimation			
Date	March	Mar-May 15	Feb-Apr
Length (inches)	6.08-6.97	3.64-4.39	6.65
Weight (#/lb)	16-17	70-40	10
Survival (%)	99.5	99.5	99.5
Acclimation and Release			
Date	Apr. 1	Apr-May 15	Mar-Apr
Distance between Sites	5-10	5-10	5-10
Length at Start (inches)	6.08-6.97	3.64-4.39	6.65
Weight at Start (#/lb)	16-17	70-40	10
Duration (d)@ 55F (days)	30	3 to 30	3 to 30
Temperature (F)			
Optimum	43	55	55
Average Monthly	35-65	35-65	35-65
Maximum Daily Temperature ^a	70	70	70
DI	0.11	0.11	0.11
FI (based on Table 8)	Table 8/1.25	Table 8/1.25	Table 8/1.25
Survival (%)	99.5	99.5	99.5
DD/inch	no growth	no growth	no growth
Length at End (inches)	6.08-6.97.	3.64-4.39	6.65
Weight at End (#/lb)	15	70-40	10

^a Maximum Daily Temperatures are based on 75 percentile values

Length-Weight Relationship

The weight of a fish in relation to its length, at any time, is expressed as follows:

$$W = C \times L^3$$

where W = weight in pounds, L = length in inches, and C is the condition factor for the specific species.

Development Rate

Eggs. Egg development rate is based on the number of degree days above 32 F.

Fry. Fry development rate is based on the number of degree days to achieve an inch of growth.

Feed Consumption

The amount of food to be fed to the fish must be known in order to predict oxygen demand, ammonia concentrations, and suspended solids production levels. Generally, the daily feeding rate is determined from information provided by feed companies or as summarized in Piper et al. (1982). This information can be converted to simple feeding coefficients (Fc) that relate feeding rate to water temperatures and growth rate.

TABLE 10

FEEDING COEFFICIENT AT VARIOUS WATER TEMPERATURES (a)

<u>Temperature</u> (°F)	<u>Feeding</u> <u>Coefficient-(b)</u>
46	7.38
49	8.54
52	9.70
55	10.86
58	12.02

(a) Based on feeding rates presented in Table 25 of Piper et al. (1982) for fish growing at 900 DD/inch length increase.

(b) Feeding Coefficient = (Water temperature - 26.94) x 0.387

To determine the daily amount of feed offered to fish, one would use the formula:

$$\% \text{ of Body Weight to Feed} = Fc/L$$

Where Fc is the feeding coefficient, and L is the length of fish in inches.

Oxygen Consumption

The calculations of oxygen levels and consumption will be based on the following relationship between feed (F) and oxygen consumption in raceways (**Oc**):

$$Oc = 0.25 \times F$$

Stated in another way, for each 100 pounds of food introduced to a raceway, 25 pounds of oxygen will be consumed in that raceway in the same period of time. This is probably conservative in that a general value of **Oc=0.22** x F was proposed by Willoughby for a dry diet. Values of Oc ranging from 0.22 to 0.25 are probably valid for fingerlings under production conditions. Higher values may be needed for smaller fish and for fry and fingerlings fed restricted rations.

Ammonia Production

The calculation of ammonia production is based on the following relationship between feed (F) and total ammonia produced, TAN (total ammonia expressed as nitrogen):

$$TAN = 0.029 \times F$$

This relationship is based on work by Mayo & Liao at the Cowlitz Trout Hatchery and verified by other sources.

Carbon Dioxide

As proposed by Piper et al (1982) the dissolved carbon dioxide produced per pound of feed will be based on the following relationship between feed (F) and carbon dioxide production (Cp):

$$Cp = 0.28 \times F$$

Suspended Solids

Suspended solids sources in the effluent of a production unit consist of materials in the **influent** water, fecal solids, uneaten feed, and other materials that have fallen or have been blown in the water. Pollution control requirements may be based in part on effluent suspended solids (**SuS**) levels. The calculations of **SuS** generated will be based on the following relationship between feed (F) and total **SuS**:

$$SuS = 0.35 \times F$$

Because of the number of materials that can contribute to suspended solids, operational considerations, and site-specific factors, the above relationship may not be valid for all locations.

Phosphate

Phosphate sources in intensive culture include uneaten feed, fecal matter, and direct excretion from the kidneys. The amount of phosphates added to the water also depends on the type of solids removal system used. Commonly, the amount of phosphate added to the diet is in excess of that needed by the fish. Because of discharge restrictions on phosphate

in North America and Europe, major research has been directed towards the reduction in the amount of phosphate in the diet and development of operational procedures to reduce the phosphate concentration in the discharge water. Based on work reported by Liao and Mayo (1974), the phosphate production rate will be based on the following relationship between feed (F) and total P04:

$$PO_4 = 0.016 \times F$$

Rearing Mortalities

To develop a hatchery model, it is necessary to have an estimate of mortalities that may be expected in the facility. Typically, survival is lowest at the beginning of a cycle and highest at the end. Survival assumptions for NEOH are shown on Table 11:

TABLE 11

ASSUMED SURVIVAL RATES BY LIFE STAGE AND SPECIES

Life Stage	Spring Chinook	Fall Chinook	Summer Steelhead
Capture-Spawning	75	80	75
Eggs-Smolt	72	75	75
Eggs-Feeding	90 (assumed)	90 (assumed)	90 (assumed)
Feeding-200/#	90 (assumed)	90 (assumed)	90 (assumed)
200/#-Release	92 (assumed)	92 (assumed)	92 (assumed)
Smolt Hauling	99.5 (assumed)	99.5 (assumed)	99.5 (assumed)
Acclimation Ponds	99.5 (Assumed)	99.5 (Assumed)	99.5 (Assumed)

Rearing Density

Density criteria (maximum weight of fish per cubic foot) is developed in terms of the Density Index approach. The Density Index (**DI**) is:

$$\text{DI} = \frac{\text{Fish density (lb/ft}^3\text{)}}{\text{Length of fish (inches)}}$$

or

$$\text{Density (lb/ft}^3\text{)} = \text{DI} \times \text{length in inches}$$

Detailed information on **DI**s for a number of similar projects is shown on Tables 12 and 13.

TABLE 12

DENSITY AND FLOW INDICES USED BY DIFFERENT AGENCIES IN THE PACIFIC NORTHWEST FOR OUTDOOR RACEWAYS (>800/LB.)

Agency/Project	Density Index (lb/(cfΣin))	Flow Index (lb/gpmΣin) (a)
ODF&W Design Values (Based on FMC, 1984)	0.22-0.30 (mean=0.26)	65
ODF&W (Recent Hatcheries)		
Willamette (standard)	0.16 (max)	50
Umatilla (ChS)	0.16 (max)	78
Umatilla (ChF)	0.17 (max)	83
WDF Design Values	undetermined	100
WDF (Recent Hatcheries)		
Issaquah (chinook)	0.08 (max)	96
Lyons Ferry (ChS)	0.03-0.23 (mean = 0.10)	60
Lyons Ferry (ChF)	0.06-0.27 (mean = 0.16)	60
Yakima/Klickitat Production Design Values	0.175 raceways (max) 0.150 ponds (max) 0.110 acclimation ponds (max)	4 (available O ₂ , mg/l) ----- (% food fed)(length, in.) (b)
US Fish & Wildlife Service		
Dworshak National Fish Hatchery (S tealhead)	0.25 (max)	
Makah National Fish Hatchery (Fall Chinook)	0.50 (max)	----
Piper et al., 1982 (Salmon and Trout)	0.50 (max)	100
Bonneville Power Administration (Assessment of Present Anadromous Fish Production 1990)	0.25 ChS (max) 0.30 ChF (max) 0.25 S tealhead (max)	100

(a) Percent of Table 8, Piper et al. (1982).

(b) Depending on specific rearing cycle and temperatures, the FIs computed from this equation range from 110- 130% of the values shown on Table 8, Piper et al. (1982).

TABLE 13

DENSITY AND FLOW INDICES USED BY VARIOUS AGENCIES IN THE PACIFIC NORTHWEST FOR EARLY REARING (<800/LB.)

Agency/Project	Density Index (lb/(cfΣin))	Flow Index (lb/gpmΣin) (a)
South Tacoma Hatchery Rainbow Trout	01.5-1.7	65-86
Cowlitz Hatchery Steelhead and Cutthroat	2.3-2.5	104-114
Mossyrock Hatchery Rainbow Trout	Similar to Cowlitz	Similar to cowlitz

(a) Percent of Table 8, Piper et al. (1982).

For NEOH, the following DIs are proposed for planning purposes (Table 14):

TABLE 14

PROPOSED DENSITY INDICES BY LIFE STAGE FOR NEOH

Phase	Density Index (lb/cfΣin)
Early Rearing	1 .00 (possibly up to 2.00 depending on feeding response)
Rearing in Raceways	0.17
Acclimation in Raceways	0.17
Acclimation in Earthen Ponds	0.11
Acclimation in Large Earthen Ponds	no information available
Acclimation in Side Channels	no information available

Flow Requirements

The water requirements in an intensive culture salmon hatchery are determined by six factors: (1) The amount of oxygen consumed, (2) the oxygen levels in the **influent** water supplied to the raceways, (3) tolerance to lowered oxygen levels, (4) ammonia in the incoming water supply, (5) metabolites, primarily ammonia, carbon dioxide, and suspended solids, produced in the rearing process, and (6) tolerance to the metabolites, specifically un-ionized ammonia, carbon dioxide and suspended solids. In turn, oxygen consumption and metabolite production is directly related to the amount of feed.

Flow requirements for adult holding as a function of temperature (°F) are based on Senn et. al. (1984) and are shown on Table 15.

TABLE 15

FLOW REQUIREMENTS AS A FUNCTION OF TEMPERATURE (T)

Species	gpm/fish
Spring Chinook	$-1.5 + 0.05T$
Fall Chinook	$-1.5 + 0.05T$
Summer S tealhead	$-0.5 + 0.05T$

Loading criteria for rearing (pounds of fish per gallon per minute) are developed in terms of the Flow Index approach. The Flow Index (FI) is:

$$FI = \frac{\text{Loading (lb/gpm)}}{\text{Length of fish (inches)}}$$

or

$$\text{Loading (lb/gpm)} = FI \times \text{length in inches}$$

The flow indices proposed for NEOH are shown on Table 16 and are based on Piper et al. (1982). For rearing and acclimation, Piper's values are derated by a factor equal to 1.25. Therefore, more water is required compared to Piper's table.

TABLE 16

FLOW INDEX RELATED TO WATER TEMPERATURE AND ELEVATION

Temp (°F)	Elevation (Feet)									
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
40	2.70	2.61	2.54	3.43	2.34	2.25	2.16	2.09	2.01	1.94
41	2.61	2.52	2.44	2.35	2.26	2.18	2.09	2.02	1.94	1.87
42	2.52	2.44	2.35	2.27	2.18	2.10	2.02	1.95	1.88	1.81
43	2.43	2.35	2.27	2.19	2.11	2.03	1.94	1.88	1.81	1.74
44	2.34	2.26	2.18	2.11	2.03	1.95	1.87	1.81	1.74	1.68
45	2.25	2.18	2.10	2.03	1.95	1.88	1.80	1.74	1.68	1.61
46	2.16	2.09	2.02	1.94	1.87	1.80	1.73	1.67	1.61	1.55
47	2.07	2.00	1.93	1.86	1.79	1.73	1.66	1.60	1.54	1.48
48	1.98	1.91	1.85	1.78	1.72	1.65	1.58	1.53	1.47	1.42
49	1.89	1.83	1.76	1.70	1.64	1.58	1.51	1.46	1.41	1.36
50	1.80	1.74	1.68	1.62	1.56	1.50	1.44	1.39	1.34	1.29
51	1.73	1.67	1.62	1.56	1.50	1.44	1.38	1.34	1.29	1.24
52	1.67	1.61	1.56	1.50	1.44	1.39	1.33	1.29	1.24	1.19
53	1.61	1.55	1.50	1.45	1.39	1.34	1.29	1.24	1.20	1.15
54	1.55	1.50	1.45	1.40	1.34	1.29	1.24	1.20	1.16	1.11
55	1.50	1.45	1.40	1.35	1.30	1.25	1.20	1.16	1.12	1.07
56	1.45	1.40	1.35	1.31	1.26	1.21	1.16	1.12	1.08	1.04
57	1.41	1.36	1.31	1.27	1.22	1.17	1.13	1.09	1.05	1.01
58	1.36	1.32	1.27	1.23	1.18	1.14	1.09	1.05	1.02	0.98
59	1.32	1.28	1.24	1.19	1.15	1.10	1.06	1.02	0.99	0.95
60	1.29	1.24	1.20	1.16	1.11	1.07	1.03	0.99	0.96	0.92
61	1.25	1.21	1.17	1.13	1.08	1.04	1.00	0.97	0.93	0.90
62	1.22	1.18	1.14	1.09	1.05	1.01	0.97	0.94	0.91	0.87
63	1.18	1.14	1.11	1.07	1.03	0.99	0.95	0.92	0.88	0.85
64	1.15	1.12	1.08	1.04	1.00	0.96	0.92	0.89	0.86	0.83

NOTE: Based on optimum index of FI = 1.5 at 50F and 5,000 Feet Elevation. Oxygen Concentration is Assumed to be at or Near 100% Saturation (Piper et al., 1982).

WATER AND SPACE REQUIREMENTS

INTRODUCTION

In order to adequately evaluate the NEOH program objectives, the potential facilities that may be necessary to satisfy both the production goals and biological requirements of the program have been evaluated. These preliminary descriptions and design criteria were used for analyzing the candidate sites' available land area, water supply, water quality and major institutional issues.

The following information defines the critical factors that are required for preliminary screening of alternatives and evaluation of options. The criteria presented are based upon information obtained from BPA, ODF&W, CTUIR, NPT as well as Montgomery Watson's experience. These criteria are presented to elicit comment, to assist and to facilitate discussion, and are intended to be modified as necessary.

Because the NEOH project area covers 3 separate basins, the number and mix of facilities could vary widely. To simplify this section, only two program options have been considered for the Final Siting Report:

- 1) A single, centralized facility for the entire NEOH project area
- 2) Separate facilities for adult holding, incubation, and rearing in each basin.

The facilities used to meet the production goals will be based on the information collected during site evaluation. The following sections present basic information for each of the life stages involved in planning.

FACILITY DESCRIPTIONS

Adult Capture

Location

Walla Walla (2)
Grande Ronde (2 or more)
Imnaha (1)
Umatilla (1)

Schedule

Apr 15 -December

Minimum Flow Necessary

10 cfs

Facilities Necessary or Desirable for Adult Capture

1. Weir
2. Ladder
3. Holding (short-term)
4. Security (Personnel on-site during operations, security guard during holding).
5. Small office/storage
6. Small trailer or bunkhouse for personnel

Adult Holding - Single Facility

Number of Adult Fish (Assumed)

CHS	2195
CHF	706
STS	80

Flow Criteria

<u>Temperature</u>	CHS gpm/fish	CHF gpm/fish	STS gpm/fish
50°F	1.00	1.00	2.00
55°F	1.25	1.25	2.50
60°F	1.50	1.50	3.00
65°F	1.75	1.75	3.50

Holding Volume Criteria

	<u>Unit (cf/fish)</u>
CHS	8
CHF	7
STS	2.5

Schedule

	<u>Period</u>
CHS	April 15 -1 October
CHF	September-December
STS	November-May

Holding Volume and Flow Requirement

Based on a design temperature of 55 °F, the required volumes and flows are:

Species	Volume (cf)	Flow (gpm)
CHS	13,176	2,744
CHF	4,942	883
STS	200	200

The maximum holding volume and flows will be computed based on the assumption that during the month of September, 100% of the Spring Chinook and 25% of the Fall Chinook must be held. This would require 14,412 cf of holding space and 2,965 gpm. Seven different stocks of fish must be held. At least 5 stocks may be held at one time. Therefore, assuming a minimum holding volume/stock of 5,000 cf, a total adult holding volume of 25,000 cf will be required.

Summary

Maximum Volume Required - 25,000 cf
Maximum Sustained Temp. - 55°F
Maximum Flow Required - 6.6 cfs (2965 gpm)

Facilities Necessary or Desirable for Adult Holding Facility

1. Water supply
2. Ponds or Raceways (2 min)
3. Office/storage
4. Sanitary facilities
5. Utilities
6. Carcass Disposal
7. Limited bunk house
8. **Security**
9. Access
- 1b. Effluent discharge / water treatment
11. Egg taking station

Assumed Size (General) for Complete Facility Layout

10 acres

Adult Holding • Facilities in Each Basin

Number of Adult Fish

Basin	CHS	CHF	STS
Walla Walla	559		80
Grande Ronde	696	640	
Imnaha	392	66	
Umatilla	548		
Total	2195	706	80

Flow Criteria

<u>Temperature</u>	<u>CHS gpm/fish</u>	<u>CHF gpm/fish</u>	<u>STS gpm/fish</u>
50°F	1.00	1.00	2.00
55°F	1.25	1.25	2.50
60°F	1.50	1.50	3.00
65°F	1.75	1.75	3.50

Holding Volume Criteria

	<u>Unit (cf/fish)</u>
CHS	8
CHF	7
STS	2.5

Holding Schedule

	<u>Period</u>
CHS	April 15 -1 October
CHF	September-December
STS	November-May

Holding Volume and Flow Requirement

The maximum holding volume and flow will be computed based on the assumption that during the month of September 100% of the Spring Chinook and 25% of the Fall Chinook must be held. Based on a design temperature of 55 °F, the required volumes and flows by basin are:

VOLUME REQUIREMENT (cubic feet)

Basin	CHS	CHF	STS	Design Value
Walla Walla	4,472		200	4,500
Grande Ronde	5,568	4,480		6,700
Imnaha	3,136	462		3,300
Umatilla	4,384			4,400

FLOW REQUIREMENTS (gpm)

Basin	CHS	CHF	STS	Design Value
Walla Walla	699		200	700
Grande Ronde	870	800		1,100
Imnaha	490	83		510
Umatilla	685			700

SUMMARY

Basin	Volume (cf)	Flow (gpm)
Walla Walla	4,500	700
Grande Ronde	6,700	1,100
Imnaha	3,300	510
Umatilla	4,400	700

Facilities Necessary or Desirable for Adult Holding

1. Water supply
2. Ponds or Raceways (2 min)
3. Office/storage
4. Sanitary facilities
5. Utilities
6. Carcass Disposal
7. Limited bunk house
8. Security
9. Access
- 1b. Effluent discharge / water treatment
11. Egg taking station

Assumed Size (General) for Complete Facility Layout

5 acres

Incubation and Early Rearing - Single Facility

Incubation and early rearing is defined as rearing of fish from green eggs to 200/pound.

Number of Eggs and Fry

Species	Fry Needed	Eggs Needed
CHS -	3,174,000	3,919,000
CHF -	1,489,000	1,838,000
STS -	109,000	134,000
Total	4,772,000	5,891,000

Schedule

Species	Incubation	Early Fry Rearing
CHS -	Aug-Dec	Nov-Feb
CHF -	Oct 15-Feb	Jan-Mar
STS -	March 15-Jun	May-Jul

Temperature and Flows Required (total program)

Incubation

Maximum Water Temperature 55°F
Water Temperature Range - 45 to 55°F

CHS	Design flow (120 stack of 8 trays @ 8 gpm)	960 gpm
CHF	Design flow (52 stack of 8 trays @ 8 gpm)	416 gpm
STS	Design flow (4 stack of 8 trays @ 8 gpm)	32 gpm
Controlling Flow = 1,376 gpm (CHS+CHF)		

Early Rearing

Maximum Water Temperature 55°F
Water Temperature Range - 45 to 56°F

Design Flow

FI=1.35, (55°F/3,000 ft elevation)
Loading =3.47 lb/gpm
6,900 gpm

Density

DI = 1.0
D = 2.47 lb/ct
Volume = 10,000 cf

Water Source

Groundwater (first priority)
Disinfected Surface Water (second priority)

Facility Size (generic)

2 acre (max.)

Facilities Necessary or Desirable for Incubation/Early Rearing

1. Groundwater supply (1st option)
2. Disinfection facilities (secondary option)
3. Loading facility
4. Incubation room (controlled environment)
5. Office lab area
6. Personnel facilities
7. Sanitary facilities
8. Early rearing facilities
9. Effluent disinfection

Incubation and early rearing would be developed with other facilities at a particular site, such as full-term rearing or adult holding, so infrastructure would be in place.

Incubation and Early Rearing - Facilities in Each Basin

Incubation and early rearing is defined as rearing of fish from green eggs to **200/pound**.

Number of Eggs and Fry

Eggs

Basin	CHS	CHF	STS
Walla Walla	738,000		134,000
Grande Ronde	1,470,000	1,677,000	
Imnaha	835,000	161,000	
Umatilla	790,000		

Fry

Basin	CHS	CHF	STS
Walla Walla	598,000		109,000
Grande Ronde	1,190,000	1,359,000	
Imnaha	677,000	130,000	
Umatilla	1640,000		

Schedule

Species	Incubation	Early Rearing
CHS -	Aug-Dec	Nov-Feb
CHF -	Oct 15-Feb	Jan-Mar
STS -	March 15-Jun	May-Jul

Temperature and Flows Required

Incubation

Maximum Water Temperature 55°F
Water Temperature Range - 45 to 55°F
Water flow per 8 trays = 8 gpm

It is assumed that both CHS and CHF are in the incubators at the same time.

Number of Stacks

Basin	CHS	CHF	STS	Total
Walla Walla	22		4	22
Grande Ronde	44	47		91
Imnaha	25	5		30
Umatilla	24			24

Water Flow (gpm)

Basin	CHS	CHF	STS	Total
Walla Walla	176		32	176
Grande Ronde	352	376		728
Imnaha	200	40		240
Umatilla	192			192

Early Rearing

Maximum Water Temperature 55°F
Water Temperature Range - 45 to 56°F
Assume 100% of CHS and 50% of CHF in raceways during January and February

Design Flow

FI=1.35, (55°F/3,000 ft elevation)
Loading =3.47 lb/gpm

Density

DI = 1.0
D = 2.47 lb/ct

Rearing Volume (cf)

Basin	CHS	CHF	STS	Total
Walla Walla	1,200		220	1,200
Grande Ronde	2,410	2,800		3,810
Imnaha	1,370	263		1,400
Umatilla	1,300			1,300

Water Flow (gpm)

Basin	CHS	CHF	STS	Total
Walla Walla	962		160	962
Grande Ronde	1,800	1,960		2,780
Imnaha	976	190		1,070
Umatilla	922			920

Water Source

Groundwater (first priority)
Disinfected Surface Water (second priority)

Facility Size (generic)

1 acre (max.)

Facilities Necessary or Desirable for Incubation/Early Rearing

1. Groundwater supply (1st option)
2. Disinfection facilities (secondary option)
3. Loading facility
4. Incubation room (controlled environment)
5. Office lab area
6. Personnel facilities

7. Sanitary facilities
8. Early rearing facilities
9. Effluent disinfection

Incubation and early rearing would be developed with other facilities at a particular site, such as full-term rearing or adult holding, so infrastructure would be in place.

Full Term (Satellite) Rearing - Single Facility

Full term rearing is defined as rearing of fish from 200/pound to release, it does not include incubation and early fry rearing.

Number of Fish Total

ChS would be the limiting factor for rearing because of the longer rearing period and larger biomass. CHS programmed for release at 150/lb. have not been considered as they will be planted early in the rearing cycle.

1,139,000 @ 10/lb	6.97"
1,338,000 @ 15/lb	6.08"

Schedule

Rearing Period - 15 months
 Schedule - April to May release
 Size initial - 200/lb

Flows Required (total program)

FI = 0.93 (3000 ft & 60 F)	
Loading = 6.48 lb/gpm @ 10/lb	
Loading = 5.65 lb/gpm @ 15/lb	
Flow @ 10/lb =	17,577 gpm
Flow @ 15/lb =	15,788 gpm
Total Flow =	33,365 gpm (74.5 cfs)

Volume Required

DI = 0.18	
Density = 1.25 lb/cf @ 10/lb	
Density = 1.09 lb/cf @ 15/lb	
Volume @ 10/lb =	91,120 cf
Volume @ 15/lb =	81,835 cf
Total =	173,000 cf

Summary

Maximum Holding Area Required - 173,000 cf
 Temperature Range - 45-65°F
 Peak Maximum diurnal temperature 60-65°F
 Maximum Flow Required - 74.5 cfs
 Maximum summer critical flow - 56 cfs (75% of maximum)

Facilities Necessary or Desirable for Full Term Rearing Facilities

1. Water supply
2. Water treatment
3. Loading facilities
4. **Office/storage/lab**
5. Personnel facilities
6. Raceways/ponds
7. Sanitary facilities
8. Access
9. Utilities
- 1b. **Security**
11. Effluent water treatment and return

Assumed Size of Complete Facilities

10 acres

Full Term (Satellite) Rearing - Facilities in Each Basin

Full term rearing is defined as rearing of fish from **200/pound** to release, it does not include incubation and early fry rearing.

Number of Fish Total

The CHS planted at **150/lb** have not been considered in this computation because of the small amount of biomass.

Basin	CHS	CHF	STS
Walla Walla	550,000@10/#		100,000@10/#
Grande Ronde	945,155@15/#	1,250,000@40/#	
Imnaha	392,500@15/#	120,000@70/#	
Umatilla	589,000@10/#		

C H S 10/lb 6.97"

C H S 15/lb 6.08"

C H F 40/lb 4.39"

C H F 70/lb 3.64"

S T S 5/lb 8.37"

Schedule

CHS

Rearing Period - 200 days
Release Period - April to May

CHF

Rearing Period - 50 days
Release Period - April to May

STS

Rearing Period - 189 days
Release Period - April to May

Flows Required

Water flows are based on CHS + STS as these two species will be in the raceways at the same time. The overlap between the CHS and CHF will be considered during concept design.

Design Flow Index

$$FI = 1.35 \text{ (3000 ft \& 55 F)}$$

SCH

Loading = 6.48 lb/gpm @ 10/lb
Loading = 5.65 lb/gpm @ 15/lb

CHF

Loading = 4.08 lb/gpm @ 40/lb
Loading = 3.39 lb/gpm @ 70/lb

STS

Loading = 7.78 lb/gpm @ 5/lb

Water Flow (gpm)

Basin	CHS	CHF	STS	Total
Walla Walla	8,488		2,570	9,800
Grande Ronde	11,152	7,659		11,200
Imnaha	4,631	506		4,600
Umatilla	9,090			9,100

Volume Required

Volumes are based on CHS + STS as these two species will be in the raceways at the same time. The overlap between the CHS and CHF will be considered during concept design.

Design Density Index

$$DI = 0.18$$

CHS

Density = 1.25 lb/cf @ 10/lb
 Density = 1.09 lb/cf @ 15/lb

CHF

Density = 0.73 lb/cf @ 40/lb
 Density = 0.61 lb/cf @ 70/lb

STS

Density = 1.40 lb/cf @ 5/lb

Volume (cf)

Basin	CHS	CHF	STS	Total
Walla Walla	44,000		14,200	51,100
Grande Ronde	58,000	43,000		58,000
Imnaha	24,000	2,800		24,000
Umatilla	47,000			47,000

Summary

Maximum flow and volume listed above

Maximum summer critical flow at 75% of maximum

Facilities Necessary or Desirable for Full Term Rearing Facilities

1. Water supply
2. Water treatment
3. Loading facilities
4. Office/storage/lab
5. Personnel facilities
6. Raceways/ponds
7. Sanitary facilities
8. Access
9. Utilities
- 1b. Security
11. Effluent water treatment and return

Assumed Size of a Complete Facilities

10 acres

Direct Release

Number of Fish

1.37 million CHF

0.380 million CHS subsmolt

Some portion of the remaining 2.47 million CHS smolts

Site Locations

Greater than 3 river miles between sites.

Schedule

- Spring Chinook
 - June-July-September (subsmolts)
- Fall Chinook
 - April-May
- Summer S tealhead
 - None planned

Facilities Necessary or Desirable for Direct Release

1. Access to river (safety consideration)
2. Flowing “pool” near access
3. Public parking if access is open (2-3 spaces)

Final (Extended) Rearing/Acclimation Facilities

Final rearing/acclimation of fish may occur over a period of time ranging from 3 to 30 days.

Number of Fish

CHS

Some portion of the 2.47 million CHS smolts

STS

100,000 @ 5/lb

Unit Assumption

Assume 1 unit equal 100,000 fish @ 5/lb (arbitrary but convenient)

Schedule

- Spring Chinook March-May
- Summer Steelhead March-April

Flow Required

Approximately 4 cfs/unit (0.018 gpm/fish)

Acclimation Unit Options to be Considered

- Option 1 - Holding Raceway - Concrete Trough
A minimum of 2 independent sub units (tanks) per unit
Volume each unit 8,600 cf
Area per unit - 2 acres
- Option 2 - Pond (Earthen or FML Lined)
One or more ponds per unit
Volume each unit 20,000 cf
Area per unit (general) 4 acres
- Option 3 - Flow through Natural Pond
Environment with developed cover and vegetation
One pond per unit

Volume each unit 20,000 (plus) cf
Area per unit (general) 4 (plus) acres

Option 4 - Natural Side Channel

One per unit
Volume per unit - 10,000 \pm cf
Area per unit - depending upon site selection

Facilities Necessary or Desirable for Final Rearing/Acclimation Facility for the NEOH Basins

1. Water intake and supply
2. Raceway tankage/pond
3. Access
4. Security
5. Water discharge and return facilities
6. Release structure
7. Weir ladder and holding area if adult collection included
8. Fish barrier/ screens

Small-Scale Hatchery

Facility Size per Unit

50,000 smolts (10/lb) (preliminary assumption)

Water Quality

River water 8/gpm = 700 gpm (1.6 cfs)
Groundwater 2.15/gpm 50 gpm

All incubation and early rearing (up to 500/lb) must be on groundwater or a disinfected surface water supply ($50^{\circ}\pm 5$)

Facilities Required

1. Water source surface and ground (disinfected surface water)
2. Egg source
3. Egg incubation (boxes, trough, etc.)
4. Raceways (2)
5. Utilities
6. Security
7. Sanitary Facilities
8. Personnel facilities

ADVANCED TECHNOLOGY APPROACHES

Adult Holding

1. Conventional flow through facilities and refrigeration to use available water.

Assumptions:

Single Facility
2,965 gpm flow

Would require a peak ($\Delta T=10^{\circ}F$) chiller capacity of approximately 1200 tons which equates to 830 kWh

2. Reuse and Refrigeration

Assumption:

2965 gpm		No recycle
297 g-pm	Influent	90% recycle
30 gpm	Influent	99% recycle

3. Influent detention basin to reduce peak daily maximum temperatures

Assumptions

Detention Time (hours)	Volume (ft)
2	48,000
4	95,000
6	143,000

4. Reduced flow during day + pure oxygen aeration

4000 gpm during night and early morning
1000 gpm recirculation flow during the afternoon

Incubation

1. Moist incubation for reduced groundwater use and refrigeration cost.

Assumptions:

Single Facility (1,376 gpm)
50 gpm needed

Rearing

1. Reuse for rearing supply.

Assumptions:

Single Facility (33,365 gpm)

90% reuse reduces flow from 74.5 to 7.5 cfs with increased costs and complexity but workable in a water shortage.

2. Use of pure oxygen for satellite rearing to reduce water demand in combination with refrigeration.

Assumptions:

Single Facility (33,365 gpm)
74.5 cfs flow through water
24.8 cfs with O₂ supplementation

Enhanced Species Introduction

Eggs Collected from Wild Stock or other Sources

1,000,000 eggs (200 spawning pairs)

Adult Objective

500 adults at 1:1 (M:F)

Adults raised to full term from egg source for brood stock purpose.

Water Flow Necessary

Temperature = 55°
Loading = 3 gpm/fish
Water Flow = 1,500 gpm

Volume Required

Density = 25 cf/ fish
Volume = 12,500 cf

Facilities Required

1. Complete hatchery facility
2. Brood stock tanks (no salt water)
3. Net pens
4. Brood stock tanks (salt water or recycle)

Potential Existing Site

Ore-Aqua facilities at Springfield or Newport, Oregon

SURFACE WATER AND GROUNDWATER AVAILABILITY AND QUALITY

SURFACE WATER

Surface Water Quantity

The NEOH study area includes the Grande Ronde, Imnaha and Walla Walla Rivers. Streamflow data in these basins was obtained from the U.S. Geological Survey (USGS). The location of the gages with period of record greater than ten years is shown on the individual river basin drainage maps. Tabulated values and graphs of minimum, maximum and average streamflow, by month may be found in Appendix A. Table 17 summarizes the streamflow gages in these river basins, their source and period of record.

TABLE 17

SUMMARY OF STREAMFLOW GAGES IN THE NEOH STUDY AREA

SOURCE	LOCATION	PERIOD
USGS 13292000	Imnaha River at Imnaha	1929-1982
USGS 13318500	Grande Ronde River near Hilgard	1938-1956
USGS 13318800	Grande Ronde River at Hilgard	1907-1982
USGS 13319000	Grande Ronde River at La Grande	1904-1982
USGS 13320000	Catherine Creek nr Union (before diversion)	1912-1936
USGS 13320000	Catherine Creek nr Union (after diversion)	1938-1982
USGS 13323500	Grande Ronde River near Elgin	1956-1981
USGS 13323600	Indian Creek near Imbler	1939-1950
USGS 13327500	Wallowa River at Joseph	1905-1982
USGS 13329500	Hurricane Creek near Joseph	1925-1978
USGS 13330000	Lostine River near Lostine	1913-1982
USGS 13330500	Bear Creek near Wallowa	1925-1982
USGS 13331500	Minam River at Minam	1966-1982
USGS 13332500	Grande Ronde River at Rondowa	1927-1982
USGS 13333000	Grande Ronde River at Troy	1945-1982
USGS 14010000	S. Fork Walla Walla near Milton	1907-1982
USGS 14010500	S. Fork Walla Walla below PP&L. nr Milton	1904-1945
USGS 14010800	N. Fork Walla Walla nr Milton-Freewater	1970-1982
USGS 14011000	N. Fork Walla Walla nr Milton	1931-1969
USGS 14018500	Walla Walla River near Touchet, WA	1951-1989
USGS 14017000	Touchet River at Bolles	1941-1989
USGS 14015000	Mill Creek at Walla Walla, WA	1941-1989
USGS 14013000	Mill Creek nr Walla Walla, WA	1939-1989

Surface Water Quality

Water quality information for the NEOH study area included temperature measurements recorded by the USGS at three stations, Oregon Department of Environmental Quality (DEQ) water quality monitoring stations at 9 locations, and ongoing water temperature monitoring at a number of sites conducted by NPT Fisheries Department. Appendix B contains summaries of water temperature for a number of sites within the NEOH study area.

Three USGS gages in the NEOH study area included water temperature data (Table 18). Daily maximums and minimums are available for the period of record shown. The Minam River gage is a USGS hydrologic bench-mark station where extensive water quality data is available for the period of record.

TABLE 18
USGS TEMPERATURE STATIONS IN THE NEOH STUDY AREA

SOURCE	LOCATION	PERIOD
USGS 13331500	Minam River at Minam	1965-1985
USGS 13329900	Wallowa River at Wallowa	1976-1977
USGS 13330200	Lostine River at Lostine	1976-1977

There is extensive water quality data available in the Grande Ronde River basin. Table 19 lists DEQ monitoring stations where water quality data is available. The analysis performed for the DEQ monitoring stations is designed to determine basic water quality conditions. This data should be obtained in a site-specific basis for conceptual design purposes.

TABLE 19
DEQ WATER QUALITY MONITORING STATIONS IN THE NEOH STUDY AREA

SOURCE	LOCATION	PERIOD
STORET 402398	Near Red Bridge State Park	1967-1968
STORET 402397	Hilgard St. Park	1967-1972
STORET 402919	Highway 82 Bridge	1966-67,1973
STORET 402400	Catherine Creek at Cove	1960-1968
STORET 402167	3.8 mi. S. of Elgin	1962-1974
STORET 402396	Hwy 82 E. of Elgin	1967-1968
STORET 402399	Wallowa Lk. discharge	1966-1968
STORET 402080	Wallowa River at Minam	1968-1974
STORET 402395	Hinhway 3	1966-1968

Spot observations of temperature and and other water quality parameters are available for the following drainages: Catherine Creek, Grande Ronde River, Lostine River, Indian Creek, Wallowa River, Minam River, and Prairie Creek.

Water samples for general minerals and other water quality parameters were collected at sites within each basin during initial site visits (Tables 20 and 21).

TABLE 20

GRANDE RONDE BASIN - WATER QUALITY (4/91)

Sample Locations

Parameters (mg/L unless noted)	N. Fork Catherine Creek. (Grande Ronde)	S. Fork Catherine Creek (Grande Ronde)	Vey Meadows (Grande Ronde)	Sheep Creek (Grande Ronde)	Beaver Ck. at Grande Ronde (Grande Ronde)	Grande Ronde at Beaver Ck. (Grande Ronde)	Hayes Fork Springs Prairie Creek (Wallowa)	Minam R. Confluence (Minam / Wallowa)	ODF&W Bighorn Sheep Range (Lostine)
Alkalinity	31.0	20.0	35.0	29.0	29.0	29.0	148.0	21.0	30.0
Bicarbonate	31.0	28.0	35.0	29.0	29.0	29.0	148.0	21.0	30.0
Carbonate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calcium	1.0	5.0	1.0	5.0	6.0	4.0	39.0	7.0	11.0
Chloride	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0
Conductivity (µmhos)	45.0	42.0	54.0	44.0	42.0	44.0	265.0	41.0	55.0
Fluoride	0.02	0.04	0.04	0.04	0.05	0.07	0.15	0.03	0.03
Hardness	23.0	20.0	28.0	21.0	23.0	23.0	123.0	21.0	27.0
Nitrate N	<0.10	<0.10	<0.10	0.10	<0.10	<0.10	1.71	<0.10	<0.10
Sulfate	<1.0	<1.0	1.0	2.0	1.0	2.0	9.0	2.0	5.0
TDS	76.0	70.0	78.0	80.0	98.0	90.0	214.0	60.0	12.0
Magnesium	2.3	1.7	2.3	1.4	2.4	1.8	3.1	1.6	9.0
pH (pH units)	7.6	1.1	7.6	7.5	7.7	7.6	8.5	7.6	7.8
Potassium	0.94	1.0	2.0	2.0	2.0	2.0	2.4	1.5	1.0
Sodium	3.5	4.0	4.0	4.5	4.0	4.5	15.0	3.0	1.6
Hydroxide	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE 21

WALLA WALLA AND IMNAHA BASINS - WATER QUALITY (4/91)

Sample Locations

<u>Parameters</u> (mg/L unless noted)	Touchet R. at Dayton (Touched/ Walla Walla)	S. Fork at Harris Park (Walla Walla)	Big Sheep Creek (Imnaha)	Marr Ranch (Imnaha)	Fence Creek near Marr Ranch (Imnaha)
Alkalinity	35.0	29.0	40.0	57.0	81.0
Bicarbonate	35.0	29.0	40.0	57.0	81.0
Carbonate	0.0	0.0	0.0	0.0	0.0
Calcium	8.0	6.0	11.0	17.0	17.0
Chloride	c1.0	c1.0	<1.0	<1.0	1.0
Conductivity (µmhos)	62.0	51.0	89.0	115.0	136.0
Fluoride	0.08	0.07	0.08	0.07	0.14
Hardness	26.0	20.0	35.0	58.0	57.0
Nitrate N	<0.10	<0.10	<0.10	<0.10	<0.10
Sulfate	1.0	c1.0	11.0	11.0	3.0
TDS	80.0	70.0	110.0	110.0	140.0
Magnesium	3.0	2.0	5.0	3.0	5.0
pH (pH units)	7.0	7.1	7.9	8.2	7.9
Potassium	1.6	1.6	1.7	1.7	5.1
Sodium	2.3	2.1	6.5	4.5	8.8
Hydroxide	0.0	0.0	0.0	0.0	0.0

Flood Frequency Data

The Federal Emergency Management Agency Flood Insurance Studies for the drainage basins have been obtained from FEMA. These contain flood flow statistics and stages in the creeks and river as well as floodplain boundaries.

The Flood Insurance Study for each county or city with proposed sites was reviewed for flooding information or documentation. The 100-year return period flood boundary has been defined by The Federal Emergency Management Agency (FEMA) on the larger creeks and major rivers, and Table 22 indicates whether the site falls within the 100-year flood boundary.

The flooding potential at each of the proposed sites was qualitatively evaluated and rated as low, moderate or high. This judgement was based on field observation, local knowledge and published documentation. Low flood potential means there were no evident signs of flood potential at the site, and no documented flood history. Moderate flood potential means there is a known or documented history of moderate flooding, or that the site lies within the FEMA defined 100-year floodway, or if evidence of flooding was observed in the field. Sites were rated as having a high flood potential if there is a known or documented history of recurrent flooding.

GROUNDWATER

Groundwater potential for facility water supply has been evaluated to determine the potential for development of disease-free groundwater supplies ranging from 500 to 5000 gpm for egg incubation, fry rearing, and general hatchery water supply. Groundwater temperatures in the 50 to 60 °F range are preferable.

The preliminary evaluation indicates that there is moderate to good potential for development of 500 to 1000 g-pm wells at the identified sites in the Grande Ronde and Wallowa River drainages. There is poor to moderate potential for development of 500 to 1000 gpm wells at the identified sites in the Imnaha River drainage. Test drilling as part of the Umatilla Satellite and Release Sites Project determined probable well yields in the 250 gpm range for an identified site on the South Fork Walla Walla River.

The evaluation is based primarily upon published geologic and hydrologic data and well logs on file with the Oregon Department of Water Resources. The well logs examined are nearly all domestic wells, typically drilled to the first water bearing zone of significance. As such, they do not give a true indication of groundwater potential at depth. Except for the test well drilling on the South Fork Walla Walla River, no field investigations of groundwater potential have been performed as part of this evaluation. A summary of the well logs that were reviewed is contained in Appendix C.

This evaluation describes groundwater development “potential”, based upon regional data and limited local data. Thus, it is possible that only low yield wells might be developed at sites identified as having “good potential”, or high yield wells might be developed at sites described as having “poor potential”. Additional investigations will be required at all sites selected for further study. This additional study may consist of further well log review, conversations with local well drillers and residents, and field examination of

TABLE 22

QUALITATIVE EVALUATION OF FLOOD POTENTIAL AT PROPOSED SITES

Sites In Grande Rone River Dralnsge Basin	River	Flood Potential	Site Within 100-Year Floodway	Comments
1. Catherine Creek N&S forks confluence	Catherine Creek	High	NoFEMAdata	bottom freezing, ice jams
2. Catherine-Milk Creek confluence (OSU site)	Catherine Creek	Moderate	NoFEMAdata	
3. Catherine Creek at Union (Old Hatchery)	Catherim Creek	Moderate	NoFEMAdata	
4. Vey Meadows	Grade Ronde	LOW	NoFEMAdata	
5. SheepCreek	Sheep Creek	LOW	NoFEMAdata	
6. Beaver Creek	Beaver Creek	High	NoFEMAdata	South side is braided river channel
7. Sanderson Springs/Mill Creek (site ellminated)				
8. Lower Willow Crk near Elgin (site ellminated)				
9. Indian Creek near Elgin	Indian Creek	Low	No FEMA data	
10. Gmnde Ron& near Elgin (b)	Grande Ronde	Moderate	Yes	
11. Looking Glass Hatchery	Looking Glass Crk	Low	No FEMA data	
12. Wildcat Creek Area	Wildcat Creek	Moderate	Yes	
13. Fish Ladder (Former USFWS Research Site)	Grande Ronde	Moderate	Yes	
14. Flora Grade (Schoolbus Flats)	Grande Ronde	Moderate	Yes	
15. Cottonwood Creek	Grande Ronde	Low	No FEMA data	
16. Wallowa Lake	Wallowa R.	Moderate	Yes	
17. Hayes Fork-Prarle Creek (site ellminated)				
18. Wallowa Hatchery	Wallowa R.	Low	No	
19. Big Canyon Creek	Wallowa R.	Moderate	Yes	
20. Minam River confluence with Wallowa	Wallowa R.	Low	No	
21. ODFW Bighorn Sheep range	Lostine R.	High	Yes	icing conditions, gravel deposition
22. Strathearn Ranch	Lostine R.	Moderate	Yes	
23. Lostine Dam	Lostine R.	Moderate	Yes	
24. Cross-Valley diversion	Lostine R.	High	Yes	site in floodplain

Table 22 (cont.)

Sites In Imnaha River Drainage Basin	River	Flood Potential	Site Within 100-Year Floodway	Comments
1. Indian Crossing	Imnaha River	Low	No FEMA data	
2. Gumboot Creek (Fish Weir)	Gumboot Creek	Low	No FEMA data	
3. Grouse Creek-Imnaha confluence	Imnaha River	Moderate	Yes	
4 Big Sheep-Lick Creek confluence	Big Sheep Creek	Low	No FEMA data	
5. Big Sheep Creek	Big Sheep Creek	Moderate	Yes	
6. Big Sheep-Little Sheep confluence	Big Sheep Creek	Moderate	Yes	
7. Little Sheep Creek	Little Sheep Creek	LOW	No FEMA data	
8. Gene Marr Ranch	Imnaha River	Moderate	Yes	
9. Horse Creek (site eliminated)				

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Sites In Walla Walla River Drainage Basin	River	Flood Potential	Site Within 100-Year Floodway	Comments
1. NE 8th Street Bridge (Milton Freewater)	Walla Walla River	Low	No	
2. 9th and Walnut (Milton Freewater)	Walla Walla River	Low	No	
3. Harris Park (at park)	S Fork Walla Walla	Low	No	
4. Harris Park No. 2 (site eliminated)				
5. S. Fork/Elbow Creek confluence (site eliminated)				
6. Russell Walker property	S Fork Walla Walla	Moderate	Yes	
7. Wolf Fork Confluence	Wolf Fork	undetermined	undetermined	
8. WDW Dayton Conditioning Pond	Touchet River	undetermined	undetermined	
9. Railroad Bridge (a)	Walla Walla River	undetermined	undetermined	
10. Pond at FS boundary	N Fork Touchet River	undetermined	undetermined	

sites. Test well drilling is recommended at all sites selected for further study of the potential for development of incubation/early rearing facilities

A technical term frequently used in the following discussions is “specific capacity”. Specific capacity is an expression of the productivity of a well, and is derived by dividing well yield by water-level drawdown. Specific capacity is typically expressed by gpm/ft. For instance, a well that yields 400 gpm with 100 feet of water level drawdown would have a specific capacity of 4 gpm/ft. In general, specific capacities of less than one gpm/ft indicate poor production potential.

Aquifers

Aquifers in the NEOH study area include the following general units:

- Basalt aquifers
- Sedimentary aquifers
- Igneous and metamorphic aquifers.

These units are briefly discussed below in order of importance. Much of the following discussion is based upon information taken from Gonthier (1985).

Basalt Aquifers. Basalt aquifers in northeastern Oregon consist of layered sequences of lava flows with some sedimentary interbeds, tuff, and flow breccia. The basalt aquifers are part of the Columbia River Group, a major interstate aquifer system. The basalt aquifers are highly developed in the irrigated areas west and north of Pendleton, but are largely undeveloped in the upland areas to the east. Typical high capacity wells in the basalt aquifers yield 500 to 1000 gpm, with specific capacities typically ranging from 5 to 50 gpm/ft.

Hampton (1964) noted that in the Grande Ronde Valley, there is a 50 percent chance of obtaining 1 gpm/ft of drawdown per 100 feet of saturated basalt penetrated. In other words, specific capacity would average 2 gpm/ft for a 200-foot well or 4 gpm/ft for a 400-foot well. Thus, the potential yield from a well completed in the basalt is generally directly proportional to the saturated thickness of rock penetrated.

Sedimentary Aquifers. Sedimentary aquifers consist of layered sequences and mixtures of clay, silt, sand, and gravel. Within the NEOH study area, sedimentary aquifers are most prominent in the Grande Ronde Valley and in the Enterprise area. The Grande Ronde Valley sediments are as much as 2000 feet thick, and consist primarily of sand and clay. The best aquifers are typically sand units in the upper 300 feet of the sediments, and coarse-grained alluvial fan deposits near the large inflowing streams at the valley margins. Specific capacities of wells in the Grande Ronde Valley are typically in the range of 5 to 10 gpm/ft, although yields appear to vary considerably with location. In the Enterprise area, the aquifers are found in glaciofluvial, ground moraine, and alluvial deposits.

In addition to deep sediment sequences, Quaternary alluvium (surface sand and gravel) is present at many sites. Where deep enough, the alluvium often has potential for groundwater production. However, groundwater from the alluvium is often obtained from surface water infiltration and is thus subject to variations in temperature and quality.

Igneous and Metamorphic Aquifers. Igneous and metamorphic rocks of Cretaceous to Devonian age form the cores or basement beneath much of highlands in northeastern Oregon. These aquifers are exposed in areas such as the lower Imnaha River where

erosion has cut through the overlying blanket of Columbia River basalt. The igneous and metamorphic aquifers typically have low permeability, with typical specific capacities of less than 0.5 gpm/ft.

Grande Ronde River Basin Sites

Beaver Creek Area. The Beaver Creek area is mapped as Columbia River Basalt, with overlying sediments in areas. Potential aquifers are found in the basalt. Groundwater potential at this site should be considered similar to other areas of basalt aquifer in the upper Grande Ronde basin. That is, there is a 50 percent chance of 500 gpm yield from a 500-foot well with a 100-foot pumping level. However, the well logs from the Beaver Creek area suggest that yields from moderately deep wells may be slightly less than average for the Grande Ronde Basin (Appendix C).

Catherine Creek at Union. At Union, the surficial geology is alluvial fan material, with Columbia River Basalt exposed at the surface to the east of Union. The Columbia River Basalt is below the fan material at Union at depths of more than 150 feet on the west side of town. Basalt is at the surface on the east side of town. High capacity wells in town would tap basalt aquifers.

Groundwater potential at this site should be considered as similar to other areas of basalt aquifer in the upper Grande Ronde basin. That is, there is a 50 percent chance of 500 gpm yield from a 500-foot well with a 100-foot pumping level. Note that the City of Union has drilled three deep (1200 to 1695 feet) municipal wells with high yields (800 to 1922 gpm, Appendix C). However, these wells also have relatively high temperatures (68 to 72°F).

Hampton (1963) reported that a 337-foot well completed in the Catherine Creek alluvial fan about 2 miles northwest of Union produced 3,000 gpm sustained yield with a 95-foot pumping level. Temperature from this well was reported to be 58 degrees. This suggests good potential from sediments in the area north and west of Union.

In general, chances for development of facility groundwater supplies are good at Union, although cold groundwater may need to be piped one mile or more to a hatchery facility at the primary site being considered. Warm groundwater should be available from wells in close proximity to town.

Catherine Creek at OSU Site. The geology at the OSU site consists of alluvial sediments in the valley bottom which are underlain by Miocene basalt and Triassic marine sedimentary rocks and volcanics. Thickness of the alluvium is unknown, but might be in the range of 100 to 150 feet. The older rocks are exposed at the surface to the south and east, near the forks of Catherine Creek and in the southeast corner of the valley. The older rocks have relatively low groundwater potential, and the bedrock groundwater target will be fractured basalt along identified shear zones. The character of the Columbia River basalts in this area of Catherine Creek is different than other areas of the Grande Ronde basin, with the rock having a somewhat andesitic appearance. The groundwater potential from these rocks is not well known, given a lack of wells in the vicinity of the site. The nearest successful well is at Catherine Creek State Park. The driller's log for this well reported that it is 365 feet deep and flowed 80 gpm of 70°F water. No shut-in pressure was reported on the log.

There appears to be potential for warm groundwater from deep basalt wells and cold groundwater from alluvial sediments in this area. A groundwater investigation at this site would probably best be accomplished by conducting a geophysical (seismic refraction)

survey to determine bedrock profiles across the valley. Based upon the seismic profiles, a shallow test well could be drilled at the site with the greatest thickness of alluvial fill. A deep test well would also be recommended. The deep well would preferentially be sited along one of the identified faults in the vicinity of the site.

Lower Willow Creek near Imbler. According to Hampton (1964), an irrigation well located one mile east of Imbler (1S/38E-24) is 1,150 feet deep and flowed 3,500 gpm with a shut-in pressure of 43 psi and a temperature of 84 degrees. The well penetrated sand and clay to a depth of 685 feet, including 29 feet of coarse sand at 541 feet that flowed 65 gpm. Thus, it appears that the Imbler area has good potential for high capacity wells, although well depth may exceed 500 feet and temperature may be a problem with deeper (greater than 700 feet) wells.

Well logs for this area show moderate potential from sediments above 500 feet, and good potential from basalt aquifers below 500 feet (Appendix C). However, we anticipate that temperatures from the deep wells will be in excess of 60°F.

Grande Ronde River near Elgin. Groundwater at Elgin could be obtained from either the basalt or the overlying lake-bed sediments. Hampton (1964) reported that two municipal wells for the City of Elgin were completed in basalt below the lake bed sediments, with total depths of 350 and 655 feet. Each well cut about 100 feet of basalt. Yield from the deeper well was tested at 1,095 gpm with 87 feet of drawdown (12.6 gpm/ft), and 552 gpm with 27 feet of drawdown (20.4 gpm/ft). Yield from the shallower well was 590 gpm with 62 feet of drawdown (9.5 gpm/ft) and 300 gpm with 38 feet of drawdown (7.9 gpm/ft). The deep well temperature was 52 OF with 140 ppm total dissolved solids. These wells suggest good potential for high capacity (500 to 1000 gpm) basalt wells in this area.

Well logs from the area northwest of Elgin show relatively poor yields from the sediments. For instance, the Ronald Rademacher well penetrates "clay, rocks, and sand" to 400 feet (Appendix C). Although these wells are not constructed for efficient production, it appears that the gravels and sands tapped in this area are typically too clayey for high yield. Thus, the shallow (sediment aquifer) groundwater potential west of Elgin should be considered relatively poor.

Sanderson Springs Area (Mill Creek). This area is located north of Summerville within the Grande Ronde structural basin. The area is mapped as containing alluvial fan deposits underlain by lake-bed sediments. The logs indicate a considerable amount of gravel and sand, but most appear to be mixed with clay. Therefore, it may be difficult to intercept a clean, coarse layer of sand or gravel for high capacity wells. The Marvin Peterson well went into rock at 88 feet, indicating that basalt may be shallow in some places (Appendix C).

Given the success of deep wells near Imbler (discussed in connection with the Lower Willow Creek site), there is good potential for development of high capacity (500 to 1000 gpm) deep wells in this general area. However, temperature could be a problem with deep basalt wells.

Lookingglass Hatchery. Lookingglass Hatchery was evaluated during a June 18-19 site visit. There appears to be considerable potential for additional groundwater development at the Lookingglass Hatchery. The hatchery manager, Scott Lusted, provided information for their current water supply situation. It appears that fish production is currently limited by some relatively minor problems, most of which appear to be solvable.

In terms of groundwater, the hatchery manager does not feel comfortable with increasing production from the system for the following reasons.

- He was told that the pipeline from Tempering Well No. 2 is sized for 2000 gpm, so they limit their pumping in that pipeline to only 2000 gpm. (Tempering Well 2 is equipped with a nominal 2000 gpm pump, but the well is capable of much more).
- He does not think that they have sufficient water rights to produce more water.
- Operation of Tempering Well No. 1 causes interference in the nearby domestic well, which results in domestic well pump cavitation. Therefore, they do not operate Tempering Well No. 1.

Following the site visit, well logs were obtained from ODWR for the four wells at the facility (Tempering Well No. 1, Tempering Well No.2, Test Well BI, and the domestic well). A copy of Hydrogeological Evaluation - Lookingglass Fish Hatchery prepared for the Corps of Engineers by SRH Environmental Management was also reviewed. SRI-I concluded that Tempering Well No. 2 is capable of 3000 to 4000 gpm. They predicted pumping well drawdown of only 39 feet after 30 days of continuous pumping at 3000 gpm. The well is about 500 feet deep with a 130-foot static water level. SRH recommended increasing production from Tempering Well No. 2 and construction of an additional well north of the facility along Jarboe Creek.

Based upon the SRI-I report and our conversation with the hatchery manager, there appears to be good opportunities to increase groundwater production at the facility. This would require abandoning or deepening both Tempering Well No. 1 and the nearby domestic well so that pump exposure is not a problem. The pump size in Tempering Well No. 2 could be increased, and additional production wells drilled. It is realistic to expect that the hatchery groundwater production could be more than doubled (i.e. to 5000 gpm or more), at least for seasonal uses such as tempering. Also, it appears that temperature is not a problem with their existing wells, so that deeper wells could also be completed at the site.

Wallowa River Sites

Wallowa Hatchery. The well log from a deep production well at the Wallowa Hatchery in Enterprise suggests poor production potential at this site (Appendix C). This well was 942 feet deep with 19 psi artesian pressure but only produced 120 gpm with a 335-foot pumping level. A shallower (288-foot) production well at the same site produced 183 gpm with 42 feet of drawdown, suggesting that production potential is highly variable. Most of the water at the hatchery site may be derived from the shallower basalt aquifers. Other well logs from the Enterprise area are either completed in relatively shallow gravel aquifers or in basalts. The gravels appear to be too thin or shallow for large capacity wells. The basalts typically do not show significant production potential.

Information obtained during a June 18, 1991 site visit to the Wallowa Hatchery suggests that additional water supplies might be developed with a groundwater exploration program. Existing wells include a moderate producer (200 gpm \pm , 288 feet deep), a poor producer (150 gpm \pm , 942 feet deep), and an almost dry hole (10 gpm \pm , 255 feet deep). Although it does not appear likely that high capacity wells could be constructed in this area, an exploration program consisting of six-inch diameter 500-foot test holes could probably develop a total of 300 to 500 hundred gpm.

Hayes Fork - Prairie Creek. The geology in this area appears to consist of basalt which is overlain by alluvium, conglomerate, and glacial moraine. Depth to basalt bedrock ranges from less than 10 feet to more than 150 feet. As with the Enterprise area, the gravels appear to be too thin or shallow for large capacity wells and the basalts typically do not show significant production potential (Appendix C).

Minam-Wallowa Confluence. The geology of this area is all Columbia River Basalt. Two well logs are available, both completed in Columbia River Basalt (Appendix C). The logs show moderate to good potential for high capacity (greater than 500 gpm) wells.

Lostine River Sites

The Strathearn Ranch on the Lostine River is located at the lower end of a glacially formed valley. The geology of the Strathearn site consists of alluvial and glacial sediments in the valley floor, generally underlain by Columbia River basalt. Near the upstream (southern) property boundary at the Strathearn Ranch, one of the Wallowa Mountain range frontal faults cuts across the valley. The fault separates the basalts to the north from Triassic-age marine sediments found on the south, or upthrown, side of the fault.

Successful cold water (50-55°F) wells can probably be developed in the alluvial/glacial sediments. In addition, the alluvial sediments may be sufficiently permeable to permit the use of shallow “collector-type” wells or laterals for water supply. Potential for development of successful cold water wells is rated at 60 percent.

There is potential for warmer (>55°F) water wells completed in the basalt at the Strathearn site. Potential for successful warmer water wells is rated at 50 percent.

Five well logs from the vicinity of the Strathearn Ranch range from 70 to 240 feet in depth, and all are in sand and gravel (Appendix C).

Imnaha River Basin Sites

Four potential facility sites have been examined for groundwater potential in the Imnaha River Basin. They are the Big Sheep Creek - Imnaha River Confluence, the Little Sheep Creek - Big Sheep Creek Confluence, the Gene Marr Ranch and the mouth of Horse Creek. In addition to the identified sites, the Imnaha River area upstream of Imnaha has also been evaluated.

Big and Little Sheep Creeks are in areas of Columbia River basalt. Driller's logs from these areas suggest that the basalt flows do not have significant sedimentary interbeds or highly permeable inter-flow zones, suggesting that this area may have less than average production potential in comparison to other areas of the Columbia River Basalt aquifer.

Gene Marr Ranch. The Marr Ranch and the mouth of Horse Creek sites are located in areas of partially metamorphosed sedimentary and igneous rocks of Triassic and Permian age. These rocks are probably present as basement rocks beneath the Columbia River Basalt throughout much of the Imnaha Basin, and are exposed by erosion in the lower portion of the canyon. We anticipate poor production potential for wells completed in these rocks, unless significant fractured zones are encountered.

A field reconnaissance to the Gene Marr Ranch to evaluate groundwater potential was made on June 18. The geology at the Gene Marr Ranch is not conducive to groundwater development by wells. The geology at the site consists of a fine-grained mafic intrusive rock (perhaps andesite or dacite). This rock crops out along the river at the upstream end

of the Marr Ranch and continues downstream for more than a mile. Anticipated well yields at the ranch site would be less than 50 gpm. Groundwater might also be warm at this site, as a fault-related warm spring is present along the river about one-quarter mile downstream of the ranch.

Although on-site wells do not appear to be practical, there is groundwater available from springs. These springs surface from a permeable basalt layer a few hundred feet above the river level. The combined flow of the springs which supply Fence Creek (at the upper end of the property) and Fall Creek (at the lower end of the property) is probably about 4 cfs (1500 to 2000 gpm).

An additional source of groundwater for this site might be obtained by drilling wells into the basalt upstream of the Marr Ranch and piping it to a facility at the ranch. For instance, the Clyde Simmons well (about one-half mile upstream) has a specific capacity of 6 gpm per foot and a total depth of about only about 100 feet. A total of a few hundred gpm might be developed from shallow basalt wells in this area.

The well logs available for the Imnaha basin are all domestic wells, typically drilled to the first water bearing zone of significance (Appendix C). As such, they do not give a true indication of groundwater potential in the Imnaha River Basin. However, in general the well logs show relatively poor production, with many drilled to over 100 feet below the water table before encountering enough water for domestic use. Thus, the potential for high-yield water supply wells appears to be relatively low in comparison to other areas of basalt aquifers in northeast Oregon. Probable yields are a few hundred gallons per minute from deep wells, with possible yields of less than 100 gpm. Probable temperatures from deep (400 to 800 feet) wells would be in the mid to upper 50's.

A test well at the Little Sheep Creek Hatchery site was 100 feet deep, with a specific capacity of 3 gpm per foot of drawdown, and a static water level of 10 feet. Assuming that the hydrogeology is relatively consistent with depth at that site, we might expect yields in the range of 500 gpm from a well 500 to 1000 feet deep with at 250-foot pumping level. However, this facility is several miles upstream from the proposed sites and may not be representative of aquifer conditions at the proposed Big Sheep Creek - Imnaha River Confluence and Little Sheep Creek - Big Sheep Creek Confluence sites.

In general, it appears that the Big Sheep Creek - Imnaha River Confluence and Little Sheep Creek - Big Sheep Creek Confluence sites have the best groundwater potential of the four identified Imnaha basin sites, based upon geology and well logs. Probable deep (400 to 800 feet) well yields would be in the range of a few hundred gallons per minute. Similar groundwater potential is available along the river upstream of Imnaha. At the Horse Creek and Gene Marr Ranch sites, deep well yields might be less than a hundred gallons per minute because the wells would be completed in igneous and metamorphic aquifers rather than the basalt aquifers present further upstream.

Walla Walla River Basin Sites

Four potential facility sites have been evaluated on the South Fork of the Walla Walla River. These sites are Harris Park No. 1, Harris Park No. 2, South Fork - Elbow Creek Confluence, and the South Fork area between Harris Park and the mouth of the North Fork. Potential aquifers within the South Fork of the Walla Walla basin are all Yakima Basalt. Anticipated aquifer characteristics in this area are similar to those of basalt aquifers in the Umatilla River area.

A test well was drilled at the Russell Walker site (located between Harris Park and the mouth of the North Fork) for the Umatilla Satellite and Release Sites Project. The well was 450 feet deep and is projected to be capable of a sustained yield of approximately 250 gpm. However, the groundwater is warm (68°F) and has about 1 ppm hydrogen sulfide.

Review of well logs suggests that the potential sites on the South Fork of the Walla Walla River can be considered to all have similar aquifer characteristics and groundwater development potential (Appendix C). As such, we would expect poor to moderate potential for 500 gpm yields from deep basalt wells. Chances for warm (>60°F) water temperatures are high at all sites, and hydrogen sulfide may be a problem, although a local resident reported that sulfur odor is not present in wells completed in the Harris Park area.

Powder River Basin Sites

Eagle Creek (upstream from Newbridge) - This site is located about four miles above Newbridge in an area mapped as basalt. Thus, we anticipate that wells would be completed in basalt aquifers.

Well logs indicate that wells in this area are all completed in basalt and all have very low yields (Appendix C). Thus, the groundwater potential appears to be relatively low .

Summary of Sites

Grande Ronde River Basin Sites

Beaver Creek - Grande Ronde Confluence. Moderate potential for high yield (>500 gpm) wells based upon geology and local well logs. Basalt aquifers.

Catherine Creek at Union. Good potential for 500 to 1000 gpm wells based upon geology and local well logs. Basalt aquifers or nearby sedimentary aquifers. Temperatures will be-high from high-yield, deep basalt wells.

Catherine Creek at OSU Site. Low to moderate potential for 500 gpm wells completed in bedrock aquifers. Fair potential for development of groundwater supplies from alluvium.

Lower Willow Creek (near Imbler). Moderate to good potential for 500 to 1000 gpm wells based upon geology and local well logs. Basalt aquifers or sedimentary aquifers. Temperatures will be high from deep, high-yield basalt wells.

Grande Ronde River (near Elgin). Good potential for 1000 gpm wells based upon geology and local well logs. Basalt aquifers.

Sanderson Springs (Mill Creek). Moderate to good potential for 500 to 1000 gpm wells based upon geology and local well logs. Basalt aquifers or nearby sedimentary aquifers. Temperatures may be high from deep, high-yield basalt wells.

Wallowa River Basin Sites

Wallowa Hatchery. Low to moderate potential for high yield wells. Basalt aquifers.

Hayes Fork - Prairie Creek. Low to moderate potential for high yield wells. Basalt aquifers.

Minam River - Wallowa River Confluence. Moderate to good potential for high yield (>500 gpm) wells based upon geology and local well logs. Basalt aquifers.

Lostine River - ODFW Bighorn Sheep Range. Moderate potential for 500 gpm wells based upon geology and local well logs. Glacial or alluvial aquifers.

Lostine River - Strathearn Ranch. Moderate potential for high yield wells based upon geology and local well logs. Glacial or alluvial aquifers.

Innaha River Basin Sites

Gene Marr Ranch. Low potential for 500 gpm wells based upon geology and local well logs. Igneous and metamorphic aquifers.

Horse Creek - Innaha River Confluence. Low potential for 500 gpm wells based upon geology. No local well log data. Igneous and metamorphic aquifers.

Big Sheep Creek - Innaha River Confluence. Moderate potential for 500 gpm wells based upon geology and local well logs. Basalt aquifers.

Little Sheep Creek - Big Sheep Creek Confluence. Moderate potential for 500 gpm wells based upon geology and local well logs. Basalt aquifers.

Innaha River Upstream of Innaha. Moderate potential for high yield wells based upon geology and local well logs. Basalt aquifers.

South Fork Walla Walla River Basin Sites

Harris Park No. 1. Low to moderate potential for high yield (>500 gpm) wells based upon geology and local well logs. Basalt aquifers.

Harris Park No. 2. Low to moderate potential for high yield (>500 gpm) wells based upon geology and local well logs. Basalt aquifers.

South Fork - Elbow Creek Confluence. Low to moderate potential for high yield (>500 gpm) wells based upon geology and local well logs. Basalt aquifers.

South Fork area between Harris Park and the mouth of the North Fork. Low to moderate potential for high yield (>500 gpm) wells based upon geology and local well logs. Basalt aquifers.

Powder River Basin Sites

Eagle Creek. Very low potential for high yield wells. Basalt aquifers.

RECOMMENDATIONS FOR FURTHER GROUNDWATER EVALUATIONS

With the selection of four potential incubation/early rearing sites within the NEOH project area (see Section 8-Program Development), more detailed groundwater evaluations at these sites are recommended prior to conceptual design. Siting has been based upon location, surface water quality and availability, and groundwater potential. The four sites are (1) the confluence of the Minam and Wallowa Rivers, (2) the Innaha River, (3) Catherine Creek

upstream of Union, and (4) the Lostine River at the Strathearn Ranch. Discussions of site geology, well location criteria, and proposed test well designs follow.

Information in this section builds upon the information presented above for specific sites. The initial groundwater evaluation consisted of a review of regional geology and hydrogeology, and review of driller's logs for wells completed near identified potential facility sites.

Minam-Wallowa Confluence

The Minam-Wallowa confluence site is located on the south bank of the Wallowa, just downstream of the mouth of the Minam. The geology of this area consists of Columbia River Basalt, with a basalt intrusive mapped on the north side of the river downstream of the confluence. Significant thicknesses of saturated alluvium do not appear to be present, and there are no mapped faults or geologic structures in the vicinity of the proposed hatchery site.

A test well site near the confluence, probably in the vicinity of the electrical substation is recommended. This location takes advantage of the intersection of linear topographical features. Linear features may indicate fractures or zones of weakness in the basalt, which could potentially increase groundwater potential. The proposed well location also would be at the upper end of any hatchery facilities, in the proximity of any potential surface water intake structures where de-icing water may be needed. Potential for a successful (500 gpm) test well is rated at 60 percent at this site.

A test well at this site would be drilled to a projected depth of 600 feet. The well would be completed with 8-inch well casing to approximately 150 feet. The well would be completed as an open hole below 150 feet unless caving conditions are encountered. If caving is encountered, the hole will be lined with 6-inch perforated casing.

Imnaha Area

Gene Marr Ranch. Two areas are being considered for hatchery development on the Imnaha River. The downstream area would obtain groundwater from springs while the upstream areas would obtain groundwater from wells. The downstream site, Gene Marr Ranch, has spring water available from Fall Creek for disease free purposes, and spring water from both Fall Creek and Fence Creek for cooling or de-icing. Although Montgomery Watson has not measured flows from these sources, visual estimates suggest that 600 to 1000 gallons per minutes are available from each, for a total groundwater supply of about 1500 gpm.

The geology at the Marr Ranch site consists of what appear to be intrusive volcanic rocks of late Triassic age. Overlying the Triassic volcanics are younger Miocene-age basalts of the Columbia River Group. The springs that supply Fall and Fence Creeks issue from springs located along a permeable basalt layer at an approximate elevation several hundred feet above the river level. A normal fault is located in the vicinity of the Fall Creek springs. The relationship between the fault and the springs is not clear, but the fault related fracturing may be partly responsible for the significant flow from the Fall Creek springs.

The Triassic volcanics at the Marr Ranch have poor potential for significant groundwater production from wells. Expected well yields from these rocks would be less than 50 gpm. If groundwater from wells is needed, it might be possible to obtain some supply from wells located upstream of the Gene Marr Ranch, were basalt is present in the canyon bottom. However, it is possible that the Triassic volcanics are also present below the basalt in these

areas at relatively shallow depths, so that well yields might be limited to a less than a hundred gallons per minute.

A warm spring located approximately one-quarter mile downstream of the Marr Ranch emerges from the Triassic volcanics in the canyon bottom. The spring appears to flow a few gallons per minute or less, and is located along a large fracture that is visible on both sides of the river. There might be potential to develop water along this fracture with a well, but significant yields (i.e., more than 50 gpm) would not be expected.

Upstream Sites. Potential hatchery sites were identified on river bars a few miles above the town of Imnaha. The geology at these sites consists of Columbia River Group basalts informally named the Imnaha Basalt (Walker 1979). There are no geologic structures mapped in the vicinity of these properties. A basalt intrusive body is mapped by Walker (1979) along the west side of the river, above the Royes property. This intrusive body forms a prominent high terrace above the river, and was formerly mapped as a fault (Walker, 1977). It is unlikely that this feature will contribute to the water bearing properties of the rocks at the potential sites.

As no significant geologic structures have been identified at these sites, the wells should be located along linear features (i.e., at the mouths of creeks or draws) when practical. The linear features could indicate zones of weakness or more pervasive fracturing. However, these features may not significantly increase the chances of a successful well and we suggest that test wells be located where convenient. Potential for successful (500 gpm) wells at either of these sites is rated at 40 percent.

Well construction at these sites should consist of 8-inch well casing extending to an approximate depth of 150 feet. The wells should be completed as open-holes below the 8-inch casings to a target depth of 600 feet, unless caving conditions are encountered. In the event of caving, the holes should be lined with 6-inch perforated casing.

Upper Grande Ronde Basin - Catherine Creek

Catherine Creek and the Grande Ronde River (above LaGrande) have been investigated for groundwater potential. The investigation suggests moderate groundwater potential at sites on both Catherine Creek and the upper Grande Ronde River. Based upon a combination of groundwater and surface water considerations, Catherine Creek has been chosen as the preferred alternative at the present time. However, if suitable groundwater supplies cannot be proven at Catherine Creek, test well drilling on the Grande Ronde is warranted.

Two sites have been identified at Catherine Creek. The downstream site, at the town of Union, appears to have good potential for groundwater supplies but poorer quality surface water. The groundwater potential at Union has been confirmed by local municipal and irrigation wells. The upstream site, at the OSU property above the State Park, has good surface water supply but less groundwater potential. Based upon our evaluation, we recommend test well drilling at the upstream (OSU) site to attempt to identify potential groundwater supplies. If insufficient groundwater is available at the upstream site, groundwater at the Union site can probably be confirmed at a later date following conceptual design. Probable success for developing groundwater is rated at 50 percent at the OSU site and 90 percent at Union (assuming that groundwater may have to be pumped in from off-site wells). These two sites are discussed in more detail below.

Union Site. The Union site is located at the upstream end of the town of Union, at the location of the Union Sportsman's Park. This site was a former hatchery that apparently failed because of warm surface water temperatures.

The geology at the Union site consists of Columbia River basalt grading into sediments of the Catherine Creek fan. The sediments increase in thickness to the northwest and west of town, with known thicknesses in excess of 500 feet within about one mile of the site. Well yields in excess of 1000 gpm of mid-50 degree water are possible where these sediments are coarse and thick. However, at the proposed facility location we anticipate that the sediments extend to only about 125 feet. As such, we would not expect significant production from these sediments. Instead, production from wells at the Union site would be obtained from basalt aquifers at depths in excess of 500 feet. These aquifers are located along the Grande Ronde Valley frontal fault system and typically have water temperatures above 65 degrees. For instance, the City of Union has three deep wells drawing from basalt aquifers with tested yields averaging 1400 gpm and average water temperatures of 70°F. These wells average 1400 feet in depth. Thus, we expect that production at the Union site would require deep wells with mechanical cooling to achieve water temperatures of less than 60 degrees unless colder groundwater is piped to the site from wells located north or west of the City.

If cold groundwater is desired, off-site wells could be located approximately one mile northwest or west of the site. These wells would tap alluvial sand and gravel deposits of the Catherine Creek fan. Well depths would probably range from 300 to 600 feet. Well yields in the range of 1000 to 2000 gpm are probable with temperatures in the range of 54 to 58°F.

OSU Site. The OSU site has better surface water supply potential than the Union site. Groundwater potential is not well known, given a lack of wells in the vicinity of the site.

The geology at the OSU site consists of alluvial sediments in the valley bottom which are underlain by Miocene basalt and Triassic marine sedimentary rocks and volcanics. Thickness of the alluvium is unknown, but might be in the range of 100 to 150 feet. The older rocks are exposed at the surface to the south and east, near the forks of Catherine Creek and at in the southeast corner of the OSU valley. The older rocks have relatively low groundwater potential, and the bedrock groundwater target will be fractured basalt along identified shear zones. The character of the Columbia River basalts in this area of Catherine Creek is different than other areas of the Grande Ronde basin, with the rock having a somewhat andesitic appearance. The groundwater potential from these rocks is not well known, given a lack of wells in the vicinity of the site. The nearest successful well is at Catherine Creek State Park. The driller's log for this well reported that it flowed 80 gpm of 70°F water. No shut-in pressure was reported on the log.

There appears to be potential for warm groundwater from deep basalt wells and cold groundwater from alluvial sediments in this area. Therefore, we recommend drilling two test wells, one deep and one shallow, at this site. The work should be conducted in phases, with the shallow well drilled in the first phase and, based upon further site evaluation, the deeper well drilled in a second phase.

The deep well will be located on the southside of the highway at the west end of the valley, along one of the mapped northeast-trending faults bordering the south side of the valley. The best location would be at the south end of the valley, where a northeast-trending linear feature following Little Catherine Creek may intersect the mapped northwest-trending fault. Other potential deep well sites would be located farther east along northwest-trending fault at the base of the slope along the south side of the valley. Construction would consist of 8-inch casing to about 150 feet, with 8-inch open hole to 600 feet.

The shallow well will be located at the center of the valley where geophysical surveys suggest the greatest thickness of alluvial fill. The well would be constructed with 6-inch

casing drilled to bedrock. Estimated depth is 100 feet. Well screen would be install opposite potential water bearing zones; alternatively, the casing would be perforated with a rotary perforator in lieu of well screen. The well could be tested at pump rates in the range of 100 gpm.

Lostine River - Strathearn Ranch

The Lostine River site would be located at the Strathearn Ranch. The Strathearn Ranch is located at the lower end of a glacially formed valley. The geology of the site consists of alluvial and glacial sediments in the valley floor, generally underlain by Columbia River basalt. Near the upstream (southern) property boundary, one of the Wallowa Mountain range frontal faults cuts across the valley. The fault separates the basalts to the north from Triassic-age marine sediments found on the south, or upthrown, side of the fault.

We anticipate that successful cold water (50-55°F) wells can be constructed in the alluvial/glacial sediments. In addition, the alluvial sediments at the upstream end of the site may be sufficiently permeable to permit the use of shallow “collector-type” wells or laterals for primary water supply. Collector-type systems could eliminate the need for a surface water intake structure, and the associated problems from icing and stream stabilization. There is also potential for warmer (>55°F) water wells completed in the basalt.

Both the shallow alluvial and deep basalt bedrock should be investigated in an attempt to locate groundwater supplies for this site. Potential for development of successful cold water wells is rated at 60 percent. Potential for successful warmer water wells is rated at 50 percent.

Strathearn Ranch - Alluvial Drill Sites. The key to successful alluvial/glacial wells will be locating drill sites with deep, clean alluvial or glacial outwash materials. Choice of these locations will be aided by a geophysical survey of the site. The geophysical survey will consist of seismic profiles of the valley bottom to identify the areas with the thickest accumulations of saturated glacial and alluvial materials.

Our conceptual geologic model of the Strathearn Ranch area suggests that valley glaciers have deposited glacial moraines at the southern end of the Strathearn property and again farther downstream of the Strathearn property. The moraines probably acted in a manner similar to the end moraine at present-day Wallowa Lake, and formed a shallow lake within the present Strathearn property. The materials within the moraine may be poorly sorted with relatively low potential for high capacity wells. However, there may be significant accumulations of coarse-grained materials behind or beneath these moraines. In particular, there is a good chance for success at the southern end of the property, where coarser-grained glacial outwash and alluvial material may have been deposited into the basin or lake behind the end moraine. Farther to the north, the thickness of the deposits may increase, although the deposits may become finer grained. However, there is potential for the presence of buried channel deposits beneath the moraine or beneath the basin created by the moraine. For instance, the wells on the Strathearn property are located on upstream side of the end moraine. The logs of these wells suggest the presence of permeable sands and gravels at depths below 60 feet.

We recommend two shallow drill sites (phase 1) and potentially a third shallow drill site (phase 2) to assess the alluvial/glacial groundwater potential. The three sites will be located along the axis of the valley, at the locations showing the greatest potential for success based upon geophysical surveys. The first hole will probably be located at the southern border of the property. This area has good potential for accumulations of coarse-grained alluvial materials. The second hole will probably be located in the center of the property, near the

southeast corner of the lake. The third hole will be located in the northern third of the property, which appears to have the least potential.

The shallow alluvial drilling will consist of drilling and driving 6-inch steel casing to bedrock. These casings will then be perforated opposite potential water bearing zones. This well construction should permit testing at flow rates in the range of 100 gpm.

Strathearn Ranch - Bedrock Drill Site. We recommend a deep well drillsite in a phase 2 evaluation of this site. The bedrock drill site with the best potential is at the upstream end of the property where a Wallowa Mountains frontal fault crosses the Lostine valley. The frontal fault may have increased the fracture permeability of the rock in this vicinity. The well would be located on the basalt side (north) of the fault as the presence of limestone on the south side of the fault is less conducive for groundwater production compared to the basalt.

The basalt bedrock well will be constructed by drilling and driving 8-inch casing to rock, with open hole 8-inch drilling through the rock. If caving conditions are encountered, 6-inch steel liner will be set opposite the caving zones. Projected depth of this well is 600 feet. This well construction will allow pumping tests at rates of up to several hundred gallons per minute.

Summary of Recommendations

Test well drilling programs are outlined above for four sites in the upper Grande Ronde Basin. The drilling program will consist of the following:

Minam-Wallowa Confluence. One 600-foot, 8-inch diameter test well completed in Columbia River basalt is recommended. Potential for 500 gpm yield is rated at 60 percent.

Innaha Area. At the Gene Marr Ranch property, approximately 1500 gpm of groundwater is available from springs. There is very little potential for development of significant additional groundwater from wells. Upstream, at the Marks or Royes properties, or other as yet unidentified areas, one 600-foot, 8-inch diameter test well is recommended. This well would be completed in Innaha basalt, with chances of obtaining a 500 gpm yield from a single well rated at 40 percent.

Catherine Creek - At the OSU site, a shallow (approximately 100-foot deep) 6-inch diameter test well is recommended as a first phase to assess the shallow alluvial groundwater potential. A deep well (600-foot, 8-inch diameter) to evaluate the groundwater potential from basalt aquifers is appropriate as a second phase of investigation. Potential for success in developing 500 gpm from the two wells is rated at 50 percent. No test well drilling is recommended for the Union Site at the present time, although the potential for developing adequate groundwater supplies is rated at 90 percent, assuming that cold groundwater would be piped in from off site.

Lostine River at the Strathearn Ranch - A drilling program consisting of a first phase of two shallow wells and a potential second phase of one deep well is recommended for the Strathearn Ranch. The shallow wells will be six inches in diameter with probable depths of 200 feet. These wells will explore the groundwater potential from aquifers in glacial and alluvial sediments. The deep well will be approximately 600 feet deep, completed in basalt along a Wallowa Front fault. Potential for success in developing 500 gpm from a single or multiple wells completed in the alluvial/glacial deposits is rated at 70 percent. Potential for developing 500 gpm from the deep well is rated at 50 percent.

REVIEW OF EXISTING FACILITIES AND ASSESSMENT OF EXPANSION POTENTIAL

INTRODUCTION

Implementation of the NEOH Basin Plan will require additional hatchery production and related fisheries facilities. The purpose of this section is to review and assess the expansion potential of existing hatcheries and facilities in the Columbia River Basin. The use or expansion of existing facilities (if possible) may offer significant economic saving in capital and operating costs. The information presented in this section is based on published information, site visits, and discussion with agency, tribal, and fisheries personnel.

The following hatcheries/fisheries facilities have been evaluated for use in the implementation of the NEOH Basin Plan:

- Wallowa Hatchery
- Looking Glass Hatchery
- Irrigon Hatchery
- Umatilla Hatchery
- Lyons Ferry Trout Hatchery
- Springfield Aquaculture Facility

ASSESSMENT OF EXPANSION POTENTIAL

Wallowa Hatchery

Hatchery Data

Location:	Enterprise, Oregon
Operating Agency:	ODF&W
Funding Agencies:	COE USF&WS under LSRCF ODF&W
Species Reared:	Summer Chinook Resident Trout Resident Coho
Type of Rearing System	Single-Pass Raceways Acclimation Ponds for StSu

Water Supply

Groundwater

Springs

Spring Creek

Wallowa River

Expansion Potential

The expansion of this hatchery would require additional water. For groundwater this would entail a test well drilling program to evaluate the additional yield available from shallow and deep aquifers (see discussion of this site in section on Grande Rhonde River Basins). Surface water supplies include Spring Creek and the Wallowa River. Spring Creek is impacted by agricultural run-off and has poor water quality at times. Low flows and high temperatures are experienced during the summer. Plans to provide increased flows in the Wallowa River could also allow increased production at this hatchery.

Additional Information:

Assessment of Present Anadromous Fish Production Facilities in the Columbia River Basin, Volume 3, Bonneville Power Administration.

Looking Glass Hatchery

Hatchery Data

Location:	near Elgin, Oregon
Operating Agency:	ODF&W
Funding Agency:	USF&WS under LSRCF
Species Reared:	Spring Chinook
Type of Rearing System	Single Pass Raceway
Water Supply	Groundwater Looking Glass Creek

Expansion Potential

The operation of this hatchery is complicated by winter access problems, icing in Lookingglass Creek, and low water temperatures that limit fish growth in winter and early spring. It appears possible to increase groundwater supply to provide more water (see discussion of this site in section on Wallowa River Sites). The expansion of this hatchery would also require additional raceway space which could require relocation of existing staff housing.

Additional Information:

Assessment of Present Anadromous Fish Production Facilities in the Columbia River Basin, Volume 3, Bonneville Power Administration.

Irrigon Hatchery

Hatchery Data

Location:	Irrigon, Oregon
Operating Agency:	ODF&W
Funding Agency:	USF&WS under LSRCF
Species Reared:	Fall Chinook Spring Chinook Summer S tealhead
Type of Rearing System	Two-pass Standard Oregon Raceways
Water Supply	Groundwater

Expansion Potential

The expansion of this hatchery would require additional water and space. If oxygen supplementation is proven effective and/or additional water is developed, this facility could have the potential to increase production.

Additional Information:

Assessment of Present Anadromous Fish Production Facilities in the Columbia River Basin, Volume 3, Bonneville Power Administration.

Umatilla Hatchery

Hatchery Data

Location:	Irrigon, Oregon
Operating Agency:	ODF&W/CTUIR
Funding Agency:	Bonneville Power Administration
Species Reared:	Fall Chinook Spring Chinook Summer S tealhead
Type of Rearing System	Two-pass Standard Oregon Raceways Three-pass Michigan Raceways with Supplemental Oxygen

Water Supply

Groundwater

Expansion Potential

This hatchery is testing the use of supplemental oxygen to increase the production of fall and spring chinook. If oxygen supplementation is proven effective, production could be expanded by construction of additional raceways. Because of the duration of the oxygen experiment, the potential expansion of this hatchery would not be possible for at least 5-6 years.

Additional Information:

Umatilla Fish Hatchery - Construction Drawing. 1989. U.S. Corps of Engineers, Walla Walla District, Walla Walla

Umatilla Hatchery Master Plan. 1989. Prepared by the Oregon Department of Fish and Wildlife and The Confederated Tribes of the Umatilla Indian Reservation. Prepared for the Northwest Power Planning Council.

Evaluation of the Pure Oxygen System at the Umatilla Hatchery. 1991. Fish Factory, Prepared for Bonneville Power Administration.

Lyons Ferry Trout Hatchery

Hatchery Data

Location:	Starbuck, Washington
Operating Agency:	WDW
Funding Agency:	USF&WS under LSRCF
Species Reared:	Summer S tealhead Resident Trout
Type of Rearing System	Singe-pass early rearing raceway Large Ponds (3)
Water Supply	Groundwater

Expansion Potential

The expansion of this hatchery would require additional groundwater. The amount of additional available groundwater is unknown. Because only 3 large ponds are available for fry rearing, species/stock isolation and segregation may be difficult at this hatchery

Additional Information:

Assessment of Present Anadromous Fish Production Facilities in the Columbia River Basin, Volume 5, Bonneville Power Administration.

Springfield Aquaculture Facility

Hatchery Data

Location:	Springfield, Oregon
Operating Company:	Alleco Financial Corporation
Species Reared:	Coho Chinook
Type of Rearing System	Single-pass raceway system with oxygen supplement
Adult Holding Capacity	50,000 adult fish
Incubation Capacity	25,000,000 eggs
Maximum Rearing Capacity:	500,000 lb
Maximum Yearly Rearing Capacity:	1,200,000 lb
Water Supply	McKenzie River Heated Process water from paper mill

Expansion Potential

This is a large-scale hatchery. It has the ability to mix river and heat process water to adjust hatchery water temperature. All influent water is disinfected with chlorine prior to use. This hatchery has one of the lowest cost per smolt ratios in the industry. Species/stock isolation can be maintained from adult holding through rearing. This hatchery is approximately 400 miles from LaGrande. The use of this facility for rearing would probably require the use of extended rearing/acclimation sites for any fish transported into the NEOH Basins.

This hatchery is available for purchase at the present time. Due to the facility's large size, it has good potential for NEOH production. Distance from the NEOH basins is a negative feature.

Additional Information:

Spring Hatchery Presentation. 1991. Alleco Financial Corporation. Prepared for The Columbia River Inter-Tribal Fish Commission.

Letter to Mr. Jerry Bauer, dated April 2, 1991 from Mr. Ron Mayo, James M. Montgomery, Consulting Engineers, Inc., Bellevue, Washington.

SITE ANALYSIS AND SCREENING

INTRODUCTION

This section presents information that relates potential sites in the NEOH study area to various program options available to meet NEOH production objectives. This information includes:

- the revised Master Site Lists for the Grande Ronde, Imnaha, and Walla Walla basins (Tables 23 through 25)
- site and facility summaries for each basin (Table 26)
- site and facility screening evaluation matrices for each basin (Tables 27 through 38)
- site data collected during site reconnaissance visits (Appendix D).

REVISED SITE LIST AND FACILITY SUMMARY

Tables 23 through 25 present the revised site list for the Grande Ronde, Imnaha, and Walla Walla River basins, respectively. Sites that were eliminated from further evaluation are still shown, but are noted as being eliminated. These sites are depicted on Figures 4 through 6 which are included at the end of this section.

Facility types that appear to have potential at each site, based on reconnaissance visits to the sites (Appendix D), review of available water quality and quantity data, and comments from the Initial Site Analysis Workshop are shown on Table 26.

INITIAL SITE ANALYSIS

The facility types shown at a site on Table 26 were analyzed using engineering and environmental screening criteria to identify and prioritize sites that may warrant further investigation. This screening and subsequent review by the NEOH TWG formed the basis for the recommended programs presented in the section titled SITE ANALYSIS AND SCREENING.

Tables 27 through 30 present a screening level analysis of Grande Ronde River sites for adult capture, adult holding, incubation and fry rearing, and full term (satellite) rearing facilities. The “hatchery” and “incubation and fry rearing” facilities shown on Table 26 were considered identical for site screening purposes and a separate evaluation for a hatchery was not included. Further, the final rearing/acclimation/direct release sites were not evaluated beyond the information presented in Table 26. The sites being considered could accommodate all or most of the required functions.

Similar screening matrices are shown on Tables 31 through 34 for the Imnaha basin and 35 through 38 for the Walla Walla basin.

TABLE 23
REVISED SITE LIST - GRANDE RONDE BASIN

Site Name	Comments
1. Catherine Creek N&S forks confluence	EIP measure site (a)
2. Catherine-Milk Creek confluence (OSU site)	EIP measure site (a)
3. Catherine Creek at Union (Old Hatchery)	
4. Vey Meadows	includes splash dam site
5. Sheep Creek	
6. Beaver Creek	
7. Sanderson Springs - Mill Creek	site eliminated during screening
8. Lower Willow Creek near Elgin	site eliminated during screening
9. Indian Creek near Elgin	
10. Grande Ronde near Elgin	site eliminated during screening
11. Looking Glass Hatchery	
12. Wildcat Creek Area	
13. Fish Ladder (Former USFWS Research Site)	
14. Flora Grade (Schoolbus Flats)	
15. Cottonwood Creek	
16. Wallowa Lake	site eliminated during screening
17. Hayes Fork-Prarie Creek	site eliminated during screening
18. Wallowa Hatchery	
19. Big Canyon Creek	
20. Minam River confluence with Wallowa	location changed, see Site 27
21. ODFW Bighorn Sheep range	
22. Strathearn Ranch	
23. Lostine Dam	
24. Cross-Valley Diversion (Clearwater Ditch)	
25. Catherine Creek at Davis Dam	EIP measure site (a)
26. Minam River 1/4 to 1 mile above Wallowa Confluence	EIP measure site (b)
27. Wallowa River 1/2 mile below Minam confluence	replaces Site 20
28. Wenaha River 1/4 mile above Troy	EIP measure site (b)

- (a) Early Implementation Plan Measure 2.3: “Portable adult collection/holding and juvenile acclimation/release systems”. Catherine Creek demonstration project.
- (b) Early Implementation Plan Measure 2.2: “Protecting endemic spring chinook in Minam and Wenaha Rivers (Grande Ronde subbasin)”.

TABLE 24
REVISED SITE LIST - IMNAHA BASIN

Site Name	Comments
1. Indian Crossing	
2. Gumboot Creek (Fish Weir)	
3. Grouse Creek-Imnaha confluence	site eliminated during screening
4. Big Sheep-Lick Creek confluence	
5. Big Sheep Creek	
6. Big Sheep-Little Sheep confluence	
7. Little Sheep Creek	
8. Gene Marr Ranch	
9. Horse Creek	site eliminated during screening

TABLE 25
REVISED SITE LIST - WALLA WALLA BASIN

Site Name	Comments
1. NE 8th Street Bridge (Milton Freewater)	
2. 9th and Walnut (Milton Freewater)	
3. Harris Park (at park)	
4. Harris Park No. 2	site eliminated during screening
5. S. Fork - Elbow Creek confluence	site eliminated during screening
6. Russell Walker property	
7. Wolf Fork Confluence	
8. WDW Dayton Conditioning Pond	
9. Railroad Bridge	
10. Pond at FS boundary	

TABLE 26 (1 OF 3)
SITE AND FACILITY SUMMARY
GRANDE RONDE RIVER BASIN

SITE	FACILITY						
	Adult Capture	Adult Holding	Incubation & Fry Rearing	Satellite Rearing	Direct Release	Acclimation	Hatchery
1. Catherine Creek N & S Fork Confluence Grande Ronde River					yes	yes	
2. Catherine Creek (OSU Property)) Milk Creek Confluence Grande Ronde River	yes-ChS	yes	potential depending on groundwater supply	potential depending on groundwater supply	yes	yes	potential needs data on groundwater and temp.
3. Catherine Creek at Union Grande Ronde River Old Hatchery Site	yes-ChS	yes	potential, former hatchery site	potential, former hatchery site	yes	yes	potential, former hatchery site
4. Vey Meadows Grande Ronde River	yes-ChS at lower end near splash dam	yes-at capture site			yes above meadows at FS campground	yes above meadows at FS campground	
5. Sheep Creek Grande Ronde River					yes	yes	
6. Beaver Creek Grande Ronde River	potential major in-river structures required	potential major in-river structures required	potential needs data on groundwater and temp.	potential needs data on groundwater and temp.	yes	yes	potential needs data on groundwater and temp.
7. Sanderson Springs Mill Creek Grande Ronde River							
8. Lower Willow Creek Near Elgin Grande Ronde River							
9. Indian Creek Near Elgin Grande Ronde River					yes	yes	
10. Grande Ronde near Elgin Grande Ronde River							
11. Looking Glass Hatchery Grande Ronde River Existing LSRCP Facility			potential incubation only				
12. Wildcat Creek Area Grande Ronde River					yes early ChF only	yes early ChF only	
13. Fish Ladder Former USFWS Research Site Grande Ronde River					yes with flood protection early ChF only	yes with flood protection early ChF only	
14. Flora Grade Schoolbus Flat Grande Ronde River					yes-ChF	yes-ChF	
15. Cottonwood Creek Grande Ronde River Existing LSRCP Facility					yes-ChF using Grande Ronde water	yes-ChF using Grande Ronde water	
16. Wallowa Lake Wallowa River			potential with construction of Prairie Creek project	potential with construction of Prairie Creek project		potential with construction of Prairie Creek project	potential requires construction of Prairie Creek project
17. Hayes Fork-Prarie Creek Wallowa River							
8a Wallowa Hatchery Wallowa River Existing ODFW and LSRCP Facility	yes-ChS	yes	potential with construction of Prairie Creek project	potential with construction of Prairie Creek project		potential with construction of Prairie Creek project	yes
8b Wallowa Hatchery Option 2 Wallowa River Existing ODFW and LSRCP Facility			potential with extended well at hatchery	potential with extended well at hatchery		potential with construction of Prairie Creek project	

NOTE: SHADED BOX INDICATES THAT
FACILITY TYPE IS NOT NEEDED OR IS
NOT FEASIBLE AT A SITE.



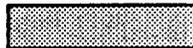
TABLE 26 (2 d 3)
 SITE AND FACILITY SUMMARY
 GRANDE RONDE RIVER BASIN

SITE	FACILITY						
	Adult Capture	Adult Holding	Incubation & Fry Rearing	Satellite Rearing	Direct Release	Acclimation	Hatchery
19. Big Canyon Creek Wallows River Existing LSRCF Facility	yes existing facility autumn chinook only	potential autumn chinook only				potential	
20. Minam - Wallows Confluence Minam & Wallows Rivers	yes groundwater supply required	yes groundwater supply required	potential groundwater supply required	yes groundwater supply required	yes	yes	yes with groundwater chilling during rearing potentially required
21. ODFW Blighorn Sheep Range Lostine River					yes	potential	
22. Strathern Ranch Lostine River	yes-ChS	yes	potential needs groundwater data	potential needs groundwater data	yes	yes	potential needs groundwater data
23. Lostine Dam Lostine River	yes-ChS	potential					
24. Cross-Valley Diversion Lostine River	potential-ChS	potential					

SITE AND FACILITY SUMMARY
 IMNAHA RIVER BASIN

SITE	FACILITY						
	Adult Capture	Adult Holding	Incubation & Fry Rearing	Satellite Rearing	Direct Release	Acclimation	Hatchery
1. Indian Crossing Imnaha River					yes	yes	
2. Gumboot Creek (Fish Weir) Imnaha River Existing LSRCF Facility	yes	yes			yes	yes need to expand facility to handle more fish	
3. Grouse Creek-Imnaha Confluence Imnaha R m	potential available land limited	potential available land limited		potential available land limited	potential	potential	
4. Big Sheep-Lick Creek Confluence Imnaha River					yes timed release of fed fry	yes timed release of fed fry	
5. Big Sheep Creek Imnaha River		potential	potential	potential	yes	yes	potential
6. Big Sheep-Little Sheep Confluence Imnaha River	not determined	not determined		potential small-scale operation	yes	yes	potential small-scale operation
7. Little Sheep Creek Imnaha River StSu Collection/Acclimation LSRCF			yes potential depending on groundwater availability			potential	
8. Gene Marr Ranch Imnaha River	yes-ChF	potential depends on groundwater availability	potential depends on groundwater availability	potential depends on groundwater availability	yes	potential depends on groundwater availability	potential depends on groundwater availability
9. Horse Creek Imnaha River							

NOTE: SHADED BOX INDICATES THAT FACILITY TYPE IS NOT NEEDED OR IS NOT FEASIBLE AT A SITE.



**TABLE 26 (3 of 3)
SITE AND FACILITY SUMMARY
WALLA WALLA RIVER BASIN**

SITE	FACILITY						
	Adult Capture	Adult Holding	Incubation & Fry Rearing	Satellite Rearing	Direct Release	Acclimation	Hatchery
1. NE 8th Street Bridge Milton-Freewater Mainstem Walla Walla-Existing StSu Ladder	potential-StSu						
2. 9th and Walnut Milton-Freewater Mainstem Walla Walla-Existing Trap	potential for smolt collection						
3. Harris Park No. 1 At Harris Park South Fork Walla Walla	potential-if needed	yes	potential need groundwater data	potential need groundwater data	yes	yes	potential needs data on groundwater
4. Harris Park No. 2 Approx. 1 mile above Harris Park South Fork Walla Walla							
5. S. Fork-Elbow Creek Confluence Approx. 2 miles above Harris Park South Fork Walla Walla							
6. Russell Walker property approx. 2 miles below Harris Park S. Fork Walla Walla	potential-if needed	yes	yes	yes	yes	yes	yes
7. Wolf Fork Confluence Touchet River Walla Walla Basin		potential			yes	yes	
8. WDW Dayton Conditioning Pond Touchet River at Dayton Walla Walla Basin	not determined	potential		potential	yes	yes	
9. Railroad Bridge mainstem at end of Columbia R. backwater Walla Walla Basin	yes						
10. Pond at FS boundary Touchet River Walla Walla Basin					yes	potential	

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**SITE AND FACILITY SUMMARY
OUT-OF-BASIN LOCATIONS**

SITE	FACILITY						
	Adult Capture	Adult Holding	Incubation & Fry Rearing	Satellite Rearing	Direct Release	Acclimation	Hatchery
1. Eagle Creek Powder River Drainage Location needs to be determined			potential	potential			potential
2. Springfield Aquaculture Facility Willamette River Springfield, OR			potential	potential			potential

NOTE: SHADED BOX INDICATES THAT FACILITY TYPE IS NOT NEEDED OR IS NOT FEASIBLE AT A SITE



TABLE 27 (1 of 4)

ADULT CAPTURE SCREENING CRITERIA

CRITERION	Catherine Creek (OSU Property)		Catherine Creek at Union		Vey Meadows (at Splash Dam)	
	Fall Chinook (Sep-Dec)	Spring Chinook (4/15-7/15)	Fall Chinook (Sep-Dec)	Spring Chinook (4/15-7/15)	Fall Chinook (Sep-Dec)	Spring Chinook (4/15-7/15)
I. WATER QUALITY						
1. Disease potential	n/a	n/a	n/a	n/a	n/a	n/a
2. Water temperature	n/a	Acceptable	n/a	Acceptable	n/a	Acceptable
3. General minerals	n/a	Acceptable	n/a	Acceptable	n/a	Acceptable
4. Other pollutants (phosphate, oil & grease)	n/a	None identified	n/a	None identified	n/a	None identified
5. Offsite risks	n/a	None identified	n/a	RR ROW across road	n/a	Grazing in upstream meadows
II. WATER QUANTITY						
6. Availability	n/a	76-440 cfs during period	n/a	06-412 cfs during period	n/a	ungaged, appears adequate
7. Dependability	n/a	Good	n/a	Good	n/a	ungaged, appears adequate
8. Intake structure	n/a	Good locations available	n/a	n/a	n/a	n/a
9. Pipeline ROW	n/a	All on site	n/a	n/a	n/a	n/a
10. Bypass reach (length & location)	n/a	undetermined	n/a	n/a	n/a	n/a
11. Pumped versus gravity source	n/a	Gravity	n/a	n/a	n/a	n/a
12. Cost of water supply (construction O&M)	n/a	Moderate	n/a	n/a	n/a	n/a
III. LOCATION ON RIVER						
13. River mile	n/a		n/a		n/a	
14. Spawning distribution (natural run)	n/a	Typically reach site	n/a	Typically reach site	n/a	Typically reach site
15. Attraction potential	n/a	Good	n/a	Good	n/a	Good
IV. 16. PERIOD OF USE	n/a	Apr. 15 - Jul 15	n/a	Apr. 15 - Jul 15	n/a	Apr. 15 - Jul 15
V. ENVIRONMENTAL CONCERNS						
17. Wetlands (other than riparian zone)	n/a	None identified	n/a	Minimal	n/a	Meadows may contain wetlands
18. Terrestrial wildlife and habitats	n/a	Coniferous forest, grassland	n/a	Brushy, trees and shrubs	n/a	grassy meadows w/ forested upland
19. Threatened/endangered species	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
20. Water quality impacts of facility	n/a	Negligible	n/a	Negligible	n/a	Negligible
21. Community impacts	n/a	Negligible	n/a	Negligible	n/a	Negligible
22. Scenic/Aesthetic	n/a	Negligible	n/a	Negligible	n/a	Minor
23. Accessibility	n/a	Adjacent to paved road	n/a	adjacent to paved, gravel to site	n/a	gravel road to site
VI. SIZE OF PARCEL						
24. Space for raceways/ ponds	n/a	10+ acres	n/a	4 acres	n/a	n/a
25. Space for sedimentation ponds	n/a	10+ acres	n/a	4 acres	n/a	n/a
26. Space for trapping	n/a	yes-large flat area	n/a	yes, existing 0.5±±±	n/a	yes
VII. SITEWORK COSTS						
27. Topography	n/a	Mostly flat	n/a	Flat	n/a	Flat to gently sloping
28. Contouring and diking (flood control)	n/a	Minimal	n/a	Minimal	n/a	Minor
29. Pipeline and intake structure	n/a	n/a	n/a	n/a	n/a	n/a
30. Utilities	n/a	3 phase power @ longpad	n/a	3 phase power adjacent to site	n/a	None
31. Costs of acquiring site	n/a	unknown	n/a	unknown	n/a	unknown
32. Soils/Groundwater	n/a	alluvial/ n/a	n/a	Alluvial/good gw potential	n/a	Alluvial/low gw potential
33. Access	n/a	gravel road to site	n/a	Paved road to site	n/a	gravel road to site
VIII. 34. PUBLIC EDUCATION/ACCESS	n/a	possible	n/a	possible	n/a	possible
IX. SECURITY						
35. Intake structure & nd water supply	n/a	Required	n/a	Required	n/a	Required
36. Pipeline	n/a	Required	n/a	Required	n/a	Required
37. Raceways/ponds	n/a	Required	n/a	Required	n/a	Required
X. PERMITTING						
38. Land Use	n/a	Undetermined	n/a	undetermined	n/a	Undetermined
39. Shorelines Designation	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
40. Flood hazard	n/a		n/a	Low	n/a	Low
XI. PROPERTY OWNERSHIP						
41. Facility site	n/a	OSU	n/a	Oregon State Parks	n/a	Private - Vey Family
42. Pipeline ROW and intake structure	n/a	OSU	n/a	n/a	n/a	Private - Vey Family
43. Time to acquire site	n/a	Unknown	n/a	Unknown	n/a	unknown
XII. SUMMARY/COMMENTS	ChF do not reach site	Relatively large, flat area along creek with good potential for facilities	ChF do not reach site	ChS reach site Existing ladder, needs rehabilitation	ChF do not reach site	good location utilizing existing splash dam, would require shading Potential holding at upper meadows

TABLE 27 (2 of 4)

ADULT CAPTURE SCREENING CRITERIA

CRITERION	Beaver Creek		Grande Ronde near Elgin		Wallows Hatchery	
	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook
I. WATER QUALITY						
1. Disease potential	n/a	n/a	n/a	n/a	n/a	n/a
2. Water temperature	n/a	Acceptable	n/a	Acceptable	n/a	Acceptable
3. General minerals	n/a	Acceptable	n/a	Acceptable	n/a	Acceptable
4. Other pollutants (phosphate, oil A grease)	n/a	None identified	n/a	None identified	n/a	None identified
5. Offsite risks	n/a	None identified	n/a	None identified	n/a	None identified
II. WATER QUANTITY						
6. Availability	n/a	98-878 cfs during period	n/a	175-1764 cfs during period	n/a	34-343 cfs during period
7. Dependability	n/a	Good	n/a	Good	n/a	Good
8. Intake structure	n/a	n/a	n/a	n/a	n/a	n/a
9. Pipeline ROW	n/a	n/a	n/a	n/a	n/a	n/a
10. Bypass reach (length and location)	n/a	n/a	n/a	n/a	n/a	n/a
11. Pumped versus gravity source	n/a	n/a	n/a	n/a	n/a	n/a
12. Cost of water supply (construction, O&M)	n/a	n/a	n/a	n/a	n/a	n/a
III. LOCATION ON RIVER						
13. River mile	n/a	GR 179	n/a	Typically pass site	n/a	Upper end of Wallows R.
14. Spawning distribution (natural run)	n/a	Typically reach site	n/a	Good	n/a	Near upper limit of Wallows ChS
15. Attraction potential	n/a	Good	n/a		n/a	Good
IV. PERIOD OF USE						
16. Period of use	n/a	Apr. 15 - Jul 15	n/a	Apr. 15 - Jul 15	n/a	Apr. 15 - Jul 15
V. ENVIRONMENTAL CONCERNS						
17. Wetlands (other than riparian zone)	n/a	Beaver Ck. mouth-wetlands	n/a	Undetermined	n/a	None identified
18. Terrestrial/wildlife habitats	n/a	Wooded riparian, steep hillside	n/a	Pasture, wooded corridors	n/a	Grass, existing facility
19. Threatened/endangered species	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
20. Water quality impacts of facility	n/a	Negligible	n/a	Negligible	n/a	Negligible
21. Community impacts	n/a	Negligible	n/a	In rural, farming area	n/a	Minor, at existing facility
22. Scenic/Aesthetic	n/a	Area generally undeveloped	n/a	Farms, pasture near site	n/a	Minor, at existing facility
23. Accessibility	n/a	adjacent to paved, gravel to site	n/a	Undetermined	n/a	paved road to site
VI. SIZE OF PARCEL						
24. Space for raceways/ ponds	n/a	5-10 acres	n/a	5-10 acres	n/a	n/a
25. Space for sedimentation ponds	n/a	5-10 acres	n/a	5-10 acres	n/a	n/a
26. Space for trapping	n/a	yes	n/a	yes	n/a	yes
VII. SITEWORK COSTS						
27. Topography	n/a	Flat	n/a	Flat	n/a	Mostly flat
28. Contouring and diking (flood control)	n/a	Moderate	n/a	Moderate	n/a	Minor
29. Pipeline and intake structure	n/a	n/a	n/a	n/a	n/a	n/a
30. Utilities	n/a	3 phase power near site	n/a	3 phase power near site	n/a	3-phase at site
31. Costs of acquiring site	n/a	unknown	n/a	unknown	n/a	unknown
32. Soils/Groundwater	n/a	Alluvial/mod. gw potential	n/a	Alluvial/mod. gw potential	n/a	Alluvial/mod. gw potential
33. Access	n/a	Paved road to site	n/a	Paved roads in area	n/a	good, developed site
VIII. PUBLIC EDUCATION/ACCESS						
34. Public education/access	n/a	possible	n/a	possible	n/a	possible
IX. SECURITY						
35. Intake structure and water supply	n/a	Required	n/a	Required	n/a	Required
36. Pipeline	n/a	Required	n/a	Required	n/a	Required
37. Raceways/ponds	n/a	Required	n/a	Required	n/a	Required
X. PERMITTING						
38. Land Use	n/a	Undetermined	n/a	undetermined	n/a	Existing facility
39. Shoreline Designation	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
40. Flood hazard	n/a	Moderate on Beaver Ck.	n/a	Moderate	n/a	Low
XI. PROPERTY OWNERSHIP						
41. Facility site	n/a	2 private owners	n/a	Undetermined	n/a	ODFW
42. Pipeline ROW and intake structure	n/a	n/a	n/a	Undetermined	n/a	ODFW
43. Time to acquire site	n/a	Unknown	n/a	Undetermined	n/a	n/a
XII. SUMMARY/COMMENTS						
	ChF do not reach site	Trap on mainstem requires major in-river structure Beaver Creek wetlands	ChF do not reach site no specific site selected	General area evaluated, no specific site selected	ChF do not reach site	Site located in upper portion of Wallows ChS habitat

TABLE 27 (3 of 4)

ADULT CAPTURE SCREENING CRITERIA

CRITERION	Big Canyon Creek		Minam-Wallowa Confluence		Strathern Ranch	
	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook
I. WATER QUALITY 1 Disease potential 2 Water temperature 3 General minerals 4 Other pollutants (phosphate, oil & grease) 5 Offsite risks	n/a Acceptable Acceptable None identified None identified	n/a n/a n/a n/a n/a	n/a Acceptable Acceptable None identified None identified	n/a Acceptable Acceptable None identified None identified	n/a n/a n/a n/a n/a	n/a Acceptable Acceptable None identified None identified
II. WATER QUANTITY 6. Availability 7. Dependability 8. Intake structure 9. Pipeline ROW 10. Bypass reach (length and location) 11. Pumped versus gravity source 12. Cost of water supply (construction, O&M)	Acceptable Acceptable n/a n/a n/a n/a n/a	n/a n/a n/a n/a n/a n/a n/a	96-215 cfs during period Good n/a n/a n/a n/a n/a	464-1702 cfs during period Good n/a n/a n/a n/a n/a	n/a n/a n/a n/a n/a n/a n/a	158-805 cfs during period Moderate n/a n/a n/a n/a n/a
III. LOCATION ON RIVER 13 River mile 14 Spawning distribution (natural run) 15 Attraction potential	potential autumn chinook habitat good	n/a n/a n/a	potential for Wallowa CHF poor	Typically reach site Good	n/a n/a n/a	intercept upper portion of run Good
IV. 16. PERIOD OF USE	Sept. - Dec	n/a	Sept. - Dec	Apr. 15 - Jul 15	n/a	Apr. 15 - Jul 15
V. ENVIRONMENTAL CONCERNS 17. Wetlands (other than riparian zone) 18 Terrestrial wildlife and habitats 19 Threatened/endangered species 20. Water quality impacts of facility 21. Community impacts 22. Scenic/Aesthetic 23. Accessibility	None identified Coniferous forest, grassland Undetermined Negligible Negligible Negligible, existing facility road to site	n/a n/a n/a n/a n/a n/a n/a	None apparent Mixed coniferous forest Undetermined Negligible Negligible Negligible paved road to site	None apparent Mixed coniferous forest Undetermined Negligible Negligible Negligible paved road to site	n/a n/a n/a n/a n/a n/a n/a	None apparent Mixed forest, meadow Undetermined Negligible Negligible Farms, houses on large lots paved & gravel roads to site
VI. SIZE OF PARCEL 24. Space for raceways/ ponds 25. Space for sedimentation ponds 26. Space for trapping	n/a n/a n/a	n/a n/a n/a	n/a n/a yes	n/a n/a yes	n/a n/a n/a	n/a n/a yes
VII. SITEWORK COSTS 27. Topography 28. Contouring and diking (flood control) 29. Pipeline and intake structure 30. Utilities 31. Costs of acquiring site 32. Soils/Groundwater 33. Access	Mostly flat Minimal n/a 3 phase power to site existing facility alluvial/mod. gw potential road to site	n/a n/a n/a n/a n/a n/a n/a	Flat, steep bank at river Major n/a 3 phase power nearby unknown Alluvial/good gw potential Paved road to site	Flat, steep bank at river Major n/a 3 phase power nearby unknown Alluvial/good gw potential Paved road to site	n/a n/a n/a n/a n/a n/a n/a	Flat Minimal n/a 3 phase power to site unknown Alluvial/good gw potential Paved & gravel roads to site
VIII. 34. PUBLIC EDUCATION/ACCESS	possible	n/a	possible	possible	n/a	possible
IX. SECURITY 35 Intake structure and water supply 36 Pipeline 37. Raceways/ponds	Required Required Required	n/a n/a n/a	Required Required Required	Required Required Required	n/a n/a n/a	Required Required Required
X. PERMITTING 38. Land Use 39. Shorelines Designation 40. Flood hazard	Existing facility Undetermined Low	n/a n/a n/a	Parkland Undetermined High	Parkland Undetermined High	n/a n/a n/a	Undetermined Undetermined Low
XI. PROPERTY OWNERSHIP 41. Facility site 42. Pipeline ROW and intake structure 43. Time to acquire site	ODFW ODFW Unknown	n/a n/a n/a	State Parks n/a Unknown	State Parks n/a Unknown	n/a n/a n/a	Private - Strathern Private - Strathern unknown-willing seller
XII. SUMMARY/COMMENTS	use for autumn chinook only		At or near limit of potential upstream distribution	CHS reach site combine w/ Minam IEP trapping need		Site located in upper portion of Lostine CHS habitat

TABLE 27 (4 of 4)

ADULT CAPTURE SCREENING CRITERIA

CRITERION	Lostine Dam		Cross Valley Diversion	
	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook
I. WATER QUALITY 1. Disease potential 2. Water temperature 3. General minerals 4. Other pollutants (phosphate, oil & grease) 5. Offsite risks	n/a n/a n/a n/a n/a	n/a Acceptable Acceptable None identified None identified	n/a n/a n/a n/a n/a	n/a Acceptable Acceptable None identified None identified
II. WATER QUANTITY 6. Availability 7. Dependability 8. Intake structure 9. Pipeline ROW 10. Bypass reach (length and location) 11. Pumped versus gravity source 12. Cost of water supply (construction, O&M)	n/a n/a n/a n/a n/a n/a n/a	158-805 cfs during period Moderate n/a n/a n/a n/a n/a	n/a n/a n/a n/a n/a n/a n/a	158-805 cfs during period Moderate n/a n/a n/a n/a n/a
III. LOCATION ON RIVER 13. River mile 14. Spawning distribution (naturalrun) 15. Attraction potential	n/a n/a n/a	typically reach site good	n/a n/a n/a	typically reach site good
IV. 16. PERIOD OF USE	n/a	Apr. 15 - Jul 15	n/a	Apr. 15 - Jul 15
V. ENVIRONMENTAL CONCERNS 17. Wetlands (other than riparian zone) 18. Terrestrial wildlife and habitats 19. Threatened/endangered species 20. Water quality impacts of facility 21. Community impacts 22. Scenic/Aesthetic 23. Accessibility	n/a n/a n/a n/a n/a n/a n/a	None observed Mixed trees, pasture Undetermined Negligible Negligible In mod. developed area gravel road to site	n/a n/a n/a n/a n/a n/a n/a	River bottom wetlands Cottonwoods and riparian veg. Undetermined Negligible Negligible In agricultural area 1/2 mile from gravel road
VI. SIZE OF PARCEL 24. Space for raceways/ ponds 25. Space for sedimentation ponds 26. Space for trapping	n/a n/a n/a	n/a n/a yes - existing facility	n/a n/a n/a	n/a n/a yes
VII. SITEWORK COSTS 27. Topography 28. Contouring and diking (flood control) 29. Pipeline and intake structure 30. Utilities 31. Costs of acquiring site 32. Soils/Groundwater 33. Access	n/a n/a n/a n/a n/a n/a n/a	Mostly flat Moderate n/a 3 phase power near site unknown alluvial/ n/a gravel road to site	n/a n/a n/a n/a n/a n/a n/a	limited flat land Major n/a 1/2 mile to 3 phase power unknown alluvial/ n/a gravel road to near site
VIII. 34. PUBLIC EDUCATION/ACCESS	n/a	possible	n/a	possible
IX. SECURITY 35. Intake structure and water supply 36. Pipeline 37. Raceways/ponds	n/a n/a n/a	Required Required Required	n/a n/a n/a	Required Required Required
X. PERMITTING 38. Land Use 39. Shorelines Designation 40. Flood hazard	n/a n/a n/a	Mixed urban and farming Undetermined Low	n/a n/a n/a	Mixed urban and farming Undetermined High
XI. PROPERTY OWNERSHIP 41. Facility site 42. Pipeline ROW and intake structure 43. Time to acquire site	n/a n/a n/a	Private n/a Unknown	n/a n/a n/a	Jerry McClean n/a Unknown
XII. SUMMARY/COMMENTS	ChF do not reach site at present	Would require rebuilding existing facility or locating new one, probably upstream on private land		Little space available for holding if used for adult capture Need - access road

TABLE 28 (1 of 4)

ADULT HOLDING SCREENING CRITERIA

CRITERION	Catherine Creek (OSU Property)		Catherine Creek at Union		Upper Vey Meadows	
	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook
I. WATER QUALITY 1. Disease potential 2. Water temperature 3. General minerals 4. Other pollutants (phosphate, oil & grease) 5. Offsite risks	n/a n/a n/a n/a n/a	n/a monitoring required Acceptable None identified None identified	n/a n/a n/a n/a n/a	n/a Acceptable Monitoring required None identified RR ROW across road	n/a n/a n/a n/a n/a	n/a Monitoring required Acceptable None identified None identified
II. WATER QUANTITY 6. Availability 7. Dependability 8. Intake structure 9. Pipeline ROW ## Bypass reach (length and location) ## Pumped versus gravity source ## Cost of water supply (construction, O&M)	n/a n/a n/a n/a n/a n/a n/a	76-440 cfs during period Good Good locations available All on site undetermined Gravity Moderate	n/a n/a n/a n/a n/a n/a n/a	96-412 cfs during period Good Good location Good location undetermined gravity moderate	n/a n/a n/a n/a n/a n/a n/a	ungaged, appears adequate ungaged, appears adequate Good location Good location, all on site undetermined gravity moderate
III. LOCATION ON RIVER ## River mile ## Spawning distribution (natural run) ## Attraction potential	n/a n/a n/a	Typically reach site Good	n/a n/a n/a	Typically reach site Good	n/a n/a n/a	Typically reach site Good
IV. ## PERIOD OF USE	n/a	4/15-7/15	n/a	Apr 15 - Jul 15	n/a	Apr. 15 - Jul 15
V. ENVIRONMENTAL CONCERNS ## Wetlands (other than riparian zone) ## Terrestrial wildlife and habitats ## Threatened/endangered species ## Water quality impacts of facility ## Community impacts ## Scenic/Aesthetic ## Accessibility	n/a n/a n/a n/a n/a n/a n/a	None observed Coniferous forest, grassland Undetermined Negligible Negligible Negligible Adjacent to paved road	n/a n/a n/a n/a n/a n/a n/a	Minimal Brushy trees and shrubs Undetermined Negligible Negligible Negligible adjacent to paved, gravel to site	n/a n/a n/a n/a n/a n/a n/a	None observed outside riparian Mixed coniferous, deciduous Undetermined Negligible Negligible Existing FS campground gravel road to site
VI. SIZE OF PARCEL ## Space for raceways/ ponds ## Space for sedimentation ponds ## Space for trapping	n/a n/a n/a	10+ acres 10+ acres yes-large flat area	n/a n/a n/a	4 acres 4 acres yes, existing ladder	n/a n/a n/a	2+ acres 2+ acres n/a
VII. SHEWORK COSTS ## Topography ## Contouring and diking (flood control) ## Pipeline and intake structure ## Utilities ## Costs of acquiring site ## Soils/Groundwater ## Access	n/a n/a n/a n/a n/a n/a n/a	Mostly flat Minimal moderate, stream bedload movement 3 phase power along road unknown alluvial/moderate gw potential gravel road to site	n/a n/a n/a n/a n/a n/a n/a	Flat Minimal moderate 3 phase power adjacent to site unknown Alluvial/good gw potential Paved road to site	n/a n/a n/a n/a n/a n/a n/a	Flat to gently sloping Minor Moderate None unknown Alluvial/low gw potential gravel road to site
VIII. ## PUBLIC EDUCATION/ACCESS	n/a	possible	n/a	possible	n/a	possible
IX. SECURITY ## Intake structure and water supply ## Pipeline ## Raceways/ponds	n/a n/a n/a	Required Required Required	n/a n/a n/a	Required Required Required	n/a n/a n/a	Required Required Required
X. PERMITTING ## Land Use ## Shorelines Designation ## Flood hazard	n/a n/a n/a	Undetermined Undetermined Low	n/a n/a n/a	undetermined Undetermined Low	n/a n/a n/a	FS campground Undetermined Low
XI. PROPERTY OWNERSHIP ## Facility site ## Pipeline ROW and intake structure ## Time to acquire site	n/a n/a n/a	OSU OSU Unknown	n/a n/a n/a	Oregon State Parks n/a Unknown	n/a n/a n/a	US forest Service US forest Service unknown
XII. SUMMARY/COMMENTS	hF do not reach site	Relatively large, flat area along creek with good potential for facilities Combine with IEP facilities	ChF do not reach site	ChS reach site rework existing ladder Combine with IEP facilities	ChF do not reach site	good location utilizing trapping downstream at splash dam

TABLE 28 (2 of 4)

ADULT HOLDING SCREENING CRITERIA

CRITERION	Beaver Creek		Grande Ronde near Elgin		Willows Hatchery	
	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook
I. WATER QUALITY						
1 Disease potential	n/a	n/a	n/a	n/a	n/a	n/a
2 Water temperature	n/a	n/a	n/a	n/a	n/a	n/a
3 General minerals	n/a	Acceptable	n/a	Acceptable	n/a	Acceptable
4 Other pollutants (phosphate, oil & grease)	n/a	None identified	n/a	ag return water	n/a	None identified
5 Offsite risks	n/a	None identified	n/a	grunoff, sedimentation	n/a	None identified
II. WATER QUANTITY						
6 Availability	n/a	98-878 cfs during period	n/a	175-1764 cfs during period	n/a	34-343 cfs during period
7 Dependability	n/a	Good	n/a	Good	n/a	Good
8 Intake structure	n/a	Good location	n/a	undetermined	n/a	0 facility
9 Pipeline ROW	n/a	good location	n/a	undetermined	n/a	0 facility
10 Bypass reach (length and location)	n/a	undetermined	n/a	undetermined	n/a	0 facility
11 Pumped versus gravity source	n/a	gravity	n/a	gravity	n/a	gravity and wells developed
12 Cost of water supply (construction, O&M)	n/a	high	n/a	undetermined	n/a	moderate
III. LOCATION ON RIVER						
13 River mile	n/a	GR 179	n/a		n/a	Upper end of Willows R.
14 Spawning distribution (natural run)	n/a	Typically reach site	n/a	Typically pass site	n/a	Near upper limit of Willows ChS
15 Attraction potential	n/a	Good	n/a	Good	n/a	Good
IV. 16 PERIOD OF USE	n/a	Apr 15 - Jul 15	n/a	Apr. 15 - Jul 15	n/a	Apr 15 - Jul 15
V. ENVIRONMENTAL CONCERNS						
17 Wetlands (other than riparian zone)	n/a	Beaver Ck. mouth-wetlands	n/a	Undetermined	n/a	None identified
18 Terrestrial wildlife and habitats	n/a	Wooded riparian, steep hillside	n/a	Pasture, wooded corridors	n/a	Grass facility
19 Threatened/endangered species	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
20 Water quality impacts of facility	n/a	Negligible	n/a	Negligible	n/a	Negligible
21 Community impacts	n/a	Negligible	n/a	In rural, farming area	n/a	Minor, at 0 facility
22. Soenic/Aesthetic	n/a	Area generally undeveloped	n/a	Farms, pasture near site	n/a	Minor, at 0 facility
23 Accessibility	n/a	adjacent to paved, gravel to site	n/a	Undetermined	n/a	paved road to site
VI. SIZE OF PARCEL						
24. Space for raceways/ ponds	n/a	5-10 acres	n/a	5-10 acres	n/a	0 facility
25 Space for sedimentation ponds	n/a	200 acres	n/a	5-10 acres	n/a	0 facility
26 Space for trapping	n/a	yes	n/a	yes	n/a	yes
VII. SITEWORK COSTS						
27 Topography	n/a	Flat	n/a	Flat	n/a	Mostly flat
28 Contouring and diking (flood control)	n/a	Low to Moderate	n/a	Moderate	n/a	Minor
29 Pipeline and intake structure	n/a	n/a	n/a	n/a	n/a	n/a
30 Utilities	n/a	3 phase power near site	n/a	3 phase power near site	n/a	3-phase at site
31 Costs of acquiring site	n/a	unknown	n/a	unknown	n/a	existing facility
32. Soils/Groundwater	n/a	Alluvial/mod gw potential	n/a	Alluvial/mod. gw potential	n/a	Alluvial/mod. gw potential
33. Access	n/a	Paved road to site	n/a	Paved roads in area	n/a	good, developed site
VIII. 34. PUBLIC EDUCATION/ACCESS	n/a	possible	n/a	possible	n/a	possible
IX. SECURITY						
35. Intake structure and water supply	n/a	Required	n/a	Required	n/a	Required
36. Pipeline	n/a	Required	n/a	Required	n/a	Required
37. Raceways/ponds	n/a	Required	n/a	Required	n/a	Required
X. PERMITTING						
38 Land Use	n/a	Undetermined	n/a	agriculture	n/a	Existing facility
39. Shorelines Designation	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
40. Flood hazard	n/a	Moderate on Beaver Ck	n/a	Moderate	n/a	Low
XI. PROPERTY OWNERSHIP						
41. Facility site	n/a	2 private owners	n/a	Undetermined	n/a	ODFW
42 Pipeline ROW and intake structure	n/a	n/a	n/a	Undetermined	n/a	ODFW
43 Time to acquire site	n/a	Unknown	n/a	Undetermined	n/a	n/a
XII. SUMMARY/COMMENTS	ChF do not reach site	Side of river most likely area for holding ponds Beaver Creek wetlands	ChF do not reach site	General area evaluated, no specific site selected	ChF do not reach site distribution	Site located in upper portion of Willows ChS habitat space may be limited for new pond or raceway construction

TABLE 28 (3 of 4)

ADULT HOLDING SCREENING CRITERIA

CRITERION	Big Canyon Creek		Minam-Wallowa Confluence		Strathearn Ranch	
	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook
I. WATER QUALITY						
1. Disease potential	n/a	n/a	n/a	n/a	n/a	n/a
2. Water temperature	Acceptable	n/a	Acceptable	summer cooling required	n/a	Good
3. General minerals	Acceptable	n/a	Acceptable	Acceptable	n/a	Acceptable
4. Other pollutants (phosphate, oil & grease)	None Identified	n/a	None Identified	None Identified	n/a	None Identified
5. Onsite risks	None Identified	n/a	None Identified	None Identified	n/a	None Identified
II. WATER QUANTITY						
6. Availability	Acceptable	n/a	96-215 cfs during period	464-1702 cfs during period	n/a	158-805 cfs during period
7. Dependability	Acceptable	n/a	Good	Good	n/a	Moderate
8. Intake structure	Existing facility	n/a	Good location	Good location	n/a	Good location
9. Pipeline ROW	Existing facility	n/a	Good location	Good location	n/a	Good location
10. Bypass reach (length and location)	Existing facility	n/a	undetermined	undetermined	n/a	undetermined
11. Pumped versus gravity source	Existing facility	n/a	gravity	gravity	n/a	gravity
12. Cost of water supply (construction, O&M)	Existing facility	n/a	High	High	n/a	moderate
III. LOCATION ON RIVER						
13. River mile		n/a			n/a	
14. Spawning distribution (natural run)	potential autumn chinook habitat	n/a	potential for Wallowa ChF	Typically reach site	n/a	Intercept upper portion of run
15. Attraction potential	good	n/a	poor	Good	n/a	Good
IV. 16. PERIOD OF USE	Sept. - Dec	n/a	Sept. - Dec	Apr. 15 - Jul 15	n/a	Apr. 15 - Jul 15
V. ENVIRONMENTAL CONCERNS						
17. Wetlands (other than riparian zone)	None Identified	n/a	None apparent	None apparent	n/a	None apparent
18. Terrestrial wildlife and habitats	Coniferous forest, grassland	n/a	Mixed coniferous forest	Mixed coniferous forest	n/a	Mixed forest, meadow
19. Threatened/endangered species	Undetermined	n/a	Undetermined	Undetermined	n/a	Undetermined
20. Water quality impacts of facility	Negligible	n/a	Negligible	Negligible	n/a	Negligible
21. Community impacts	Negligible	n/a	Negligible	Negligible	n/a	Negligible
22. Scenic/Aesthetic	Negligible, existing facility	n/a	Negligible	Negligible	n/a	Farms, houses on large lots
23. Accessibility	road to site	n/a	paved road to site	paved road to site	n/a	paved & gravel roads to site
VI. SIZE OF PARCEL						
24. Space for raceways/ ponds	Existing facility	n/a	yes	yes	n/a	yes
25. Space for sedimentation ponds	Existing facility	n/a	yes	yes	n/a	yes
26. Space for trapping	yes	n/a	yes	yes	n/a	yes
VII. SITEWORK COSTS						
27. Topography	Mostly flat	n/a	Flat, steep bank at river	Flat, steep bank at river	n/a	Flat
28. Contouring and diking (flood control)	Minimal	n/a	Major	Major	n/a	Minimal
29. Pipeline and intake structure	n/a	n/a	Major	Major	n/a	Moderate
30. Utilities	3 phase power to site	n/a	3 phase power nearby	3 phase power nearby	n/a	3 phase power to site
31. Costs of @ site	existing facility	n/a	unknown	unknown	n/a	unknown
32. Soils/Groundwater	alluvial/mod gw potential	n/a	Alluvial/good gw potential	Alluvial/good gw potential	n/a	Alluvial/good gw potential
33. Access	road to site	n/a	Paved road to site	Paved road to site	n/a	Paved & gravel roads to site
VIII. 34. PUBLIC EDUCATION/ACCESS	possible	n/a	possible	possible	n/a	possible
IX. SECURITY						
35. Intake structure and water supply	Required	n/a	Required	Required	n/a	Required
36. Pipeline	Required	n/a	Required	Required	n/a	Required
37. Raceways/ponds	Required	n/a	Required	Required	n/a	Required
X. PERMITTING						
38. Land Use	Existing facility	n/a	Parkland	Parkland	n/a	Undetermined
39. Shorelines Designation	Undetermined	n/a	Undetermined	Undetermined	n/a	Undetermined
40. Flood hazard	Low	n/a	High	High	n/a	Low
XI. PROPERTY OWNERSHIP						
41. Facility site	ODFW	n/a	State Parks	State Parks	n/a	Private - Strathearn
42. Pipeline ROW and intake structure	ODFW	n/a	n/a	n/a	n/a	Private - Strathearn
43. Time to acquire site	Unknown	n/a	Unknown	Unknown	n/a	unknown-willing seller
XII. SUMMARY/COMMENTS	use for autumn chinook only existing LSRCP facility		At or near limit of potential upstream distribution	ChS reach site combine w/ Minam IEP trapping need		Site located in upper portion of Lostine ChS habitat need groundwater development

TABLE 28 (4 of 4)

ADULT HOLDING SCREENING CRITERIA

CRITERION	Lostine Dam		Cross Valley Diversion	
	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook
I. WATER QUALITY 1 Disease potential 2 Water temperature 3 General minerals 4 Other pollutants (phosphate, oil & grease) 5 Offsite risks	n/a n/a n/a n/a n/a	n/a Acceptable Acceptable None identified None identified	n/a n/a n/a n/a n/a	n/a Acceptable Acceptable None identified None identified
II. WATER QUANTITY 6 Availability 7 Dependability 8 Intake structure 9 Pipeline ROW 10 Bypass reach (length and location) 11 Pumped versus gravity source 12 Cost of water supply (construction, O&M)	n/a n/a n/a n/a n/a n/a n/a	158-805 cfs during period Moderate possible with weir undetermined undetermined gravity moderate	n/a n/a n/a n/a n/a n/a n/a	158-805 cfs during period Moderate weir required for intake acceptable location undetermined gravity w/ weir moderate
III. LOCATION ON RIVER 13 River mile 14 Spawning distribution (natural run) 15 Attraction potential	n/a n/a n/a	typically reach site good	n/a n/a n/a	typically reach site good
IV. 16 PERIOD OF USE	n/a	Apr 15 - Jul 15	n/a	Apr 15 - Jul 15
V. ENVIRONMENTAL CONCERNS 17 Wetlands (other than riparian zone) 18 Terrestrial wildlife and habitats 19 Threatened/endangered species 20 Water quality impacts of facility 21. Community impacts 22 Scenic/Aesthetic 23 Accessibility	n/a n/a n/a n/a n/a RI. n/a	None observed Mixed trees, pasture Undetermined Negligible Negligible In mod developed area gravel road to site, wood bridge	n/a n/a n/a n/a n/a n/a n/a	River bottom wetlands Cottonwoods and riparian veg Undetermined Negligible Negligible In agricultural area 1/2 mile from gravel road
VI. SIZE OF PARCEL 24 Space for raceways/ ponds 25 Space for sedimentation ponds 26 Space for trapping	n/a n/a n/a	yes, large pasture yes, large pasture yes existing facility	n/a n/a n/a	limited limited
VII. SITEWORK COSTS 27 Topography 28 Contouring and diking (flood control) 29 Pipeline and intake structure 30 Utilities 31 Costs of acquiring site 32 Soils/Groundwater 33 Access	n/a n/a n/a n/a n/a n/a n/a	Mostly flat Moderate Moderate 3 phase power near site unknown alluvial/ mod. gw potential gravel road to site, wood bridge	n/a n/a n/a n/a n/a n/a n/a	limited flat land Major moderate 1/2 mile to 3 phase power unknown alluvial/ undetermined potential gravel road to near site
VIII. 34 PUBLIC EDUCATION/ACCESS	n/a	possible	n/a	possible
IX. SECURITY 35 Intake structure and water supply 36 Pipeline 37 Raceways/ponds	n/a n/a n/a	Required Required Required	n/a n/a n/a	Required Required Required
X. PERMITTING 38 Land Use 39 Shorelines Designation 40 Flood hazard	n/a n/a n/a	Mixed urban and farming Undetermined Low	n/a n/a n/a	Mixed urban and farming Undetermined
XI. PROPERTY OWNERSHIP 41 Facility site 42 Pipeline ROW and intake structure 43 Time to acquire site	n/a n/a n/a	Private Private Unknown	n/a n/a n/a	Jerry McC ban n/a Unknown
II. SUMMARY/COMMENTS	ChF do not reach site at present	west side of river on private pasture is best location		Little space available for holding if used for adult capture Need access road

TABLE 29 (1 of 3)

GRANDE RONDE INCUBATION AND FRY REARING SCREENING CRITERIA

CRITERION	Catherine Creek (OSU Property)		Catherine Creek at Union		Beaver Creek	
	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook
I. WATER QUALITY						
1. Disease potential	n/a	present	n/a	present	n/a	present
2. Water temperature	n/a	gw assumed acceptable	n/a	gw assumed acceptable	n/a	gw assumed acceptable
3. General minerals	n/a	gw not tested	n/a	gw not tested	n/a	gw not tested
4. Other pollutants (phosphate, oil & grease)	n/a	None identified	n/a	None identified	n/a	None identified
5. Offsite risks	n/a	None identified	n/a	None identified	n/a	None identified
II. WATER QUANTITY						
6. Availability	n/a	moderate gw potential	n/a	good gw potential	n/a	moderate gw potential
7. Dependability	n/a	undetermined	n/a	Good	n/a	undetermined
8. Intake structure	n/a	Good locations available	n/a	Good location	n/a	Good location
9. Pipeline ROW	n/a	All on site	n/a	Good location	n/a	good location
10. Bypass reach (length and location)	n/a	undetermined	n/a	undetermined	n/a	undetermined
11. Pumped versus gravity source	n/a	pumped for gw	n/a	gravity	n/a	gravity
12. Cost of water supply (construction, O&M)	n/a	Moderate to high	n/a	moderate	n/a	high
III. LOCATION ON RIVER						
13. River mile	n/a		n/a		n/a	GR 179
14. Spawning distribution (natural run)	n/a	Typically reach site	n/a	Typically reach site	n/a	Typically reach site
15. Attraction potential	n/a	Good	n/a	Good	n/a	Good
IV. PERIOD OF USE						
16. PERIOD OF USE	n/a	Aug - Feb	n/a	Aug - Feb	n/a	Aug - Feb
V. ENVIRONMENTAL CONCERNS						
17. Wetlands (other than riparian zone)	n/a	None identified	n/a	Minimal	n/a	Beaver Ck. mouth-wetlands
18. Terrestrial wildlife and habitats	n/a	Coniferous forest, grassland	n/a	Brushy, trees and shrubs	n/a	Wooded riparian, steep hillside
19. Threatened/Endangered species	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
20. Water quality impacts of facility	n/a	Negligible	n/a	Negligible	n/a	Negligible
21. Community impacts	n/a	Negligible	n/a	Negligible	n/a	Negligible
22. Scenic/Aesthetic	n/a	Negligible	n/a	Negligible	n/a	Area generally undeveloped
23. Accessibility	n/a	Adjacent to paved road	n/a	● decent topaved,gravelto site	n/a	adjacent to paved, gravel to site
VI. SIZE OF PARCEL						
24. Space for raceways/ ponds	n/a	10+ acres	n/a	4 acres	n/a	5-10 acres
25. Space for sedimentation ponds	n/a	10+ acres	n/a	4 acres	n/a	5-10 acres
26. Space for trapping	n/a	yes-large flat area	n/a	yes, existing ladder	n/a	yes
VII. SITEWORK COSTS						
27. Topography	n/a	Mostly flat	n/a	Flat	n/a	Flat
28. Contouring and diking (flood control)	n/a	Minimal	n/a	Minimal	n/a	Moderate
29. Pipeline and intake structure	n/a	High for well development	n/a	High for well development	n/a	High for well development
30. Utilities	n/a	3 phase power along road	n/a	3 phase power adjacent to site	n/a	3 phase power near site
31. Costs of acquiring site	n/a	unknown	n/a	unknown	n/a	unknown
32. Soils/Groundwater	n/a	eluvial/ n/a	n/a	Alluvial/good gw potential	n/a	Alluvial/mod. gw potential
33. Access	n/a	gravel road to site	n/a	Paved road to site	n/a	Paved road to site
VIII. PUBLIC EDUCATION/ACCESS						
34. PUBLIC EDUCATION/ACCESS	n/a	possible	n/a	possible	n/a	possible
IX. SECURITY						
35. Intake structure and water supply	n/a	Required	n/a	Required	n/a	Required
36. Pipeline	n/a	Required	n/a	Required	n/a	Required
37. Raceways/ponds	n/a	Required	n/a	Required	n/a	Required
X. PERMITTING						
38. Land Use	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
39. Shorelines Designation	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
40. Flood hazard	n/a	Low	n/a	Low	n/a	Moderate on Beaver Ck.
XI. PROPERTY OWNERSHIP						
41. Facility site	n/a	OSU	n/a	ODF&W	n/a	2 private owners
42. Pipeline ROW and intake structure	n/a	OSU	n/a	ODF&W	n/a	n/a
43. Time to acquire site	n/a	Unknown	n/a	Unknown	n/a	Unknown
XII. SUMMARY/COMMENTS						
SUMMARY/COMMENTS	ChF do not reach site	Relatively large, flat area along creek with good potential for facilities moderate gw potential	ChF do not reach site	good gw potential	ChF do not reach site	gw potential needs verification Beaver Creek wetlands

TABLE 29 (2 of 3)

GRANDE RONDE INCUBATION AND FRY REARING SCREENING CRITERIA

CRITERION	Grande Ronde near Elgin		Lookingglass Hatchery		Wallows Lake	
	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook
I. WATER QUALITY						
1 Disease potential	n/a	present	n/a	present	n/a	present
2 Water temperature	n/a	gw assumed acceptable	n/a	good, existing facility	n/a	gw assumed acceptable
3 General minerals	n/a	undetermined	n/a	good	n/a	gw not tested
4 Other pollutants (phosphate, oil & grease)	n/a	ag return water	n/a	None identified	n/a	None identified
5 Offsite risks	n/a	ag runoff, sedimentation	n/a	None identified	n/a	None identified
II. WATER QUANTITY						
6 Availability	n/a	gw potential good	n/a	good assesses 	n/a	moderate gw potential
7 Dependability	n/a	undetermined	n/a	Good	n/a	undetermined
8 Intake structure	n/a	n/a	n/a	Good location	n/a	n/a
9 Pipeline ROW	n/a		n/a	Good location	n/a	n/a
10 Bypass reach (length and location)	n/a	n/a	n/a	undetermined	n/a	n/a
11 Pumped versus gravity source	n/a	pumped for well	n/a	pumped for gw	n/a	pumped gw
12 Cost of water supply (construction, O&M)	n/a	well development high	n/a	moderate for any new items	n/a	high for gw
III. LOCATION ON RIVER						
13 River mile	n/a		n/a		n/a	
14 Spawning distribution (natural run)	n/a	Typically pass site	n/a	Typically reach site	n/a	upper limit of Wallows ChS
15 Attraction potential	n/a	Good	n/a	Good	n/a	Good
IV. PERIOD OF USE						
16 PERIOD OF USE	n/a	Aug-Feb	n/a	Aug - Feb	n/a	Aug - Feb
V. ENVIRONMENTAL CONCERNS						
17 Wetlands (other than riparian zone)	n/a	Undetermined	n/a	Minimal	n/a	None observed
18 Terrestrial wildlife and habitats	n/a	Pasture, wooded corridors	n/a	Steep slope, forest	n/a	Wooded riparian, steep hillside
19 Threatened/endangered species	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
20 Water quality impacts of facility	n/a	Negligible	n/a	Negligible	n/a	Negligible
21 Community impacts	n/a	In rural, farming area	n/a	Negligible	n/a	Undetermined
22 Scenic/Aesthetic	n/a	Farms, pasture near site	n/a	Negligible	n/a	Urbanizing around base of lake
23 Accessibility	n/a	Undetermined	n/a	road to site	n/a	good
VI. SIZE OF PARCEL						
24 Space for raceways/ ponds	n/a	5-10 acres	n/a	limited for new facilities	n/a	adequate
25 Space for sedimentation ponds	n/a	5-10 acres	n/a	limited for new facilities	n/a	adequate
26 Space for trapping	n/a	yes	n/a	yes, existing ladder	n/a	n/a
VII. SITEWORK COSTS						
27 Topography	n/a	Flat	n/a	Flat areas, slopes to creek	n/a	rolling hills, some flat areas
28 Contouring and diking (flood control)	n/a	Moderate	n/a	Minimal	n/a	Minimal
29 Pipeline and intake structure	n/a	n/a	n/a	High for well development	n/a	High for well development
30 Utilities	n/a	3 phase power near site	n/a	3 phase power adjacent to site	n/a	3 phase power near site
31 Costs of acquiring site	n/a	unknown	n/a	existing site	n/a	unknown
32 Soils/Groundwater	n/a	Alluvial/mod. gw potential	n/a	Alluvial/good gw potential	n/a	Alluvial/mod. gw potential
33 Access	n/a	Paved roads in area	n/a	road to site	n/a	road to site
VIII. PUBLIC EDUCATION/ACCESS						
34 PUBLIC EDUCATION/ACCESS	n/a	possible	n/a	possible	n/a	possible
IX. SECURITY						
35 Intake structure and water supply	n/a	Required	n/a	Required	n/a	Required
36 Pipeline	n/a	Required	n/a	Required	n/a	Required
37 Raceways/ponds	n/a	Required	n/a	Required	n/a	Required
X. PERMITTING						
38 Land Use	n/a	agriculture	n/a	existing facility	n/a	Undetermined
39 Shorelines Designation	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
40 Flood hazard	n/a	Moderate	n/a	Low	n/a	n/a
XI. PROPERTY OWNERSHIP						
41 Facility site	n/a	Undetermined	n/a	ODFW	n/a	private
42 Pipeline ROW and intake structure	n/a	Undetermined	n/a	ODFW	n/a	private
43 Time to acquire site	n/a	Undetermined	n/a	n/a	n/a	Unknown
XII. SUMMARY/COMMENTS						
XII. SUMMARY/COMMENTS	ChF do not reach site	General area evaluated, no specific site selected need gw testing	ChF do not reach site	expansion capability limited for new raceways	ChF do not reach site	gw potential needs verification

TABLE 29 (3 of 3)

GRANDE RONDE INCUBATION AND FRY REARING SCREENING CRITERIA

CRITERION	Wallowa Hatchery		Minam-Wallowa Confluence		Stratheim Ranch	
	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook
I. WATER QUALITY 1 Disease potential 2 Water temperature 3 General minerals 4 Other pollutants (phosphate, oil & grease) 5 Offsite risks	* n/a n/a n/a n/a n/a	potential present Acceptable None identified None identified	n/a need gw tested None identified None identified	n/a need gw tested None identified None identified	n/a n/a n/a n/a n/a	potential present need gw tested undetermined None identified None identified
II. WATER QUANTITY 6 Availability 7 Dependability 8 Intake structure 9 Pipeline ROW 10 Bypass reach (length and location) 11 Pumped versus gravity source 12 Cost of water supply (construction, O&M)	n/a n/a n/a n/a n/a n/a	need additional well undetermined existing facility existing facility gravity and wells developed moderate	96-215 cfs during period Good potential Good location Good location undetermined pumped for gw High	96-215 cfs during period Good potential Good location Good location undetermined pumped for gw High	n/a n/a n/a n/a n/a n/a	need gw tested undetermined Good location Good location undetermined pumped for gw High
III. LOCATION ON RIVER 13 River mile 14 Spawning distribution (natural run) 15 Attraction potential	n/a n/a n/a	Upper end of Wallowa R. Near upper limit of Wallowa ChS Good	potential for Wallowa ChF poor	Typically reach site Good	n/a n/a n/a	intercept upper portion of run Good
IV. 16 PERIOD OF USE	n/a	Aug - Feb	Oct. 15 - Mar	Aug - Feb	n/a	Aug - Feb
V. ENVIRONMENTAL CONCERNS 17 Wetlands (other than riparian zone) 18 Terrestrial wildlife and habitats 19 Threatened/endangered species 20 Water quality impacts of facility 21 Community impacts 22 Scenic/Aesthetic 23 Accessibility	n/a n/a n/a n/a n/a n/a	None identified Grass, existing facility Undetermined Negligible Minor, at existing facility Minor, at existing facility paved road to site	Non. apparent Mixed coniferous forest Undetermined Negligible Negligible Negligible paved road to site	None apparent Mixed coniferous forest Undetermined Negligible Negligible Negligible paved road to site	n/a n/a n/a n/a n/a n/a	None apparent Mixed forest, meadow Undetermined Negligible Negligible Farms, houses on large lots paved & gravel roads to site
VI. SIZE OF PARCEL 24 Space for raceways/ ponds 25 Space for sedimentation ponds 26 Space for trapping	n/a n/a n/a	existing facility existing facility yes	yes yes yes	yes yes yes	n/a n/a n/a	yes yes yes
VII. SITework COSTS 27 Topography 28 Contouring and diking (flood control) 29 Pipeline and intake structure 30 Utilities 31 Costs of acquiring site 32 Soils/Groundwater 33 Access	n/a n/a n/a n/a n/a n/a	Mostly flat Minor n/a 3-phase at site existing facility Alluvial/mod. gw potential good, developed site possible	Flat, steep bank at river Major Major 3 phase power nearby unknown Alluvial/good gw potential Paved road to site possible	Flat, steep bank at river Minor Major 3 phase power nearby unknown Alluvial/good gw potential Paved road to site possible	n/a n/a n/a n/a n/a n/a	Flat Minimal Moderate 3 phase power to site unknown Alluvial/good gw potential Paved & gravel roads to site possible
VIII. 34. PUBLIC EDUCATION/ACCESS	n/a				n/a	
IX. SECURITY 35 Intake structure and water supply 36 Pipeline 37 Raceways/ponds	n/a n/a n/a	Required Required Required	Required Required Required	Required Required Required	n/a n/a n/a	Required Required Required
X. PERMITTING 38 Land Use 39 Shorelines Designation 40 Flood hazard	n/a n/a n/a	Existing facility Undetermined Low	Parkland Undetermined High	Parkland Undetermined High	n/a n/a n/a	Undetermined Undetermined Low
XI. PROPERTY OWNERSHIP 41 Facility site 42 Pipeline ROW and intake structure 43 Time to acquire site	n/a n/a n/a	ODFW ODFW n/a	State Parks n/a Unknown	State Parks n/a Unknown	n/a n/a n/a	Private - Stratheim Private - Stratheim unknown-willing seller Site located in upper portion of Losine ChS habitat need groundwater development
XII. SUMMARY/COMMENTS	ChF do not reach str. distribution	Would require Prane Creek project or extended well May require additional raceway capacity	At or near limit of potential upstream distribution	ChS reach site combine w/ Minam IEP trapping need		

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TABLE 30 (1 of 3)

GRANDE RONDE SATELLITE REARING SCREENING CRITERIA

CRITERION	Catherine Creek (OSU Property)		Catherine Creek at Union		Beaver Creek	
	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook
I. WATER QUALITY						
1. Disease potential	n/a	present	n/a	present	n/a	present
2. Water temperature	n/a	need gw for winter mixing	n/a	need gw for winter mixing	n/a	need gw for winter mixing
3. General minerals	n/a	acceptable	n/a	acceptable	n/a	acceptable
4. Other pollutants (phosphate, oil & grease)	n/a	None identified	n/a	None identified	n/a	None identified
5. Offsite risks	n/a	None identified	n/a	None identified	n/a	None identified
II. WATER QUANTITY						
6. Availability	n/a	Adequate	n/a	adequate	n/a	adequate
7. Dependability	n/a	undetermined	n/a	Good	n/a	undetermined
8. Intake structure	n/a	Good locations available	n/a	Good location	n/a	Good location
9. Pipeline ROW	n/a	All on site	n/a	Good location	n/a	good location
10. Bypass reach (length and location)	n/a	undetermined	n/a	undetermined	n/a	undetermined
11. Pumped versus gravity source	n/a	pumped for gw	n/a	gravity	n/a	gravity
12. Cost of water supply (construction, O&M)	n/a	Moderate to high	n/a	moderate	n/a	high
III. LOCATION ON RIVER						
13. River mile	n/a		n/a		n/a	GR 179
14. Spawning distribution (natural run)	n/a	Typically reach site	n/a	Typically reach site	n/a	Typically reach site
15. Attraction potential	n/a	Good	n/a	Good	n/a	Good
IV. PERIOD OF USE						
16. PERIOD OF USE	n/a	Dec-May 15 (18mos)	n/a	Dec-May 15 (18mos)	n/a	Dec-May 15 (18mos)
V. ENVIRONMENTAL CONCERNS						
17. Wetlands (other than riparian zone)	n/a	None identified	n/a	Minimal	n/a	Beaver Ck. mouth-wetlands
18. Terrestrial wildlife and habitats	n/a	Coniferous forest, grassland	n/a	Brushy, trees and shrubs	n/a	Wooded riparian, steep hillside
19. Threatened/endangered species	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
20. Water quality impacts of facility	n/a	Negligible	n/a	Negligible	n/a	Negligible
21. Community impacts	n/a	Negligible	n/a	Negligible	n/a	Negligible
22. Scenic/Aesthetic	n/a	Negligible	n/a	Negligible	n/a	Negligible
23. Accessibility	n/a	Adjacent to paved road	n/a	adjacent to paved, gravel to site	n/a	Area generally undeveloped adjacent to paved, gravel to site
VI. SIZE OF PARCEL						
24. Space for raceways/ ponds	n/a	10+ acres	n/a	4 acres	n/a	5-10 acres
25. Space for sedimentation ponds	n/a	10+ acres	n/a	4 acres	n/a	5-10 acres
26. Space for trapping	n/a	yes-large flat area	n/a	yes, existing ladder	n/a	yes
VII. SITEWORK COSTS						
27. Topography	n/a	Mostly flat	n/a	Flat	n/a	Flat
28. Contouring and diking (flood control)	n/a	Minimal	n/a	Minimal	n/a	Moderate
29. Pipeline and intake structure	n/a	Moderate	n/a	Moderate	n/a	High for well development
30. Utilities	n/a	3 phase power along road	n/a	3 phase power adjacent to site	n/a	3 phase power near site
31. Costs of acquiring site	n/a	unknown	n/a	unknown	n/a	unknown
32. Soils/Groundwater	n/a	alluvial/ n/a	n/a	Alluvial/good gw potential	n/a	Alluvial/mod. gw potential
33. Access	n/a	gravel road to site	n/a	Paved road to site	n/a	Paved road to site
VIII. PUBLIC EDUCATION/ACCESS						
34. PUBLIC EDUCATION/ACCESS	n/a	possible	n/a	possible	n/a	possible
IX. SECURITY						
35. Intake structure and water supply	n/a	Required	n/a	Required	n/a	Required
36. Pipeline	n/a	Required	n/a	Required	n/a	Required
37. Raceways/ponds	n/a	Required	n/a	Required	n/a	Required
X. PERMITTING						
38. Land Use	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
39. Shorelines Designation	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
40. Flood hazard	n/a	Low	n/a	Low	n/a	Moderate on Beaver Ck.
XI. PROPERTY OWNERSHIP						
41. Facility site	n/a	OSU	n/a	ODFW	n/a	2 private owners
42. Pipeline ROW and intake structure	n/a	OSU	n/a	ODFW	n/a	n/a
43. Time to acquire site	n/a	Unknown	n/a	Unknown	n/a	Unknown
XII. SUMMARY/COMMENTS						
XII. SUMMARY/COMMENTS	ChF do not reach site	Relatively large, flat area along creek with good potential for facilities moderate gw potential	ChF do not reach site		ChF do not reach site	gw potential needs verification Beaver Creek wetlands

TABLE 30 (2 of 3)

GRANDE RONDE SATELLITE REARING SCREENING CRITERIA

CRITERION	Grande Ronde near Elgin		Willows Lake		Willows Hatchery	
	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook
I. WATER QUALITY 1. Disease potential 2. Water temperature 3. General minerals 4. Other pollutants (phosphate, oil & grease) 5. Offsite risks	present gw needed for winter mixing acceptable ag return water ag runoff, sedimentation	present gw needed for winter mixing acceptable ag return water ag runoff, sedimentation	n/a n/a n/a n/a n/a	present gw needed for winter mixing acceptable None identified None identified	n/a n/a n/a n/a n/a	present gw needed for winter mixing Acceptable None identified None identified
II. WATER QUANTITY 6. Availability 7. Dependability 8. Intake structure 9. Pipeline ROW 10. Bypass reach (length and location) 11. Pumped versus gravity source 12. Cost of water supply (construction, O&M)	adequate adequate good location good location undetermined gravity high	adequate adequate good location good location undetermined gravity high	n/a n/a n/a n/a n/a n/a n/a	adequate adequate good location good location undetermined gravity high	n/a n/a n/a n/a n/a n/a n/a	adequate adequate existing facility existing facility existing facility gravity and wells developed moderate
III. LOCATION ON RIVER 13. River mile 14. Spawning distribution (natural run) 15. Attraction potential	potential to reach site Good	Typically pass site Good	n/a n/a n/a	upper limit of Willows ChS Good	n/a n/a n/a	Upper end of Willows R. Near upper limit of Willows ChS Good
IV. PERIOD OF USE	Jan - May 15 (5-6 mos)	Dec - May 15 (18 mos)	n/a	Dec - May 15 (18 mos)	n/a	Dec - May 15 (18 mos)
V. ENVIRONMENTAL CONCERNS 17. Wetlands (other than riparian zone) 18. Terrestrial wildlife and habitats 19. Threatened/endangered species 20. Water quality impacts of facility 21. Community impacts 22. Scenic/Aesthetic 23. Accessibility	Undetermined Pasture, wooded corridors Undetermined Negligible In rural, farming area Farms, pasture near site Undetermined	Undetermined Pasture, wooded corridors Undetermined Negligible In rural, farming area Farms, pasture near site Undetermined	n/a n/a n/a n/a n/a n/a n/a	None observed Wooded riparian, steep hillside Undetermined Negligible Undetermined Urbanizing around base of lake good	n/a n/a n/a n/a n/a n/a n/a	None identified Grass, existing facility Undetermined Negligible Minor, at existing facility Minor, at existing facility paved road to site
VI. SIZE OF PARCEL 24. Space for raceways/ ponds 25. Space for sedimentation ponds 26. Space for trapping	5-10 acres 5-10 acres yes	5-10 acres 5-10 acres yes	n/a n/a n/a	adequate adequate n/a	n/a n/a n/a	existing facility existing facility ---
VII. SITEWORK COSTS 27. Topography 28. Contouring and diking (flood control) 29. Pipeline and intake structure 30. Utilities 31. Costs of acquiring site 32. Soils/Groundwater 33. Access	Flat Moderate n/a 3 phase power near site unknown Alluvial/mod. gw potential Paved roads in area	Flat Moderate n/a 3 phase power near site unknown Alluvial/mod. gw potential Paved roads in area	n/a n/a n/a n/a n/a n/a n/a	rolling hills, some flat areas Minimal Moderate 3 phase power near site unknown Alluvial/mod. gw potential road to site	n/a n/a n/a n/a n/a n/a n/a	Mostly flat Minor n/a 3-phase at site existing facility Alluvial/mod. a potential good, developed site
VIII. PUBLIC EDUCATION/ACCESS	possible	possible	n/a	possible	n/a	possible
IX. SECURITY 35. Intake structure and water supply 36. Pipeline 37. Raceways/ponds	Required Required Required	Required Required Required	n/a n/a n/a	Required Required Required	n/a n/a n/a	Required Required Required
X. PERMITTING 38. Land Use 39. Shorelines Designation 40. Flood hazard	agriculture Undetermined Moderate	agriculture Undetermined Moderate	n/a n/a n/a	Undetermined Undetermined Low	n/a n/a n/a	Existing facility Undetermined
XI. PROPERTY OWNERSHIP 41. Facility site 42. Pipeline ROW and intake structure 43. Time to acquire site	Undetermined Undetermined Undetermined	Undetermined Undetermined Undetermined	n/a n/a n/a	private private Unknown	n/a n/a n/a	ODFW ODFW n/a
XII. SUMMARY/COMMENTS		General area evaluated, no specific site selected need gw testing	ChF do not reach site		ChF do not reach site distribution	Would require additional rearing capacity

TABLE 30 (3 of 3)

GRANDE RONDE SATELLITE REARING SCREENING CRITERIA

CRITERION	Minam-Willowa Confluence		Strathern Ranch	
	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook
I. WATER QUALITY 1. Disease potential 2. Water temperature 3. General minerals 4. Other pollutants (phosphate, oil & grease) 5. Offsite risks	Present need gw for winter mixing acceptable None identified None identified	Present need gw for winter mixing acceptable None identified None identified	n/a n/a n/a n/a	Present need gw for winter mixing acceptable None identified None identified
II. WATER QUANTITY 6. Availability 7. Dependability 8. Intake structure 9. Pipeline ROW 10. Bypass reach (length @ ± location) 11. Pumped versus gravity source 12. Cost of water supply (construction, O&M)	adequate Good Good location Good location undetermined gravity High	adequate Good Good location Good location undetermined gravity High	n/a n/a n/a n/a n/a n/a	adequate Good Good location Good location undetermined gravity high
III. LOCATION ON RIVER 13. River mile 14. Spawning distribution (natural run) 15. Attraction potential	potential for Willowa ChF poor	Typically reach site Good	n/a n/a n/a	Intercept upper portion of run Good
IV. PERIOD OF USE 16.	Jan - May 15 (5 to 6 mos)	Dec - May 15 (18 mos)	n/a	Dec - May 15 (18 mos)
V. ENVIRONMENTAL CONCERNS 17. Wetlands (other than riparian zone) 18. Terrestrial wildlife and habitats 19. Threatened/endangered species 20. Water quality impacts of facility 21. Community impacts 22. Scenic/Aesthetic 23. Accessibility	None apparent Mixed coniferous forest Undetermined Negligible Negligible Negligible paved road to site	None apparent Mixed coniferous forest Undetermined Negligible Negligible Negligible paved road to site	n/a n/a n/a n/a n/a n/a	None apparent Mixed forest, meadow Undetermined Negligible Negligible Farms, houses on large lots paved & gravel roads to site
VI. SIZE OF PARCEL 24. Space for raceways/ ponds 25. Space for sedimentation ponds 26. Space for trapping	yes yes yes	yes yes	n/a n/a n/a	yes yes yes
VII. SITEWORK COSTS 27. Topography 28. Contouring and diking (flood control) 29. Pipeline and intake structure 30. Utilities 31. Costs of acquiring site 32. Soils/Groundwater 33. Access	Flat, steep bank at river Major Major 3 phase power nearby unknown Alluvial/good gw potential Paved road to site	Flat, steep bank at river Major Major 3 phase power nearby unknown Alluvial/good gw potential Paved road to site	n/a n/a n/a n/a n/a n/a	Flat Minimal Moderate 3 phase power to site unknown Alluvial/good gw potential Paved & gravel roads to site
VIII. PUBLIC EDUCATION/ACCESS 34.	possible	possible	n/a	possible
IX. SECURITY 35. Intake structure and water supply 36. Pipeline 37. Raceways/ponds	Required Required Required	Required Required Required	n/a n/a n/a	Required Required Required
X. PERMITTING 38. Land Use 39. Shorelines Designation 40. Flood hazard	Parkland Undetermined High	Parkland Undetermined High	n/a n/a n/a	Undetermined Undetermined Low
XI. PROPERTY OWNERSHIP 41. Facility site 42. Pipeline ROW and intake structure 43. Time to acquire site	State Parks n/a Unknown	State Parks n/a Unknown	n/a n/a n/a	Private - Strathern Private - Strathern unknown - willing seller
XII. SUMMARY/COMMENTS	At or near limit of potential upstream distribution	ChS reach site combine w/ Minam EIP trapping need		Site located in upper portion of Lostine ChS habitat need groundwater development

TABLE 31 (1 of 2)
IMNAHA RIVER BASIN
ADULT CAPTURE SCREENING CRITERIA

CRITERION	Gumboot Creek (Fish Weir)		Grouse Creek-Imnaha Confluence		Big Sheep-Little Sheep Confluence	
	Fall Chhook (Sep-Dec)	Spring Chinook (4/15-7/15)	Fall Chinook (Sep-Dec)	Spring Chinook (4/15-7/15)	Fall Chinook (Sep-Dec)	Spring Chinook (4/15-7/15)
I. WATER QUALITY						
1 Disease potential	n/a	n/a	n/a	n/a	n/a	n/a
2 Water temperature	n/a	Acceptable	n/a	Acceptable	n/a	Acceptable
3 General minerals	n/a	Acceptable	n/a	Acceptable	n/a	Acceptable
4 Other pollutants (phosphate, oil & grease)	n/a	None identified	n/a	None identified	n/a	None identified
5 Offsite risks	n/a	None identified	n/a	None identified	n/a	Grazing upstream of site
II. WATER QUANTITY						
6 Availability	n/a	good during period, unged	n/a	unged, assumed adequate	n/a	unged, appears adequate
7 Dependability	n/a	good during period	n/a	assumed adequate during period	n/a	unged, appears adequate
8 Intake structure	n/a	Existing Facility	n/a	n/a	n/a	n/a
9 Pipeline ROW	n/a	Existing Facility	n/a	n/a	n/a	n/a
10. Bypass reach (length and location)	n/a	Existing Facility	n/a	n/a	n/a	n/a
11. Pumped versus gravity source	n/a	Gravity	n/a	n/a	n/a	n/a
12 Cost of water supply (construction, O&M)	n/a	Existing Facility	n/a	n/a	n/a	n/a
III. LOCATION ON RIVER						
13 River mile	n/a		n/a		n/a	
14 Spawning distribution (natural run)	n/a	Typically reach site	n/a	Typically reach site	n/a	Typically reach site
15 Attraction potential	n/a	Good	n/a	Good	n/a	Good
IV. 16. PERIOD OF USE	n/a	Apr 15 - Jul 15	n/a	Apr. 15 - Jul 15	n/a	Apr. 15 - Jul 15
V. ENVIRONMENTAL CONCERNS						
17. Wetlands (other than riparian zone)	n/a	None identified	n/a	No obvious areas	n/a	Wetlands vegetation present
18 Terrestrial wildlife and habitats	n/a	Coniferous forest, @ @ @ slope	n/a	Forest, pasture	n/a	grassy meadows w/ forested upland
19 Threatened/endangered species	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
20 Water quality impacts of facility	n/a	Negligible	n/a	Negligible	n/a	Negligible
21 Community impacts	n/a	Negligible	n/a	Negligible	n/a	Negligible
22 Scenic/Aesthetic	n/a	Existing facility	n/a	Undeveloped pasture	n/a	Minor
23 Accessibility	n/a	Good, snowplow in winter	n/a	adjacent to gravel road	n/a	off paved road via gravel
VI. SIZE OF PARCEL						
24 Space for raceways/ ponds	n/a	Approx. for @ @ @ @ @	n/a	very limited	n/a	< 2 acres
25 Space for sedimentation ponds	n/a	Approx. 5 ac for expansion	n/a	very limited	n/a	< 2 acres
26 Space for trapping	n/a	Existing weir and ladder	n/a	yes	n/a	yes
VII. SITEWORK COSTS						
27. Topography	n/a	Mostly flat	n/a	Moderately sloping	n/a	Flat to moderately sloping
28. Contouring and diking (flood control)	n/a	Existing facility	n/a	Minor	n/a	mod to high in low area
29. Pipeline and intake structure	n/a	n/a	n/a	n/a	n/a	n/a
30. Utilities	n/a	3 phase power along road	n/a	3 phase power adjacent to site	n/a	3-phase available
31. Costs of acquiring site	n/a	unknown	n/a	unknown	n/a	unknown
32. Soils/Groundwater	n/a	alluvial n/a	n/a	Alluvial/low gw potential	n/a	Alluvial/moderate gw potential
33. Access	n/a	gravel road to site	n/a	gravel road to site	n/a	gravel road off paved highway
VIII. 34. PUBLIC EDUCATION/ACCESS	n/a	possible	n/a	possible	n/a	possible
IX. SECURITY						
35. Intake structure and water supply	n/a	Required	n/a	Required	n/a	Required
36. Pipeline	n/a	Required	n/a	Required	n/a	Required
37. Raceways/ponds	n/a	Required	n/a	Required	n/a	Required
X. PERMITTING						
38. Land Use	n/a	Existing facility	n/a	undetermined	n/a	Undetermined
39. Shorelines Designation	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
40. Flood hazard	n/a	Low	n/a	Low	n/a	Mod to high in low areas
XI. PROPERTY OWNERSHIP						
41. Facility site	n/a	ODF&W	n/a	private	n/a	Private
42. Pipeline ROW and intake structure	n/a	ODF&W	n/a	private	n/a	Private
43. @ @ @ to @ @ @ site	n/a	n/a	n/a	Unknown	n/a	unknown
SUMMARY/COMMENTS	ChF do not reach site	existing LSACP facility some room for expansion use of exist. weir during high flows difficult	ChF do not reach site	Limited area for uses other than trapping Landowner may not be cooperative	Beyond limit of ChF distribution	Site area limited for uses other than trapping Wetlands present

TABLE 31 (2 of 2)

IMNAHA RIVER BASIN

ADULT CAPTURE SCREENING CRITERIA

CRITERION	Gene Marr Ranch	
	Fall Chinook (Sep-Dec)	Spring Chinook (4/15-7/15)
I. WATER QUALITY 1 Disease potential 2 Water temperature 3 General minerals 4 Other pollutants (phosphate, oil & grease) 5 Offsite risks	n/a Acceptable Acceptable None identified None identified	n/a Acceptable Acceptable None identified None identified
II. WATER QUANTITY 6 Availability 7 Dependability 8 Intake structure 9 Pipeline ROW 10 Bypass reach (length and location) 11 Pumped versus gravity source 12 Cost of water supply (construction, O&M)	143-210 cfs during period 80-89 cfs minimum n/a n/a n/a n/a	567-1603 cfs during period 123-445 cfs minimum n/a n/a n/a n/a
III. LOCATION ON RIVER 13 River mile 14 Spawning distribution (natural run) 15 Attraction potential	Will not intercept entire run good	All the run passes site moderate
IV. PERIOD OF USE 16	Sep - Dec	Apr 15 - Jul 15
V. ENVIRONMENTAL CONCERNS 17 Wetlands (other than riparian zone) 18 Terrestrial wildlife and habitats 19 Threatened/endangered species 20 Water quality impacts of facility 21 Community impacts 22 Scenic/Aesthetic 23 Accessibility	2 springs w/ assoc. veg Brushy, trees and shrubs Undetermined Negligible Negligible Negligible gravel road to near site	2 springs w/ assoc. veg Brushy, trees and shrubs Undetermined Negligible Negligible Negligible gravel road to near site
VI. SIZE OF PARCEL 24 Space for raceways/ ponds 25 Space for sedimentation ponds 26 Space for trapping	5+ acres 5+ acres	5+ acres 5+ acres yes
VII. SITEWORK COSTS 27 Topography 28 Contouring & riddling (flood control) 29 Pipeline and intake structure 30 Utilities 31 Costs of acquiring site 32 Soils/Groundwater 33 Access	Flat site area Moderate n/a n/a undetermined alluvial/low gw potential Good	Flat site area Moderate n/a n/a undetermined alluvial/low gw potential Good
VIII. PUBLIC EDUCATION/ACCESS 34	possible	possible
IX. SECURITY 35 Intake structure and water supply 36 Pipeline 37 Raceways/ponds	Required Required Required	Required Required Required
X. PERMITTING 38 Land Use 39 Shoreline Designation 40 Flood hazard	undetermined Undetermined Low to moderate	undetermined Undetermined Low to moderate
XI. PROPERTY OWNERSHIP 41 Facility site 42 Pipeline ROW and intake structure 43 Time to acquire site	Gene Marr Gene Marr undetermined, willing seller	Gene Marr Gene Marr undetermined, willing seller
XII. SUMMARY/COMMENTS	Would not intercept all ChF Some wetlands on site Permit issues with weir	Some wetlands on site Permit issues with weir

TABLE 32 (1 of 2)
IMNAHA RIVER BASIN
ADULT HOLDING SCREENING CRITERIA

CRITERION	Gumboot Creek (Fish Wet)		Grouse Creek-Imnaha Confluence		Big Sheep-Imnaha Confluence	
	Fall Chinook (Sep-Dec)	Spring Chinook (4/15-7/15)	Fall Chhoooh (Sep-Dec)	Spring Chinook (4/15-7/15)	Fall Chinook (Sep-Dec)	Spring Chinook (4/15-7/15)
I. WATER QUALITY						
1. Disease potential	n/a	Low w/ temp and flow control	rd.	Low w/ temp and flow control	n/a	mod. w/ temp and flow control
2. Water temperature	n/a	Acceptable	n/a	Acceptable	n/a	marginal in late season
3. General minerals	n/a	Acceptable	n/a	Acceptable	n/a	Acceptable
4. Other pollutants (phosphate, oil & grease)	n/a	None identified	n/a	None identified	n/a	None identified
5. Offsite risks	n/a	None identified	n/a	None identified	n/a	Nearby feedlot runoff
II. WATER QUANTITY						
6. Availability	n/a	good during period, unged	n/a	unged, + + + + + adequate	n/a	567-1603 cfs during period
7. Dependability	n/a	good during period	n/a	assumed adequate during period	n/a	123-445 cfs minimum
8. Intake structure	n/a	Existing Facility	n/a	mod to high bedload movement	n/a	good location
9. Pipeline ROW	n/a	Existing Facility	n/a	long if gravity supply	n/a	good location
10. Bypass reach (length and location)	n/a	Existing Facility	n/a	rel. long on Imnaha R.	n/a	short on Imnaha R
11. Pumped versus gravity source	n/a	Gravity	n/a	gravity potential poor	n/a	gravity potential good
12. Cost of water supply (construction, O&M)	n/a	Existing Facility	n/a	high	n/a	moderate
III. LOCATION ON RIVER						
13. River mile	n/a		n/a		n/a	
14. Spawning distribution (natural run)	n/a	Typically reach site	n/a	Typically reach site	n/a	Typically reach site
15. Attraction potential	n/a	Good	n/a	Good	n/a	Good
IV. PERIOD OF USE						
16. PERIOD OF USE	n/a	Apr 15 - Jul 15	n/a	Apr 15 - Jul 15	n/a	Apr 15 - Jul 15
V. ENVIRONMENTAL CONCERNS						
17. Wetlands (other than riparian zone)	n/a	None identified	n/a	No obvious areas	n/a	None identified
18. Terrestrial wildlife and habitats	n/a	Coniferous forest, steep slope	n/a	Forest, pasture	n/a	pastures, stock feedlot
19. Threatened/endangered species	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
20. Water quality impacts of facility	n/a	Negligible	n/a	Negligible	n/a	Negligible
21. Community impacts	n/a	Negligible	n/a	Negligible	n/a	near town of Imnaha
22. Scenic/Aesthetic	n/a	Existing facility	n/a	Undeveloped pasture	n/a	some developed areas nearby
23. Accessibility	n/a	Good, snowplow in winter	n/a	adjacent to gravel road	n/a	adjacent to paved road
VI. SIZE OF PARCEL						
24. Space for raceways/ ponds	n/a	Approx 5 ac. for expansion	n/a	very limited	n/a	3+ acres
25. Space for sedimentation ponds	n/a	Approx. 5 ac. for expansion	n/a	very limited	n/a	3+ acres
26. Space for trapping	n/a	Existing weir and ladder	n/a	yes	n/a	yes
VII. SITWORK COSTS						
27. Topography	n/a	Mostly flat	n/a	Moderately sloping	n/a	moderately sloping
28. Contouring & diking (flood control)	n/a	Existing facility	n/a	Minor	n/a	low
29. Pipeline and intake structure	n/a	n/a	n/a	Major	n/a	moderate bedload movement
30. Utilities	n/a	3 phase power along road	n/a	3 phase power @ adjacent to site	n/a	3-phase available
31. Costs of acquiring site	n/a	unknown	n/a	unknown	n/a	unknown
32. Soils/Groundwater	n/a	DMISA n/a	n/a	Alluvial/low gw potential	n/a	Alluvial/low to mod. gw potential
33. Access	n/a	gravel road to site	n/a	gravel road to site	n/a	adjacent to paved road
VIII. PUBLIC EDUCATION/ACCESS						
34. PUBLIC EDUCATION/ACCESS	n/a	possible	n/a	possible	n/a	possible
IX. SECURITY						
35. Intake structure and water supply	n/a	Required	n/a	Required	n/a	Required
36. Pipeline	n/a	Required	n/a	Required	n/a	Required
37. Raceways/ponds	n/a	Required	n/a	Required	n/a	Required
X. PERMITTING						
38. Land Use	n/a	Existing facility	n/a	undetermined	n/a	Undetermined
39. Shorelines Designation	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
40. Flood hazard	n/a	Low	n/a	Low	n/a	Low
XI. PROPERTY OWNERSHIP						
41. Facility site	n/a	ODF&W	n/a	private	n/a	Private
42. Pipeline ROW and intake structure	n/a	ODF&W	n/a	private	n/a	Private
43. Time to acquire site	n/a	n/a	n/a	Unknown	n/a	unknown
XII. SUMMARY/COMMENTS						
XII. SUMMARY/COMMENTS	ChF do not reach site	existing LSRCP facility some room for expansion	ChF do not reach site	Limited area for holding Site high above river for supply Landowner may not be cooperative	Beyond limit of ChF distribution	Would require shading High water temps in late season Near town water supply

TABLE 32 (2 of 2)
IMNAHA RIVER BASIN
ADULT HOLDING SCREENING CRITERIA

CRITERION	Big Sheep-Little Sheep Confluence		Gene Marr Ranch	
	Fall Chhook (Sep-Dec)	Spring Chinook (4/15-7/15)	Fall Chhook (Sep-Dec)	Spring Chinook (4/15-7/15)
I. WATER QUALITY				
1 Disease potential	n/a	Low w/ flow and temp control	mod. in late season	low w/ flow and temp control
2 Water temperature	n/a	marginal in late season	Exceeds criteria in late season	Acceptable
3 General minerals	n/a	Acceptable	Acceptable	Acceptable
4 Other pollutants (phosphate, oil & grease)	n/a	None identified	None identified	None identified
5 Offsite risks	n/a	Grazing upstream of site	None identified	None identified
II. WATER QUANTITY				
6 Availability	n/a	ungaged, may limit use	143-219 cfs during period	567-1603 cfs during period
7 Dependability	n/a	ungaged, may limit use	80-89 cfs minimum	123-445 cfs minimum
8 Intake structure	n/a	moderate bedload movement	good location	good location
9 Pipeline ROW	n/a	short	good location	good location
10 Bypass reach (length and location)	n/a	short	rel short on Imnaha R.	rel. short on Imnaha R.
11 Pumped versus gravity source	n/a	pumping most probable	gravity	gravity
12 Cost of water supply (construction, O&M)	n/a	high	moderate	moderate
III. LOCATION ON RIVER				
13 River mile	n/a	Typically reach site	Will not intercept entire run	All the run passes site
14 Spawning distribution (natural run)	n/a	Good	good	moderate
15 Attraction potential	n/a			
IV. 16. PERIOD OF USE	n/a	Apr 15 - Jul 15	Sep - Dec	Apr. 15 - Jul 15
V. ENVIRONMENTAL CONCERNS				
17 Wetlands (other than riparian zone)	n/a	Wetlands vegetation present	2 springs w/ assoc. veg.	2 springs w/ assoc. veg.
18 Terrestrial wildlife and habitats	n/a	grassy meadows w/ forested upland	Brushy, trees and shrubs	Brushy, trees & shrubs
19 Threatened/endangered species	n/a	Undetermined	Undetermined	Undetermined
20 Water quality impacts of facility	n/a	Negligible	Negligible	Negligible
21 Community impacts	n/a	Negligible	Negligible	Negligible
22 Scenic/Aesthetic	n/a	Minor	Negligible	Negligible
23 Accessibility	n/a	off paved road via gravel	gravel road to near site	gravel road to near site
VI. SIZE OF PARCEL				
24 Space for raceways/ ponds	n/a	< 2 acres	5+ acres	5+ acres
25 Space for sedimentation ponds	n/a	< 2 acres	5+ acres	5+ acres
26 Space for trapping	n/a		yes	yes
VII. SITEWORK COSTS				
27. Topography	n/a	Flat to moderately sloping	Flat site area	Flat site area
28. Contouring and diking (flood control)	n/a	mod to high in low areas	Moderate	Moderate
29. Pipeline and intake structure	n/a	n/a	moderate	moderate
30. Utilities	n/a	3-phase available	moderate	moderate
31. Costs of acquiring site	n/a	unknown	undetermined	undetermined
32. Soils/Groundwater	n/a	Alluvial/moderate gw potential	alluvial/low gw potential	alluvial/low gw potential
33. Access	n/a	gravel road off paved highway	Good	Good
VIII. 34. PUBLIC EDUCATION/ACCESS	n/a	possible	possible	possible
IX. SECURITY				
35. Intake structure and water supply	n/a	Required	Required	Required
36. Pipeline	n/a	Required	Required	Required
37. Raceways/ponds	n/a	Required	Required	Required
X. PERMITTING				
38. Land Use	n/a	Undetermined	undetermined	undetermined
39. Shorelines Designation	n/a	Undetermined	Undetermined	Undetermined
40. Flood hazard	n/a	Mod to high in low areas	Low to moderate	Low to moderate
XI. PROPERTY OWNERSHIP				
41. Facility site	n/a	Private	Gene Marr	Gene Marr
42. Pipeline ROW and intake structure	n/a	Private	Gene Marr	Gene Marr
43. Time to acquire site	n/a	unknown	undetermined, willing seller	undetermined, willing seller
XII. SUMMARY/COMMENTS	Beyond limit of CHF distribution	Site area limited for uses other than trap and hold Wetlands present Water quantity limited	Would not intercept all CHF Some wetlands on site High water temps late season	Some wetlands on site

TABLE 33 (1 of 1)
IMNAHA RIVER BASIN
INCUBATION AND FRY REARING SCREENING CRITERIA

CRITERION	Big Sheep-Imnaha Confluence		Little Sheep Creek		Gene Marr Ranch	
	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook
I. WATER QUALITY 1 Disease potential 2 Water temperature 3 General minerals 4 Other pollutants (phosphate, oil & grease) 5 Offsite risks	present gw assumed acceptable gw not tested N/A identified Nearby feedlot runoff	present gw assumed acceptable gw not tested None identified Nearby feedlot runoff	present gw assumed acceptable gw not tested None identified None identified	P - r - gw assumed acceptable gw not tested None identified None identified	P - r - gw assumed acceptable gw untested None identified None identified	present gw assumed acceptable gw untested None identified None identified
II. WATER QUANTITY 6 Availability 7 Dependability 8 Intake structure 9 Pipeline ROW 10 Bypass reach (length and location) 11 Pumped versus gravity source 12 Cost of water supply (construction, O&M)	low-mod. potential >500gpm undetermined good locations available All on site n/a pumped for gw high	low-mod. potential >500gpm undetermined good locations available All on site n/a pumped for gw high	mod. potential >500gpm undetermined good locations available all on site undetermined pumped for gw high	mod. potential >500gpm undetermined good locations available d.m.d. undetermined pumped for gw high	low-mod. potential >500gpm undetermined good locations available All on site n/a pumped for gw high	low-mod. potential >500gpm undetermined good locations available All on site n/a pumped for gw high
III. LOCATION ON RIVER 13 River mile 14 Spawning distribution (natural run) 15 Attraction potential	Above most of distribution n/a	Typically reach site n/a	Above normal distribution none	Typically reach site Good	Will not intercept entire run good	All the run passes site moderate
IV. PERIOD OF USE	Oct 15 - Mar	Aug - Feb	Oct 15 - Mar	Aug - Feb	Oct 15 - Mar	Aug - Feb
V. ENVIRONMENTAL CONCERNS 17 Wetlands (other than riparian zone) 18 Terrestrial wildlife and habitats 19 Threatened/endangered species 20 Water quality impacts of facility 21 Community impacts 22 Scent/Aesthetic 23 Accessibility	None identified pastures, stock feedlot Undetermined Negligible near town of Imnaha near developed area adjacent to paved road	None identified pastures, stock feedlot Undetermined Negligible near town of Imnaha near developed area adjacent to paved road	No obvious areas Forest, pasture Undetermined Negligible Negligible Undeveloped pasture adjacent to gravel road	No obvious areas Forest, pasture Undetermined Negligible Negligible Undeveloped pasture adjacent to gravel road	2 springs w/ assoc. veg. Brushy, trees and shrubs Undetermined Negligible Negligible Negligible gravel road to near site	2 springs w/ assoc. veg. Brushy, trees and shrubs Undetermined Negligible Negligible Negligible gravel road to near site
VI. SIZE OF PARCEL 24 Space for raceways/ ponds 25 Space for sedimentation ponds 26 Space for trapping	3+ acres 3+ acres yes	3+ acres 3+ acres yes	some add'l space available some add'l space available yes/existing ladder	some add'l space available some add'l space available yes/existing ladder	5+ acres 5+ acres yes	5+ acres 5+ acres yes
VII. SITEWORK COSTS 27 Topography 28 Contouring and diking (flood control) 29 Pipeline and intake structure 30 Utilities 31 Costs of acquiring site 32 Soils/Groundwater 33 Access	moderately sloping low moderate bedload movement 3-phase available unknown Alluvial/low to mod. potential adjacent to paved road	moderately sloping low moderate bedload movement 3-phase available unknown Alluvial/low to mod. potential adjacent to paved road	flat moderate moderate moderate existing ODF&W site gw potential/moderate good possible	flat moderate moderate moderate existing ODF&W site gw potential/moderate good possible	Flat site area Moderate moderate moderate undetermined alluvial/low gw potential Good possible	Flat site area Moderate moderate moderate undetermined alluvial/low gw potential Good possible
VIII. PUBLIC EDUCATION/ACCESS 34 SECURITY	possible	possible	possible	possible	possible	possible
IX. SECURITY 35 Intake structure and water supply 36 Pipeline 37 Raceways/ponds	Required Required Required	Required Required Required	already developed already developed already developed	already developed already developed already developed	Required Required Required	Required Required Required
X. PERMITTING 38 Land Use 39 Shorelines Designation 40 Flood hazard	Undetermined Undetermined Low	Undetermined Undetermined Low	existing facility unknown Low	existing facility unknown Low	undetermined Undetermined Low to moderate	undetermined Undetermined Low to moderate
XI. PROPERTY OWNERSHIP 41 Facility site 42 Pipeline ROW and intake structure 43 Time to acquire site	Private Private unknown	Private Private unknown	ODF&W ODF&W n/a	ODF&W ODF&W n/a	Gene Marr Gene Marr undetermined, willing seller	Gene Marr Gene Marr undetermined, willing seller
XII. SUMMARY/COMMENTS	gw potential needs evaluation	gw potential needs evaluation	Existing LS/RCP SESU facility Development depends on gw and space availability	Existing LS/RCP SESU facility Development depends on gw and space availability	Would not intercept all ChF Some wetlands on site Low to mod. gw potential	Some wetlands on site Low to mod. gw potential

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TABLE 34 (1 of 2)
IMNAHA RIVER BASIN
SATELLITE REARING SCREENING CRITERIA

CRITERION	Grouse Creek-Imnaha Confluence		Big Sheep-Imnaha Confluence		Big Sheep-Little Sheep Confluence	
	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook	Fall Chinook	Spring Chinook
I. WATER QUALITY						
1 Disease potential	n/a	Low w/ temp and flow control	n/a	Low w/ temp and flow control	n/a	Low w/ temp and flow control
2 Water temperature	n/a	need cooling/warming capability	n/a	need cooling/warming capability	n/a	need cooling/warming capability
3 General minerals	n/a	Acceptable	n/a	Acceptable	n/a	Acceptable
4 Other pollutants (phosphate, oil & grease)	n/a	None identified	n/a	None identified	n/a	None identified
5 Offsite risks	n/a	None identified	n/a	Nearby feedlot runoff	n/a	Grazing upstream of site
II. WATER QUANTITY						
6 Availability	n/a	ungaged, assumed adequate	n/a	adequate during period	n/a	ungaged, appears adequate
7 Dependability	n/a	assumed adequate during period	n/a	adequate	n/a	ungaged, appears adequate
8 Intake structure	n/a	mod. to high bedload movement	n/a	good location	n/a	good locations for intake
9 Pipeline ROW	n/a	long if gravity supply	n/a	good location	n/a	undetermined
10 Bypass reach (length and location)	n/a	rel. long on Imnaha R.	n/a	short on Imnaha R.	n/a	undetermined
11 Pumped versus gravity source	n/a	gravity potential poor	n/a	gravity potential good	n/a	pumped most probable
12 Cost of water supply (construction, O&M)	n/a	high	n/a	moderate	n/a	moderate
III. LOCATION ON RIVER						
13 River mile	n/a		n/a		n/a	
14 Spawning distribution (natural run)	n/a	Typically reach site	n/a	Typically reach site	n/a	Typically reach site
15 Attraction potential	n/a	Good	n/a	Good	n/a	Good
IV. 16 PERIOD OF USE	n/a	Dec - May 15 (18 mos.)	n/a	Dec - May 15 (18 mos.)	n/a	Dec - May 15 (18 mos.)
V. ENVIRONMENTAL CONCERNS						
17 Wetlands (other than riparian zone)	n/a	No obvious areas	n/a	None identified	n/a	Wetlands vegetation present
18 Terrestrial wildlife and habitats	n/a	Forest, pasture	n/a	pastures, stock feedlot	n/a	grassy meadows w/ forested upland
19 Threatened/endangered species	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
20 Water quality impacts of facility	n/a	Negligible	n/a	Negligible	n/a	Negligible
21 Community impacts	n/a	Negligible	n/a	near town of Imnaha	n/a	Negligible
22 Scenic/Aesthetic	n/a	Undeveloped pasture	n/a	some developed areas nearby	n/a	Minor
23 Accessibility	n/a	adjacent to gravel road	n/a	adjacent to paved road	n/a	off paved road via gravel
VI. SIZE OF PARCEL						
24 Space for raceways/ ponds	n/a	very limited	n/a	3+ acres	n/a	< 2 acres
25 Space for sedimentation ponds	n/a	very limited	n/a	3+ acres	n/a	< 2 acres
26 Space for trapping	n/a	yes	n/a	yes	n/a	
VII. SITEWORK COSTS						
27 Topography	n/a	Moderately sloping	n/a	moderately sloping	n/a	Flat to moderately sloping
28 Contouring and diking (flood control)	n/a	Minor	n/a	low	n/a	mod to high in low area
29 Pipeline and intake structure	n/a	Major	n/a	moderate bedload movement	n/a	n/a
30 Utilities	n/a	3 phase power adjacent to site	n/a	3-phase available	n/a	3-phase available
31 Costs of acquiring site	n/a	unknown	n/a	unknown	n/a	unknown
32 Soils/Groundwater	n/a	Alluvial/low gw potential	n/a	Alluvial/low to mod. gw potential	n/a	Alluvial/moderate gw potential
33 Access	n/a	gravel road to site	n/a	adjacent to paved road	n/a	gravel road off paved highway
III. 34 PUBLIC EDUCATION/ACCESS	n/a	possible	n/a	possible	n/a	possible
IX. SECURITY						
35 Intake structure and water supply	n/a	Required	n/a	Required	n/a	Required
36 Pipeline	n/a	Required	n/a	Required	n/a	Required
37 Raceways/ponds	n/a	Required	n/a	Required	n/a	Required
X. PERMITTING						
38 Land Use	n/a	undetermined	n/a	Undetermined	n/a	Undetermined
39 Shorelines Designation	n/a	Undetermined	n/a	Undetermined	n/a	Undetermined
40 Flood hazard	n/a	Low	n/a	Low	n/a	Mod to high in low areas
XI. PROPERTY OWNERSHIP						
41 Facility site	n/a	private	n/a	Private	n/a	Private
42 Pipeline ROW and intake structure	n/a	private	n/a	Private	n/a	Private
43 Time to acquire site	n/a	Unknown	n/a	unknown	n/a	unknown
XII. SUMMARY/COMMENTS	ChF do not reach site	Limited area for rearing ponds Site high above river for supply Landowner may not be cooperative	Beyond limit of ChF distribution	Would require shading Require cooling/warming	Beyond limit of ChF distribution	Site area limited for multiple uses Wetlands present

TABLE 34 (2 of 2)

IMNAHA RIVER BASIN

SATELLITE REARING SCREENING CRITERIA

CRITERION	Gene Marr Ranch	
	Fall Chinook	Spring Chinook
I. WATER QUALITY 1 Disease potential 2 Water temperature 3 General minerals 4 Other pollutants (phosphate, oil & grease) 5 Offsite risks	low w/ flow and temp control acceptable None identified None identified	low w/ flow and temp control need warming/cooling ability acceptable None identified None identified
II. WATER QUANTITY 6 Availability 7 Dependability 8 Intake structure 9 Pipeline ROW 10 Bypass reach (length and location) 11 Pumped versus gravity source 12 Cost of water supply (construction, O&M)	adequate during period some icing potential good locations available All on site undetermined gravity moderate	adequate during period some icing potential good locations available All on site undetermined gravity moderate
III. LOCATION ON RIVER 13 River mile 14 Spawning distribution (natural run) 15 Attraction potential	within natural distribution	All the run passes site
IV. 16. PERIOD OF USE	Jan - May 15 (5 - 6 mos.)	Dec - May 15 (18 mos.)
V. ENVIRONMENTAL CONCERNS 17. Wetlands (other than riparian zone) 18. Terrestrial wildlife and habitats 19. Threatened/endangered species 20. Water quality impacts of facility 21. Community impacts 22. Scenic/Aesthetic 23. Accessibility	2 springs w/ assoc. veg. Brushy, trees and shrubs Undetermined Negligible Negligible Negligible gravel road to near site	2 springs w/ assoc. veg. Brushy, trees and shrubs Undetermined Negligible Negligible Negligible gravel road to near site
VI. SIZE OF PARCEL 24 Space for raceways/ ponds 25 Space for sedimentation ponds 26 Space for trapping	5+ acres 5+ acres	5+ acres 5+ acres yes
VII. SITEWORK COSTS 27 Topography 28 Contouring and diking (flood control) 29 Pipeline and intake structure 30 Utilities 31 Costs of acquiring site 32 Soils/Groundwater 33. Access	Flat site area Moderate moderate moderate undetermined alluvial/low gw potential Good	Flat site area Moderate moderate moderate undetermined alluvial/low gw potential Good
III. 34. PUBLIC EDUCATION/ACCESS	possible	possible
IX. SECURITY 35 Intake structure and water supply 36 Pipeline 37. Raceways/ponds	Required Required Required	Required Required Required
X. PERMITTING 38 Land Use 39 Shorelines Designation 40 Flood hazard	undetermined Undetermined Low to moderate	undetermined Undetermined Low to moderate
XI. PROPERTY OWNERSHIP 41 Facility site 42. Pipeline ROW and intake structure 43. Time to acquire site	Gene Marr Gene Marr undetermined, willing seller	Gene Marr Gene Marr undetermined, willing seller
XII. SUMMARY/COMMENTS	Some wetlands on site Low to mod gw potential	Some wetlands on site Low to mod gw potential

TABLE 35 (1 of 2)
WALLA WALLA RIVER BASIN
ADULT CAPTURE SCREENING CRITERIA

CRITERION	NE 8th St. Bridge		9th and Walnut		Harris Park No. 1	
	Steelhead	Spring Chinook	Steelhead (kelt and smolt trapping)	Spring Chinook	Steelhead	Spring Chinook
I. WATER QUALITY						
1 Disease potential	n/a	n/a	n/a for trapping	n/a	n/a	n/a for trapping
2 Water temperature	ok during period	n/a	acceptable	n/a	n/a	Acceptable
3 General minerals	assumed acceptable	n/a	assumed acceptable	n/a	n/a	Acceptable
4 Other pollutants (phosphate, oil & grease)	urban stormwater runoff	n/a	urban stormwater runoff	n/a	n/a	None identified
5 Offsite risks	none identified	n/a	none identified	n/a	n/a	None identified
II. WATER QUANTITY						
6 Availability	112-426 avg.cfs pre diversion	n/a	good during period	n/a	n/a	good
7 Dependability	86-160 min cfs	n/a	good during period	n/a	n/a	good
8 Intake structure	existing ladder	n/a	existing facility	n/a	n/a	good location
9 Pipeline ROW	existing ladder	n/a	existing facility	n/a	n/a	good location
10 Bypass reach (length and location)	n/a	n/a	existing facility	n/a	n/a	short and within park area
11 Pumped versus gravity source	n/a	n/a	existing facility-gravity	n/a	n/a	gravity
12 Cost of water supply (construction, O&M)	n/a	n/a	low of new facil	n/a	n/a	moderate to high
III. LOCATION ON RIVER						
13 River mile	mainstem, 4 mi. below forks	n/a	mainstem, 3-4 miles below forks	n/a	n/a	approx. RM 8 on S. Fork
14 Spawning distribution (natural run)	SISu spawn above site	n/a	SISu spawn above site	n/a	n/a	at upper 1/2 potential S Fork range
15 Attraction potential	good	n/a	good	n/a	n/a	Good
IV. PERIOD OF USE						
16 PERIOD OF USE	Oct. - May	n/a	kelts: Mar 15 - May smolts: Mar - Apr	n/a	n/a	Apr 15 - Jul 15
V. ENVIRONMENTAL CONCERNS						
17 Wetlands (other than riparian zone)	none identified	n/a	dense riparian wetlands	n/a	n/a	Some wetland areas seen
18 Terrestrial wildlife and habitats	urbanized upland	n/a	riparian zone, upland developed	n/a	n/a	forested, steep hillside
19 Threatened/endangered species	not determined	n/a	undetermined	n/a	n/a	Undetermined
20 Water quality impacts of facility	negligible	n/a	negligible	n/a	n/a	Minor
21 Community impacts	minor, w/ existing facility	n/a	minor-existing facility	n/a	n/a	Moderate
22 Scenic/Aesthetic	minor, w/ existing facility	n/a	minor-existing facility	n/a	n/a	Site within County Park
23 Accessibility	good	n/a	good	n/a	n/a	good gravel road
VI. SIZE OF PARCEL						
24 Space for raceways/ ponds	<1 acre for holding	n/a	<1 acre for holding	n/a	n/a	n/a for trapping
25 Space for sedimentation ponds	n/a	n/a	n/a	n/a	n/a	n/a for trapping
26 Space for trapping	yes, existing ladder	n/a	yes-existing trap	n/a	n/a	yes
VII. SITEWORK COSTS						
27 Topography	flat upland, channeled banks	n/a	flat	n/a	n/a	Flat to moderately sloping
28 Contouring and diking (flood control)	existing rip-rap, channeling	n/a	low	n/a	n/a	low to moderate
29 Pipeline and intake structure	existing ladder	n/a	low	n/a	n/a	moderate to high
30 Utilities	power adjacent to site	n/a	power available	n/a	n/a	3-phase available
31 Costs of acquiring site	undetermined for upland	n/a	existing trap, upland undetermined	n/a	n/a	unknown
32 Soils/Groundwater	alluvial soils/ gw n/a	n/a	n/a	n/a	n/a	Alluvial/moderate gw potential
33 Access	good	n/a	good	n/a	n/a	good gravel road
III. PUBLIC EDUCATION/ACCESS	possible	n/a	possible	n/a	n/a	possible
IX. SECURITY						
35 Intake structure and water supply	required during use period	n/a	required	n/a	n/a	Required
36 Pipeline	n/a	n/a	required	n/a	n/a	Required
37 Raceways/ponds	n/a	n/a	required	n/a	n/a	Required
X. PERMITTING						
38 Land Use	undetermined	n/a	existing facility	n/a	n/a	existing park
39 Shorelines Designation	undetermined	n/a	undetermined	n/a	n/a	Undetermined
40 Flood hazard	appears to be low	n/a	low	n/a	n/a	low to moderate
XI. PROPERTY OWNERSHIP						
41 Facility site	undetermined for upland	n/a	undetermined for upland	n/a	n/a	Umatilla Co. Parks
42 Pipeline ROW and intake structure	n/a	n/a	undetermined for upland	n/a	n/a	Umatilla Co. Parks
43 Time to acquire site	undetermined	n/a	undetermined for upland	n/a	n/a	unknown
XII. SUMMARY/COMMENTS	80 adults for broodstock Existing ladder at site Some holding needed Site below irrigation diversions		Existing smolt and kelt trap Would benefit from upgrading			Development within park could be difficult Would only capture S Fork ChS when reestablished

TABLE 35 (2 of 2)
WALLA WALLA RIVER BASIN
ADULT CAPTURE SCREENING CRITERIA

CRITERION	Russell Walker property		WDW Dayton Conditioning Pond		Railroad Bridge	
	Steelhead	Spring Chinook	Steelhead	Spring Chinook	Steelhead	Spring Chinook
I. WATER QUALITY						
1. Disease potential	n/a	n/a for trapping	n/a for trapping	n/a for trapping	n/a	n/a for trapping
2. Water temperature	n/a	Acceptable	Acceptable	Acceptable	n/a	assumed acceptable
3. General minerals	n/a	Acceptable	Acceptable	Acceptable	n/a	assumed acceptable
4. Other pollutants (phosphate, oil & grease)	n/a	None identified	None identified	None identified	n/a	None identified
5. Offsite risks	n/a	None identified	None identified	None identified	n/a	Railroad ROW
II. WATER QUANTITY						
6. Availability	n/a	good	assumed good-ungaged	assumed good-ungaged	n/a	good
7. Dependability	n/a	good	assumed good-ungaged	assumed good-ungaged	n/a	good
8. Intake structure	n/a	good location	existing intake	existing intake	n/a	n/a
9. Pipeline ROW	n/a	good location	existing supply pipeline	existing supply pipeline	n/a	n/a
10. Bypass reach (length and location)	n/a	short, all on site property	short, all on site property	short, all on site property	n/a	n/a
11. Pumped versus gravity source	n/a	gravity	gravity	gravity	n/a	gravity
12. Cost of water supply (construction, O&M)	n/a	moderate to high	low	low	n/a	moderate to high
III. LOCATION ON RIVER						
13. River mile	n/a	approx. RM 7 on S. Fork	1 mile below N & S forks	1 mile below N & S forks	n/a	Walla Walla mainstem above
14. Spawning distribution (natural run)	n/a	upper 1/2 of potential S. Fork range	Typically reach site	within potential range on Touchet	n/a	limit of Col. FL backwater
15. Attraction potential	n/a	Good	Good	Good	n/a	all basin ChS would pass site
IV. PERIOD OF USE	n/a	Apr. 15 - Jul 15	n/a Oct. - May	Apr. 15 - Jul 15	n/a	Apr. 15 - Jul 15
V. ENVIRONMENTAL CONCERNS						
17. Wetlands (other than riparian zone)	n/a	Some wetland areas seen	appears minimal	appears minimal	n/a	Undetermined
18. Terrestrial wildlife and habitats	n/a	forested, steep hillside	trees, brush, grass	trees, brush, grass	n/a	Undetermined
19. Threatened/endangered species	n/a	Undetermined	Undetermined	Undetermined	n/a	Undetermined
20. Water quality impacts of facility	n/a	Minor	minor	minor	n/a	Minor
21. Community impacts	n/a	Minor	existing facility	existing facility	n/a	Minor
22. Scenic/Aesthetic	n/a	Currently undeveloped pasture	existing facility	existing facility	n/a	undeveloped site
23. Accessibility	n/a	good gravel road	good	good	n/a	good gravel road
VI. SIZE OF PARCEL						
24. Space for raceways/ ponds	n/a	n/a for trapping	existing 1 acre pond	existing 1 acre pond	n/a	n/a for trapping
25. Space for sedimentation ponds	n/a	n/a for trapping	yes	yes	n/a	n/a for trapping
26. Space for trapping	n/a	yes	yes	yes	n/a	yes
VII. SITEWORK COSTS						
27. Topography	n/a	Flat	Flat	Flat	n/a	Flat to moderately sloping
28. Contouring and diking (flood control)	n/a	low to moderate	low	low	n/a	low to moderate
29. Pipeline and intake structure	n/a	moderate to high	low	low	n/a	moderate to high
30. Utilities	n/a	3-phase available	3-phase available	3-phase available	n/a	3-phase available
31. Costs of acquiring site	n/a	unknown	unknown	unknown	n/a	unknown
32. Soils/Groundwater	n/a	Alluvial/good gw potential	Alluvial/gw undetermined	Alluvial/gw undetermined	n/a	Alluvial/gw n/a
33. Access	n/a	good gravel road	good road	good road	n/a	good gravel road
VIII. PUBLIC EDUCATION/ACCESS	n/a	possible	possible	possible	n/a	possible
IX. SECURITY						
35. Intake structure and water supply	n/a	Required	Required	Required	n/a	Required
36. Pipeline	n/a	Required	Required	Required	n/a	Required
37. Raceways/ponds	n/a	Required	Required	Required	n/a	Required
X. PERMITTING						
38. Land Use	n/a	Undetermined	Existing facility	Existing facility	n/a	Undetermined
39. Shorelines Designation	n/a	Undetermined	Undetermined	Undetermined	n/a	Undetermined
40. Flood hazard	n/a	low to moderate	low	low	n/a	low to moderate
XI. PROPERTY OWNERSHIP						
41. Facility site	n/a	Russell Walker	WA Dept. of Game	WA Dept. of Game	n/a	Undetermined
42. Pipeline ROW and intake structure	n/a	Russell Walker	WA Dept. of Game	WA Dept. of Game	n/a	Undetermined
43. Time to acquire site	n/a	unknown, willing seller	undetermined	undetermined	n/a	unknown
XII. SUMMARY/COMMENTS						
		Would only capture S. Fork ChS when reestablished	Existing StSu acclimation Use potential undetermined Only capture Touchet stock	Existing StSu acclimation Use potential undetermined Only capture Touchet stock when ChS reestablished		when reestablished, would allow capture/sorting of all basin ChS

TABLE 36 (1 of 2)
WALLA WALLA RIVER BASIN
ADULT HOLDING SCREENING CRITERIA

CRITERION	Harris Park No. 1		Russell Walker property		Wolf Fork Confluence	
	Steelhead	Spring Chinook	Steelhead	Spring Chinook	Steelhead	Spring Chinook
I. WATER QUALITY						
1. Disease potential	low with temp/flow control	low with temp/flow control	low with temp/flow control	low with temp/flow control	low w/ temp and flow control	low w/ temp and flow control
2. Water temperature	Acceptable	Acceptable	Acceptable	Acceptable	Assumed acceptable-no data	Assumed acceptable-no data
3. General minerals	Acceptable	Acceptable	Acceptable	Acceptable	Assumed acceptable-no data	Assumed acceptable-no data
4. Other pollutants (phosphate, oil & grease)	None Identified	None Identified	None Identified	None Identified	Undetermined	Undetermined
5. Oil/sle risks	None Identified	None Identified	None Identified	None Identified	Undetermined	Undetermined
II. WATER QUANTITY						
6. Availability	good	good	good	good	ungaged	ungaged
7. Dependability	good	good	good	good	ungaged	ungaged
8. Intake structure	good location	good location	good location	good location	undetermined	undetermined
9. Pipeline ROW	good location	good location	good location	good location	undetermined	undetermined
10. Bypass reach (length and location)	short and within park area	short and within park area	short, all on site property	short, all on site property	undetermined	undetermined
11. Pumped versus gravity source	gravity	gravity	gravity	gravity	probably pumped	probably pumped
12. Cost of water supply (construction O&M)	moderate to high	moderate to high	moderate to high	moderate to high	high	high
III. LOCATION ON RIVER						
13. River mile	approx. RM 8 on S. Fork	approx. RM 8 on S. Fork	approx. RM 7 on S. Fork	approx. RM 7 on S. Fork	Trib. to N.Fork Touchet	Trib. to N.Fork Touchet
14. Spawning distribution (natural run)	Typically reach site	would reach site when reestablished	Typically reach site	would reach site when reestablished	SRSu spawn above site	potential ChS habitat
15. Attraction potential	Good	Good	Good	Good		
IV. 16. PERIOD OF USE						
	Oct. - May	Apr. 15 - Jul 15	Oct. - May	Apr. 15 - Jul 15	Oct. - May	Apr. 15 - Jul 15
V. ENVIRONMENTAL CONCERNS						
17. Wetlands (other than riparian zone)	Some wetland areas seen forested, steep hillside	Some wetland areas seen forested, steep hillside	Some wetland areas seen forested, steep hillside	Some wetland areas seen forested, steep hillside	probably present	probably present
18. Terrestrial wildlife and habitats	Undetermined	Undetermined	Undetermined	Undetermined	mbad conif./decid. river bottom	mbad conif./decid. river bottom
19. Threatened/endangered species	Minor	Minor	Minor	Minor	undetermined	undetermined
20. Water quality impacts of facility	Moderate	Moderate	Moderate	Moderate	probably low	probably low
21. Community impacts	Site within County Park	Site within County Park	Currently under pasture	Currently under pasture	adjacent homesites	adjacent homesites
22. Sensitive/wildlife	good gravel road	good gravel road	gravel road	gravel road	currently undeveloped	currently undeveloped
23. Accessibility					need 1/4 mile access road	need 1/4 mile access road
VI. SIZE OF PARCEL						
24. Space for raceways/ ponds	yes, 6-8 acres total	yes, 6-8 acres total	yes, 10-15 acres total	yes, 10-15 acres total	1-4 developable acres	1-4 developable acres
25. Space for sedimentation ponds	yes	yes	yes	yes	1-4 developable acres	1-4 developable acres
26. Space for trapping	yes	yes	yes	yes	yes	yes
VII. SITEWORK COSTS						
27. Topography	Flat to moderately sloping	Flat to moderately sloping	Flat	Flat	mostly flat, low gradient	mostly flat, low gradient
28. Contouring and diking (flood control)	low to moderate	low to moderate	low to moderate	low to moderate	undetermined	undetermined
29. Pipeline and intake structure	moderate to high	moderate to high	moderate to high	moderate to high	undetermined	undetermined
30. Utilities	3 phase available	3 phase available	3 phase available	3 phase available	3-phase within 1/4 mile	3-phase within 1/4 mile
31. Costs of acquiring ll.	unknown	unknown	unknown	unknown	undetermined	undetermined
32. Soils/Groundwater	Alluvial/mod. ge potential	Alluvial/mod. ge potential	Alluvial/good ge potential	Alluvial/good ge potential	alluvial/gw undetermined	alluvial/gw undetermined
33. Access	good gravel road	good gravel road	good gravel road	good gravel road	need new road	need new road
VIII. PUBLIC EDUCATION/ACCESS						
34	possible	possible	possible	possible	possible	possible
IX. SECURITY						
35. Intake structure and water supply	Required	Required	Required	Required	Required	f - W -
36. Pipeline	Required	Required	Required	Required	Required	- W -
37. Raceways/ponds	Required	Required	Required	Required	Required	Required
PERMITTING						
38. Land Use	existing park	existing park	Undetermined	Undetermined	undetermined	undetermined
39. Shorelines Designation	Undetermined	Undetermined	Undetermined	Undetermined	undetermined	undetermined
40. Flood hazard	low to moderate	low to moderate	low to moderate	low to moderate	undetermined	undetermined
X. PROPERTY OWNERSHIP						
41. Facility site	Umatilla Co. Parks	Umatilla Co. Parks	Russell Walker	Russell Walker	private	private
42. Pipeline ROW and intake structure	Umatilla Co. Parks	Umatilla Co. Parks	Russell Walker	Russell Walker	private	private
43. Time to acquire site	unknown	unknown	unknown, willing seller	unknown, willing seller	unknown	unknown
XI. SUMMARY/COMMENTS						
	Development within park could be difficult. Need holding for approx. 80 steelhead max.	Development within park could be difficult. Need holding for approx. 550 NECH ChS max.	Need holding for approx. 80 steelhead max.	Need holding for approx. 800 NECH ChS max.	None to few SRSu at present. Small-scale potential for Touchet R. SRSu.	No ChS at present. Small-scale future potential for Touchet R. ChS.

TABLE 36 (2 of 2)

WALLA WALLA RIVER BASIN

ADULT HOLDING SCREENING CRITERIA

CRITERION	WDW Dayton Conditioning Pond	
	Steelhead	Spring Chinook
I. WATER QUALITY 1. Disease potential 2. Water temperature 3. General minerals 4. Other pollutants (phosphate, oil & grease) 5. Offsite risks	low w/ flow and temp control Assumed acceptable-no data Assumed acceptable-no data Undetermined Undetermined	low w/ flow and temp control Assumed acceptable-no data Assumed acceptable-no data Undetermined Undetermined
II. WATER QUANTITY 6. Availability 7. Dependability 8. Intake structure 9. Pipeline ROW 10. Bypass reach (length @ ± location) 11. Pumped versus gravity source 12. Cost of water supply (construction, O&M)	ungaged ungaged I [] [] 0 [] [] short, all on site gravity prob. relatively low	ungaged ungaged I [] [] existing short, @ nonsite gravity prob. relatively low
III. LOCATION ON RIVER 13. River mile 14. Spawning distribution (natural run) 15. Attraction potential	Touchet R. below N and S Forks StSu spawn above site good	Touchet R. below N and S Forks within potential ChS habitat
IV. 16. PERIOD OF USE	Oct. - May	Apr. 15 - Jul 15
V. ENVIRONMENTAL CONCERNS 17. Wetlands (other than riparian zone) 18. Terrestrial wildlife and habitats 19. Threatened/endangered species 20. Water quality impacts of facility 21. Community impacts [] Scenic/Aesthetic [] Accessibility	appears minimal trees, brush, grass Undetermined minor [] facility [] facility good	appears minimal trees, brush, grass Undetermined minor [] facility existing facility good
VI. SIZE OF PARCEL 24. Space for raceways/ ponds 25. Space for sedimentation ponds 26. Space for trapping	[] [] [] [] acre [] [] yes yes	existing 1 acre pond yes
VII. SITEWORK COSTS 27. Topography 28. Contouring and diking (flood control) 29. Pipeline and intake structure 30. Utilities 31. Costs of acquiring site 32. Soils/Groundwater 33. Access	Flat low low 3-phase available unknown Alluvial/gw undetermined good road	Flat low low 3-phase available unknown Alluvial/gw undetermined good road
VIII. 34. PUBLIC EDUCATION/ACCESS	possible	possible
IX. SECURITY 35. Intake structure @ nd water supply 36. Pipeline 37. Raceways/ponds	Required Required Required	Required Required Required
X. PERMITTING 38. Land Use 39. Shorelines Designation 40. Flood hazard	Existing facility Undetermined low	Existing facility Undetermined
XI. PROPERTY OWNERSHIP 41. Facility site 42. Pipeline ROW and intake structure 43. Time to acquire site	WA Dept. of Game WA Dept. of Game undetermined	WA Dept. of Game WA Dept. of Game undetermined
XII. SUMMARY/COMMENTS	Existing StSu acclimation Use potential undetermined	Existing StSu acclimation Use potential undetermined

TABLE 37 (1 of 1)
WALLA WALLA RIVER BASIN
INCUBATION AND FRY REARING SCREENING CRITERIA

CRITERION	Harris Park No. 1		Russell Walker property	
	Steelhead	Spring Chinook	Steelhead	Spring Chinook
I. WATER QUALITY				
1. Disease potential	high, gw or disinfect	high, gw or disinfect	high, gw or disinfect	high, gw or disinfect
2. Water temperature	Acceptable	Acceptable	Acceptable	Acceptable
3. General minerals	Acceptable	Acceptable	Acceptable	Acceptable
4. Other pollutants (phosphate, oil & grease)	None Identified	None Identified	None Identified	None Identified
5. Offsite risks	None Identified	None Identified	None Identified	None Identified
II. WATER QUANTITY				
6. Availability	gw potential moderate	gw potential moderate	gw potential good	gw potential good
7. Dependability	test well being drilled nearby	test well being drilled nearby	test well being drilled at site	test well being drilled at site
8. Intake structure	good location	good location	good location	good location
9. Pipeline ROW	good location	good location	good location	good location
10. Bypass reach (length and location)	short and within park area	short and within park area	short, all on site property	short, all on site property
11. Pumped versus gravity source	pump for inc. facility	pump for inc. facility	pump for inc. facility	pump for inc. facility
12. Cost of water supply (construction, O&M)	moderate to high	moderate to high	high	high
III. LOCATION ON RIVER				
13. River mile	approx. RM 8 on S. Fork	approx. RM 8 on S. Fork	approx. RM 7 on S. Fork	approx. RM 7 on S. Fork
14. Spawning distribution (natural run)	Typically reach site	would reach site when reestablished	Typically reach site	would reach site when reestablished
15. Attraction potential	Good	Good	Good	Good
IV. PERIOD OF USE				
16. PERIOD OF USE	Mar - Jun (Inc.) May - Jul (Early Rear.)	Aug - Dec (Inc.) Nov - Feb (Early Rear.)	Mar - Jun (Inc.) May - Jul (Early Rear.)	Aug - Dec (Inc.) Nov - Feb (Early Rear.)
V. ENVIRONMENTAL CONCERNS				
17. Wetlands (other than riparian zone)	Some wetland areas seen	Some wetland areas seen	Some wetland areas seen	Some wetland areas seen
18. Terrestrial wildlife and habitats	forested, steep hillside	forested, steep hillside	forested, steep hillside	forested, steep hillside
19. Threatened/endangered species	Undetermined	Undetermined	Undetermined	Undetermined
20. Water quality impacts of facility	effluent discharge permit	effluent discharge permit	effluent discharge permit	effluent discharge permit
21. Community impacts	Moderate	Moderate	Moderate	Moderate
22. Scenic/Aesthetic	Site within County Park	Site within County Park	Currently undeveloped pasture	Currently undeveloped pasture
23. Accessibility	good gravel road	good gravel road	good gravel road	good gravel road
VI. SIZE OF PARCEL				
24. Space for raceways/ ponds	yes, 6-8 acres total	yes, 6-8 acres total	yes, 10-15 acres total	yes, 10-15 acres total
25. Space for sedimentation ponds	yes	yes	yes	yes
26. Space for trapping	yes	yes	yes	yes
VII. SITEWORK COSTS				
27. Topography	Flat to moderately sloping	Flat to moderately sloping	Flat	Flat
28. Contouring and diking (flood control)	low to moderate	low to moderate	low to moderate	low to moderate
29. Pipeline and intake structure	moderate to high	moderate to high	moderate to high	moderate to high
30. Utilities	3-phase available	3-phase available	3-phase available	3-phase available
31. Costs of acquiring site	unknown	unknown	unknown	unknown
32. Soils/Groundwater	Alluvial/mod. gw potential	Alluvial/mod. gw potential	Alluvial/good gw potential	Alluvial/good gw potential
33. Access	good gravel road	good gravel road	good gravel road	good gravel road
VIII. PUBLIC EDUCATION/ACCESS				
34. PUBLIC EDUCATION/ACCESS	possible	possible	possible	possible
IX. SECURITY				
35. Intake structure and water supply	Required	Required	Required	Required
36. Pipeline	Required	Required	Required	Required
37. Raceways/ponds	Required	Required	Required	Required
X. PERMITTING				
38. Land Use	existing park	existing park	Undetermined	Undetermined
39. Shoreline Designation	Undetermined	Undetermined	Undetermined	Undetermined
40. Flood hazard	low to moderate	low to moderate	low to moderate	low to moderate
XI. PROPERTY OWNERSHIP				
41. Facility site	Umatilla Co. Parks	Umatilla Co. Parks	Russell Walker	Russell Walker
42. Pipeline ROW and intake structure	Umatilla Co. Parks	Umatilla Co. Parks	Russell Walker	Russell Walker
43. Time to acquire site	unknown	unknown	unknown, willing seller	unknown, willing seller
XII. SUMMARY/COMMENTS				
XII. SUMMARY/COMMENTS	Land acquisition difficult Use Walla Walla stock gw potential moderate	Land acquisition difficult Use Carson stock initially gw potential moderate	willing seller, ample space Use Walla Walla stock gw potential good	willing seller, ample space Use Carson stock initially gw potential good

TABLE 38 (1 of 1)
WALLA WALLA RIVER BASIN
SATELLITE REARING SCREENING CRITERIA

CRITERION	Harris Park No. 1		Russell Walker property		WDW Dayton Conditioning Pond	
	Steelhead	Spring Chinook	Steelhead	Spring Chinook	Steelhead	Spring Chinook
I. WATER QUALITY						
1 Disease potential	moderate to high	moderate to high	moderate to high	moderate to high	moderate to high	moderate to high
2 Water temperature	good, potential icing	good, potential icing	good, potential icing	good, potential icing	no data	no data
3 General minerals	Acceptable	Acceptable	Acceptable	Acceptable	None identified	None identified
4 Other pollutants (phosphate, oil & grease)	None identified	None identified	None identified	None identified	None identified	None identified
5 Offsite risks	None identified	None identified	None identified	None identified	None identified	None identified
II. WATER QUANTITY						
6 Availability	good except potential icing	good except potential icing	good except potential icing	good except potential icing	assumed good-ungaged	assumed good-ungaged
7 Dependability	good except potential icing	good except potential icing	good except potential icing	good except potential icing	assumed good-ungaged	existing intake
8 Intake structure	good location	good location	good location	good location	existing intake	existing intake
9 Pipeline ROW	good location	good location	good location	good location	short, all on site properly	existing supply pipeline
10 Bypass reach length and location	short and within park area	short and within park area	short, all on site	short, all on site	short, all on site properly	short, all on site properly
11 Pumped versus gravity source	gravity	gravity	gravity	gravity	gravity	gravity
12 Cost of water supply (construction, O&M)	moderate to high	moderate to high	moderate to high	moderate to high	low	low
III. LOCATION ON RIVER						
13 River mile	approx. RM 8 on S. Fork	approx. RM 8 on S. Fork	approx. RM 7 on S. Fork	approx. RM 7 on S. Fork	1 mile below N & S forks	1 mile below N & S forks
14 Spawning distribution (natural run)	SI/Su spawn above site	at upper 1/2 potential S Fork range	SI/Su spawn above site	at upper 1/2 potential S Fork range	Typically reach site	within potential range on Touchet
15 Attraction potential	Good	Good	Good	Good	Good	Good
IV. PERIOD OF USE	May - Apr (12 mos)	Dec - May 15 (18 mos)	May - Apr (12 mos)	Dec - May 15 (18 mos)	May - Apr (12 mos)	Dec - May 15 (18 mos)
V. ENVIRONMENTAL CONCERNS						
17 Wetlands (other than riparian zone)	Some wetland areas seen forested, steep hillside	Some wetland areas seen forested, steep hillside	Some wetland areas seen forested, steep hillside	Some wetland areas seen forested, steep hillside	appears minimal trees, brush, grass	appears minimal trees, brush, grass
18 Terrestrial wildlife and habitats	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined
19 Threatened/endangered species	raceway effluent discharge	raceway effluent discharge	raceway effluent discharge	raceway effluent discharge	raceway effluent discharge	raceway effluent discharge
20 Water quality impacts of facility	Moderate	Moderate	Moderate	Moderate	existing facility	existing facility
21 Community impacts	Site within County Park	Site within County Park	Currently under pasture	Currently under pasture	existing facility	existing facility
22 Soenic/Aesthetic	good gravel road	good gravel road	good gravel road	good gravel road	good	good
23 Accessibility						
VI. SIZE OF PARCEL						
24 Space for raceways/ ponds	yes, 6.8 acres total	yes, 6.8 acres total	yes, 10-15 acres total	yes, 10-15 acres total	expansion potential needs to be determined	expansion potential needs to be determined
25 Space for sedimentation ponds	yes, 6.8 acres total	yes, 6.8 acres total	yes, 10-15 acres total	yes, 10-15 acres total	yes	yes
26 Space for trapping	yes	yes	yes	yes	yes	yes
VII. SITEWORK COSTS						
27 Topography	Flat to moderately sloping	Flat to moderately sloping	Flat	Flat	Flat	Flat
28 Contouring and diking (flood control)	low to moderate	low to moderate	low to moderate	low to moderate	low	low
29 Pipeline and intake structure	moderate to high	moderate to high	moderate to high	moderate to high	moderate to high	moderate to high
30 Utilities	3 phase available	3 phase available	3 phase available	3 phase available	3 phase available	3 phase available
31 Costs of acquiring site	unknown	unknown	unknown	unknown	site sharing undetermined	site sharing undetermined
32 Soils/Groundwater	Alluvial/mod. gw potential	Alluvial/mod. gw potential	Alluvial/good gw potential	Alluvial/good gw potential	Alluvial/gw undetermined	Alluvial/gw undetermined
33 Access	good gravel road	good gravel road	good gravel road	good gravel road	good road	good road
VIII. PUBLIC EDUCATION/ACCESS	possible	possible	possible	possible	possible	possible
IX. SECURITY						
35 Intake structure and water supply	Required	Required	Required	Required	Required	Required
36 Pipeline	Required	Required	Required	Required	Required	Required
37 Raceways/ponds	Required	Required	Required	Required	Required	Required
X. PERMITTING						
38 Land Use	existing park	existing park	Undetermined	Undetermined	Existing facility	Existing facility
39 Shorelines Designation	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined
40 Flood hazard	low to moderate	low to moderate	low to moderate	low to moderate	low	low
XI. PROPERTY OWNERSHIP						
41 Facility site	Umatilla Co. Parks	Umatilla Co. Parks	Russell Walker	Russell Walker	WA Dept. of Game	WA Dept. of Game
42 Pipeline ROW and intake structure	Umatilla Co. Parks	Umatilla Co. Parks	Umatilla Co. Parks	Umatilla Co. Parks	WA Dept. of Game	WA Dept. of Game
43 Time to acquire site	unknown	unknown	unknown, willing seller	unknown, willing seller	undetermined	undetermined
XII. SUMMARY/COMMENTS	Development within park could be difficult Reported surface water freeze-up in winter	Development within park could be difficult Reported surface water freeze-up in winter	adequate space and water potential winter freezing	adequate space and water potential winter freezing	Existing SI/Su acclimation Use potential undetermined would need separate facilities for NEOH activities	Existing SI/Su acclimation Use potential undetermined would need separate facilities for NEOH activities

GRANDE RONDE DRAINAGE BASIN

LEGEND

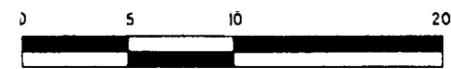
FACILITY SITES

- ① CATHERINE CREEK N&S FORKS CONFLUENCE
- ② CATHERINE-MILK CREEK CONFLUENCE (OSU SITE)
- ③ CATHERINE CREEK AT UNION (OLD HATCHERY)
- ④ VEY MEADOWS
- ⑤ SHEEP CREEK
- ⑥ BEAVER CREEK
- ⑦ SANDERSON SPRINGS - MILL CREEK
- ⑧ LOWER WILLOW CREEK NEAR ELGIN
- ⑨ INDIAN CREEK NEAR ELGIN
- ⑩ GRANDE RONDE NEAR ELGIN
- ⑪ LOOKING GLASS HATCHERY
- ⑫ WILDCAT CREEK AREA
- ⑬ FISH LADDER (FORMER USFWS RESEARCH SITE)
- ⑭ FLORA GRADE
- ⑮ COTTONWOOD CREEK
- ⑯ WALLOWA LAKE
- ⑰ HAYES FORK- PRAIRIE CREEK
- ⑱ WALLOWA HATCHERY 1
- ⑲ BIG CANYON CREEK
- ⑳ MINAM RIVER CONFLUENCE WITH WALLOWA
- ㉑ ODFW BIGHORN SHEEP RANGE
- ㉒ STRATHEARN RANCH
- ㉓ LOSTINE DAY
- ㉔ CROSS-VALLEY DIVERSION
- ㉕ DA VIS DAM
- ㉖ MINAM ABOVE WALLOWA RIVER
- ㉗ WALLOWA BELOW MINAM RIVER
- ㉘ WENAHA RIVER ABOVE TROY
- ㉙ BEAR CREEK

STREAMFLOW GAGES

- ▲ 13333000
- ▲ 13332500
- ▲ 13323500
- ▲ 13319000
- ▲ 13318800
- ▲ 13318500
- ▲ 3331500
- ▲ 13330500
- ▲ 13330000
- ▲ 13329500
- ▲ 13327500
- ▲ 13323600
- ▲ 13320000

- 🐟 EXISTING ACCLIMATION PONDS
- 🐟 EXISTING HATCHERIES
- SMOLT OR ADULT TRAPS
- BASIN BOUNDARY
- ~ RIVER OR CREEK
- - - ROADS
- RESERVATION BOUNDARY
- ▨ NATIONAL FOREST
- ▩ WILDERNESS AREA
- ▤ NATIONAL RECREATION AREA



SCALE IN MILES

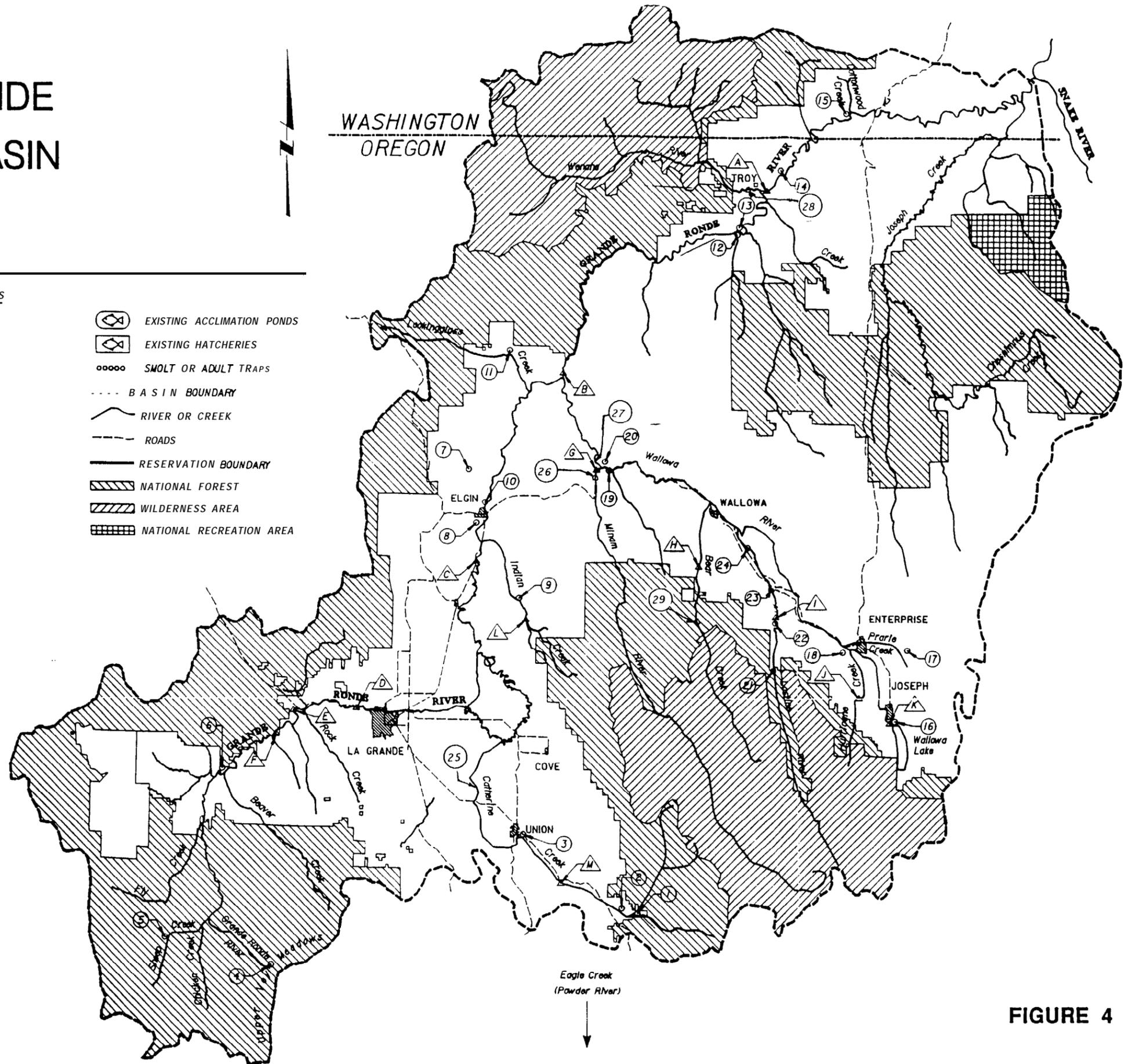
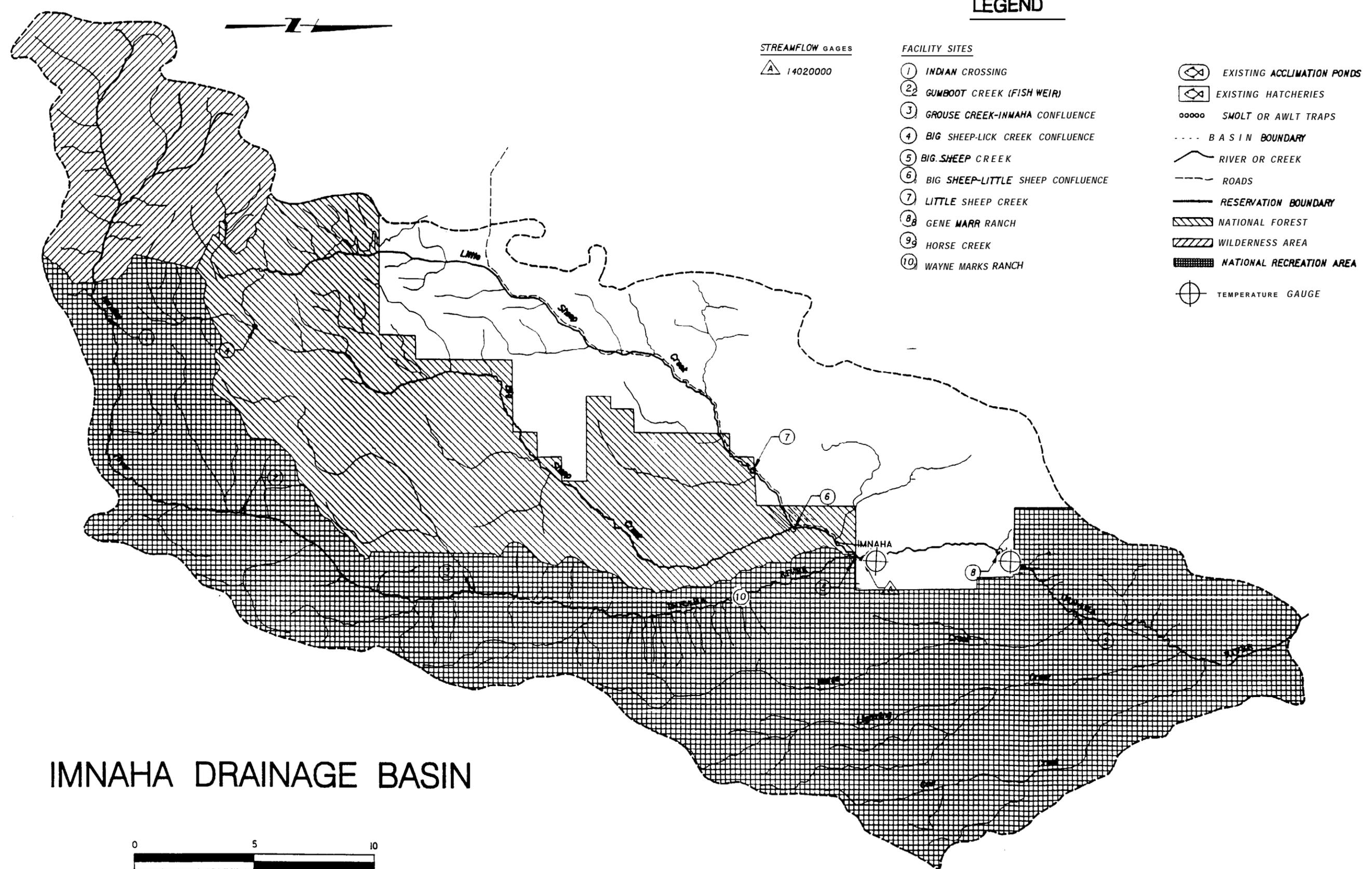


FIGURE 4



LEGEND

STREAMFLOW GAGES

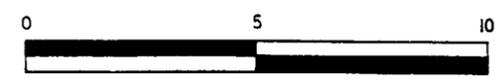
▲ 14020000

FACILITY SITES

- ① INDIAN CROSSING
- ② GUMBOOT CREEK (FISH WEIR)
- ③ GROUSE CREEK-IMNAHA CONFLUENCE
- ④ BIG SHEEP-LICK CREEK CONFLUENCE
- ⑤ BIG SHEEP CREEK
- ⑥ BIG SHEEP-LITTLE SHEEP CONFLUENCE
- ⑦ LITTLE SHEEP CREEK
- ⑧ GENE MARR RANCH
- ⑨ HORSE CREEK
- ⑩ WAYNE MARKS RANCH

- ⊕ EXISTING ACCLIMATION PONDS
- ⊕ EXISTING HATCHERIES
- SMOLT OR AWLT TRAPS
- B A S I N B O U N D A R Y
- ~ RIVER OR CREEK
- - - ROADS
- RESERVATION BOUNDARY
- ▨ NATIONAL FOREST
- ▩ WILDERNESS AREA
- ▧ NATIONAL RECREATION AREA
- ⊕ TEMPERATURE GAUGE

IMNAHA DRAINAGE BASIN



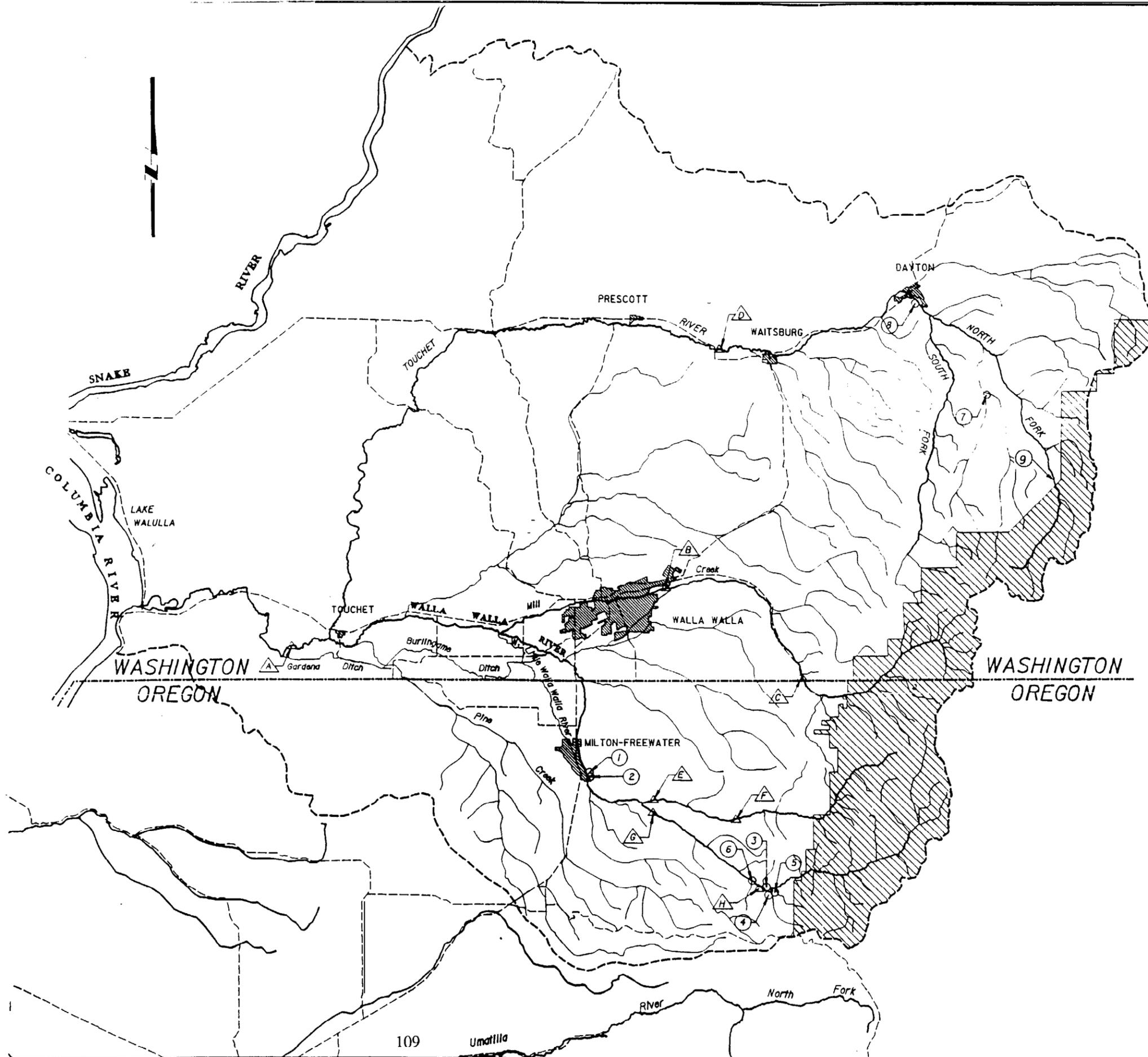
SCALE IN MILES

FIGURE 5

WALLA WALLA DRAINAGE BASIN



SCALE IN MILES



LEGEND

STREAMFLOW GAGES FACILITY SITES

A - 14018500	①	N E 8TH STREET BRIDGE (MILTON FREEWATER)
A - 14015000	②	9TH AND WALNUT (MILTON FREEWATER)
A - 14013000	③	HARRIS PARK NO. 1 (AT PARK)
△ - 14017000	④	HARRIS PARK NO.2 (APPROX 1 MILE UPSTREAM)
A - 14011000	⑤	S. FORK WALLA WALLA - ELBOW CREEK CONFLUENCE
A - 14010800	⑥	LOWER S. FORK WALLA WALLA BELOW HARRIS PARK
A - 14010500	⑦	WOLF FORK CONFLUENCE
△ - 14010000	⑧	WOW DAYTON CONDITIONING POND
	⑨	POND AT FS BOUNDARY

- EXISTING ACCLIMATION PONDS
- EXISTING HATCHERIES
- SMOLT OR AWLT TRAPS
- BASIN BOUNDARY
- RIVER OR CREEK
- ROADS
- RESERVATION BOUNDARY
- NATIONAL FOREST
- WILDERNESS AREA
- NATIONAL RECREATION AREA

FIGURE 6

PROGRAM DEVELOPMENT

INTRODUCTION

The objective in identifying program alternatives is to provide an overall view of the way facilities could be combined to accomplish production goals for a particular species. The following tables present alternatives, by species, for the NEOH basins. They are developed from Tables 26 through 38 presented in the previous section. Where multiple sites are indicated for a facility, the first ones listed generally appear to have the best potential based on the screening criteria.

One purpose in listing multiple options at this time is to facilitate future NEPA environmental review which may require the analysis of several alternatives. A preferred alternative may be identified, however, one or more alternatives should be retained through the conceptual design phase.

PROPOSED NEOH PROGRAM ALTERNATIVES

These alternatives, and their priorities, were reviewed and revised at a 10/16/91 NEOH TWG meeting in La Grande. These revised lists will form the basis for the proposed NEOH facilities to be described in Conceptual Design.

Alternative programs are presented by subbasin and species, including:

- Upper Grande Ronde spring chinook (Table 39)
- Catherine Creek spring chinook (Table 40)
- Wallowa - Lostine spring chinook (Table 41)
- Imnaha spring chinook (Table 42)
- Walla Walla and Touchet spring chinook (Table 43)
- Grande Ronde fall chinook (Table 44)
- Imnaha fall chinook (Table 45)
- Walla Walla and Touchet steelhead (Table 46)

TABLE 39
UPPER GRANDE RONDE SPRING CHINOOK

UPPER GRANDE RONDE SPRING CHINOOK

Broodstock Source	Broodstock Number	Production Goal No. & Size	Acclimation Sites	Siting Report Reference
Catherine Creek	74 (Limited to 50% of the run)	100,000 @15-20/lb	2 sites above Limber Jim Creek: (1) Upper Vey Meadows and (2) Sheep Creek	Table 3-2 Group 9

Adult Capture:	Alternative 1 - Davis Darn on Catherine Creek (see Table 9-2) Alternative 2 - Vey Meadows at Splash Darn (a)
Adult Holding:	Alternative 1 - Upper Vey Meadows Alternative 2 - Catherine Creek incubation site
Incubation: (b)	Alternative 1 - Catherine Creek incubation site Alternative 2 - Stratheam Ranch
Early Rearing:	Alternative 1 - Catherine Creek incubation site Alternative 2 - Stratheam Ranch
Full Term Rearing:	Alternative 1 - Catherine Creek incubation site Alternative 2 - Stratheam Ranch
Final Rearing/Acclimation and/or Direct Release Sites:	Site 1 - Upper Vey Meadows (69,000 smolts) Site 2 - Sheep Creek (31,000 smolts)

Notes:

(a) To be used in future as returns increase. Will collect adults initially at Catherine Creek capture site.

(b) Preferred alternative incubation site dependent on outcome of further groundwater investigations. Catherine Creek incubation site includes either the Union or OSU sites. Stratheam Ranch site would be used if Catherine Creek incubation site is not feasible based on groundwater investigations.

TABLE 40
CATHERINE CREEK SPRING CHINOOK

Broodstock Source	Broodstock Number	Production Goal No. & Size	Acclimation Sites	Siting Report Reference
Catherine Creek	222 (Limited to 50% of the run)	161,000 @15-20/lb	1 site on mainsrem Catherine Creek	Table 3-2 Group 7
		112,000 @15-20/lb	N & S. forks confluence site	Table 3-2 Group 8
		28,000 @ 1520/lb	Indian Creek site	Table 3-2 Group 10
Catherine Creek	70	94,500 @ 20/lb	OSU site	EIP measure 2.3
Rapid River	260	350,000 @ 20/lb	OSU site	EIP measure 2.3

Adult Capture:	Alternative 1 - Davis Dam (EIP site) Alternative 2 - Catherine Creek at Union Alternative 3 - OSU Site
Adult Holding:	Alternative 1 - OSU Site <u>/NEOH + EIPJ</u> Alternative 2 - Catherine Creek at Union <u>/NEOH only</u>
Incubation: (a)	Alternative 1 - OSU Site Alternative 2 - Catherine Creek at Union Alternative 3 - Strathearn Ranch
Early Rearing:	Alternative 1 - OSU site Alternative 2 - Catherine Creek at Union Alternative 3 - Strathearn Ranch
Full Term Rearing:	Alternative 1 - OSU site Alternative 2 - Catherine Creek at Union Alternative 3 - Strathearn Ranch
Final Rearing/Acclimation and/or Direct Release Sites :	Site 1 - N & S Fork Confluence (112,000 smolts) Site 2 - OSU Site (3 groups:161,000, 94,500 [EIP], 350,000 [EIP]) Site 3 - Indian Creek (28,000 smolts)

Notes:

(a) Preferred alternative incubation site dependent on outcome of further groundwater investigations. Both the Union and OSU sites have moderate to good groundwater potential. Union site probably has the better overall groundwater potential.

TABLE 41
WALLOWA-LOSTINE SPRING CHINOOK

Broodstock Source	Broodstock Number	Production Goal No. & Size	Acclimation or Release Sites	Siting Report Reference
Lostine River	400	516,000 @ 15/lb	1 acclimation site on Lostine	Table 3-2 Group 4
		150,000 @ 150/lb	7 release sites on Lostine	Table 3-2 Group 5
		28,000 @ 15/lb	1 acclimation site at Bear Creek	Table 3-2 Group 6

Adult Capture: Alternative 1 - Strathearn Ranch
Alternative 2 - Cross Valley Diversion (Clearwater Ditch) **(a)**

Adult Holding: Alternative 1 - Strathearn Ranch
Alternative 2 - Wallowa Hatchery (has capacity for 400 adult ChS with no changes)
Alternative 3 - Big Canyon Creek (has capacity for 80 additional ChS adults with no changes)

Incubation: Alternative 1 - Strathearn Ranch
Alternative 2 - Wallowa Hatchery
Alternative 3 - Minam - Wallowa Confluence (b)
Alternative 4 - Catherine Creek incubation site

early Rearing: Alternative 1 - Strathcam Ranch
Alternative 2 - Minam - Wallowa Confluence (c)
Alternative 3 - Catherine Creek incubation site

Term Rearing:
Alternative 1 - Strathearn Ranch
Alternative 2 - Catherine Creek incubation site

final Rearing/Acclimation and/or Direct Release Sites:
Site 1 - Strathearn Ranch (516,000 smolts)
Site 2 - Hurricane Creek (a,c)
Site 3 - Bear Creek (c) (28,000 smolts in "temporary" acclimation facility)

7 direct release sites on upper Lostine currently in use (150,000 fry, require no design work)

Notes:

(a) Will remain as identified alternative but no conceptual design planned at this time.

(b) Potential ChS site if developed for ChF incubation and early rearing.

(c) These sites not yet evaluated.

TABLE 42
IMNAHA SPRING CHINOOK

Broodstock Source	Broodstock Number	Production Goal No. & Size	Acclimation or Direct Release Sites	Siting Report Reference
Imnaha Wild Stock	260	392,500 @ 15-20/lb	2-3 acclimation sites between Gumboot and Freezeout Cks.	Table 3-3 Group 14
	132	230,000 @150/lb	direct release	Table 3-3 Group 15

Adult Capture:	Alternative 1 - Gumboot Creek (Fish Weir) Alternative 2 - Wayne Marks Ranch
Adult Holding:	Alternative 1 - Wayne Marks Ranch Alternative 2 - Gumboot Creek (Fish Weir)
Incubation:	Alternative 1 - Wayne Marks Ranch Alternative 2 - Stratheam Ranch Alternative 3 - Catherine Creek at Union
Early Rearing:	Alternative 1 - Wayne Marks Ranch Alternative 2 - Stratheam Ranch Alternative 3 - Catherine Creek at Union
Full Term Rearing:	Alternative 1 - Wayne Marks Ranch Alternative 2 - Stratheam Ranch Alternative 3 - Catherine Creek at Union
Final Rearing/Acclimation and/or Direct Release Sites:	<p style="text-align: center;">Site 1 - Big Sheep - Lick Creek Confluence (230,000 fry)</p> <p style="text-align: center;">3 acclimation sites (not yet identified) between Gumboot and Freezeout Creeks using "natural" side channel type facility (392,500 smolts)</p>

TABLE 43

WALLA WALLA AND TOUCHET SPRING CHINOOK

Broodstock Source	Broodstock Number	Production Goal No. & Size	Acclimation or Release Sites	Siting Report Reference
Carson stock	559	350,000-400,000	S. Fork Walla Walla	Table 3-4 Group 1
		@10/lb		
		200,000-250,000 @	upper Touchet	Table 3-4 Group 2
Umatilla River (Carson stock)	548	10/lb 589,000 @ 10/lb	upper Umatilla mainstem	Table 3-5 Group 17

adult Capture:	Alternative 1 - Railroad Bridge on mainstem Walla Walla
adult Holding:	Alternative 1 - Russell Walker property Alternative 2 - Harris Park No. 1
Incubation:	Alternative 1 - Russell Walker property Alternative 2 - Harris Park No. 1
early Rearing:	Alternative 1 - Russell Walker property Alternative 2 - Harris Park No. 1
full Term Rearing:	Alternative 1 - Russell Walker property Alternative 2 - Harris Park No. 1
final Rearing/Acclimation and/or Direct Release Sites:	
	S. Fork Walla Walla sites
	Site 1 - Russell Walker property (350,000-400,000 smolts)
	Site 2 - Harris Park No. 1 (to be used if Russell Walker site not developed)
	Touchet River sites (1 to be selected: <u>200,000-250,000</u> smolts)
	Site 3 - Wolf Fork Confluence
	Site 4 - <u>1 site between Wolf Fork and South Fork</u>
	Site 5 - Pond at FS boundary

TABLE 44
GRANDE RONDE FALL CHINOOK

Broodstock Source	Broodstock Number	Production Goal No. & Size	Acclimation or Direct Release Sites	Siting Report Reference
Wenatchee Stock (October spawners) [Snake River stock is potential]	1,000	1,350,000 @ 40-50/lb	Direct release at 7 sites on mainstem Grande Ronde and Wallowa Rivers	Table 3-2 Group 11

Adult Capture:	(a) Alternative 1 - existing Wenatchee stock collection site Alternative 2 - Snake River dams (if Snake River stock is used) Alternative 3 - Miriam-Wallowa confluence
Adult Holding:	Alternative 1 - Minam - Wallowa Confluence Alternative 2 Lyons Ferry (existing facility)
Incubation:	(b) Alternative 1 - Miriam - Wallowa Confluence Alternative 2 - Catherine Creek incubation site Alternative 3 - Lookingglass Hatchery
Early Rearing:	Alternative 1 - Minam - Wallowa Confluence Alternative 2 - Catherine Creek incubation site Alternative 3 - Lookingglass Hatchery
Full Term Rearing:	Alternative 1 - Minam - Wallowa Confluence Alternative 2 - Catherine Creek incubation site Alternative 3 - Lookingglass Hatchery
Final Rearing/Acclimation and/or Direct Release Sites:	(c) Site 1 - Flora Grade (Schoolbus Flats) (develop existing natural side-channel) Site 2 - Cottonwood Creek (use existing pond, develop GRR water supply) Site 3 - Minam - Wallowa Confluence

Notes:

(a) Initial use of Wenatchee broodstock to rebuild the run is preferred. Snake River stock is a second choice for broodstock if Wenatchee stock cannot be used. Capture facility at Minam-Wallowa confluence will be planned and designed for potential future use.

(b) Preferred alternative incubation site dependent on outcome of further groundwater investigations. Depending on groundwater investigations, there may be opportunity to combine ChF and ChS incubation at one facility.

(c) These sites will be designed as the initial acclimation/release sites. Additional sites may be needed in future as total production goals are approached. If Snake River stock is used, Cottonwood Creek would be the only final rearing/release site.

TABLE 45
IMNAHA FALL CHINOOK

Broodstock Source	Broodstock Number	Production Goal No. & Size	Acclimation or Direct Release Sites	Siting Report Reference
Snake River Stock (November spawner)	66	120,000 @ 70/lb	Direct release on lower Imnaha at Marr Ranch	Table 3-3 Group 16

Adult Capture (a):	Alternative 1 - Snake River darns Alternative 2 - Gene Marr Ranch
Adult Holding:	Alternative 1 - Lyons Ferry (existing facility) Alternative 2 - Gene Marr Ranch
Incubation: (b)	Alternative 1 - Gene Man Ranch
Early Rearing:	Alternative 1 - Gene Marr Ranch
Full Term Rearing:	Alternative 1 - Gene Man Ranch
Final Rearing/Acclimation and/or Direct Release Sites:	Site 1 - Gene Marr Ranch (120,000 fish)

Notes:

(a) Initial use of Lyons Ferry (or other Snake River) broodstock to rebuild the run. Facility required when sufficient adults returning for broodstock capture.

(b) Assuming use of Falls Creek for incubation water supply.

TABLE 46
WALLA WALLA STEELHEAD

Broodstock Source	Broodstock Number	Production Goal No. & Size	Acclimation or Direct Release Sites	Siting Report Reference
Walla Walla River Stock	80	100,000 @ 5/lb	1 Final rearing / release site on S Fork Walla Walla	Table 3-4 Group 3

Adult Capture:	Alternative 1 - NE 8th St. Bridge
Adult Holding:	Alternative 1 - Russell Walker property Alternative 2 - Harris Park No. 1
Incubation:	<u>Alternative 1 - Umatilla Hatchery (a)</u> <u>Alternative 2 - Russell Walker property</u> <u>Alternative 3 - Harris Park No. 1</u>
Early Rearing:	<u>Alternative 1 - Umatilla Hatchery (a)</u> <u>Alternative 2 - Russell Walker property</u> <u>Alternative 3 - Harris Park No. 1</u>
Full Term Rearing:	<u>Alternative 1 - Umatilla Hatchery (a)</u> <u>Alternative 2 - Russell Walker property</u> <u>Alternative 3 - Harris Park No. 1</u>
Final Rearing/Acclimation and/or Direct Release Sites:	Site 1 - Russell Walker property (100,000 fish) Site 2 - Harris Park No. 1 (if Site 1 is not used)

Notes:

(a) This alternative would involve transferring the Walla Walla steelhead production to the Umatilla Hatchery, and in exchange, an equivalent amount of Umatilla Hatchery ChS production would be transferred to the Russell Walker site.

REFERENCES

- CBFWA. 1990. Integrated system plan for salmon and steelhead production in the Columbia River basin. Columbia Basin System Planning. Columbia Basin Fish and Wildlife Authority. 90-12. August 1, 1990. 449 p.
- FEMA. 1978. Flood Insurance Study for the City of Union. Federal Emergency Management Administration.
- FEMA. 1978. Flood Insurance Study for the City of Elgin. Federal Emergency Management Administration.
- FEMA. 1979. Flood Insurance Study for Union County. Federal Emergency Management Administration.
- FEMA. 1983. Flood Insurance Study for Walla Walla County. Federal Emergency Management Administration.
- FEMA. 1988. Flood Insurance Study for Wallowa County. Federal Emergency Management Administration,
- Gonthier, J.B., 1985, A Description of Aquifer Units in Eastern Oregon. USGS Water-Resources Investigations Report 84-4095.
- Hampton, E.R., and S.G. Brown, 1964, Geology and Ground-Water Resources of the Upper Grande Ronde River Basin, Union County, Oregon. USGS Water-Supply Paper 1597.
- Piper, R. G., I. B. McElwain, L. E. Orme, J. P. McCraren, L. G. Fowler, and J. R. Leonard. 1982. US Fish & Wildlife Service, Washington, D.C.
- Senn, H. J. Mack, and L. Rothfus. 1984. Compendium of low-cost Pacific Salmon and steelhead trout production facilities and practices in the Pacific Northwest, Fish Management Consultants, Olympia, Washington.
- Walker, G.M., 1977, Geologic Map of Oregon East of the 121st Meridian. USGS Miscellaneous Investigations Series Map I-902.
- Water Well Reports. State of Oregon. Department of Water Resources. Salem, OR.

APPENDIX A

SUMMARY OF STREAMFLOW DATA

This Appendix contains tabular and graphic summaries of minimum, maximum, and average monthly streamflows at the NEOH project area USGS gaging stations listed below. This information was used to determine if seasonal surface water availability at particular sites was adequate to meet projected facility flow requirements. This information was then used in the site screening analysis contained in Section 8.0.

TABLE A-1

STREAMFLOW GAGES IN THE NEOH STUDY AREA

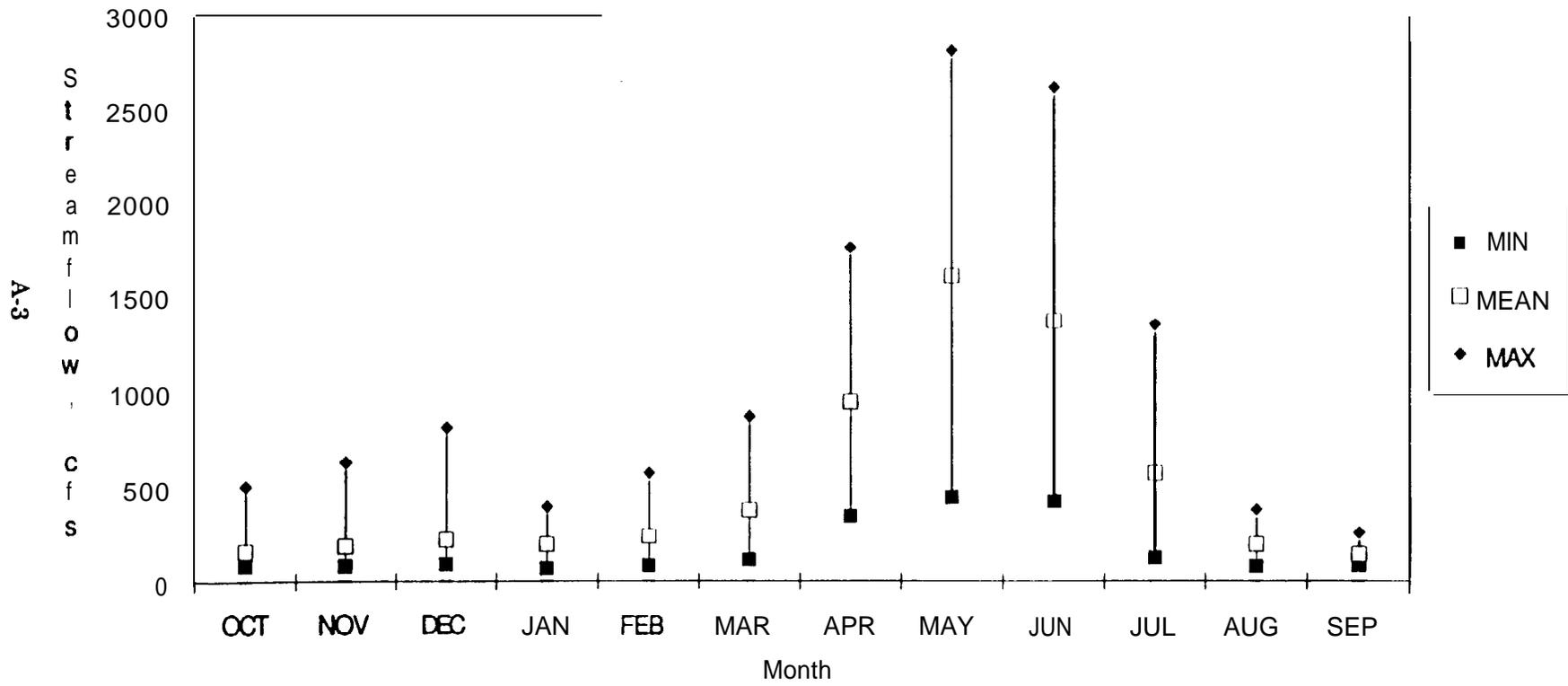
SOURCE	LOCATION	PERIOD
USGS 13292000	Imnaha River at Imnaha	1929-1982
USGS 13318500	Grande Ronde River near Hilgard	1938-1956
USGS 13318800	Grande Ronde River at Hilgard	1967-1982
USGS 13319000	Grande Ronde River at La Grande	1904-1982
USGS 13320000	Catherine Creek nr Union (before diversion)	1912-1936
USGS 13320000	Catherine Creek nr Union (after diversion)	1938-1982
USGS 13323566	Grande Ronde River near Elgin	1956-1981
USGS 13323600	Indian Creek near Imbler	1939-1950
USGS 13327566	Wallowa River at Joseph	1905-1982
USGS 13329599	Hurricane Creek near Joseph	1925-1978
USGS EB30000	Lostine River near Lostine	1913-1982
USGS 13330500	Bear Creek near Wallowa	1925-1982
USGS 13331566	Minam River at Minam	1966-1982
USGS 13332596	Grande Ronde River at Rondowa	1927-1982
USGS 13333000	Grande Ronde River at Troy	1945-1982
USGS 14010000	S. Fork Walla Walla near Milton	1907-1982
USGS 14010500	S. Fork Walla Walla below PP&L, nr Milton	1904-1945
USGS 14010800	N. Fork Walla Walla nr Milton-Freewater	1970-1982
USGS 14011000	N. Fork Walla Walla nr Milton	1931-1969

MONTHLY STREAMFLOW DATA
Data from U.S. Geological Survey

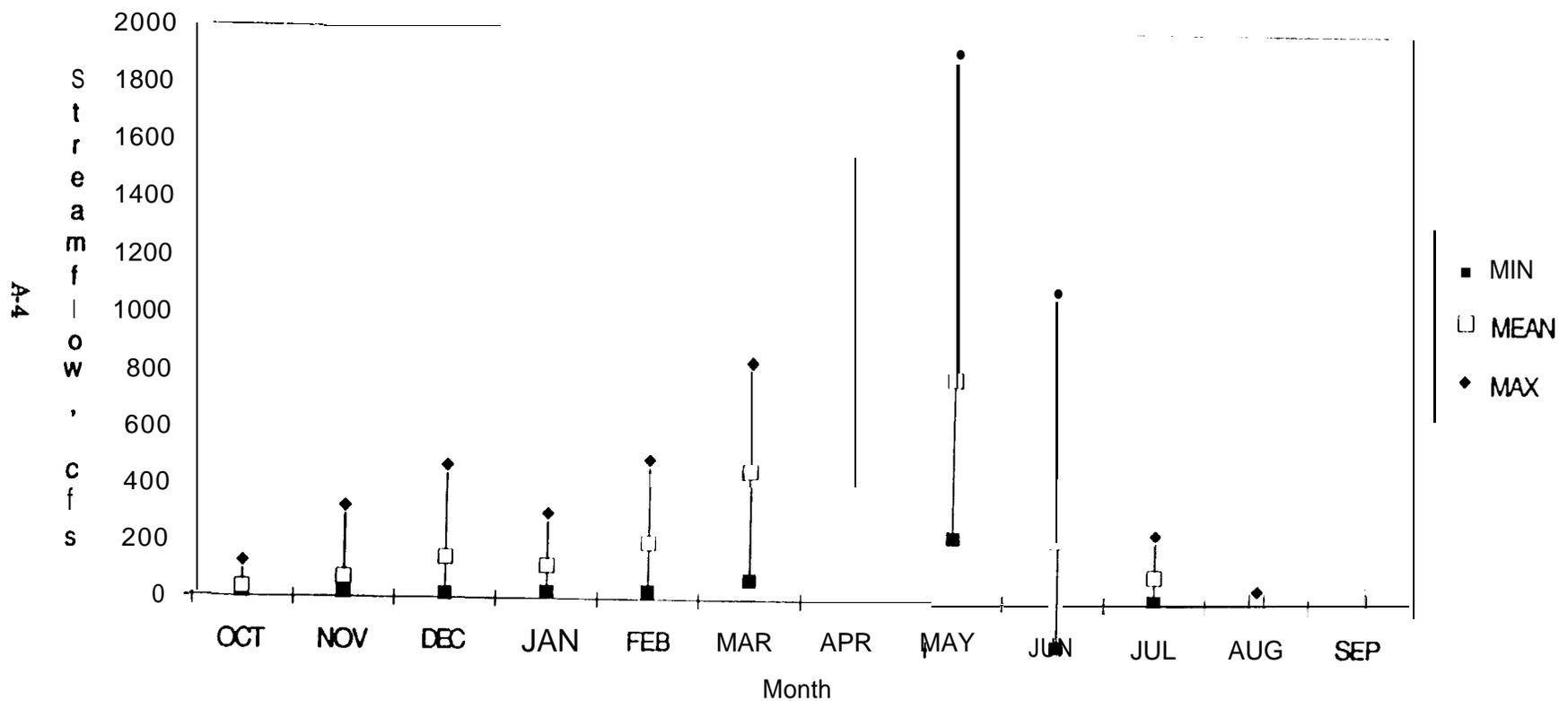
Monthly **Streamflow**, in cfs

Imnaha River	imnaha		13292000	1929-1982
		MIN	MEAN	MAX
OCT		82	159	501
NOV		80	187	625
DEC		89	219	806
JAN		69	193	393
FEB		82	236	569
MAR		114	377	869
APR		345	942	1760
MAY		445	1603	2804
JUN		423	1365	2612
Jul		123	567	1348
AUG		79	193	380
SEP		83	143	256
Grande Ronde River near Hilgard			13318500	1938-56
		MIN	MEAN	MAX
OCT		18	35	128
NOV		20	73	323
DEC		17	145	467
JAN		25	118	301
FEB		29	200	493
MAR		72	455	841
APR		387	878	1590
MAY		230	788	1922
JUN		48	420	1096
JUL		13	98	246
AUG		7	28	55
SEP		14	25	71
Grande Ronde River at Hilgard			13318800	1967-1982
		MIN	MEAN	MAX
OCT		25	36	56
NOV		31	71	236
DEC		33	159	481
JAN		27	272	681
FEB		49	288	521
MAR		75	544	1668
APR		181	787	1481
MAY		256	882	1340
JUN		85	421	825
JUL		22	101	253
AUG		12	36	81
SEP		17	31	51

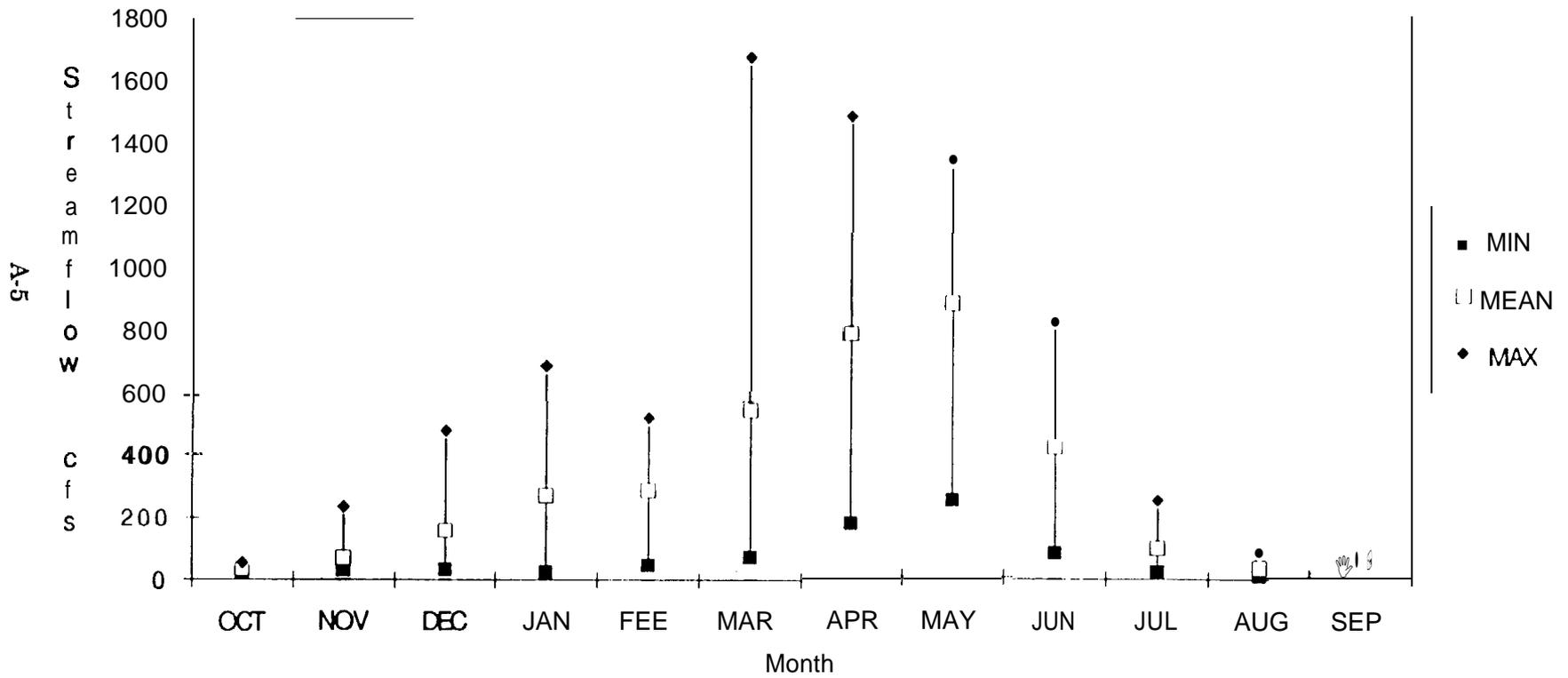
Imnaha River at Imnaha, Gage No. 13292000



Grande Ronde River near Hilgard, Gage No. 13318500



Grande Ronde River at Hilgard, Gage No. 1318800

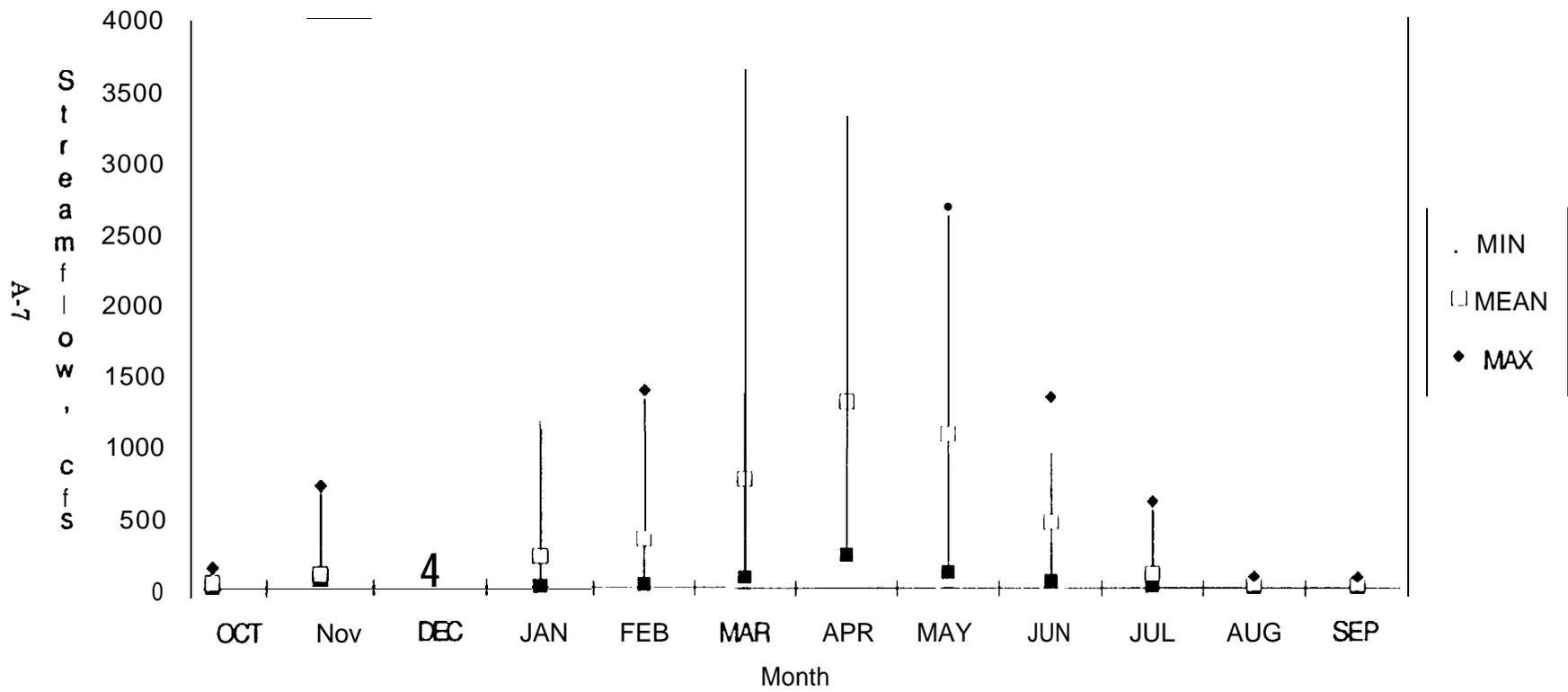


MONTHLY STREAMFLOW DATA
Data from U.S. Geological Survey

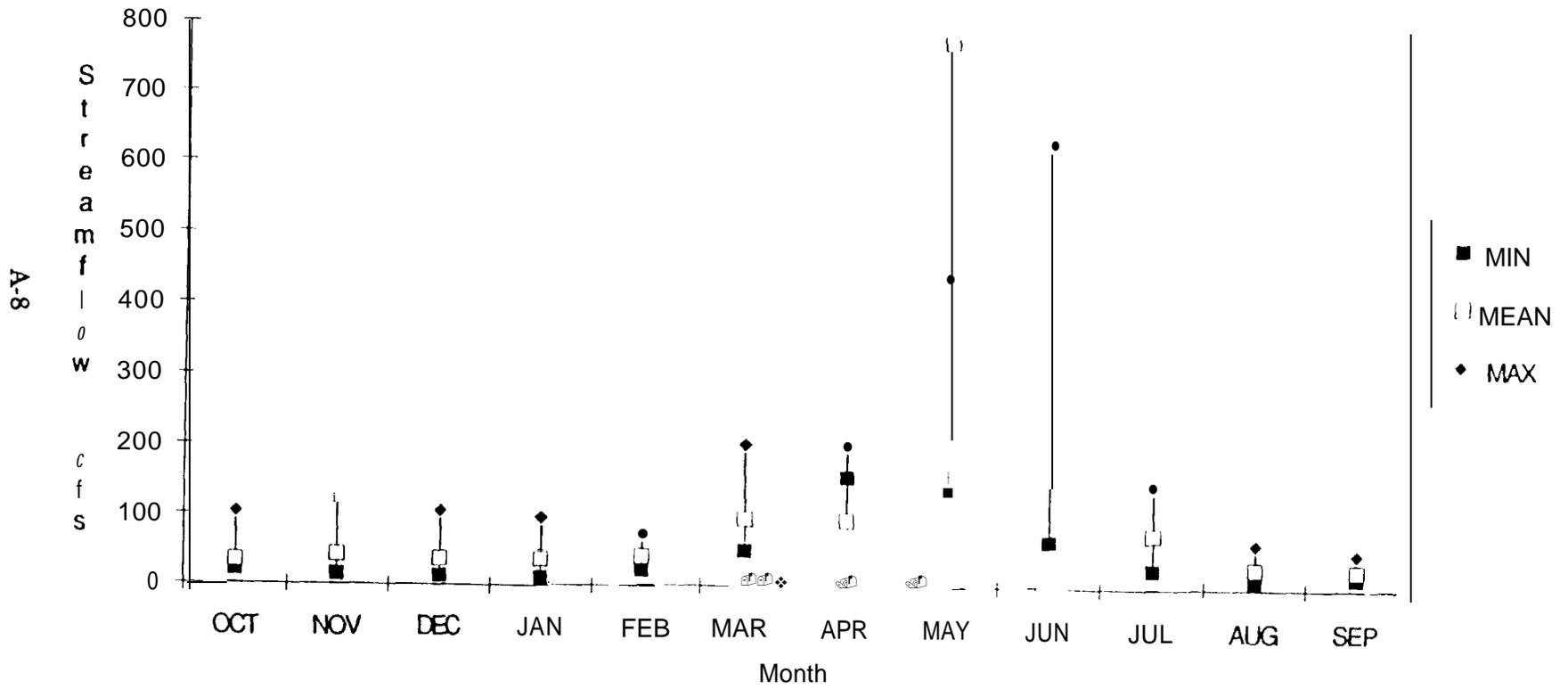
Monthly Streamflow, in cfs

Grande Ronde River at La Grande		13319000	1904-82
	MIN	MEAN	MAX
OCT	16	42	145
NOV	22	93	700
DEC	20	178	669
JAN	12	218	1295
FEB	25	334	1379
MAR	83	757	3700
APR	237	1291	3372
MAY	118	1068	2675
JUN	58	459	1328
JUL	18	104	600
AUG	7	31	88
SEP	8.8	30	52
Catherinc Creek nr Union before completion of Big Creek diversion		13320000	1912-36
	MIN	MEAN	MAX
OCT	21	34	103
NOV	14	41	157
DEC	13	37	105
JAN	12	38	95
FEB	22	42	74
MAR	51	95	203
APR	158	95	203
MAY	139	776	440
JUN	66	289	632
JUL	26	76	145
AUG	11	29	63
SEP	16	26	50
Calhcrine Creek nr Union after completion of Bg Creek diversion		13320000	1938-82
	MIN	MEAN	MAX
OCT	20	33	138
NOV	22	39	100
DEC	20	48	125
JAN	23	48	101
FEB	23	60	135
MAR	28	90	213
APR	83	230	445
MAY	121	412	742
JUN	86	313	686
JUL	34	96	226
AUG	19	38	62
SEP	18	31	58

Grande Ronde River al La Grande Gage No. 13319000



Cathrene Creek near Union, Gage No. 13320000

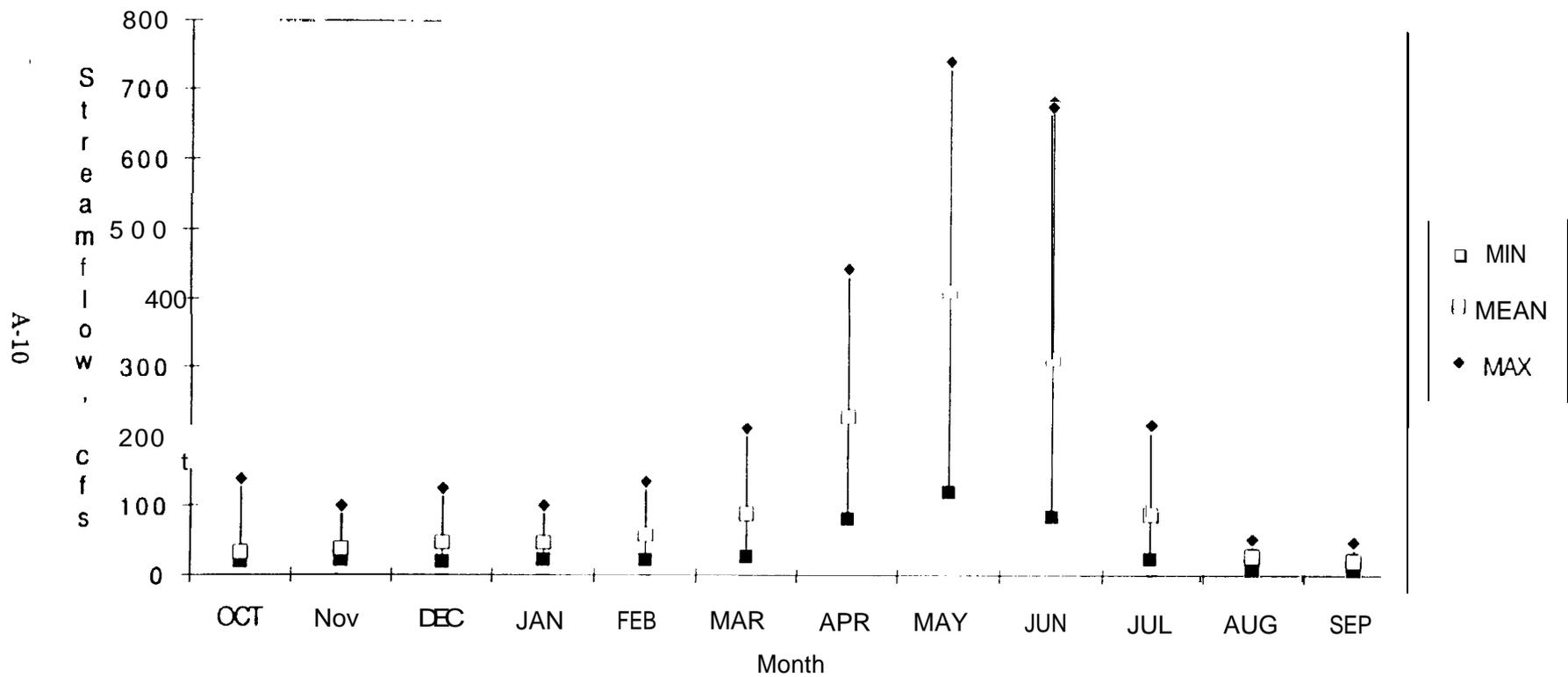


MONTHLY STREAMFLOW DATA
Data from U.S. Geological Survey

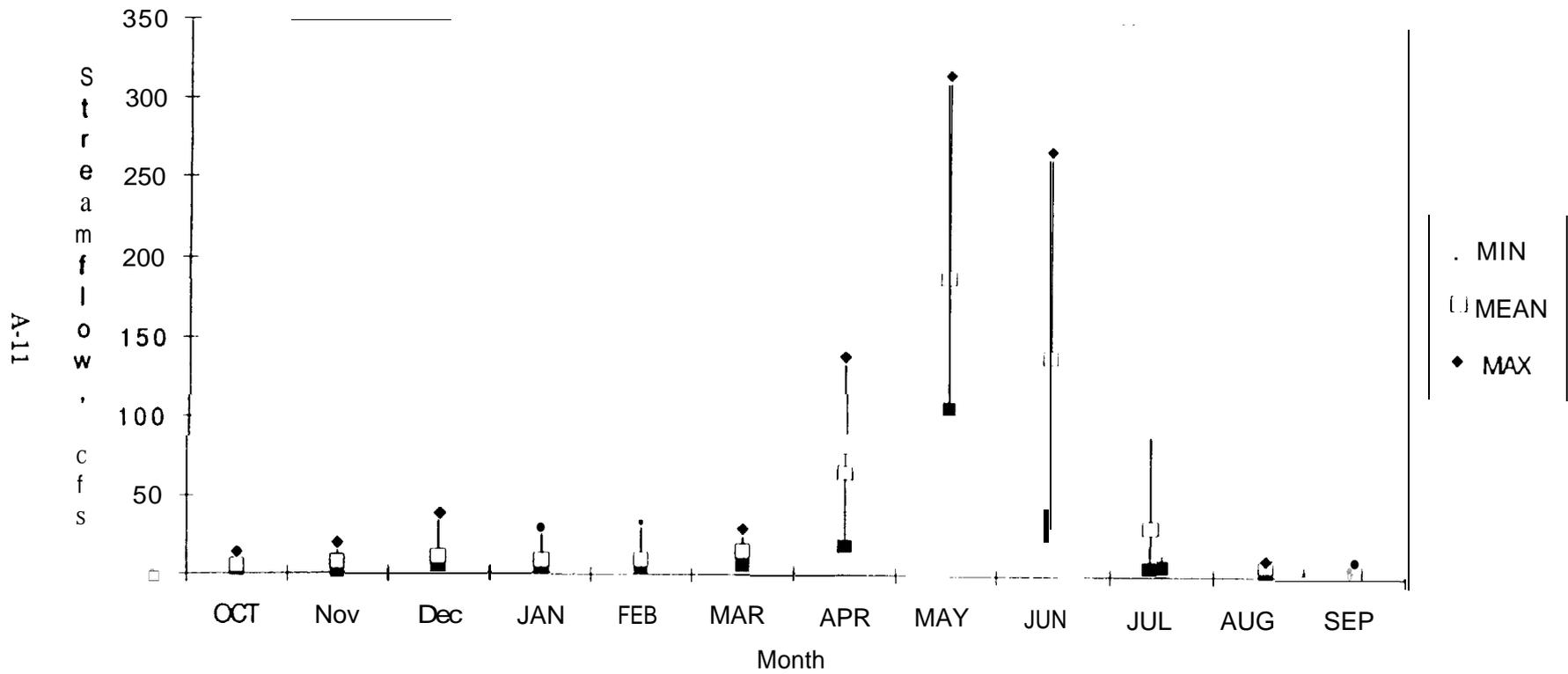
Monthly Streamflow, in cfs

Grande Ronde River near Elgin			
	MIN	MEAN	MAX
OCT	31	87	325
NOV	65	164	469
DEC	86	398	1176
JAN	90	559	1438
FEB	106	822	2760
MAR	171	1108	3605
APR	487	1764	3395
MAY	439	1879	3393
JUN	144	997	1927
JUL	11	175	629
AUG	1.7	40	140
SEP	6.9	43	117
13323500 1956-81			
Indian Creek near Imbler			
	MIN	MEAN	MAX
OCT	3.1	5.6	14
NOV	1.7	7.7	20
DEC	2.1	11	39
JAN	3.5	8.5	30
FEB	4	9.9	35
MAR	6	15	29
APR	19	66	140
MAY	107	189	316
JUN	27	140	269
JUL	6.3	32	95
AUG	3.3	6.9	10
SEP	2.8	4.8	11
13323600 1939-50			
Wallowa River at Joseph			
	MIN	MEAN	MAX
OCT	5.2	36	89
NOV	6.7	33	159
DEC	5.4	31	135
JAN	6.1	28	99
FEB	5	25	61
MAR	2.8	27	109
APR	3.1	34	173
MAY	16	168	354
JUN	159	376	567
JUL	91	343	614
AUG	22	202	397
SEP	9	59	151
13327500 1905-51			

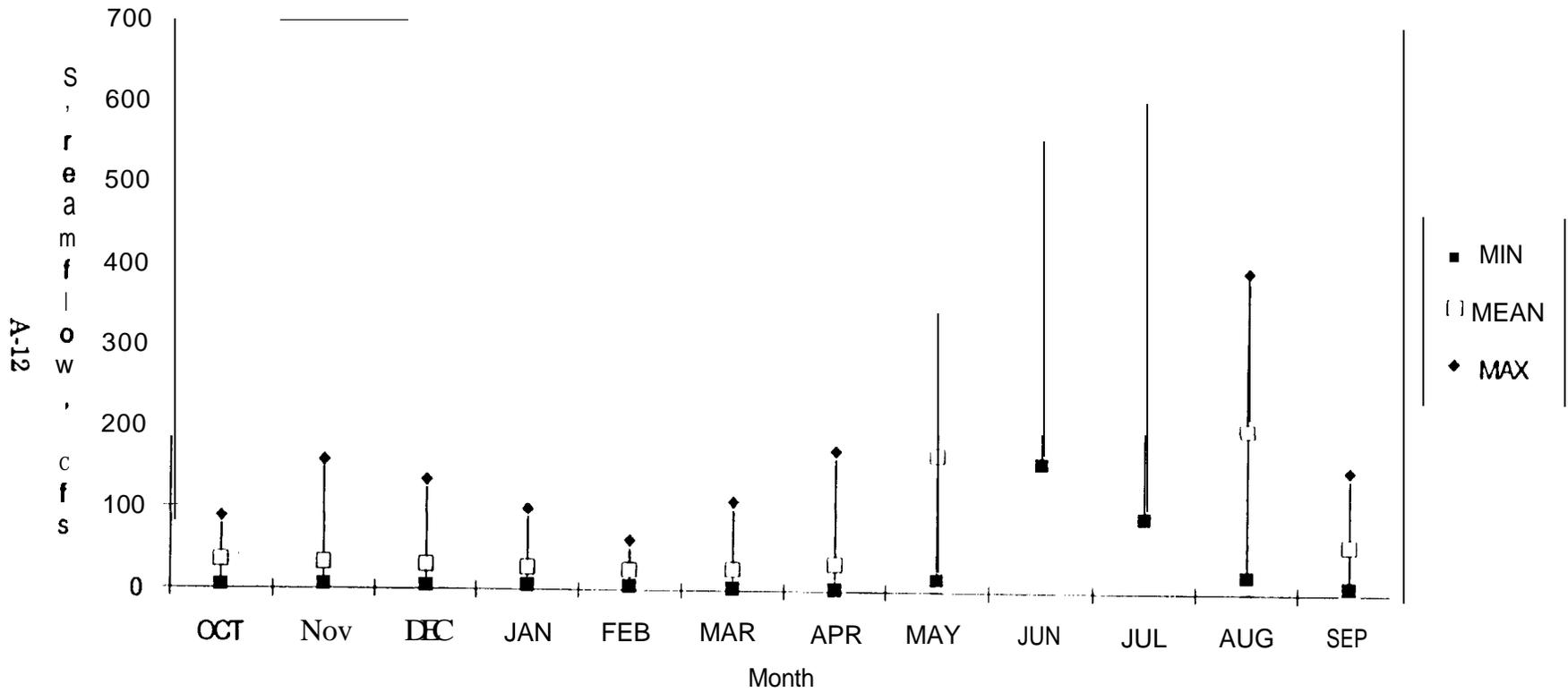
Grande Ronde River nar Elgin, Gage No. 13323500



Indian Creek near Imbler, Gage No. 13323600



Wallowa River at Joseph, Gage No. 13327500

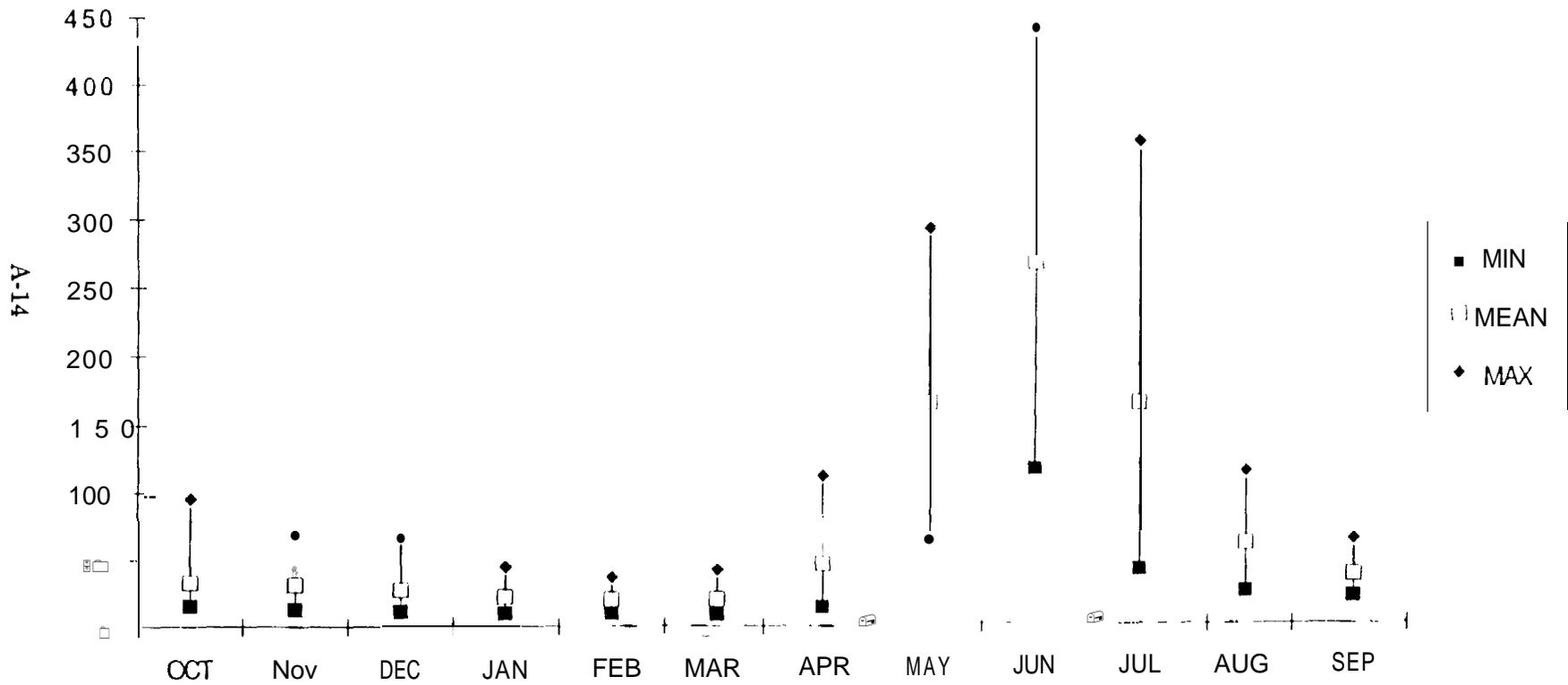


MONTHLY STREAMFLOW DATA
Data from U.S. Geological Survey

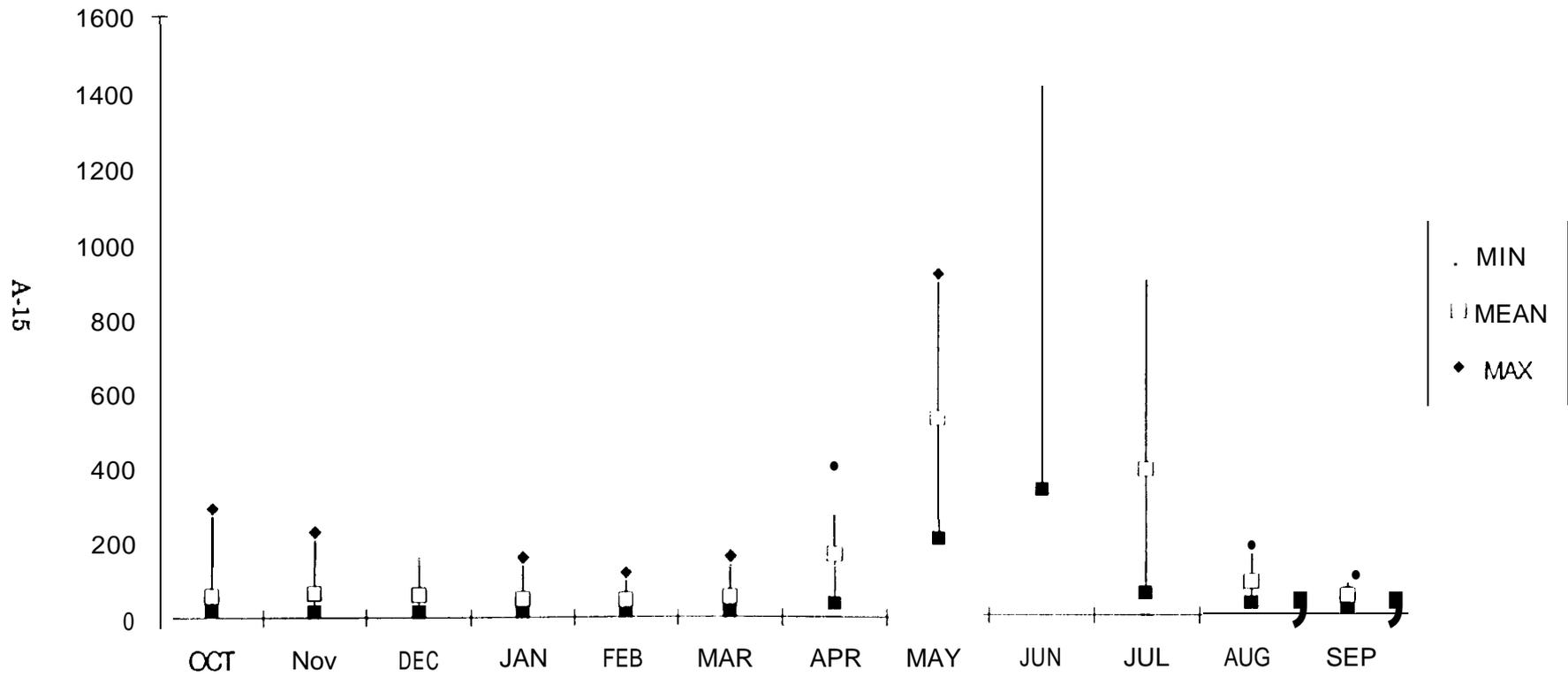
Monthly Streamflow, m cfs

Hurricane Creek near Joseph		13329500	1925-78
	MIN	MEAN	MAX
OCT	16	33	96
NOV	13	31	69
DEC	11	27	67
JAN	10	22	44
FEB	10	20	37
MAR	9	20	42
APR	14	46	111
MAY	64	165	292
JUN	116	266	439
JUL	41	164	355
AUG	25	60	113
SEP	20	36	62
Lostine River near Lostine		13330000	1913-82
	Min	MEAN	MAX
OCT	18	58	291
NOV	15	64	226
DEC	15	60	212
JAN	15	49	158
FEB	15	46	117
MAR	16	53	155
APR	36	158	393
MAY	203	525	909
JUN	332	805	1427
JUL	60	385	913
AUG	31	85	180
SEP	23	50	104
Bear Creek near Wallowa		13330500	1925-82
	MIN	MEAN	MAX
OCT	7.6	25	160
NOV	8.2	40	220
DEC	7.3	50	194
JAN	5.2	43	136
FEB	4.5	47	147
MAR	11	65	186
APR	50	171	422
MAY	138	374	682
JUN	112	402	869
JUL	19	116	388
AUG	8.1	19	38
SEP	6.3	16	44

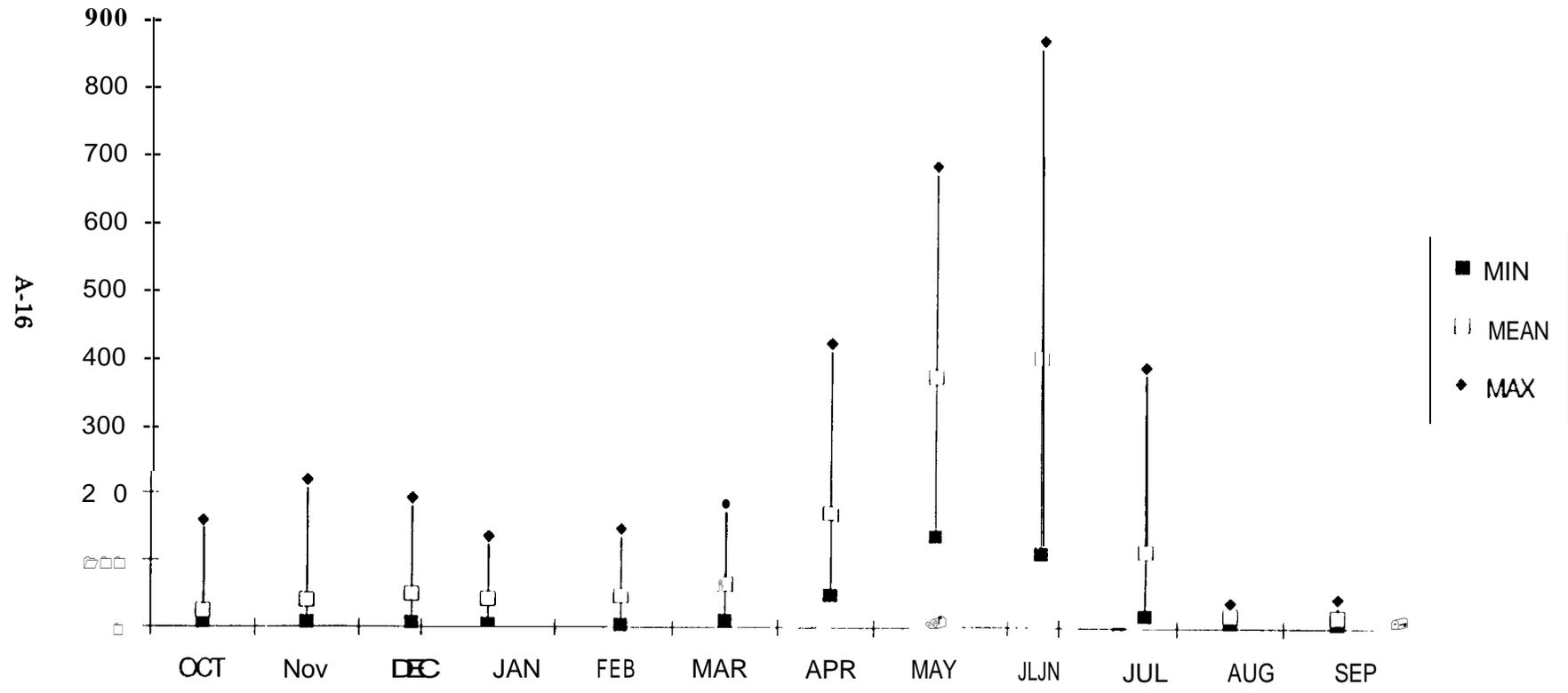
Hurricane Creek near Joseph, Gage No. 13329500



Lostline River near Losline, Gage No.13330000



Bear Creek near Wallowa, Gage No. 13330500



MONTHLY STREAMFLOW DATA
Data from U.S. Geological Survey

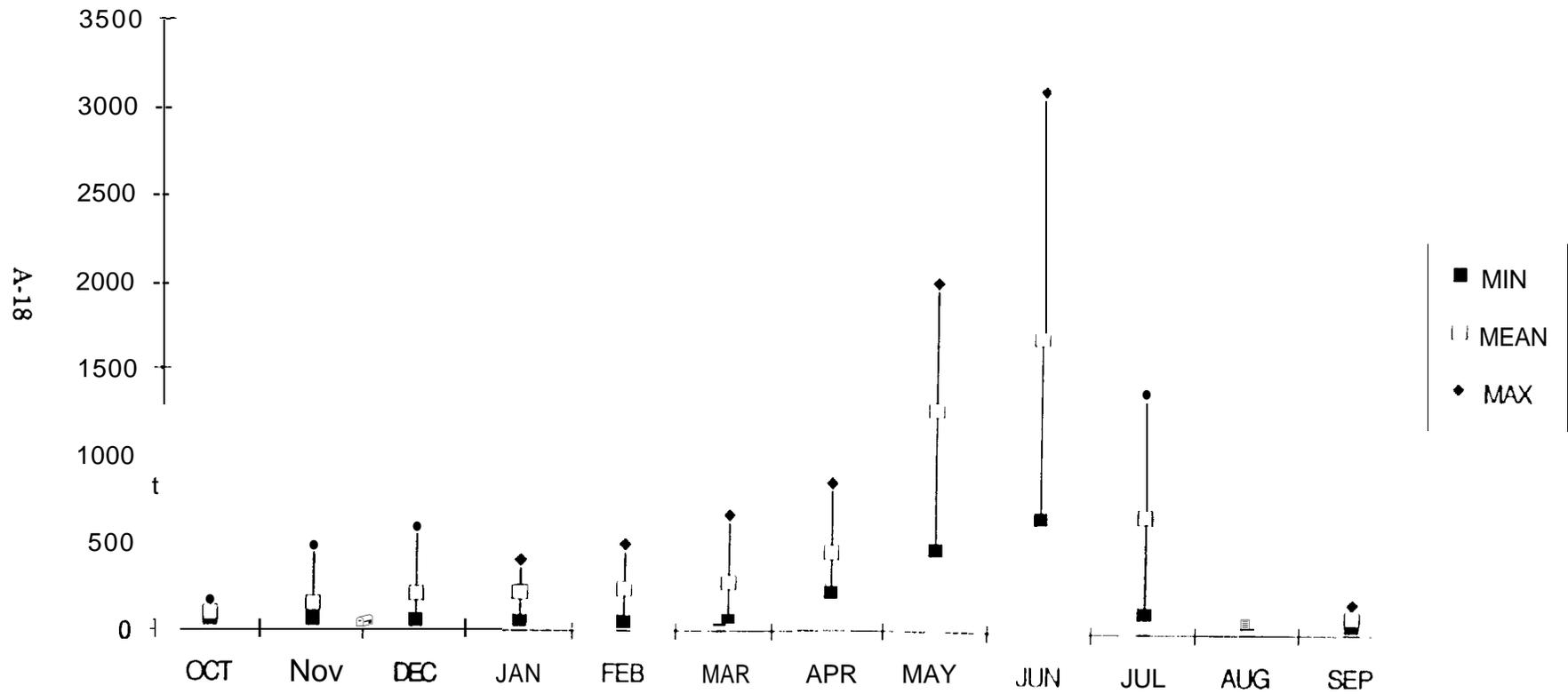
Monthly Streamflow, in cfs

Minam River at Minam				13331500	1966-82
	MIN	MEAN	MAX		
OCT	65	96	173		
NOV	62	155	493		
DEC	62	215	604		
JAN	60	228	412		
FEB	57	246	504		
MAR	67	287	672		
APR	235	464	862		
MAY	484	1289	2016		
JUN	668	1702	3125		
JUL	125	680	1392		
AUG	73	154	257		
SEP	53	99	180		

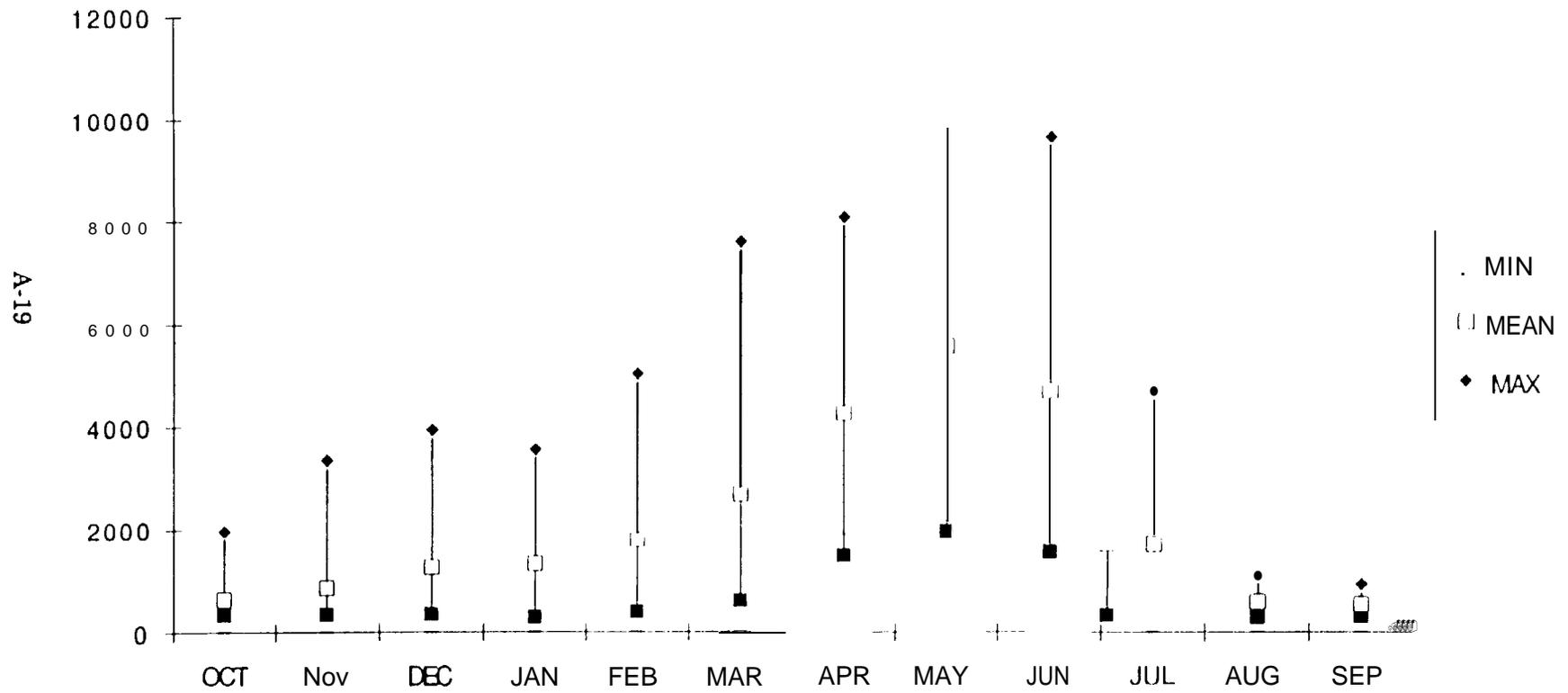
Grande Ronde River at Rondowa				13332500	1927-82
	MIN	MEAN	MAX		
OCT	343	641	1978		
NOV	342	858	3346		
DEC	358	1256	3942		
JAN	298	1326	3554		
FEB	395	1791	5029		
MAR	611	2674	7600		
APR	1498	4274	8089		
MAY	1965	5576	10010		
JUN	1561	4709	9662		
JUL	345	1712	4692		
AUG	269	589	1098		
SEP	318	543	933		

Grande Ronde River at Troy				13333000	1945-82
	MIN	MEAN	MAX		
OCT	603	915	2559		
NOV	688	1239	3023		
DEC	685	2158	6295		
JAN	702	2273	6280		
FEB	769	3095	7386		
MAR	888	3893	11520		
APR	2257	6335	10780		
MAY	2368	7656	13820		
JUN	2159	6035	11610		
JUL	520	2291	4951		
AUG	448	873	1375		
SEP	574	798	1190		

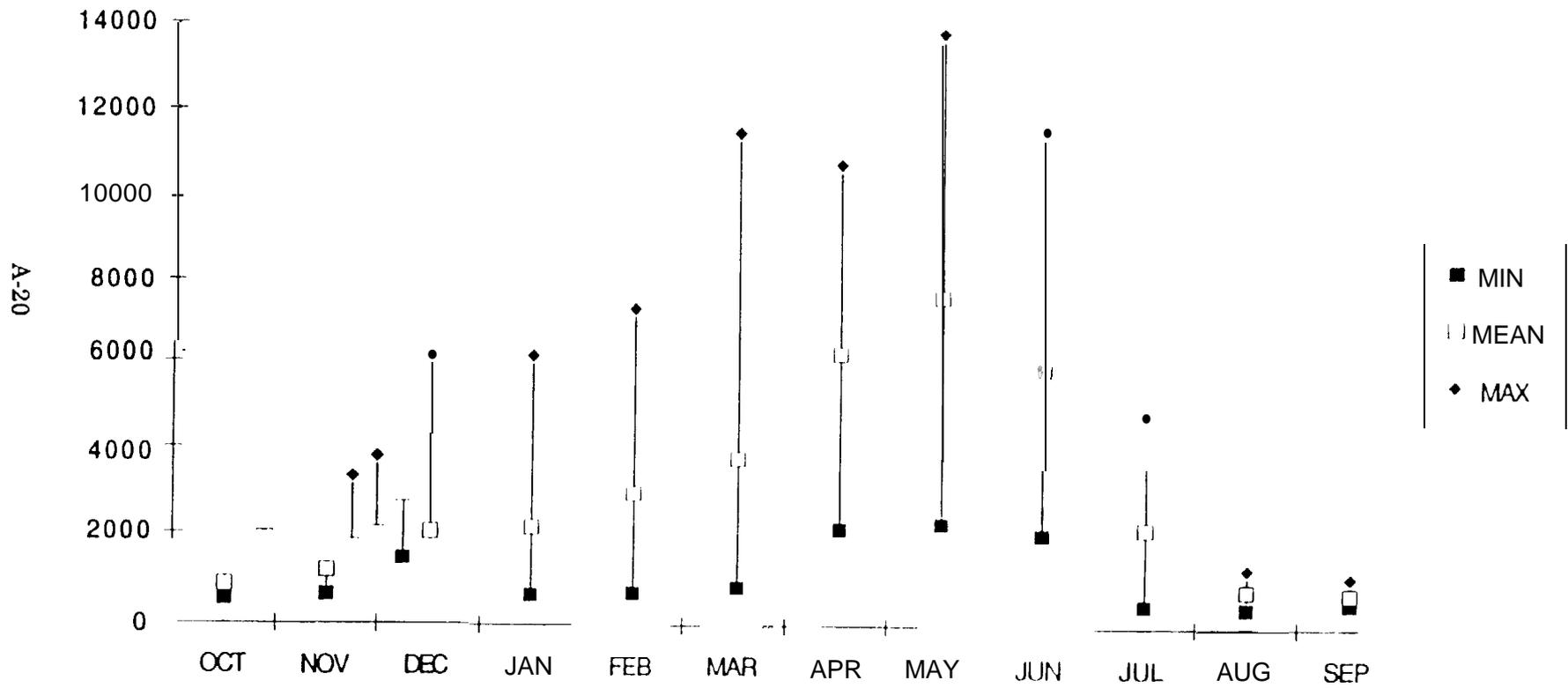
Minam River at Minam, Gage No. 13331500



Grande Ronde River at Rondowa, Gage No. 13332500



Grande Honde River at Troy, Gage No. 13333000



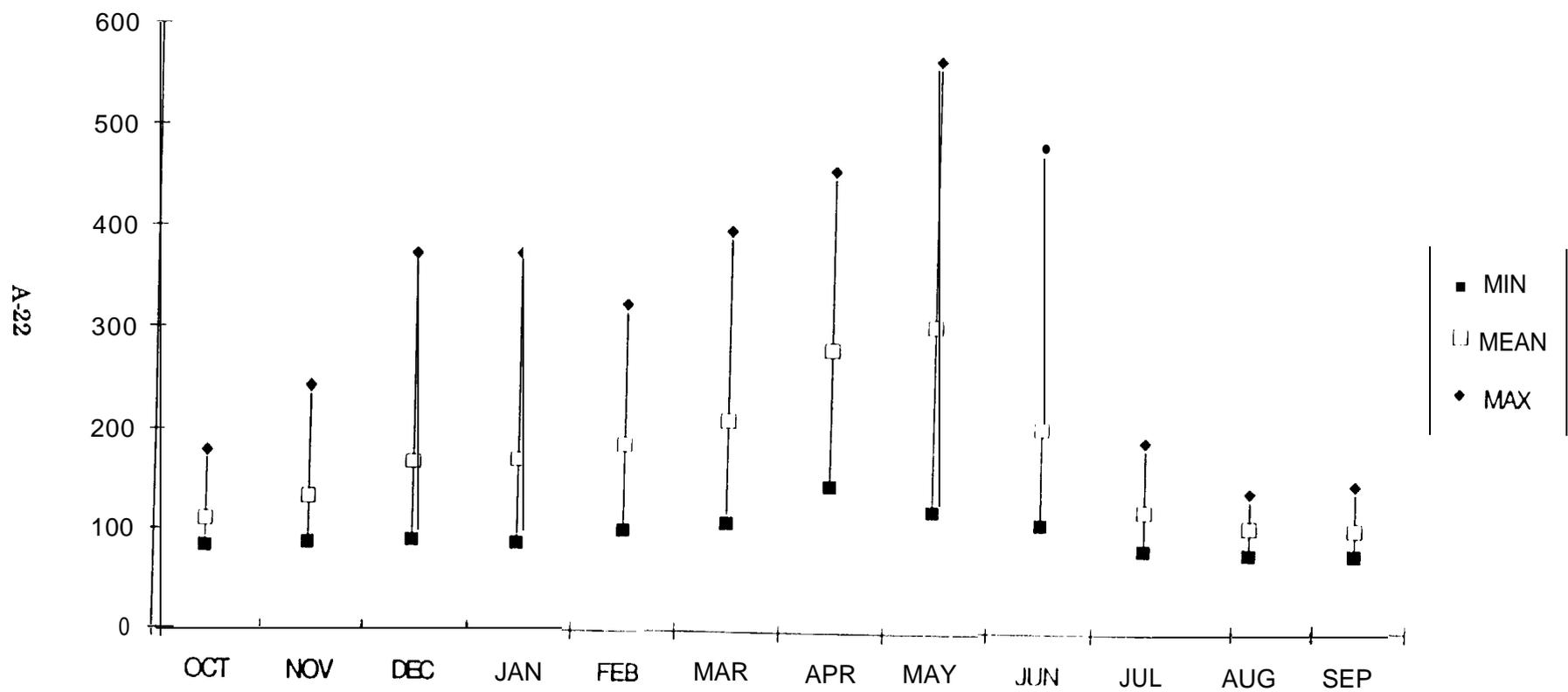
MONTHLY STREAMFLOW DATA

Data from U.S. Geological Survey

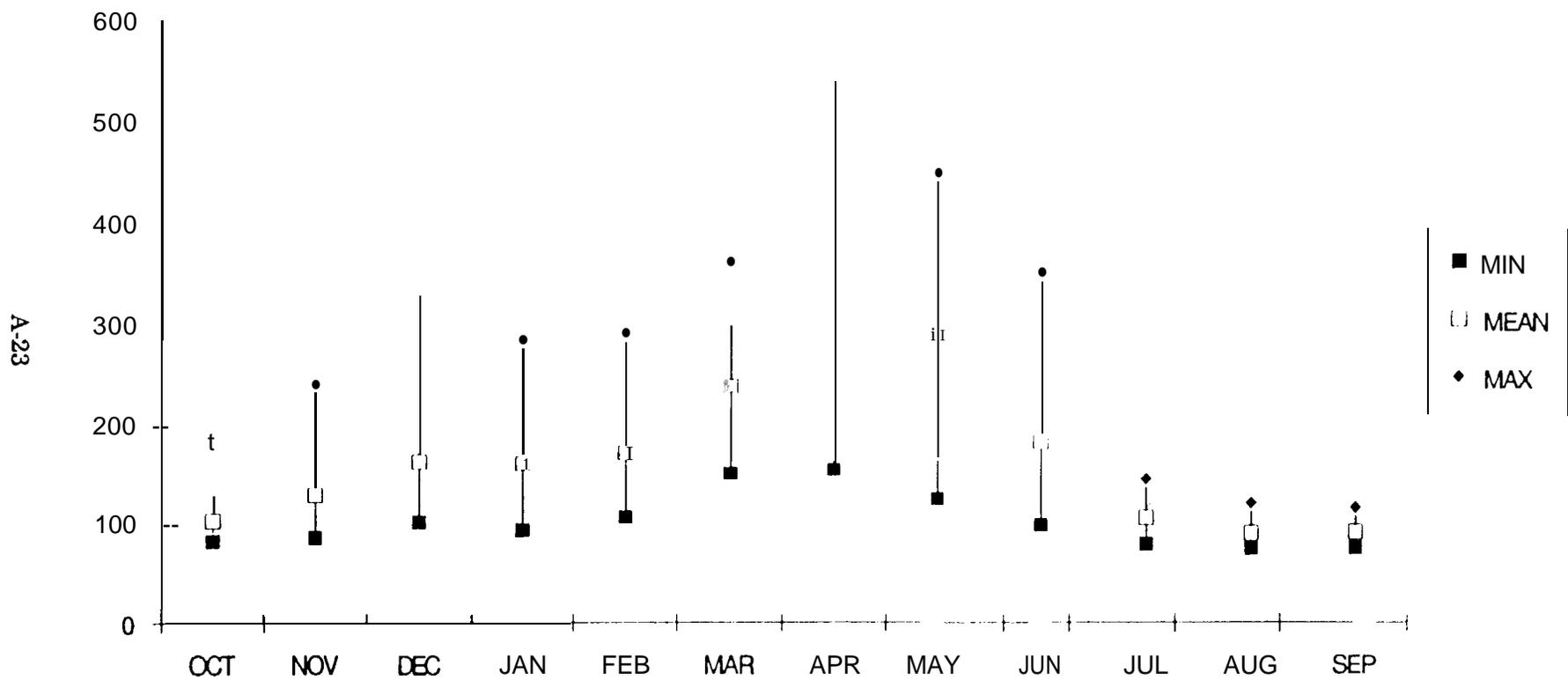
Monthly Streamflow, in cfs

S. Fork Walla Walla near Milton		14010000	1907-82
	MIN	MEAN	MAX
OCT	84	111	180
NOV	89	135	245
DEC	93	171	376
JAN	92	175	378
FEB	102	188	326
MAR	111	213	399
APR	147	282	458
MAY	123	306	569
JUN	110	206	484
JUL	85	124	193
AUG	81	108	143
SEP	82	107	151
S. Fork Walla Walla below PP&L, nr Milton		14010500	1904-45
	MIN	MEAN	MAX
OCT	81	101	180
NOV	85	126	239
DEC	100	160	335
JAN	92	158	283
FEB	105	169	290
MAR	149	237	360
APR	152	316	547
MAY	123	289	447
JUN	97	180	349
JUL	78	104	143
AUG	74	89	119
SEP	75	90	114
N. Fork Walla Walla nr Milton-Freewater		14010800	1970-82
	MIN	MEAN	MAX
OCT	6.3	9.4	16
NOV	8.3	26	86
DEC	11	62	170
JAN	12	82	175
FEB	15	85	181
MAR	43	96	236
APR	55	119	222
MAY	26	102	198
JUN	11	45	136
JUL	6.7	13	21
AUG	5.8	8.3	11
SEP	4.7	7.7	10

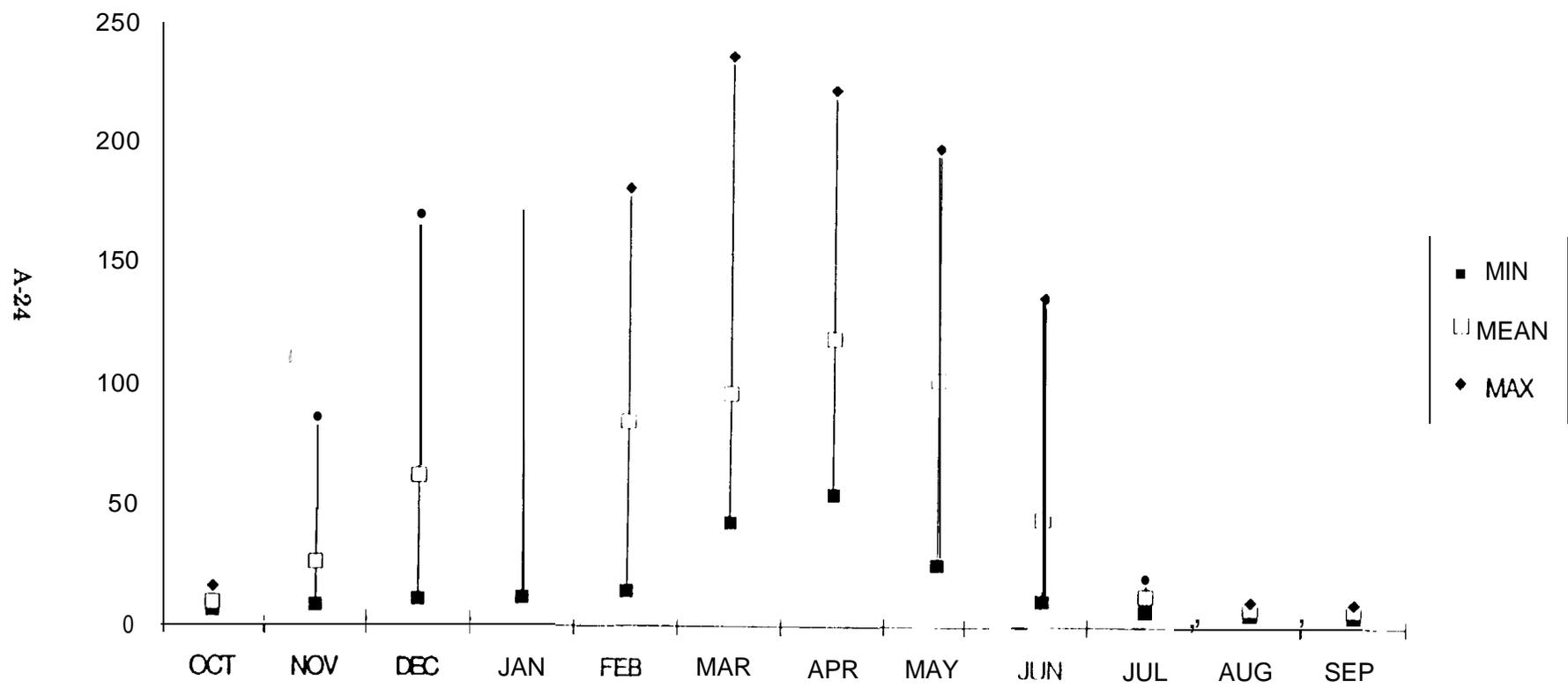
So. Fork Walla Walla River near Milton, Gage No.14010000



So. Fork Walla Walla Below Pacific Power & Light, Gage No. 14010500



No. Fork Walla Walla River near Milton-Freewater, Gage No. 14010800

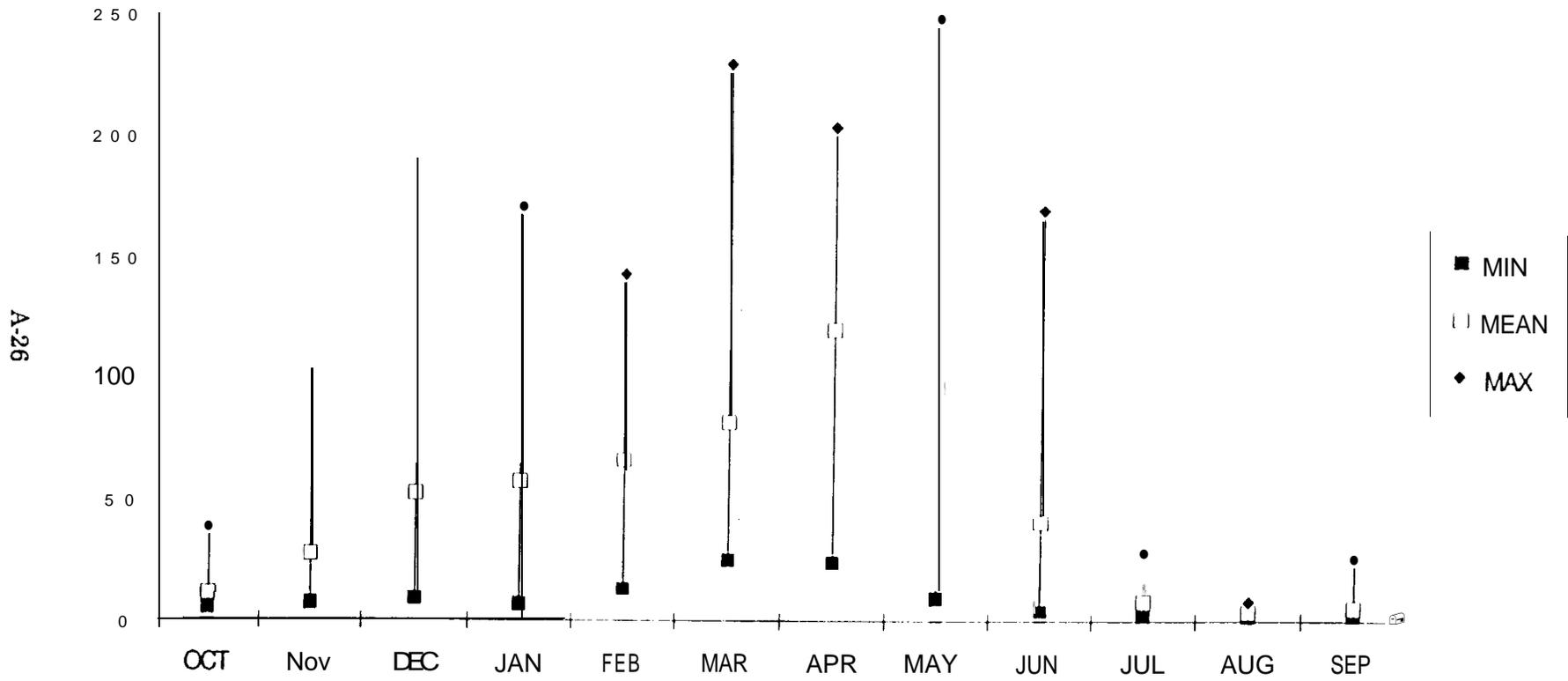


MONTHLY STREAMFLOW DATA
Data from U.S. Geological Survey

Monthly Streamflow. in cfs

N. Fork Walla Walla nr Milton		1401	1000	1931-69
	MIN	MEAN	MAX	
OCT	5.2	11	38	
NOV	7.2	27	107	
DEC	9	52	195	
JAN	6.9	57	171	
FEB	13	66	143	
MAR	25	82	230	
APR	24	120	204	
MAY	9.6	97	249	
JUN	4.4	41	170	
JUL	2.3	7.9	28	
AUG	1.9	3.5	7.8	
SEP	2.1	5.3	26	

No Fork Walla Walla River near Milton, Gage No. 1401100



APPENDIX B

SUMMARY OF WATER TEMPERATURE DATA

This Appendix contains statistical information on water temperatures at locations in the Imnaha and Lostine River basins. The locations include:

- Imnaha River at Marr Ranch (pages B-3 to B-5)
- Fall Creek at Marr Ranch(pages B-6 to B-8)
- Fence Creek at Marr Ranch (pages B-9 to B-11)
- Little Sheep Creek (pages B-12 to B-14)
- Lostine River at Stratheam Ranch (pages B-15 to B-17).

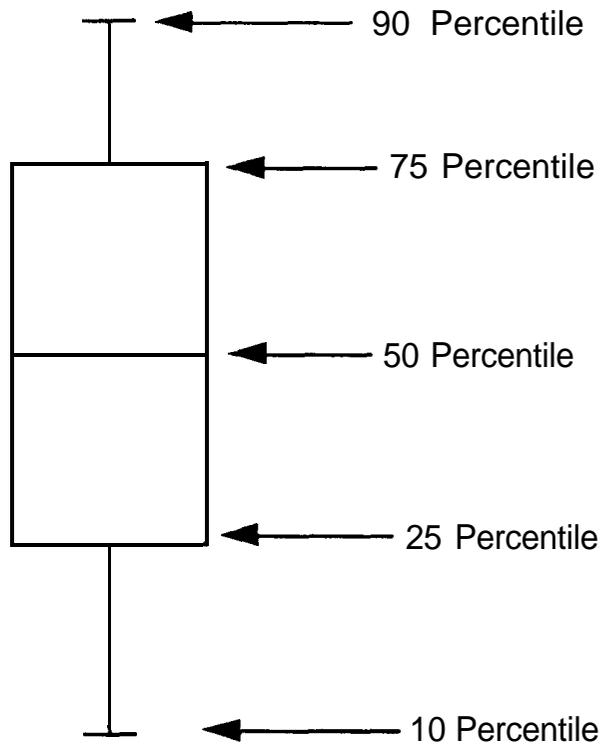
The data was collected from in-situ Tempmentor installed and monitored by the Nez Perce Tribal Fisheries Office during 1990 and 1991. With the exception of the Little Sheep Creek site, all sites have 8 to 13 months of coverage.

Data Analysis

The data was collected at 0.5 to 1-hour intervals. Daily maximums, minimums, and averages were calculated from the original data set. The temperature data was entered into the computer as maximum, minimum, and average daily temperatures. Descriptive statistical information on a monthly basis was developed using Statview computer software. The following parameters were generated on a monthly basis for each site:

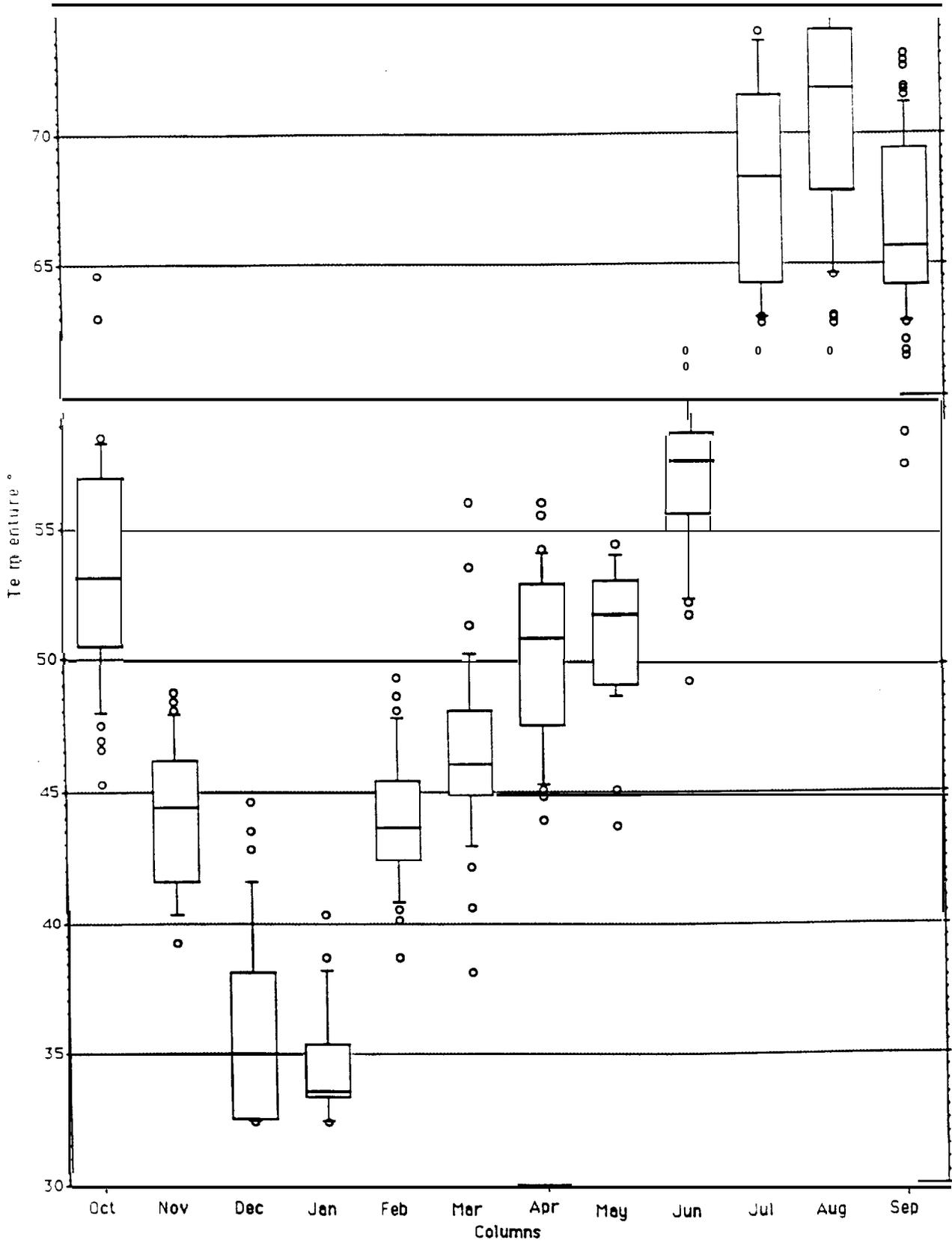
Mean
Standard Deviation
Standard Error
Variance
Coefficient of Variation
Number of Observations
Minimum
Maximum Range
Sum
Sum of Squares
Number Missing
Percentiles
 #< 10th %
 10th%
 25th%
 50th %
 75th %
 #> 90th %

The daily temperature data is represented graphically in the following form:

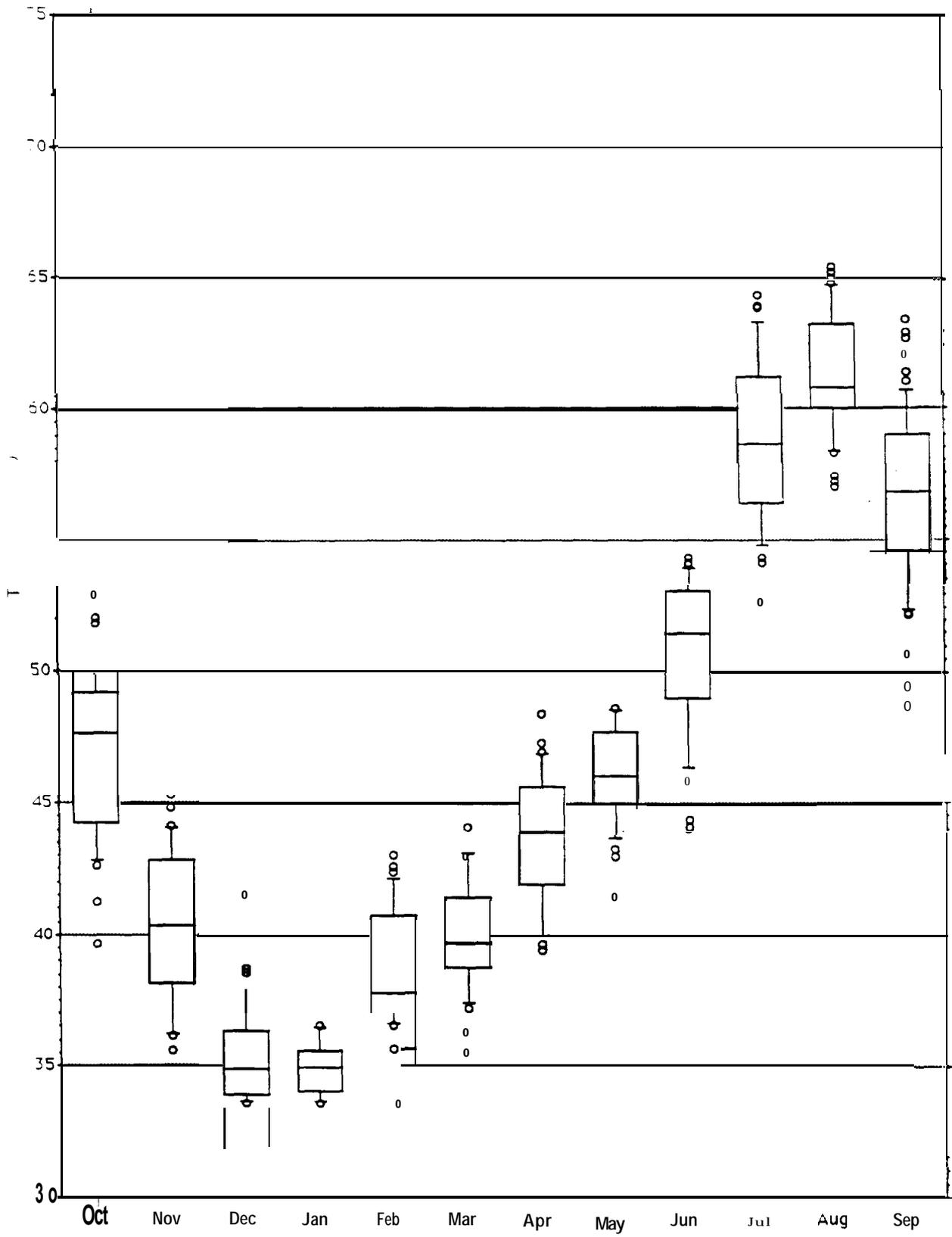


Circles above and below the 10 and 90 percentile limits represent discrete values less than or greater than these two limits.

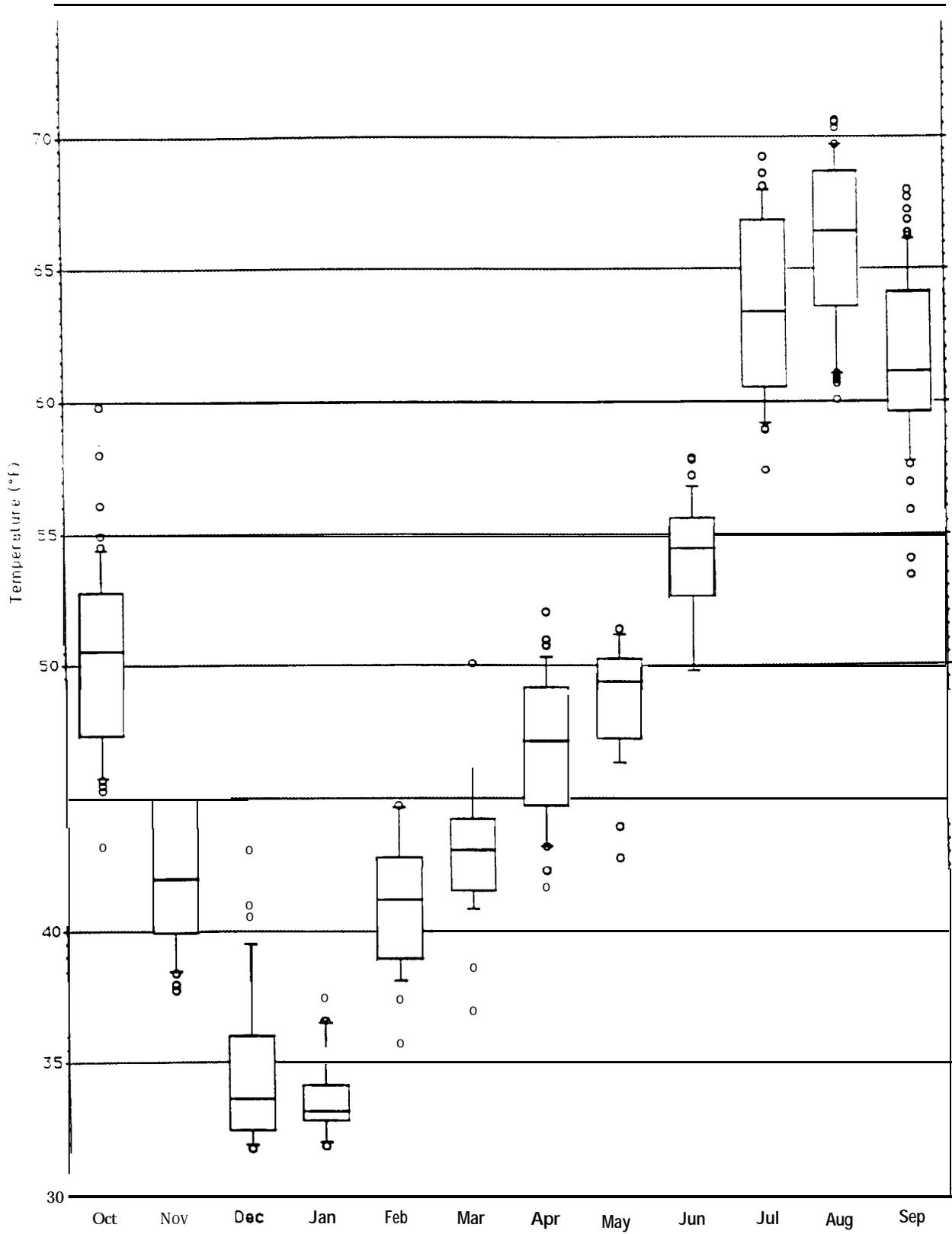
MARR Daily Maximums



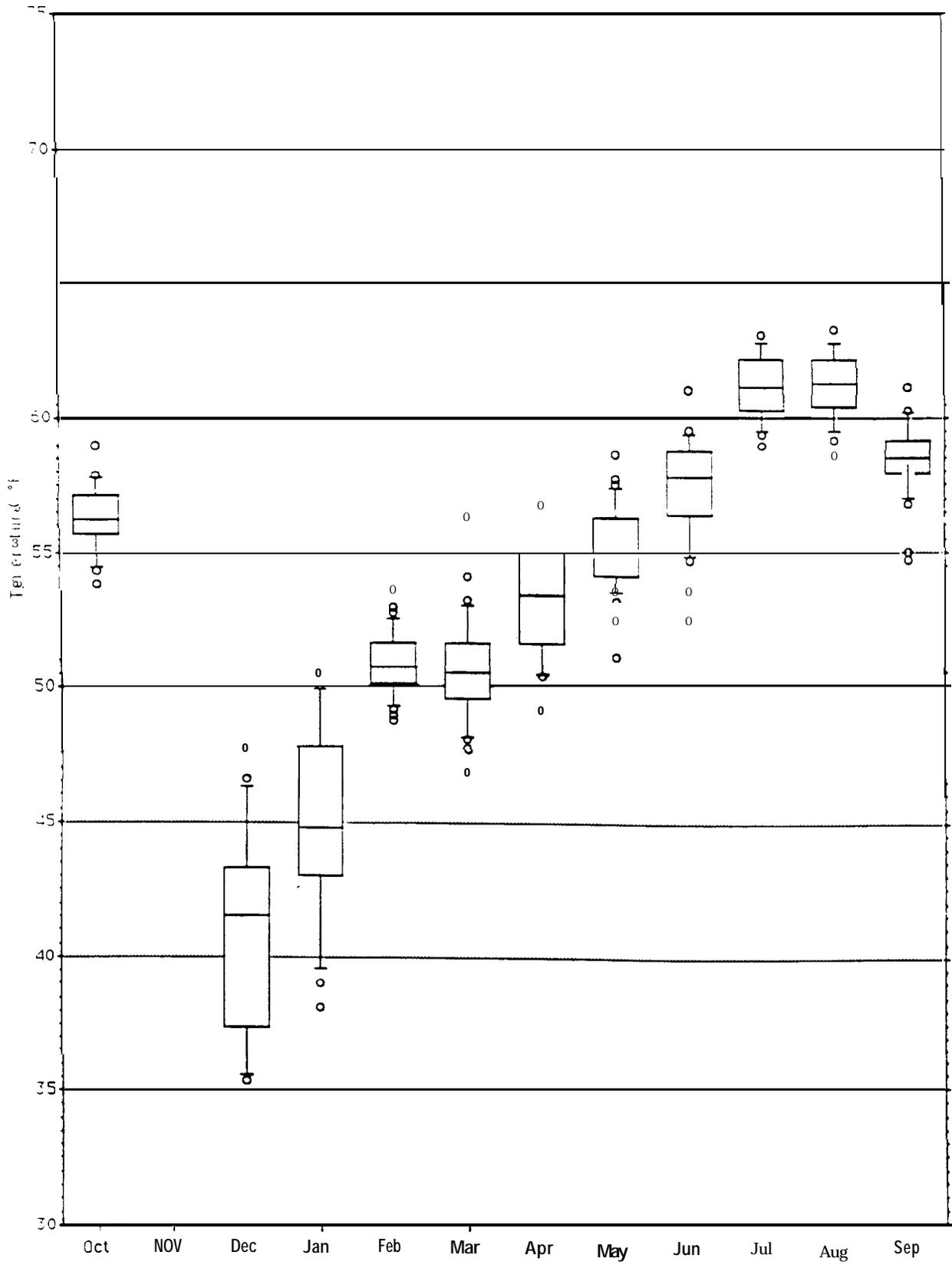
MARR Daily Minimums



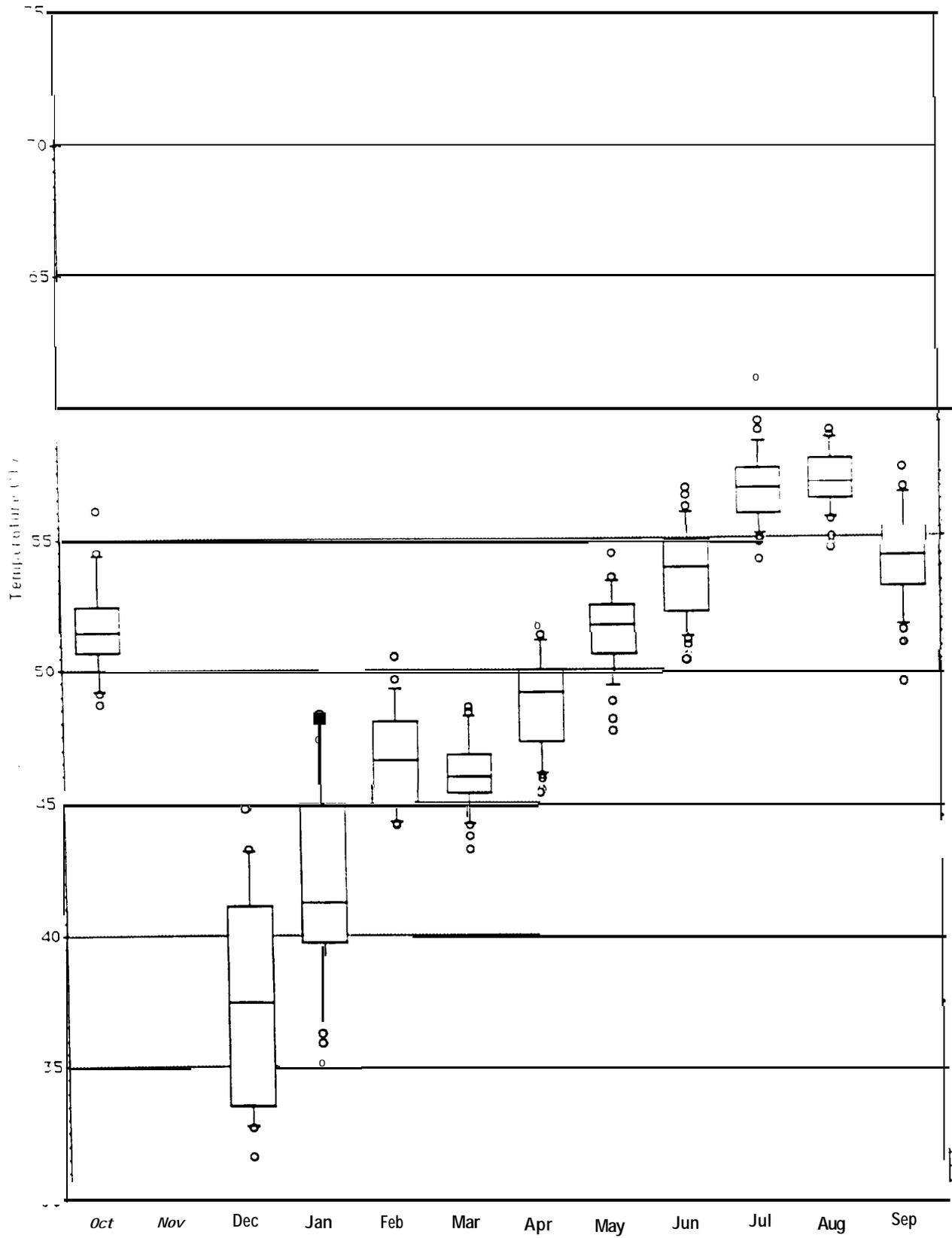
MARR Daily Averages



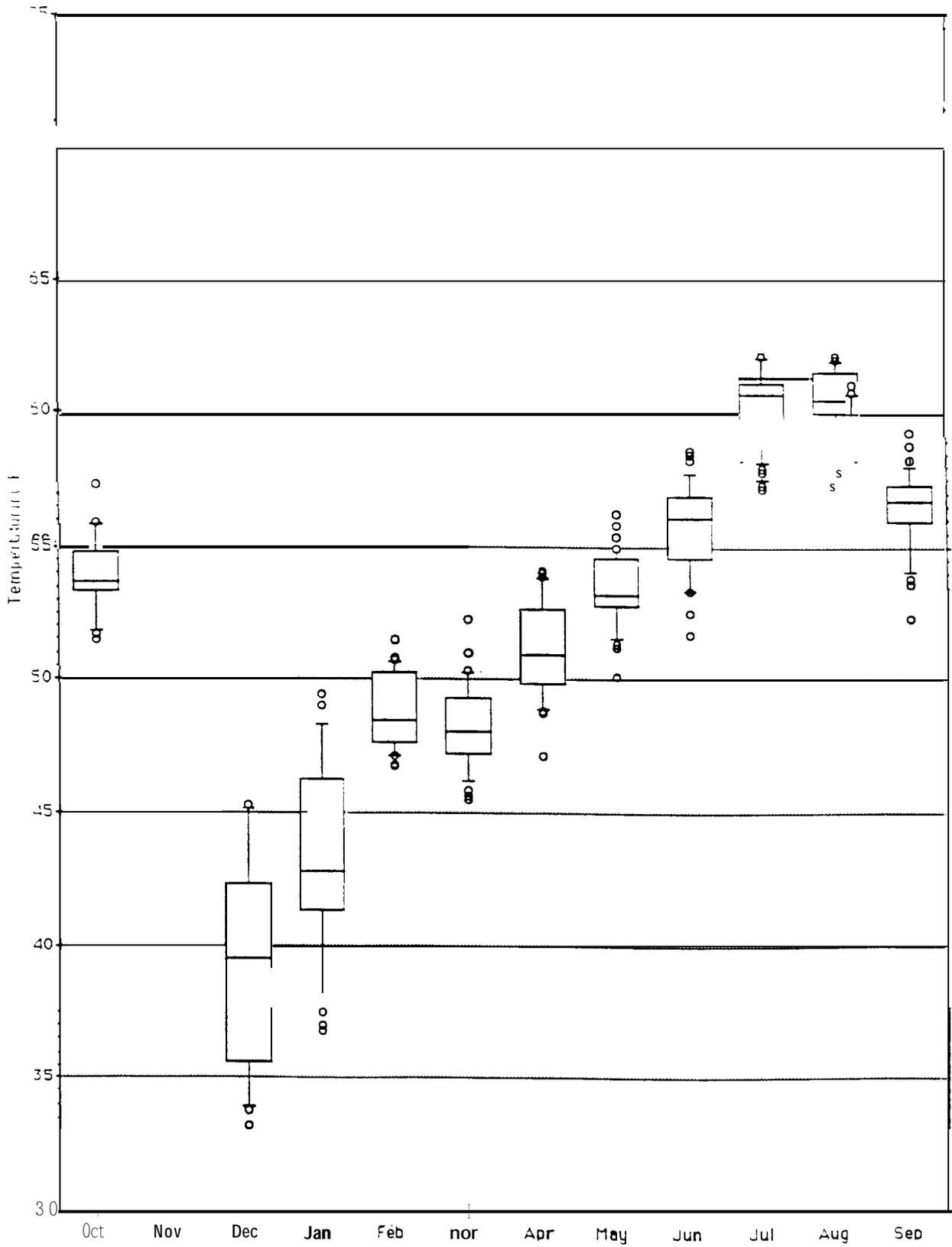
FALL CREEK Daily Maximums



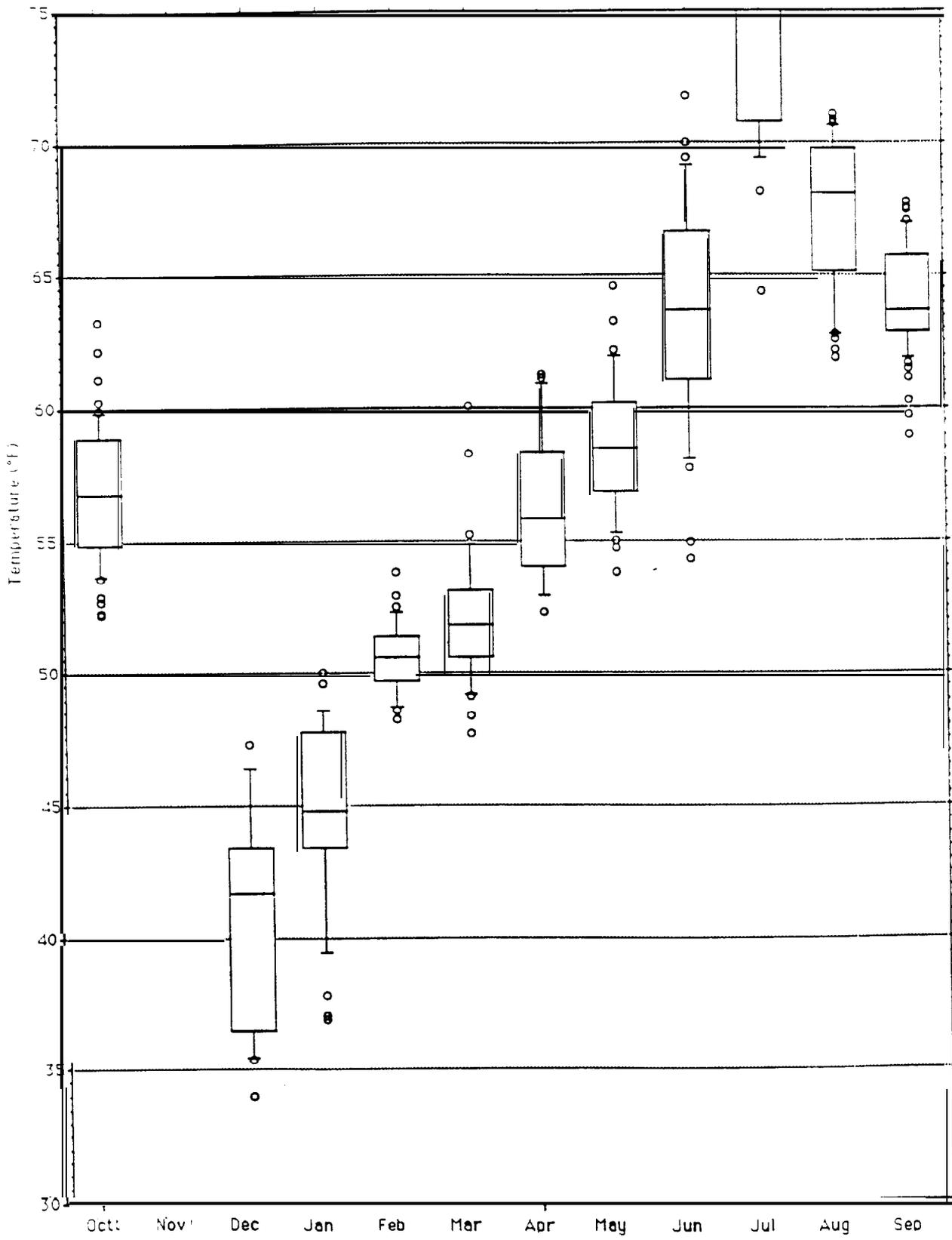
FALL CREEK Daily Minimums



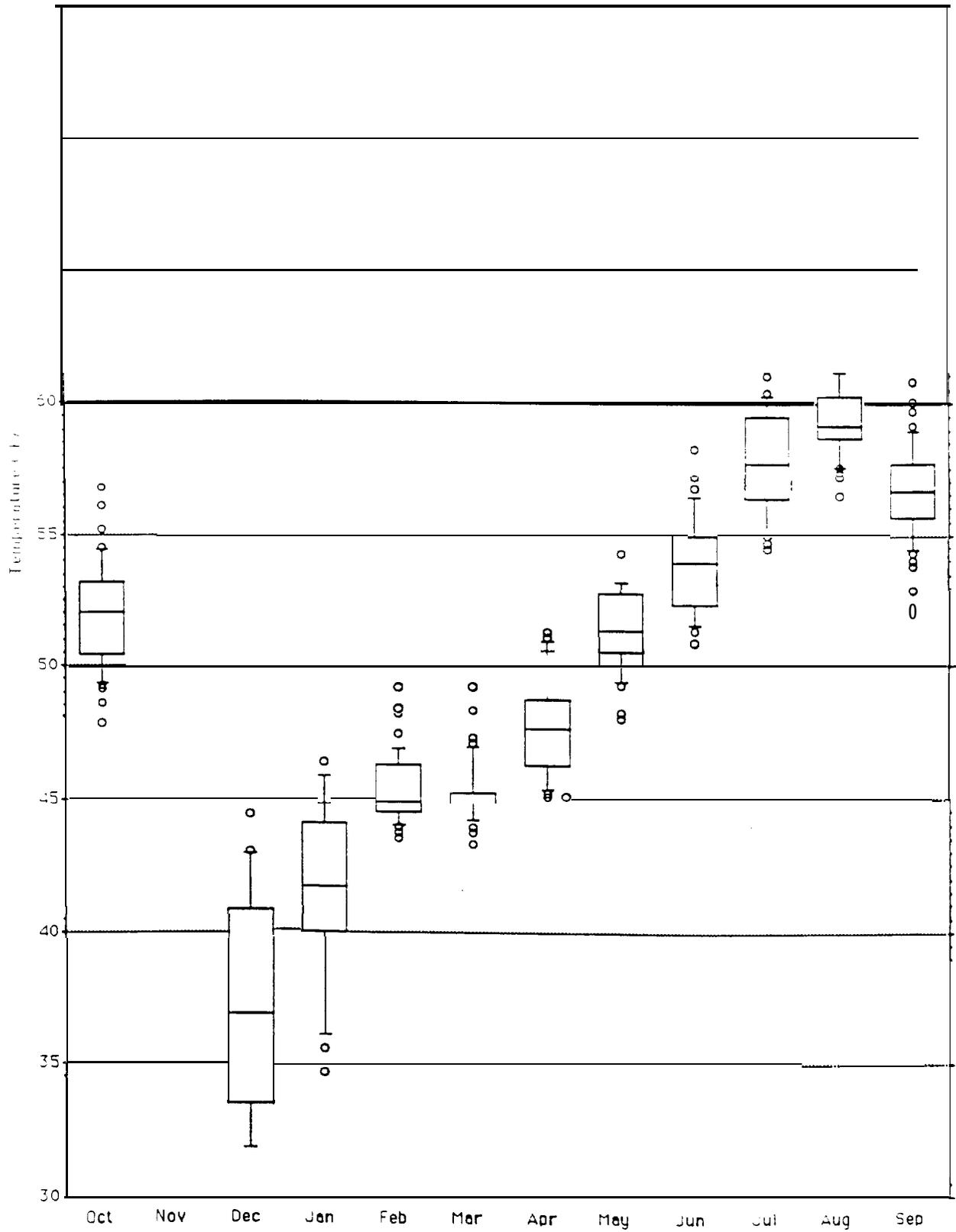
FALL CREEK Daily Averages



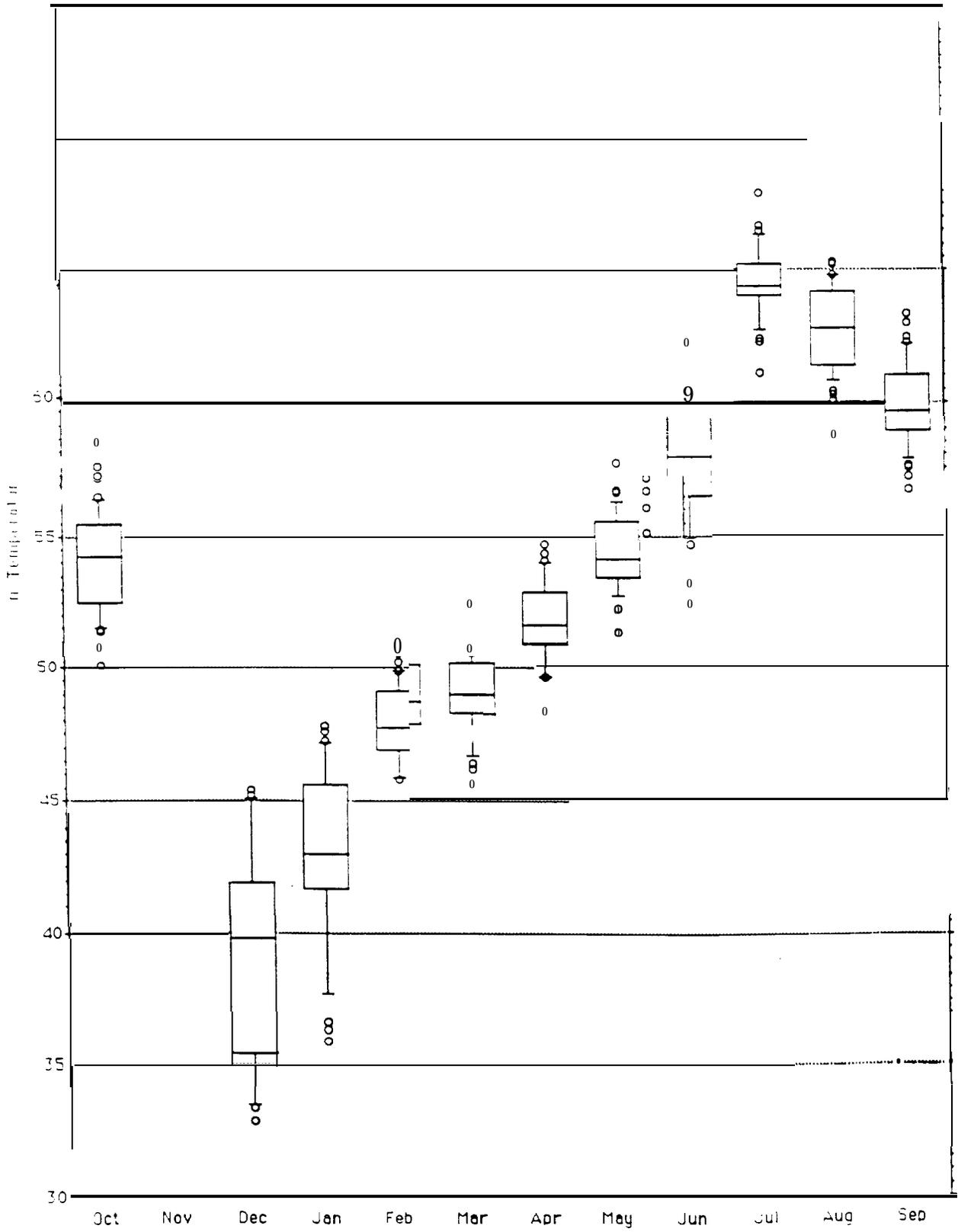
FENCE Daily Maximums



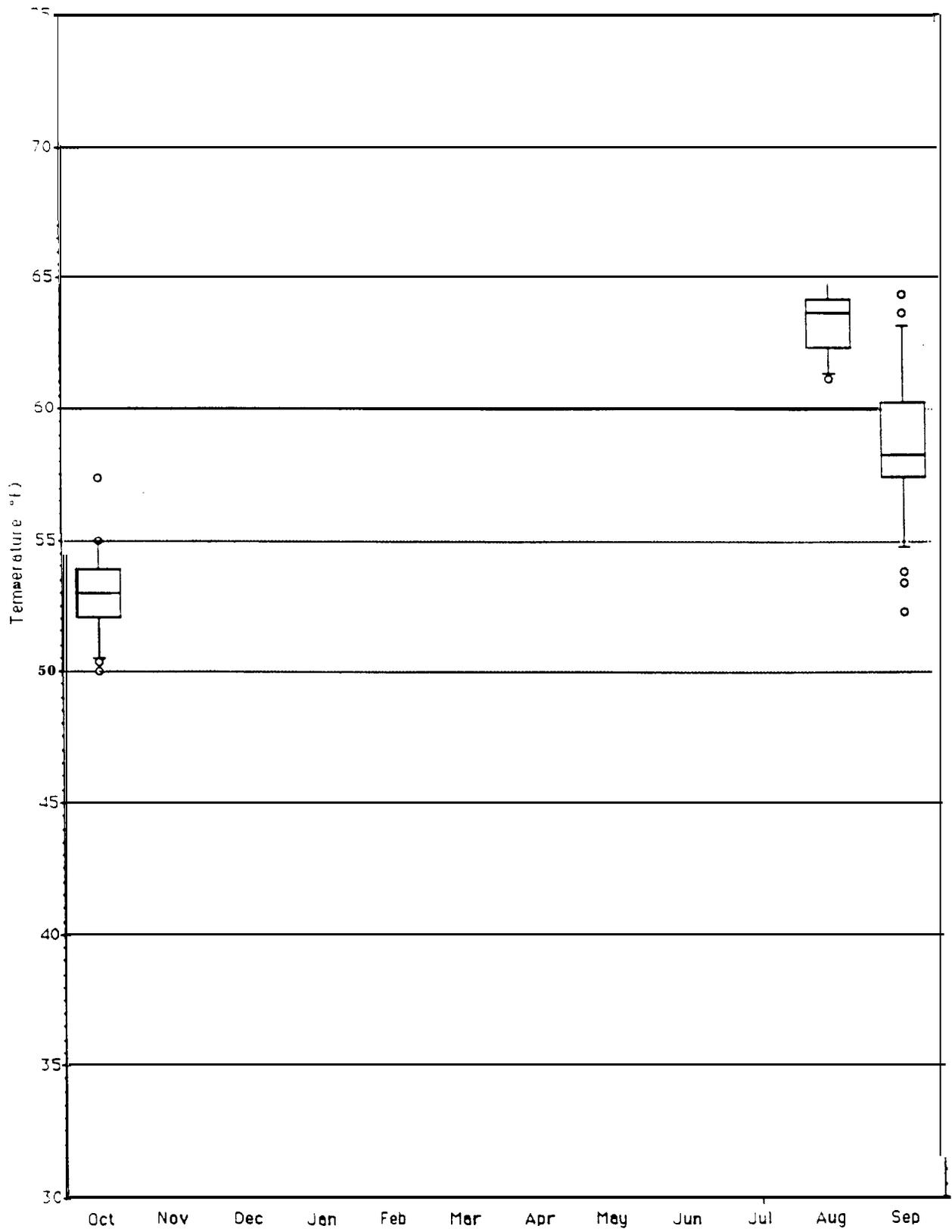
ENCE Daily Minimums



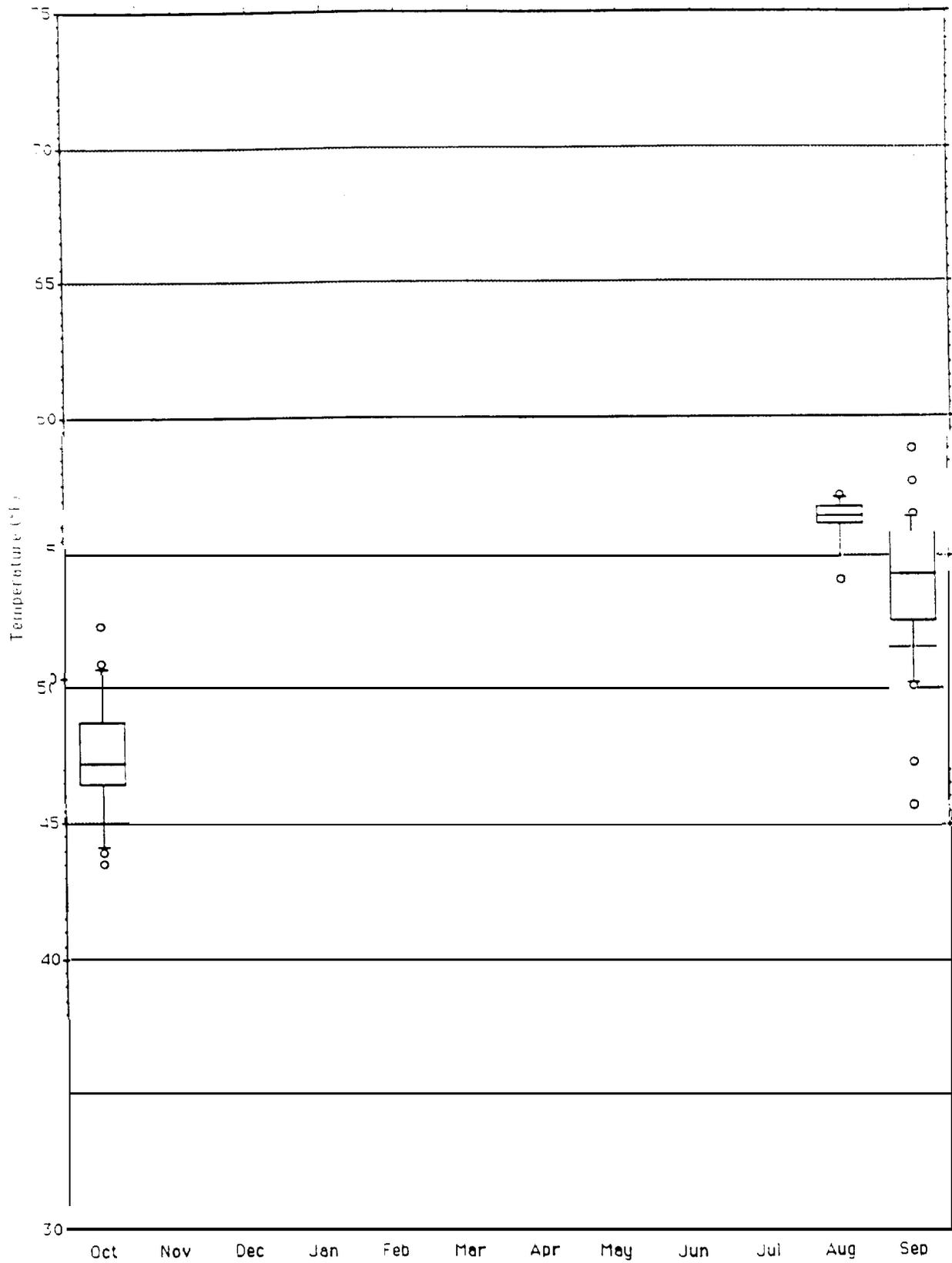
FENCE Daily Averages



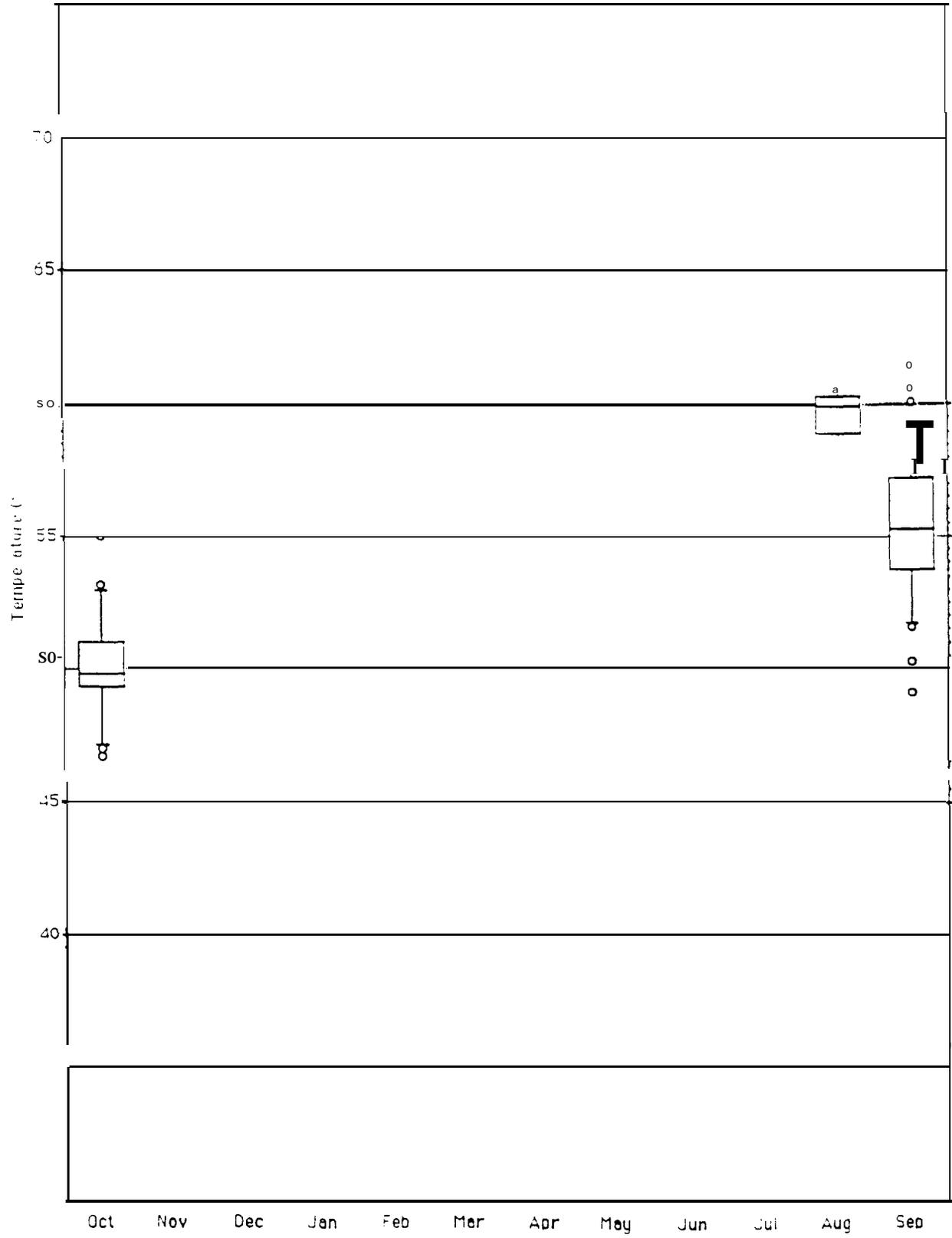
LITTLE SHEEP Daily Maximums



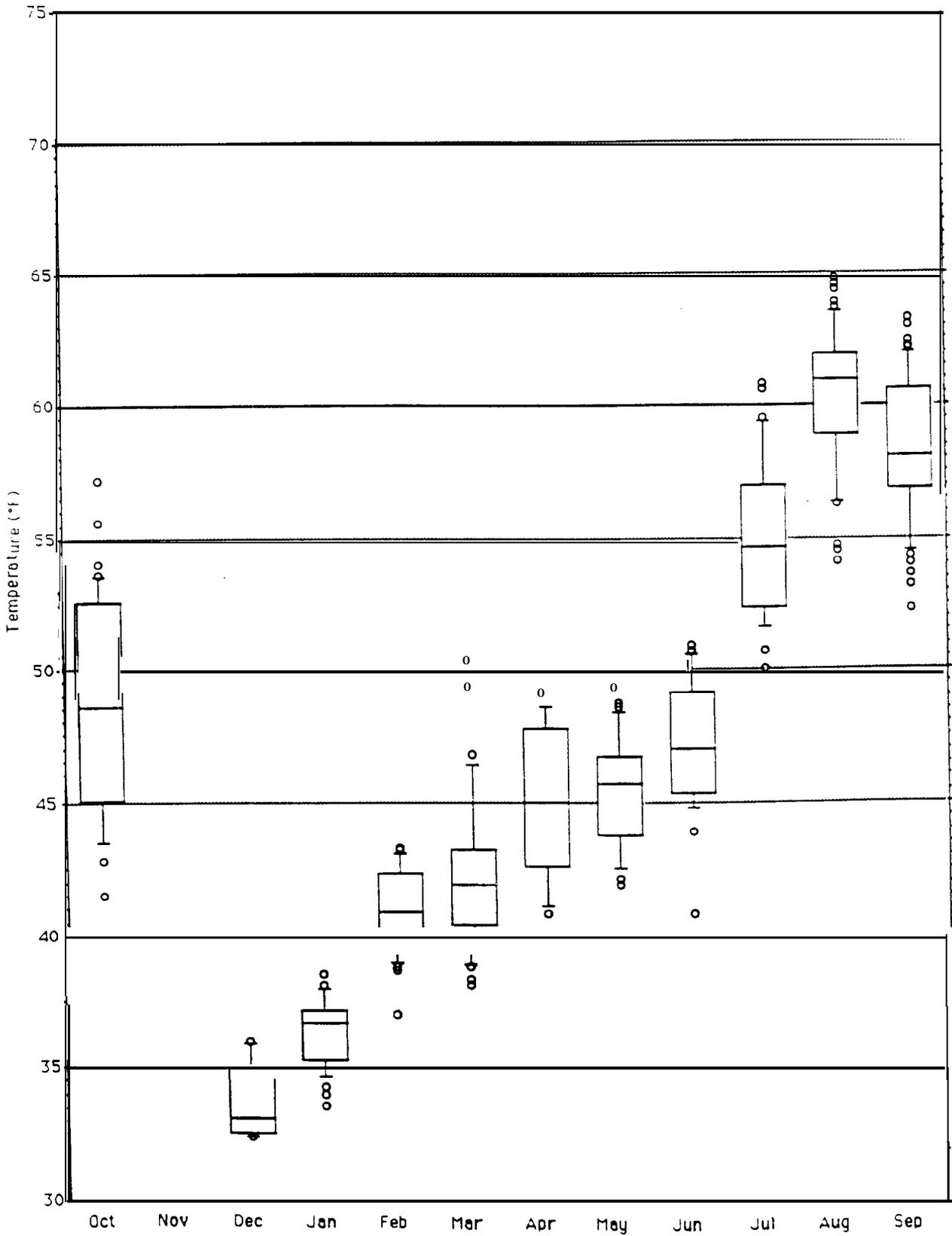
LITTLE SHEEP Daily Minimums



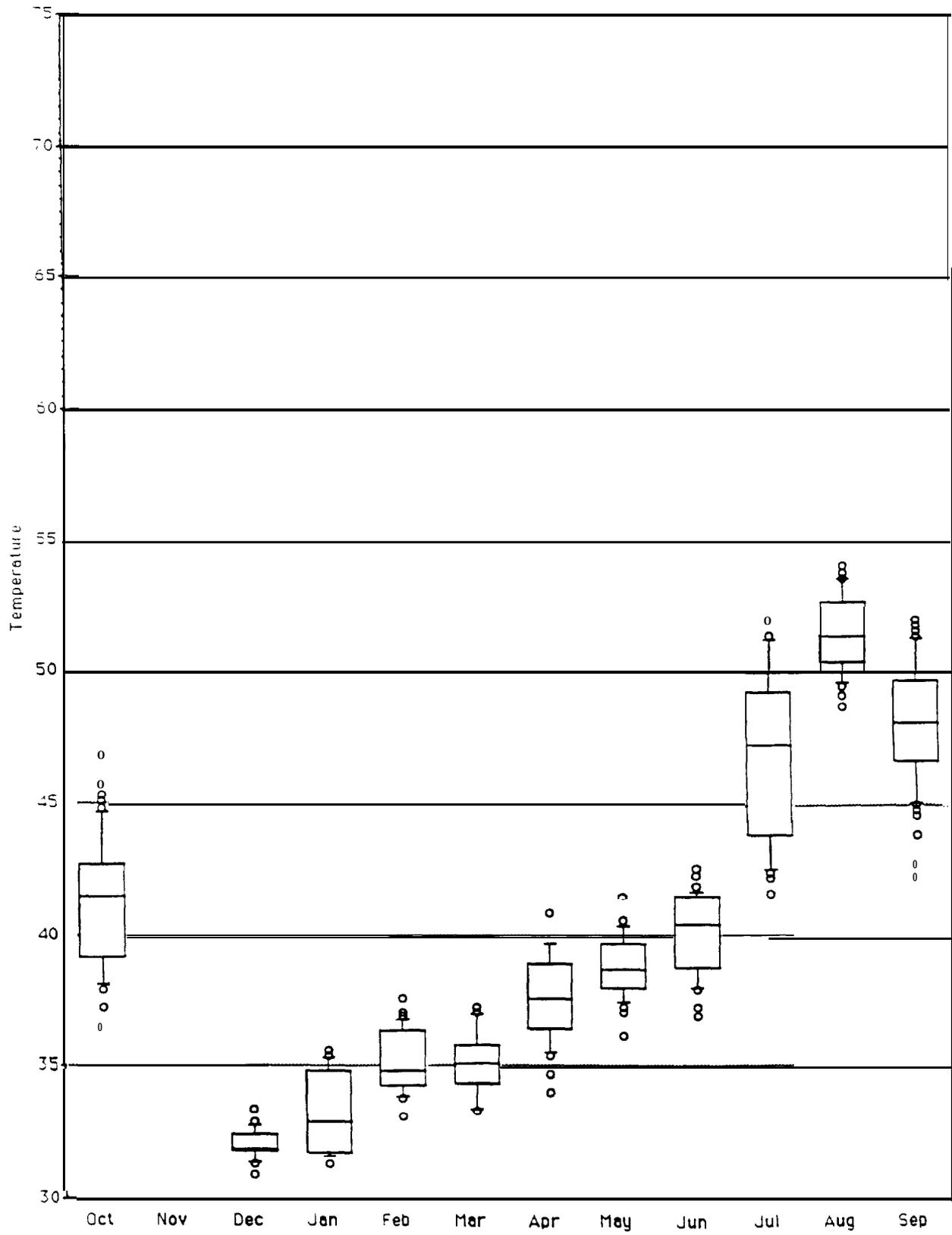
LITTLE SHEEP Daily Averages



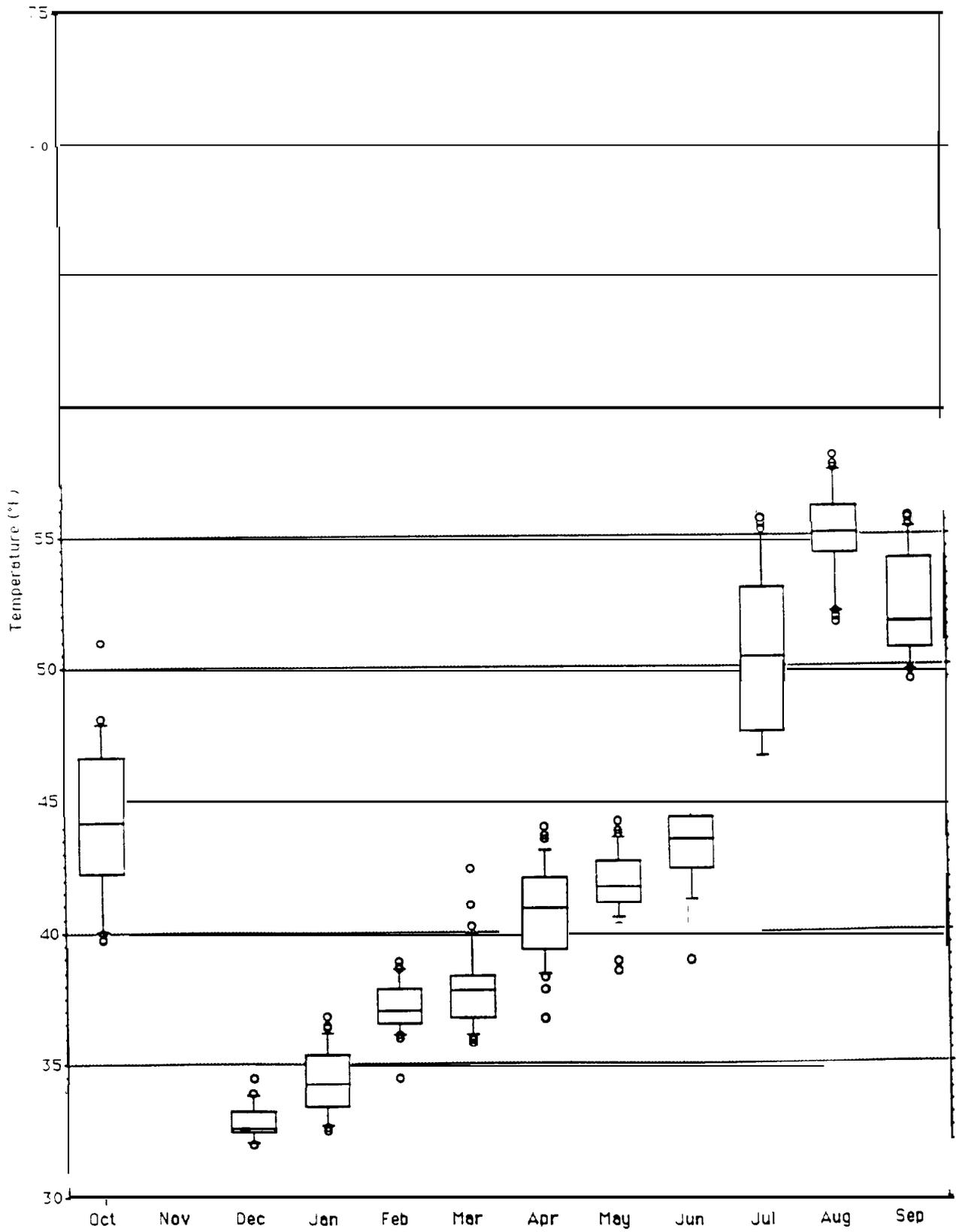
LOSTINE Daily Maximums



LOSTINE Daily Minimums



LOSTINE Daily Averages



APPENDIX C

SUMMARY OF WELL LOGS

GRANDE RONDE **RIVER BASIN** SITES

Beaver Creek Area.

Well Owner and location	Depth (feet)	static Water Level (feet)	Yield (gpm)	Specific Capacity (gpm/ft)	Temp. °
Robert Delve (4S/35E-2db)	205	+7	30		
Mike May (3S/35E-35)	300	20	30	.25	
Wayne & Joyce Turner (3S/35E-35)	405	162	75		
J. R. Able (3S/35E-36)	300	96	150	2.78	
Rita Clark (3S/36E-3ldc)	150	14	33		51

Catherine Creek at Union Area.

Well Owner and location	Depth (feet)	static Water Level (feet)	Yield (gpm)	Specific Capacity (gpm/ft)	Temp. (°F)
Robert Bowles (4S/40E-1&a)	48	30	8	.16	52
V.E. Livingston (4S/40E-18cb)	99	19	13	.24	52
Sam Leathers (4S/40E-18dc)	55	7	35	1.3	59
Boyd Tandy (4S/40E-18ab)	91	36	20	.59	50
O. C. Wilde (4S/40E-18cd)	54	7	16	1	32
M. C. Pyatt (4S/40E-18cc)	60	11	9	.36	50
E. L. Quint (4S/40E-18cc)	82	28	8	.27	52
Homer F. Richey (4S/40E-18cc)	102	29	6	.12	52
John Clausen (4S/40E-18cc)	126	24	4	.05	5
Jim Weauer (4S/40E-18a)	160	42	20	.5	52
Lewis Ash (4S/40E-18m)	150	30	13	.11	56
City of Union (4S/40E-18q)	130	12			
City of Union (4S/40E-18ca)	1295	flow	800	2.41	68
Leonard Spears (4S/40E-18)	20	16			
City of Union (4S/40E-19ab)	1686	988	1922	14.3	69
City of Union (4S/40E-19b)	1200	225	1500	9.4	72
Raymond Royals (4S/40E-19cd)	86	none	none		
Raymond Royal (4S/40E-19ca)	360	20	6	.02	54
Raymond Royal (4S/40E-19ca)	23	dry			
Ralph Titus (4S/40E-19a)	255	95	30	.21	5
Talbott Bennett (4S/40E-19da)	100	15	13	.87	76
Mr. Myron Ricker (4S/40E-20da)	208	27	6		52
Don Robinson (4S/40E-20b)	55	5	40	8	74
Don Robinson (4S/40E-20ab)	41	17	12	2	5
Theron Anderson (4S/40E-20db)	80	6	20	.57	57
City of Union (4S/40E-201)		14			

Lower Willow Creek Area (near Imbler).

Well Owner and location	Depth (feet)	Static Water Level (feet)	Yield (gpm)	Specific Capacity (gpm/ft)	Temp. (°F)
Don McKinnis (IS/39E-4nl)	53	13	5		
Russell Hug (IS/39E-5H)	402	200	22	2.2	54
James McKinnis (IS/39E-5N 1)	60				54
Cap Tuttle (IS/39E-8B 1)	116	44			53
Mr. Hauts (IS/39E-8Hl)	300	4			
George Royes (IS/39E-8Ml)	150		10		
Doyle Eisiminger (IS/39E-9cd)	465	16	250	.86	
Doyle Eisiminger (IS/39E-9cd)	1458	0	1600	10.7	70
Ruth Johnson (IS/39E-9d)	500	237	340	.68	
John Michel (IS/39E-9aa)	100		25	.69	57
Paul Johnson (IS/39E-gab)	282	16	30	.51	50
Leon Jackson (IS/39E-9dd)	52	3	15	.5	49
Dennis Haughton (IS/39E-9dd)	104	8	7.5	.11	50
Paul E. Johnson (ISI39E-9b)	90	26	68	7.56	50
Larry Starr (IS/38E-lb)	185	53	5	.04	54
J. P. Corriell (IS/38E-2ba)	105	30	20	.8	55
Jerry Talt (IS/38E-2dc)	54	11	36	1.13	50
Howard Fisher (IS/38E-2C 1)	123	8	30	1.88	
Fred Behrens (IS/38E-2RI)	103	6	10		

Elgin Area.

Well Owner and location	Depth (feet)	Static Water Level (feet)	Yield (gpm)	Specific Capacity (gpm/ft)	Temp. (°F)
Ronald Rademacher (IN/39E-9)	400	155	20	0.2	52
James Way (IN/39E-9da)	170	42	23	0.3	48
Bob Henson (IN/39E-9d)	100	19	10	0.2	
Ernest Adams (IN/39E-9)	120	17	30	0.4	50
Albert Will (IN/39E-9)	104	21	30	1	52
John Rysdam (INI39E-9cb)	260	170	18	0.2	62
Don Thomson (IN/39E-9cd)	134	38	9	0.1	50
Arie Lee Rysdam (IN/39E-9cd)	125	85	20	1	50
Ali Zubi (IN/39E-9da)	120	26	11	0.1	51
R.L.Sanders (IN/39E-9dd)	119	15	8	0.1	50
Gorden Johnson (IN/39E-9dd)	115	27	18	0.2	51
Bob Funkhouser (INI39E9dd)	230	19	7	0.1	50
Dan Looslie (IN/39E-9cb)	283	75	12	0.1	49

Sanderson Springs Area (Mill Creek).

Well Owner and location	Depth (feet)	Static Water Level (feet)	Yield (gpm)	Specific Capacity (gpm/ft)	Temp. (°F)
Eric Barker (IN/38E-35ac)	200	27	6	0.1	55
Kent Siewell (IN/38E-35)	80	21	25	0.5	
F.A. Perkins (IN/38E-35)	90	21	20	0.5	52
Marshall Kilby (IN/38E-35b)	180	21	11	0.1	
Carl Rees (IN/38E-35ab)	92	9	12	0.3	50
Roger Morris (IN/38E-35ab)	80	9	30	1.5	5
H.B. Thomas (IN/38E-35ab)	110	5	18	0.3	54
Art Morris (IN/38E-26)	90	3	60	1	52
Alvy Pfefferkorn (IN/38E-26)	80	18	35	0.5	
Claton Long (IN/38E-26cb)	91	38	14	0.5	52
Joe Scott (IN/38E-26)	80	10	18	0.3	5
Billy Sanderson (IN/38E-26bd)	80	25	15	0.3	32
Marvin Peterson (IN/38E-26)	221	36	40	0.5	52
Marvin Peterson (IN/38E-26)	186	10	28	0.3	52

WALLOWA RIVER SITES

Wallowa Hatchery Area.

Well Owner and location	Depth (feet)	Static Water Level (feet)	Yield (gpm)	Specific Capacity (gpm/ft)	Temp. °
Gilbert D Hansen (2S/44E-2cb)	65	11	30	1.88	54
Ernest Sasser (2S/44E-2)	105	8	10		
Francis Stone (2S/44E-2cc)	50	5	30	3.75	49
J. D. Bane (2S/44E-2bd)	50	14	100	8.33	5
Norman Wither-rite (2S/44E-2q)	38	4	30	15	49
Wayne Reece (2S/44E-2n)	37	6.5	21	1.68	50
Seaside Associates (2S/44E-3aa)	300	132	25	.42	5
Thane Homan (2S/44E-3ba)	135	5	16	.25	47
U.S. Corps. Engineers (2S/44E-3db)	255	5	35	.15	55
Otis Fisher (2S/44E-31)	46	6	34	2.62	49
Lee Coggins (2S/44E-3bd)	71	11	10	.18	49
OSFC (2S/44E3db)	288	6	183	4.36	52
Dept. Fish & Wildlife (2S/44E-3d)	795		145		
Dept Fish & Wildlife (2S/44E-3d)	942		120		
W. K. Zalleman C2S/44E-3g)	86	13	9	.28	48
Otis Fischer (2S/44E-3k)	35	6	18	1.8	48
Wilber Herman (2S/44E-3p)	5	11	21	3.23	52
David S. Jackman (2S/44E-7cd)	150	9	35	23	
Dave Davenport (2S/44E-16ac)	80	42	30	3.75	49
Myron Gibbs (1S/44E-44cc)	65	7	5	.1	48
Harvey Bums RV Park (1S/44E-35b)	257	35	50	.48	5
Don Smith (1S/44E-35)	270	200	5	.02	51
JD Bane (1S/44E35bd)	121	10	280	3.1	5

Hayes Fork - Prairie Creek Area.

Well Owner and location	Depth (feet)	static Water Level (feet)	Yield (gpm)	Specific Capacity (gpm/ft)	Temp. °
Jim Hubbard (2S/45E-16ac)	57	14	40	2.5	53
Guy Boyd (2S/45E-17bb)	80	35	30	2.73	53
Kit Construction (2S/45E-17)	83	30	40	4	49
3 Running M. Ranch (2S/45E-17)	75	20	45	1	
Mike Musia (2S/45E-18)	45	1.8	35	.78	
Charles M. O'Neal (2S/45E-18)	175	41	45	.54	
John Bush (2S/45E-18aa)	79	7	40	6.7	52
Mike Kurts (2S/45E-18bb)	120	19	30	1.76	47
Glen Lathrop (2S/45E-18dd)	60	13	30	6	5

Miriam-Wallowa Confluence Area.

Well Owner and location	Depth (feet)	Static Water Level (feet)	Yield (gpm)	Specific Capacity (gpm/ft)	Temp. °
Myron Fleser (2N/41E-29)	47	+1	22	1	54
Chuck Fleser (2N/41E-29)	144	92	30	5	54

LOSTINE RIVER SITES.

strathearn RanchArea

Well Owner and location	Depth (feet)	static Water Level (feet)	Yield (gpm)	Specific Capacity (gpm/ft)	Temp. °F
Bill Norman (1S/43E-27cc)	110	45	30	1.4	51
Terry Jones (1S/43E-34aa)	240	160	10	0.2	52
Dennis Longfellow (1S/43E-27cd)	70		30	3	51
Bruce Strathearn (1S/43E-34bc)	85	38.65	30	1	5
Bruce Strathearn (1S/43E-34bc)	85	65	30	1	53

IMNAHA RIVER BASIN SITES

Imnaha Basin Well Logs

The following table lists Imnaha River area well logs on file at the Oregon Department of Water Resources. All are completed in basalt or "hard rock".

Well Owner and location	Depth (feet)	Static Water Level (feet)	Yield (gpm)	Specific Capacity (gpm/ft)	Temp. °
Dale Burrell (6 miles N of Imnaha)	230	110	20	0.2	
Kenneth Stein (6 miles N of Imnaha)	160	8	20	0.2	
Bud Maxwell (6 miles N of Imnaha)	150	15	90	1	54
Ron Kellerman (6 miles N of Imnaha)	5	10	15	1.15	56
Clyde Simmons (6 miles N of Imnaha)	102	16	30	5	56
Russell Dotson (6 miles N of Imnaha)	75	13	40	2	5
Marvin Maxwell (5 miles N of Imnaha)	260	135	16	0.2	
Paul Kriley (4.2 miles N of Imnaha)	110	60	6	0.5	
Dick Walley (3 miles N of Imnaha)	49	30	20	3	54
Dave Dummer (3 miles N of Imnaha)	72	17	15	5	48
Fred Wamock (3 miles N of Imnaha)	360	6	6	.02	
Ferman Warnock (at Imnaha)	135	29	35	0.3	
Jim Bird (at Imnaha)	250	136	30	0.3	
E.V. Ulrich (at Imnaha)	34	18	8	1	5
General Telephone Company (at Imnaha)	60	28	30	6	52
JIL Ranch (Sheep Cr., 1 mi. SW of Imnaha)	240	18	10	0.2	54
Bernard Henry (near forks of Sheep Cr.)	57	20	14	2	54
Dean Gibbs (near forks of Sheep Cr.)	150	8	30	0.4	58
Michael Royes (3 mi S-SE of Imnaha)	60	5	70	1.5	
Little Sheep Cr. Hatchery (upper Sheep Cr.)	100	10	30	3	51
Imnaha Fish Facility (31 mi. S of Imnaha)	165	41	30	3	48

WALLA WALLA RIVER BASIN SITES

Harris Park Area

Well Owner and location	Depth (feet)	static Water Level (feet)	Yield (gpm)	Specific Capacity (gpm/ft)	Temp. °F
Jim Gross (4N/37E-10cc)	85	+1	>100	1.5	57
Robert Hergert (4N/37E-10)	142	12	15	0.1	58
Umatilla Co. Parks (4N/37E-10dc)	225	10	35	0.2	5
George Kraemer (4N/37E-10)	162	24	60	0.5	58
Sam Brinker (5N/36E-25)	140	19	80		56
August T Turz (5N/36E-25d)	104	6	50		5
Bob Logan (5N/36E-25a)	145	35	45		52
David Kruse (5N/36E-25d)	150	39.	50		
Dan Harsch (5N/36E-25)	60	24	30	1.5	5
Robert TenEyck (5N/36E-26b)	77	12	50		50
Earl Frasier (5N/36E-26)	200	40			5
Leon Huber (5N/36E-26)	45	9	25	2.5	5
H. Poulsen (5N/36E-26Gl)	10	6			
Kenneth Ransom (5N/37E-3 1ac)	224	+48	125		54
Shaklenn Ardledge (5N/37E-3 1c)	140	+7	30		61

POWDER RIVER BASIN SITES

Eagle Creek Area (**upstream** from Newbridge).

Well Owner and location	Depth (feet)	static Water Level (feet)	Yield (gpm)	Specific Capacity (gpm/ft)	Temp. (°F)
Mary Jo Stevens (8S/45E-20dc)	190	102	8		49
Steve Eaton (8SA5E-29d)	55	22	6		49
James Clemmons (8S/45W- 33bd)	325	80	3		51
Frank Bandell (8S45E-33ddI)	385	76	6	.02	5
Pat Sanders (8S/45E-33ac)	106	9	8	.12	51
Emma Jeene Greener (8S/45.5E-3c)					

APPENDIX D
SITE DATA SHEETS

This Appendix includes the site data sheets that contain information developed at each site during site reconnaissance surveys. This information was used to conduct the site screening analysis presented in Section 8.0. Each site is represented by a data sheet containing standardized information and a section from a USGS 7.5" topographic map identifying the site boundaries.

RIVER BASIN: Grandc Ronde
SITE NUMBER: GRI
SITE NAME: N & S Forks Catherine Ck.
SITE LOCATION: Confluence of N & S Forks of Catherine Ck.
County : Union
Road Access Directions: USFS Rd. # 7785 off of Hwy 203.
River Mile : 32.5
USGS 1:100,000 Quad Ref.: Enterprise,Ore. **USGS 7.5' Quad Ref.:** Medical Springs, Ore.
Section: 23 **Township:** T5S **Range:** R41 E

OWNERSHIP

Owner Name: Private owner
Contact Name: Duane West, ODF&W
Contact Phone: (503) %3-2138
Zoning: Undetermined
Land Use /Jurisdiction:

GENERAL CHARACTERISTICS

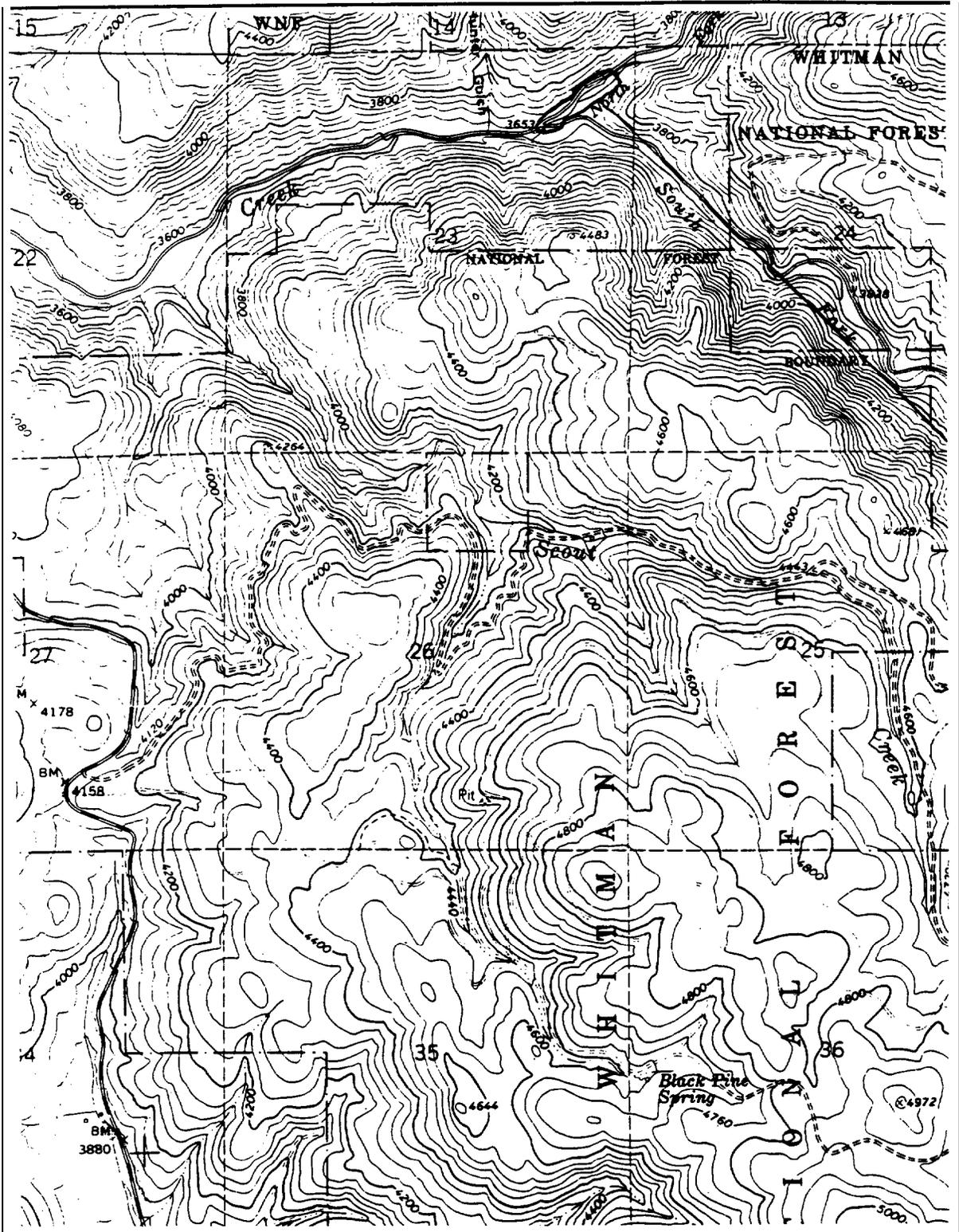
Proximity to road : Adjacent to gravel USFS road.
Proximity to power and type: None in area
Size (acres): 2 plus
General topography: Mostly level throughout site.
General soil type: Alluvial
Erosion potential: Moderate
Flood potential and history: Moderate
Upstream land use: Logging and grazing. Roadless in headwaters.
Water rights: Undetermined

WATER SUPPLY

Gravity supply evaluation: Area appears to have good potential in both forks of creek.
Groundwater evaluation: N/A

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Moderate sized cobbles with moderate bedload movement.
Anadromous fish: Yes - N. Fork roadless just above site.
Upland habitat type: Lightly treed with alders and cottonwoods.
Wetlands: None identified beyond riparian zone.
Permitting Considerations: Ownership, water rights, land use.



Site: Catherine Ck. confluence of N. and S. Forks

RIVER BASIN: GrandeRonde
SITE NUMBER: GR2
SITE NAME: Catherine Ck.. Oregon State Univ. Site.
SITE LOCATION: Site located on OSU research property near confluence of Catherine and Milk Creeks approximately 1.5 miles above Catherine Creek State Park Union
 County :
Road Access Directions: Hwy 203 southeast from Union to just before USFS Rd. # 7785. Approx. 1.5 miles beyond Catherine Creek State Park
River Mile : 29
USGS 1:100,000 Quad Ref.: Enterprise,Ore. **USGS 7.5' Quad Ref.:** Little Catherine Creek, Ore.
Section: 1 7 **Township:** T5S **Range:** R41 E

OWNERSHIP

Owner Name: Oregon State University
Contact Name: Duane West, ODF&W
Contact- Phone: (503)963-2138
Zoning: Undetermined
Land Use /Jurisdiction: Undetermined

GENERAL CHARACTERISTICS

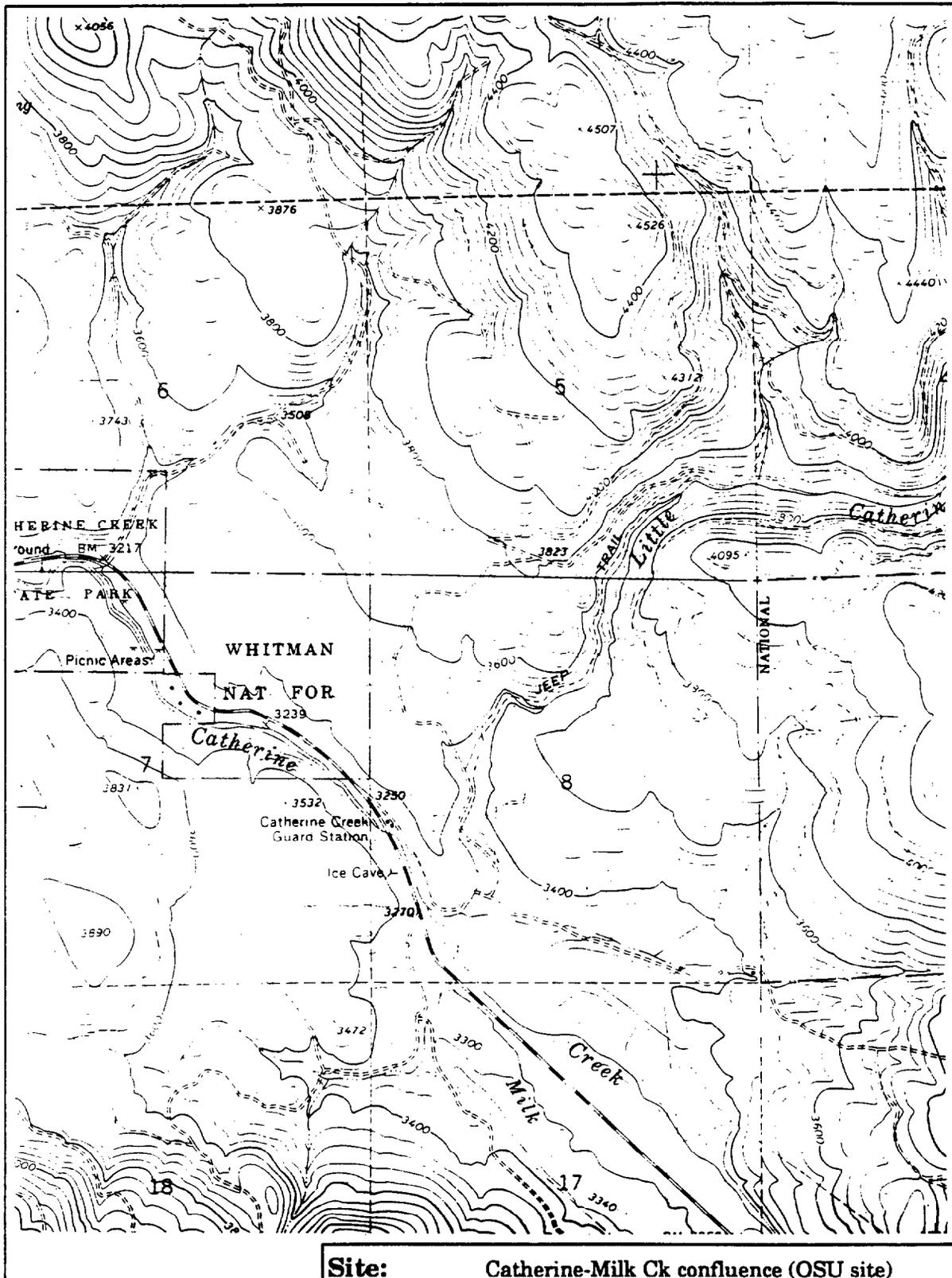
Proximity to road : Adjacent to Hwy 203, no improved access points.
Proximity to power and type: Adjacent to 3-phase power lines
Size (acres): >10
General topography: Level throughout area.
General soil type: Alluvial
Erosion potential: LOW
Flood potential and history: Low
Upstream land use: Logging and grazing
Water rights: Undetermined

WATER SUPPLY

Gravity supply evaluation: Area appears to have good potential, bank stability for intake structure may determine intake site location.
Groundwater evaluation: 50% chance of developing 500 gpm well from both shallow alluvial aquifer and deep basalt aquifer combined

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Moderate sized gravels with moderate bedload movement.
Anadromous fish: Yes
Upland habitat type: Some conifers and grasses
Wetlands: None identified beyond riparian zone, may need more detailed survey prior to any development.
Permitting Considerations: Land use, water rights



RIVER BASIN: Grande Ronde
SITE NUMBER: GR3
SITE NAME: Catherine Ck. at Union, Old Hatchery Site
SITE LOCATION: Old Hatchery on Lower Catherine Ck.
County : Union
Road Access Directions: At concrete bridge adjacent to Sportsmen Club at east City limits of Union on Hwy 203. Former site of a fish hatchery.
River Mile : 18
USGS 1:100,000 Quad Ref.: Enterprise,Ore. **USGS 7.5' Quad Ref.:**Union,
ore.
Section: 18/19 **Township:** T4S **Range:** R40E

OWNERSHIP

Owner Name: Oregon State Parks
Contact Name: Duane West, DOFCW
Contact Phone: (503) 963-2138
Zoning: Undetermined
Land Use /Jurisdiction: Oregon State Parks

GENERAL CHARACTERISTICS

Proximity to road : Across concrete bridge from paved Hwy 203.
Proximity to power and type: Adjacent to 3-phase power line
Size (acres): Estimated 4 acres
General topography: Level area immediately upstream of a diversion structure, ditch and head gate on Catherine Creek.
General soil type: Alluvial
Erosion potential: LOW
Flood potential and history: Low
Upstream land use: Agricultural and residential areas.
Water rights: Undetermined

WATER SUPPLY

Gravity supply evaluation: Excellent potential for gravity intake. Would need to redevelop existing irrigation diversion, intake, and fish ladder.
Groundwater evaluation: Moderate to good potential for 500 - 1000 gpm wells based upon geology and local well logs. Cold groundwater may be available within 1-2 miles of site. Basalt aquifers or nearby sedimentary aquifers.

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Moderate sized gravels with moderate bedload movement,
Anadromous fish: Yes
Upland habitat type: Site overgrown with weeds and hardwoods.
Wetlands: Some areas of site appear to contain wetland vegetation, may require delineation prior to development.
Permitting Considerations: Land use, wetlands, water rights



Site: Catherine Ck at Union (old hatchery)

RIVER BASIN: GmndeRonde
SITE NUMBER: GR4A
SITE NAME: Upper Vey Meadows,
SITE LOCATION: USFS Campground.
County : Union
Road Access Directions: Starkey turnoff I-80 onto Rt 244 to USFS # 5102. 34 miles from La Grande. Site at USFS Campground at upper end of meadow.
River Mile : 199
USGS 1:100,000 Quad Ref.: LaGrande, Ore **USGS 7.5' Quad Ref.:** Limber Jim Creek, Ore
Section: 5 **Township:** T6S **Range:** R 36E

OWNERSHIP

Owner Name: USFS
Contact Name: Duane West, ODF&W
Contact Phone: (503) 963-2138
Zoning: Undetermined
Land Use /Jurisdiction: National Forest Campground

GENERAL CHARACTERISTICS

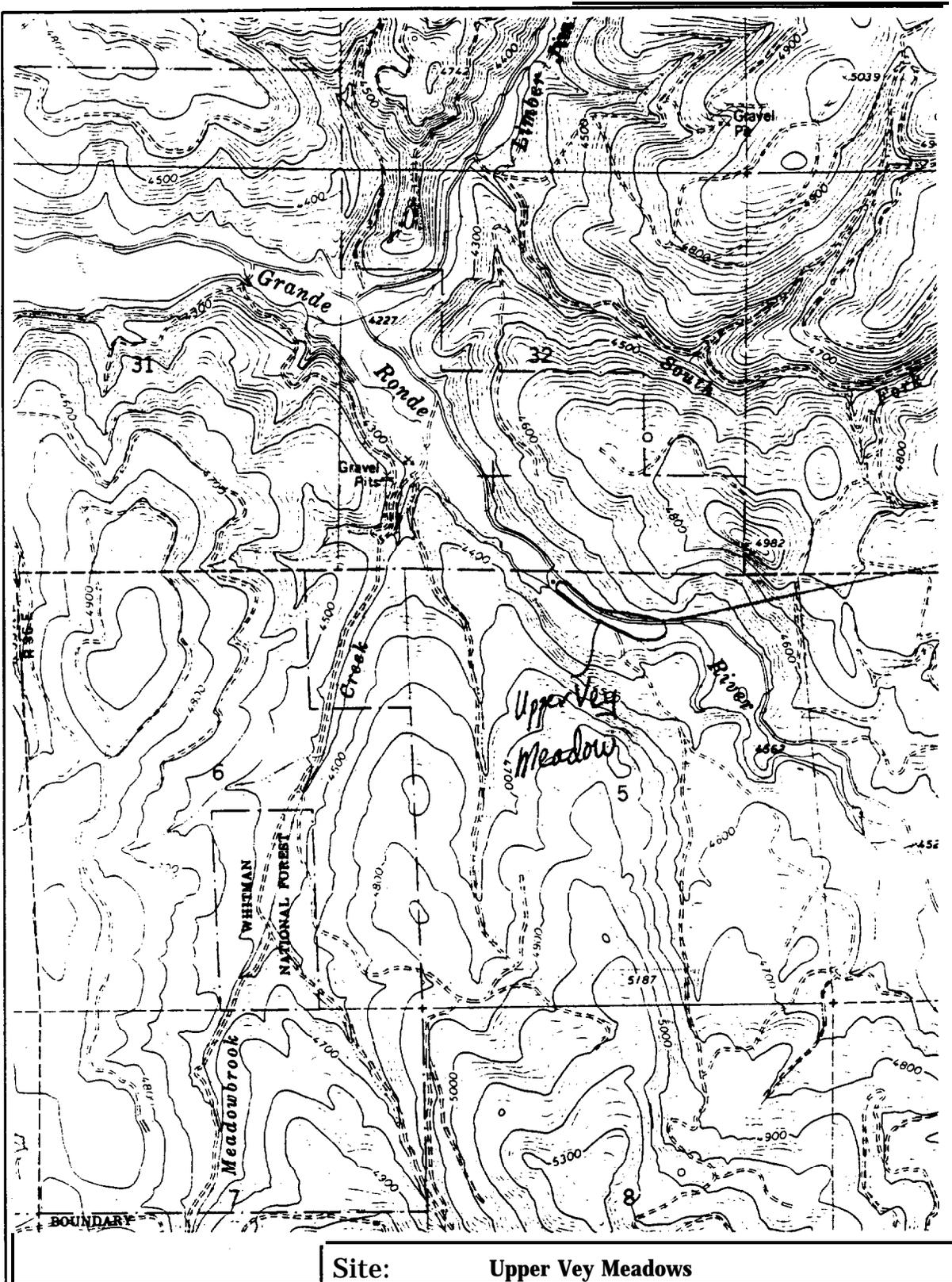
Proximity to road : Adjacent to gravel road.
Proximity to power and type: **None in area**
Size (acres): 2 plus acres
General topography: Relatively level narrow strip of land between the road and river, approximately 125' x 750'.
General soil type: Alluvial
Erosion potential: LOW
Flood potential and history: **Low**
Upstream land use: Forested with logging in watershed used as a campground, especially during hunting season.
Water rights: Undetermined

WATER SUPPLY

Gravity supply evaluation: Excellent potential for gravity intake; de-icing accomodation during winter will be required.
Groundwater evaluation: N/A

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Moderate sized gravels with moderate bedload movement
Anadromous fish: Yes
Upland habitat type: Forested with alders along river.
Wetlands: None identified beyond riparian zone
Permitting Considerations: **Land use, water rights**



Site: Upper Vey Meadows

RIVER BASIN: Grande Ronde
SITE NUMBER: GR4B
SITE NAME: Lower Vey Meadows at splash dam,

SITE LOCATION:

County : Union
Road Access Directions: Starkey turnoff I-80 onto Rt 244 to USFS # 5102. 34 miles from La Grande. Site at old splash dam at opening of Canyon into Vey Meadows.

River Mile : 199

USGS 1:100,000 Quad Ref.: La Grande, Ore **USGS 7.5' Quad Ref.:** Limber Jim Creek.Ore

Section: 19 **Township:** T6S **Range:** R36E

OWNERSHIP

Owner Name: private
Contact Name: Duane west. ODF&W
Contact Phone: (503) 933-2138
Zoning: Undetermined'
Land Use /Jurisdiction: National Forest Campground

GENERAL CHARACTERISTICS

Proximity to road : Adjacent to gravel road
Proximity to power and type: None in area
Size (acres): Approx. 5
General topography: Flat area immediately upstream of splash dam
General soil type: Alluvial
Erosion potential: Low, except for grazing animals in upstream creek area.
Flood potential and history: Low
Upstream land use: Forested with logging in watershed
Water rights: Undetermined

WATER SUPPLY

Gravity supply evaluation: Stream is low gradient above splash dam, would require long supply line.
Groundwater evaluation: N/A

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Fine to medium bed materials.
Anadromous fish: Yes
Upland habitat type: Grassy meadow, limited riparian zone
Wetlands: None identified beyond riparian zone
Permitting Considerations: Land use, water rights

RIVER BASIN: GrandeRcmde
SITE NUMBER: GR5
SITE NAME: sheep Creek
SITE LOCATION: Intersection of USFS roads on Sheep Creek above (to west of) Vey Meadows.
County : Union
Road Access Directions: Starkey tumoff I-80 onto Rt 244 to Vey Meadows past Vey ranch house. West on East Sheep Road approx. 0.5 miles past Vey ranch house Site at intersection of East Sheep Road with Sheep Creek.
River Mile : 201
USGS 1:100,000 Quad Ref.: La Grande, Ore **USGS 7.5' Quad Ref.:** Fly Valley,Ore
Section: 12 **Township:** 6S **Range:** 35E

OWNERSHIP

Owner Name: USFS
Contact Name: Duane West, ODF&W
Contact Phone: (503) 963-2138
Zoning: undetermined
Land Use /Jurisdiction: National Forest Land

GENERAL CHARACTERISTICS

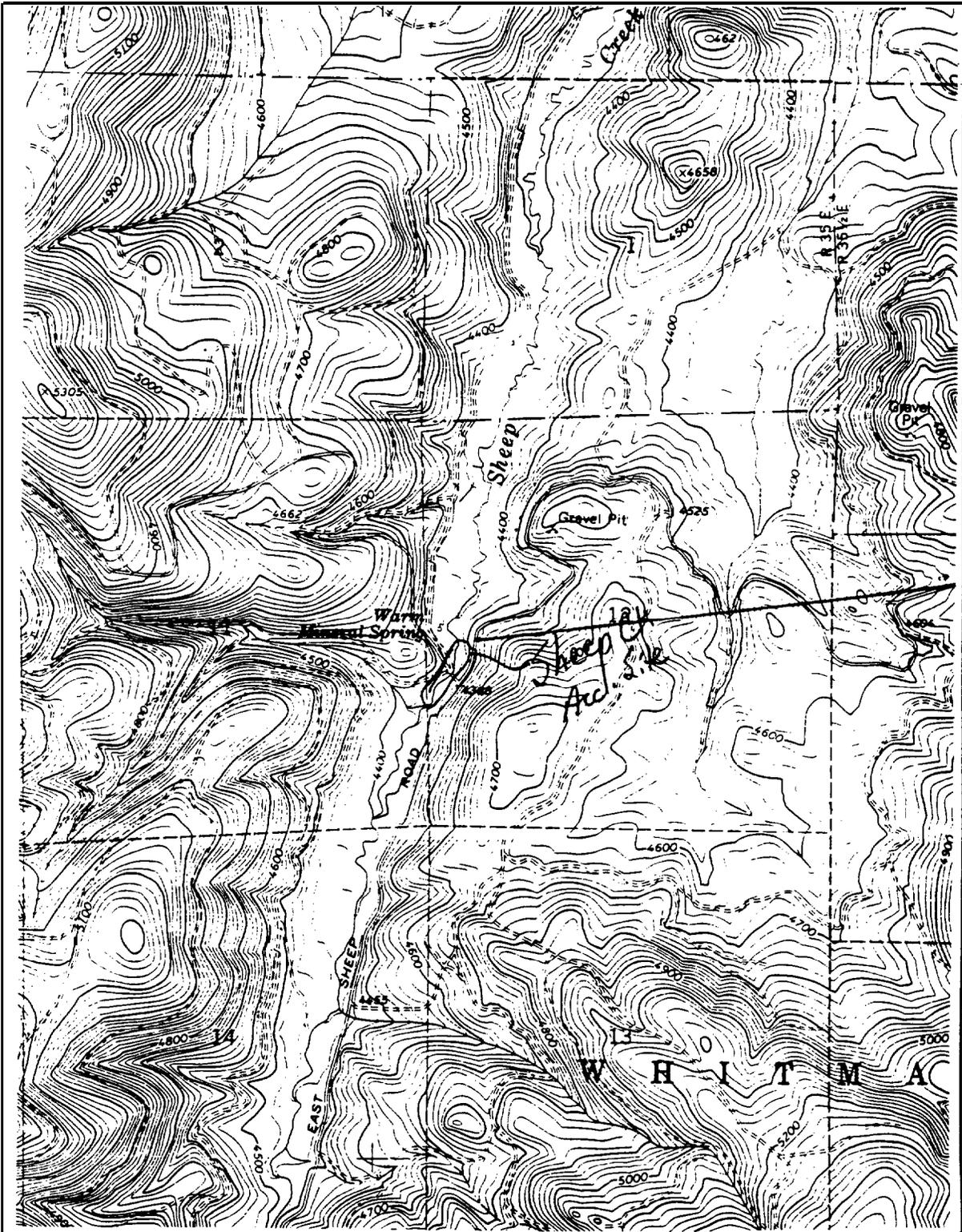
Proximity to road : Adjacent to gravel road
Proximity to power and type: None
Size (acres): <2 acres
General topography: Flat, sloping **downstrea**
General soil type: Alluvial
Erosion potential: **Low**
Flood potential and history: **Low**
Upstream land use: Forested with some logging.
Water rights: Undetermined

WATER SUPPLY

Gravity supply evaluation: Potential for gravity intake **near** culvert under road.
Groundwater evaluation: **N/A**

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Moderate sized gravels.
Anadromous fish: **Yes**
Upland habitat type: Some **alders** along stream, riparian fencing upstream.
Wetlands: None identified beyond riparian zone.
Permitting Considerations:



Site: Sheep Creek

RIVER BASIN: Grande Ronde
SITE NUMBER: GR6
SITE NAME: Beaver Creek
SITE LOCATION:
County : Union
Road Access Directions: Starkey **turnoff I-84** to Beaver Creek confluence **with** Grande Ronde.
River Mile : 179
USGS 1:100,000 Quad Ref.: La Grande, Ore USGS 7.5' Quad Ref.: Kamela
 SE ,Ore
Section: 30 **Township:** T 3 S **Range:** R 36 E

OWNERSHIP

Owner Name: Vey on north bank and other private owner on south bank.
Contact Name: Duane West, **ODF&W**
Contact Phone: (503) 963-2138
Zoning: Undetermined
Land Use /Jurisdiction: **Undetermined**

GENERAL CHARACTERISTICS

Proximity to road : Adjacent to main road.
Proximity to power and type: Adjacent
Size (acres): **5-10 acres**
General topography: Level on both sides of river.
General soil type: Alluvial
Erosion potential: **Low**
Flood potential and history: Low on north side of river. South side is braided channel of Beaver **Ck.** with associated riparian zone and high flood potential.
Upstream land use: Residential, grazing, logging.
Water rights: **Undetermined**

WATER SUPPLY

Gravity supply evaluation: Good, with supply pipeline upstream on Grande Ronde
Groundwater evaluation: Moderate potential for > 500 gpm wells based upon geology and local well logs. Basalt aquifers.

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Grande Ronde with moderate **bedload** movement. Beaver Ck. braided channel through riparian zone at confluence.
Anadromous fish: **Yes**
Upland habitat type: **Open** field and **fishing** access parking near bridge on **north** side. Riparian on Beaver Ck. side.
Wetlands: Beaver Creek mouth is all wetlands. Development would require detailed delineation of wetland areas.
Permitting Considerations: **Water rights and wetlands.**

RIVER BASIN: Grande Ronde
SITE NUMBER: GR7
SITE NAME: Sanderson Springs, Mill Creek
SITE LOCATION: Vic & Phyllis Morris Property
County : Union
Road Access Directions: Approx. 5.7 miles north of Imbler on Mill Creek Road.
River Mile : N/A
USGS 1:100,000 Quad Ref.: Enterprise.Ore. **USGS 7.5' Quad Ref.:** Sanderson Spring, Ore.
Section: 35 **Township:** T 1 N **Range:** R 38 E

OWNERSHIP

Owner Name: Vic & Phyllis Morris
Contact Name: Duane West, **ODF&W**
Contact Phone: (503) 963-2138
Zoning: Undetermined
Land Use /Jurisdiction: Agriculture, residential

GENERAL CHARACTERISTICS

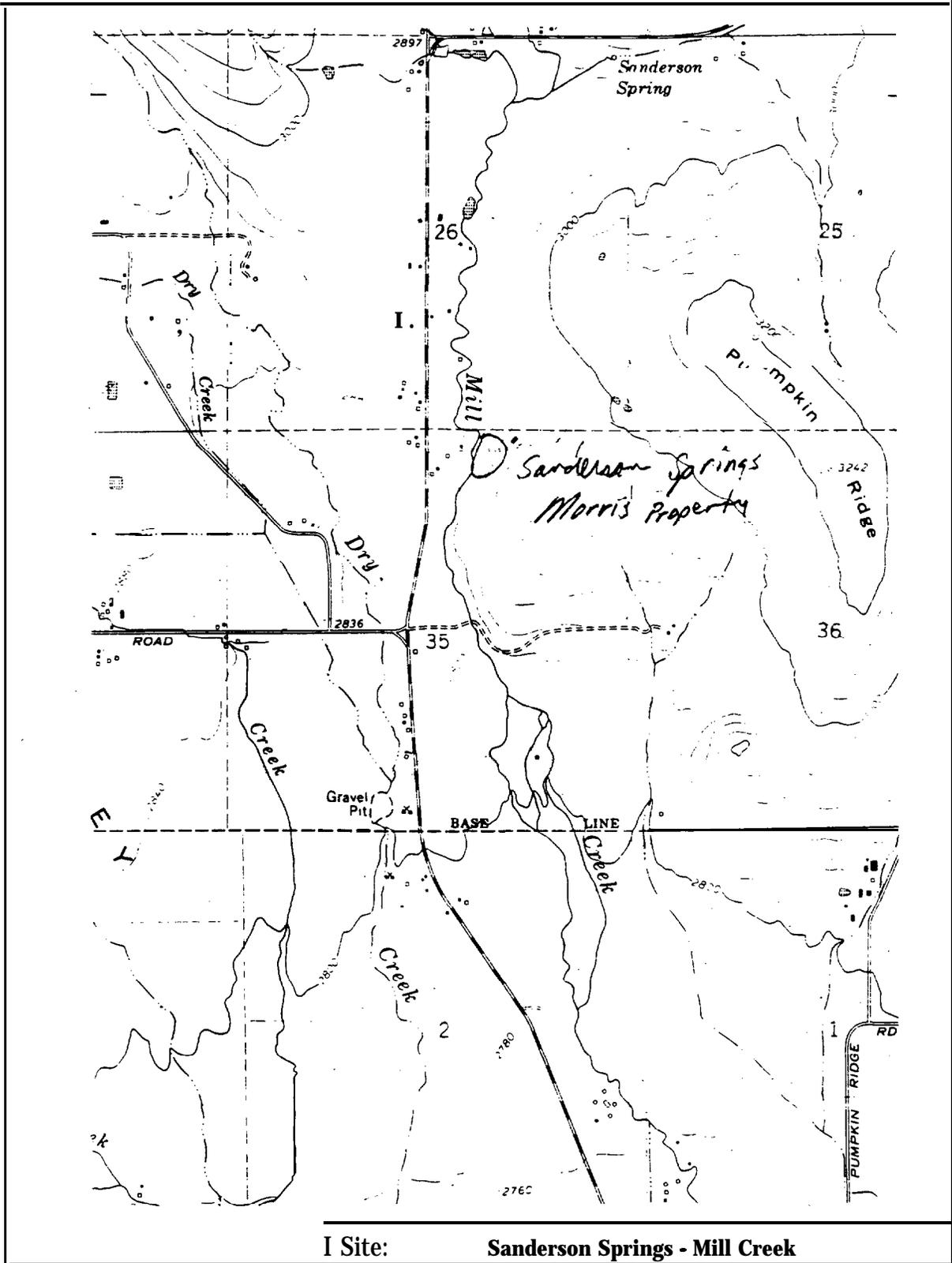
Proximity to road : Adjacent to paved road.
Proximity to power and type: Adjacent
Size (acres): . 1-2 acres.
General topography: Level to gently rolling pasture.
General soil type: Alluvial
Erosion potential: High suspended sediment loads in Mill Creek during storms from runoff of eroded soils. Limited riparian vegetation throughout this general area.
Flood potential and history: Low
Upstream land use: Residential, grazing.
Water rights: Undetermined

WATER SUPPLY

Gravity supply evaluation: Poor
Groundwater evaluation: Moderate potential to develop springs.

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Grazed pasture land at spring, limited stream habitat prior to confluence with Mill Creek.
Anadromous fish: No
Upland habitat type: Riparian and pastures
Wetlands: Spring source is a wetland.
Permitting Considerations: Groundwater rights.



RIVER BASIN: Grande Ronde
SITE NUMBER: GR8
SITE NAME: Lower Willow Creek near Imbler.
SITE LOCATION: No specific site **identified**, general area of interest is the lower reach of Willow Creek from its confluence **with** the Grande Ronde River to approximately 1 mile **upstream**.
County : Union
Road Access Directions: Highway 82 approximately 2 miles north of Imbler, just south of Rhinehart. Courtney Lane to east off Highway 82 parallels Willow Creek on its north side, turns and crosses creek near limit of upstream area of interest.
River Mile : Grande Ronde RM 105.5 is Willow Creek mouth (approx)
USGS 1:100,000 Quad Ref.: La Grande, Ore USGS 7.5' Quad Ref.:Imbler, ore.
Section: 9 **Township:** 1S **Range:** 39E

OWNERSHIP

Owner Name: Undetermined
Contact Name: Duane West, ODF&W
Contact Phone: (503) 963-2138
Zoning: Undetermined
Land Use /Jurisdiction: Undetermined

GENERAL CHARACTERISTICS

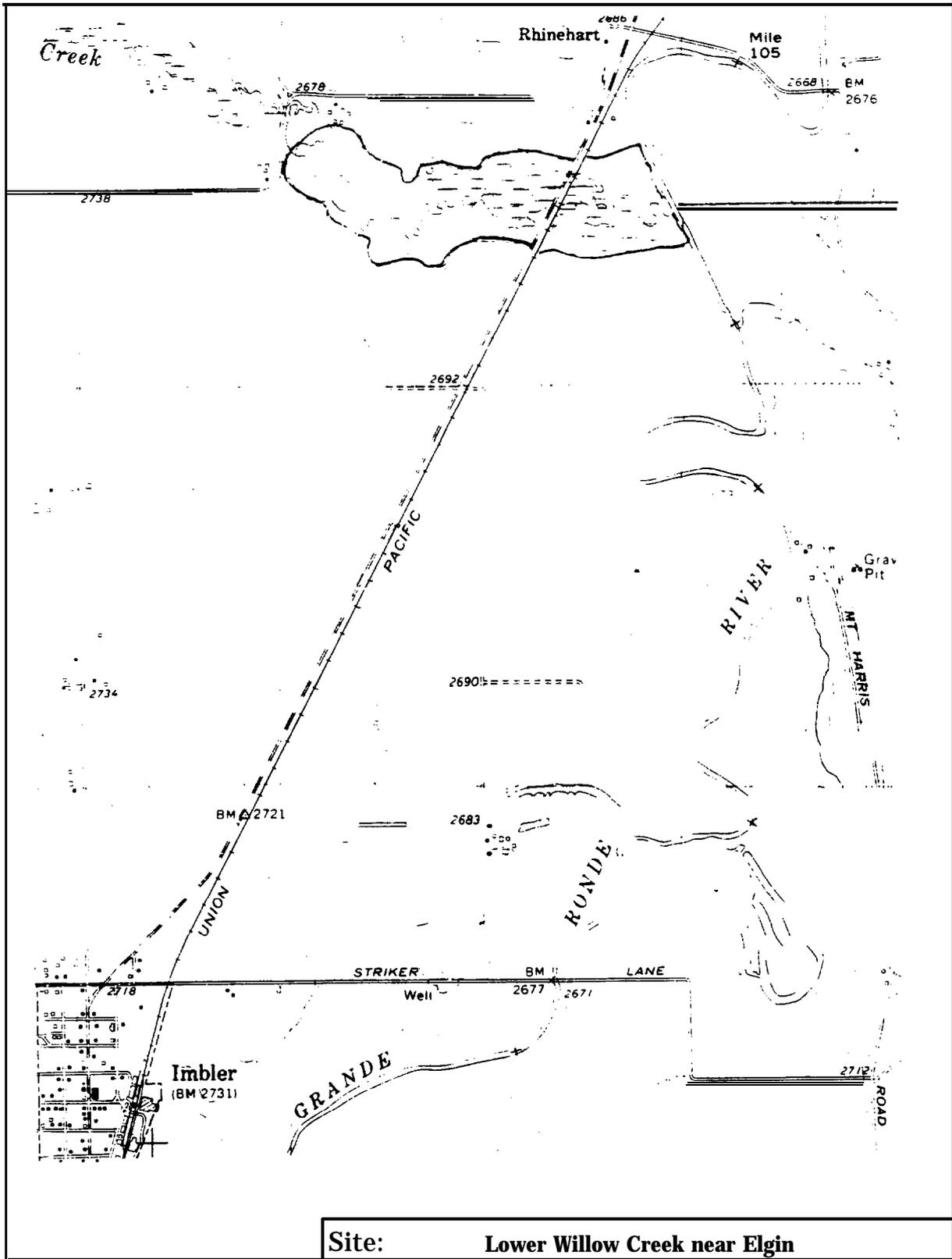
Proximity to road : Adjacent to paved roads, no good access to **stream** within its lower **reach**.
Proximity to power and type: Power available along highway.
Size (acres): Various small ,<2 acre, sites in this area
General topography: Flat
General soil type: Alluvial
Erosion potential: **Moderate** during high runoff
Flood potential and history: **Moderate**
Upstream land use: Agriculture, residential
Water rights: **Undetermined**

WATER SUPPLY

Gravity supply evaluation: Undetermined
Groundwater evaluation: Moderate potential for 500 - 1000 gpm wells based upon geology and local well logs. Basalt aquifers or sedimentary aquifers.

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Convoluted **channel** within marshy area.
Anadromous fish: **Yes**
Upland habitat type: Deciduous riparian zone, marsh vegetation
Wetlands: **Yes.** Development would require detailed delineation.
Permitting Considerations: **Wetlands**



RIVER BASIN: GrandeRonde
SITE NUMBER: GR9
SITE NAME: Indian Creek
SITE LOCATION:
County : Union
Road Access Directions: Hwy 82 to Elgin Lumber Rd. between Imbler and Elgin, Ore. left on Rinehart Lane to Indian Ck. Rd. Site above last house.
River Mile : Undetermined.
USGS 1:100,000 Quad Ref.: LaGrande, Ore **USGS 7.5' Quad Ref.:** Gasset Bluff, OR
Section: ? Township: 2S Range: 39E

OWNERSHIP

Owner Name: Private
Contact Name: Duane West, ODF&W
Contact Phone: (503) 963-2138
Zoning: Undetermined
Land Use /Jurisdiction: Undetermined

GENERAL CHARACTERISTICS

Proximity to road : Adjacent gravel road, site is below road in narrow, steep sloped area of drainage.
Proximity to power and type: 3 Phase at farm immediately down stream of site.
Size (acres): 5-10
General topography: Level
General soil type: Alluvial
Erosion potential: Low
Flood potential and history: Low
Upstream land use: Grazing
Water rights: unknown

WATER SUPPLY

Gravity supply evaluation: Good, high gradient
Groundwater evaluation: N/A

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Narrow canyon with riffles and cascades above site.
Anadromous fish: Yes
Upland habitat type: Steep slope forested with conifers and deciduous trees
Wetlands: Riparian zone, other not determined.
Permitting Considerations:

RIVER BASIN: Grande Ronde
SITE NUMBER: GR10
SITE NAME: Grande Ronde near Elgin
SITE LOCATION: Approx. 4 mile reach of Grande Ronde River downstream of Elgin.
County : Union
Road Access Directions: Access off Palmer **Jct. road** heading north from Elgin. Two unpaved roads to east at approximately **1** and 1.5 miles north of Elgin lead to river. Railroad ROW parallels river in this area.
River Mile : Approx. RM 94 to 99, just north of Elgin
USGS 1:100,000 Quad Ref.: **La Grande, Ore USGS 7.5' Quad Ref.:**Elgin, OR
Section: 35 Township: 2N Range: 39E
Section: 2,10 Township: 1N Range: 39E

OWNERSHIP

Owner Name: Undetermined
Contact Name: Duane West. **ODF&W**
Contact Phone: (503) %3-2138
Zoning: **Undetermined**
Land Use /Jurisdiction: Undetermined

GENERAL CHARACTERISTICS

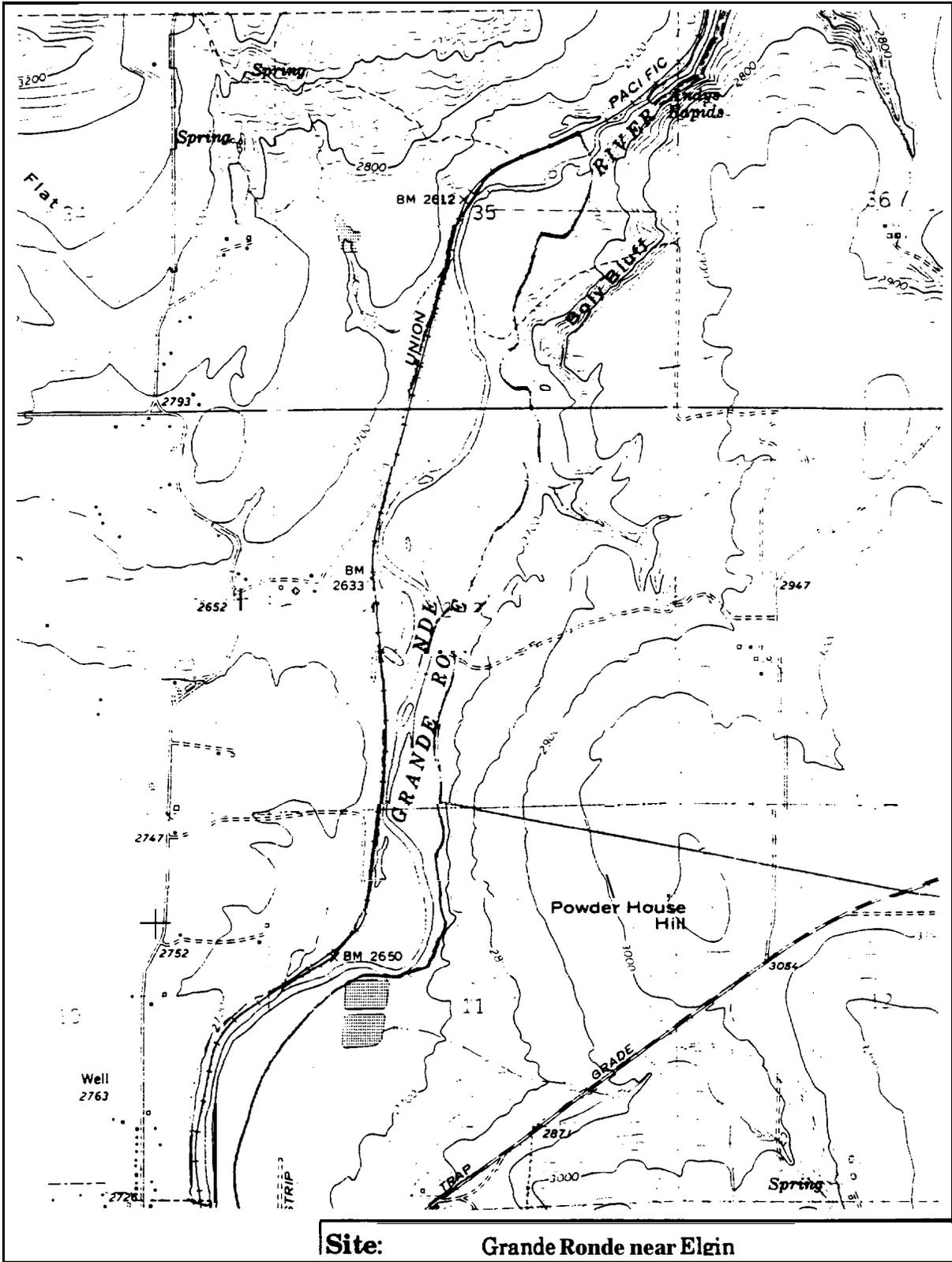
Proximity to road : Unimproved dirt roads lead to site area
Proximity to power and type: Limited power availability depending on location within this **area**
Size (acres): Numerous sites of 1 to several **acres**
General topography: Flat, level flood plain
General soil type: Alluvial
Erosion potential: Moderate during high runoff
Flood potential and history: Moderate, sites within **100-year** floodplain
Upstream land use: Agriculture
Water rights: **Undetermined**

WATER SUPPLY

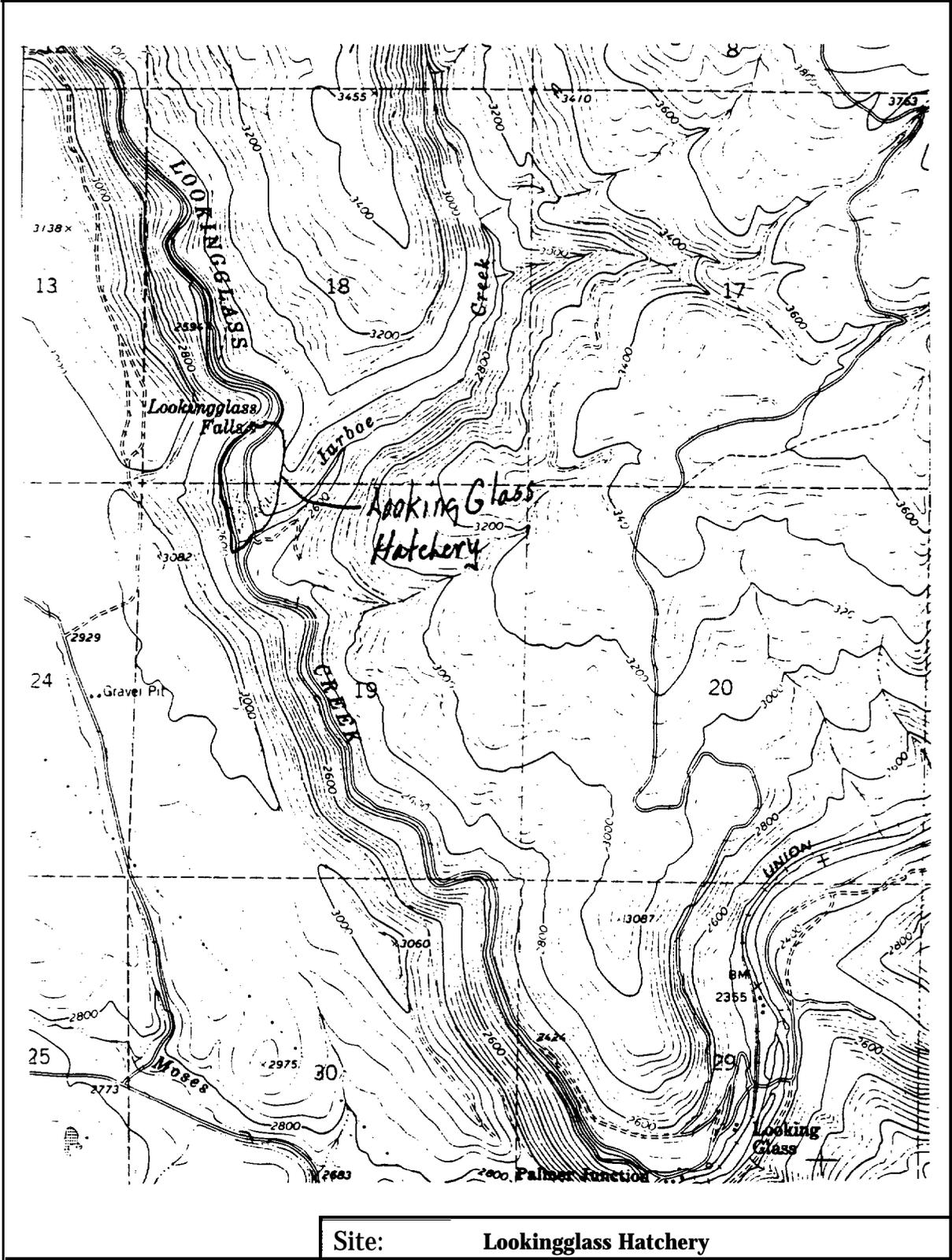
Gravity supply evaluation: Very low gradient in this reach
Groundwater evaluation: Moderate potential for 1000 gpm wells based upon geology and local well logs. Basalt aquifers.

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat:
Anadromous fish: **Yes**
Upland habitat type: Pastureland with limited **riaprian** vegetation
Wetlands: Specific sites considered within area would require delineation for **non-riparian wetland areas**
Permitting Considerations: Water rights, wetlands



RIVER BASIN	Grande Ronde
SITE NUMBER	GR11
SITE NAME	Lookingglass Hatchery
SITE LOCATION	Looking glass Hatchery
County	Union
Road Access Directions	Highway 82 east from Elgin for approx. 4.5 miles. North on Palmer JCL road approximately 12 miles to Palmer Jct. on the Grande Ronde River. Approx. 2 miles north of Palmer Jct. along Lookingglass Creek to hatchery
River Mile	Lookingglass Creek empties into Grande Ronde River at approximately RM 85
USGS 1:100,000 Quad Ref.	La Grande, OR
USGS 7.5' Quad Ref.	Rondowa, OR
Section 18,19	Township 3 N Range 40E
OWNERSHIP	
Owner Name	Hatchery operated by ODF&W
Contact Name	Scott Lusted, Hatchery Manager
Contact Phone	
Zoning	Undetermined
Land Use /Jurisdiction	Existing fish hatchery
GENERAL CHARACTERISTICS	
Proximity to road	All weather gravel road to site, some winter access problems
Proximity to power	Power to site
Size (acres)	5-10
General topography	Developed on series of benches along Lookingglass Creek
General soil type	Alluvial
Erosion potential	
Flood potential and history	
Upstream land use	Generally undeveloped upstream
Water rights	Undetermined beyond current water rights for hatchery
WATER SUPPLY	
Gravity supply evaluation	Good, existing intake with some winter icing problems
Groundwater evaluation	Good, existing groundwater development
ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS	
Adjacent stream habitat	Rocky, moderate to high gradient stream
Anadromous fish	Yes
Upland habitat type	Forested steep slope
Wetlands	None identified beyond riparian zone
Permitting Considerations	'Overlap with existing LSRCF facilities



RIVER BASIN: Grande Ronde
SITE NUMBER: GR12
SITE NAME: Wildcat Ck.
SITE LOCATION:
County : Wallowa
Road Access Directions: Estimated 8 miles **southeast** of Troy, Ore. on gravel road which parallel Grande Ronde R. Road begins at Hwy 3 bridge over river at Rattlesnake grade. It begins in Washington and parallels river **from this** point through Troy to Wildcat Ck.
River Mile : 5 4
USGS 1:100,000 Quad Ref.: Enterprise, Ore
USGS 7.5' Quad Ref.: Troy, OR
Section: 19 **Township: 5N** **Range: 43E**

OWNERSHIP

Owner Name: Private
Contact Name: Brad Smith, **ODF&W**
Contact Phone: (503) 426-3279
Zoning: **Undetermined**
Land Use /Jurisdiction: Undetermined

GENERAL CHARACTERISTICS

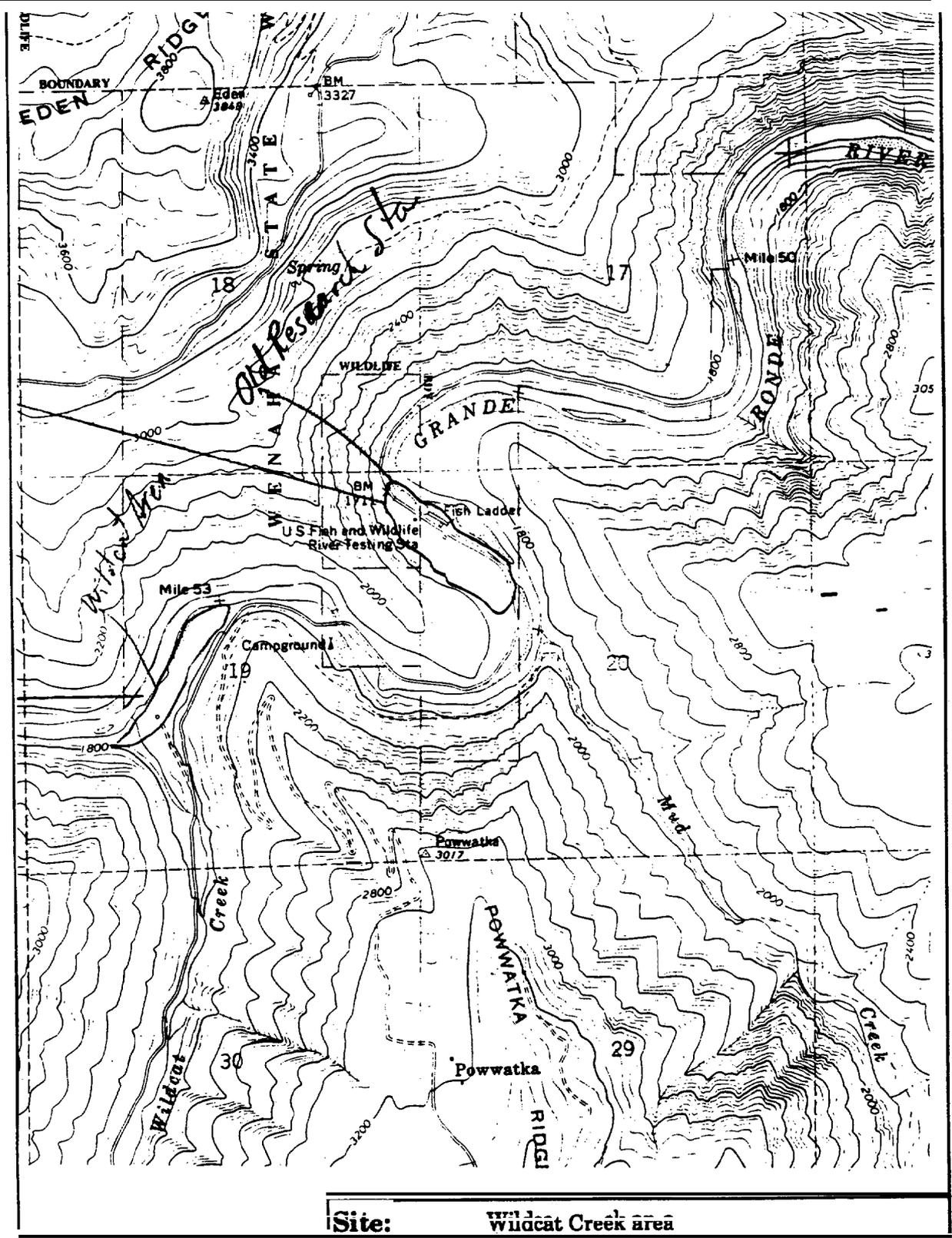
Proximity to road : Adjacent gravel road.
Proximity to power and type: None
Size (acres): 2 plus;
General topography: Generally level
General soil type: Alluvial
Erosion potential: Moderate
Flood potential and history: Moderate during high flow periods.
Upstream land use: **Grazing**
Water rights: Undetermined

WATER SUPPLY

Gravity supply evaluation: **Good**
Groundwater evaluation: **N/A**

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: River has moderate **bedload** movement
Anadromous fish: **Yes**
Upland habitat type: Steep grass covered slopes
Wetlands: None identified beyond **riparian** zone
Permitting Considerations:



RIVER BASIN: Grande Ronde
SITE NUMBER: GR13
SITE NAME: Fiih Ladder (former USFWS Research Site)

SITE LOCATION:

county : **Wallowa**
Road Access Directions: Estimated 6 miles southeast of Troy, OR on gravel road. which parallels Grande Ronde R. Road begins at Hwy 3 bridge over river at Rattlesnake grade. It begins in Washington and parallels river from **this** point through Troy to Wildcat Ck.

River Mile : 51-52
USGS 1:100,000 Quad Ref.: Enterprise, Ore
USGS 7.5' Quad Ref.: Troy, OR
Section: 19,20 **Township:** 5N **Range:** 43E

OWNERSHIP

Owner Name: **ODF&W** owns portion of site within Wenaha State Wildlife Area. Owner of portion **with** former facility unknown.
Contact Name: Brad Smith, **ODF&W**
Contact Phone: (503) 426-3279
Zoning: Undetermined
Land Use /Jurisdiction: Wenaha State Wildlife Area/State of Oregon

GENERAL CHARACTERISTICS

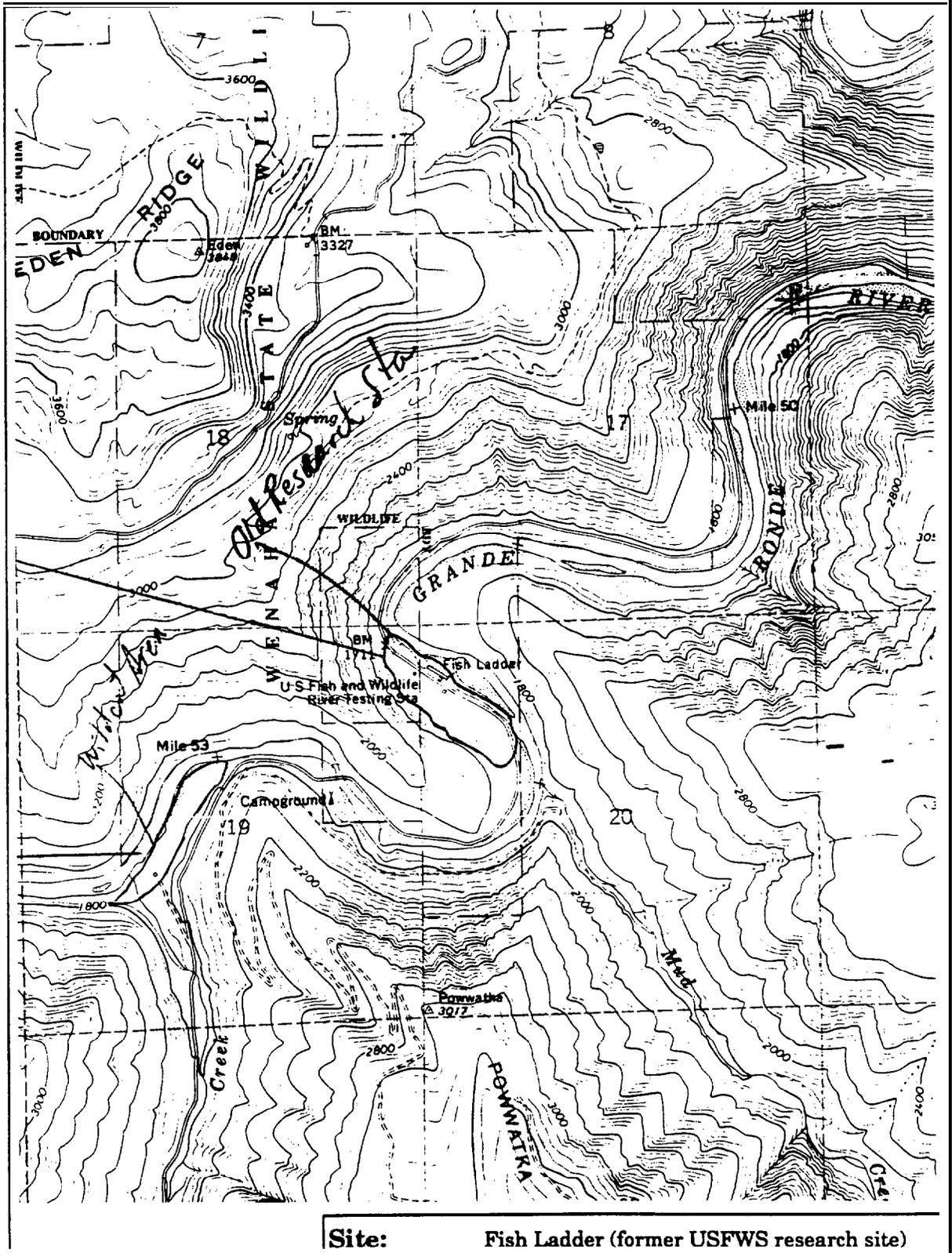
Proximity to road- : Adjacent gravel paved road
Proximity to power and type: None
Size (acres): 10+ acres
General topography: Level around site.
General soil type: Alluvial
Erosion potential: **Low**
Flood potential and history: High flooding potential. Facility had experienced flood damage in the past.
Upstream land use: **Grazing**
Water rights: Undetermined

WATER SUPPLY

Gravity supply evaluation: Existing concrete channel approx. 40' x 100'. Channel is set up for direct diversion of river. There is potential for upgrading of existing structure for use as a facility or possibly use of diversion **structure** with a new facility.
Groundwater evaluation: **N/A**

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: River has moderate **bedload** movement
Anadromous fish: **Yes**
Upland habitat type: Grain field adjacent to site which is planted by ODF & W for wildlife. The site is on an old gravel bar of river.
Wetlands: None identified beyond **riparian** zone.
Permitting Considerations:



RIVER BASIN: GrandeRonde
SITE NUMBER: GR14
SITE NAME: Flora Grade (Schoolbus Flats)

SITE LOCATION:

County : **Wallowa**
Road Access Directions: 2.5 miles NE of Troy along road from Hwy 3 at Rattlesnake Grade bridge over Grande Ronde R.
River Mile : **42.5 - 43**
USGS 1:100,000 Quad Ref.: Enterprise, Ore
USGS 7.5' Quad Ref.: Troy, OR
Section: 26.35 **Township:** 6N **Range:** 43E

OWNERSHIP

Owner Name: Private
Contact Name: Brad Smith, ODF&W
Contact Phone: (503) 426-3279
Zoning: **Undetermined**
Land Use /Jurisdiction: **Undetermined**

GENERAL CHARACTERISTICS

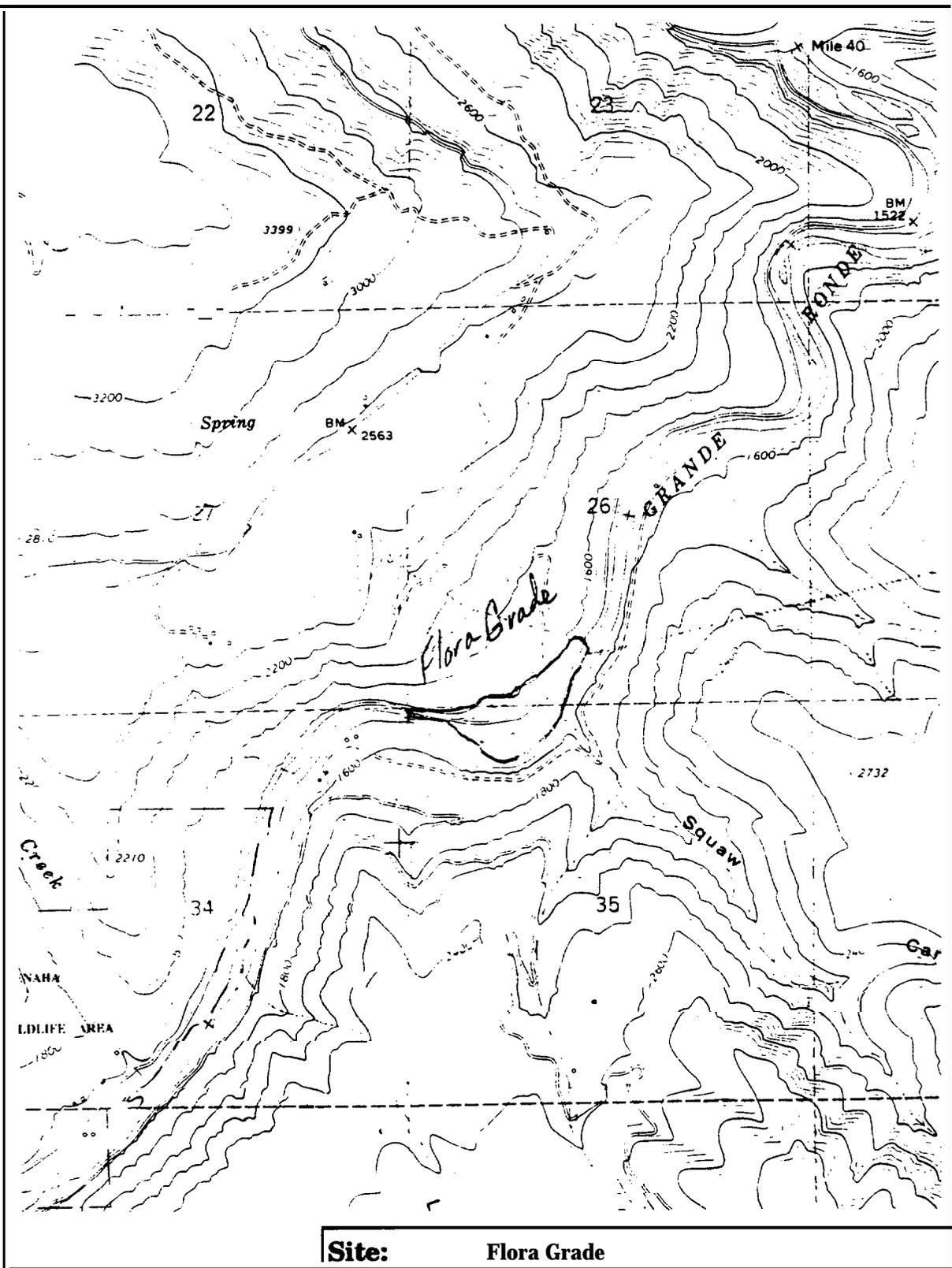
Proximity to road : Adjacent gravel paved mad.
Proximity to power and type: Adjacent to site
Size (acres): 2 plus
General topography: Level around site. Site is an existing narrow river side channel approximately 300 yards long. The island created is a narrow long strip of land approx. 4 feet high with some secondary growth cottonwoods and willows.
General soil type: Alluvial
Erosion potential: Moderate
Flood potential and history: Moderate during high river flow periods. Reported past damage in the area.
Upstream land use: **Grazing**
Water rights: Undetermined

WATER SUPPLY

Gravity supply evaluation: Good, high gradient. Potential problems with ice scour
Groundwater evaluation: N/A

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: River has moderate **bedload** movement and channel has gravels with moderate to low gradient,
Anadromous fish: **Yes**
Upland habitat type: **Pasture**
Wetlands: None identified beyond riparian zone
Permitting Considerations:



Site: Flora Grade

RIVER BASIN: Grande Ronde
SITE NUMBER: GR15
SITE NAME: Cottonwood Creek. LSRCP Steelhead Acclimation Facility

SITE LOCATION:

County : Asotin, Wa.
Road Access Directions: Highway 129 north from Enterprise approximately 45 miles to bridge over Grande Ronde River. West along gravel road on north side of river for approximately 2.25 miles to mouth of Cottonwood Creek.
River Mile : 28.7
USGS 1:100,000 Quad Ref.: Enterprise, Ore
USGS 7.5' Quad Ref.: Mountain View, Wash.
Section: 33 **Township:** 7 N **Range:** 44E

OWNERSHIP

Owner Name: Washington Department of Wildlife
Contact Name: Brad Smith, ODF&W
Contact Phone: (503) 426-3279
Zoning: Undetermined
Land Use /Jurisdiction: Existing acclimation facility

GENERAL CHARACTERISTICS

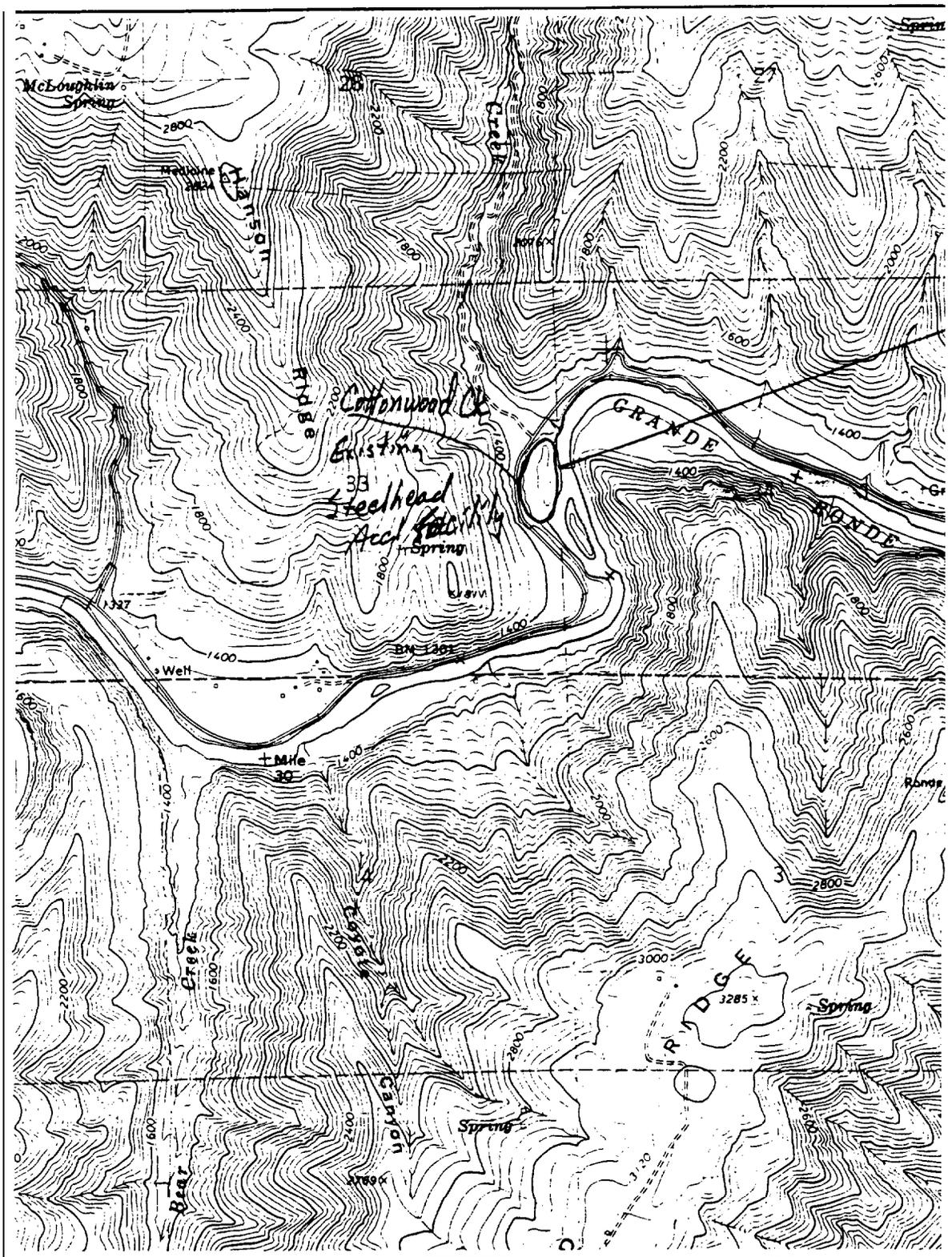
Proximity to road : Adjacent to road.
Proximity to power and type: Power at existing facility
Size (acres): Approx. 5
General topography: Level around site.
General soil type: Alluvial
Erosion potential: Low
Flood potential and history: Low
Upstream land use: Grazing
Water rights: Undetermined

WATER SUPPLY

Gravity supply evaluation: Existing gravity supply from Cottonwood Ck. used for steelhead acclimation. Could be developed to allow gravity supply from GRR if desired.
Groundwater evaluation: N/A

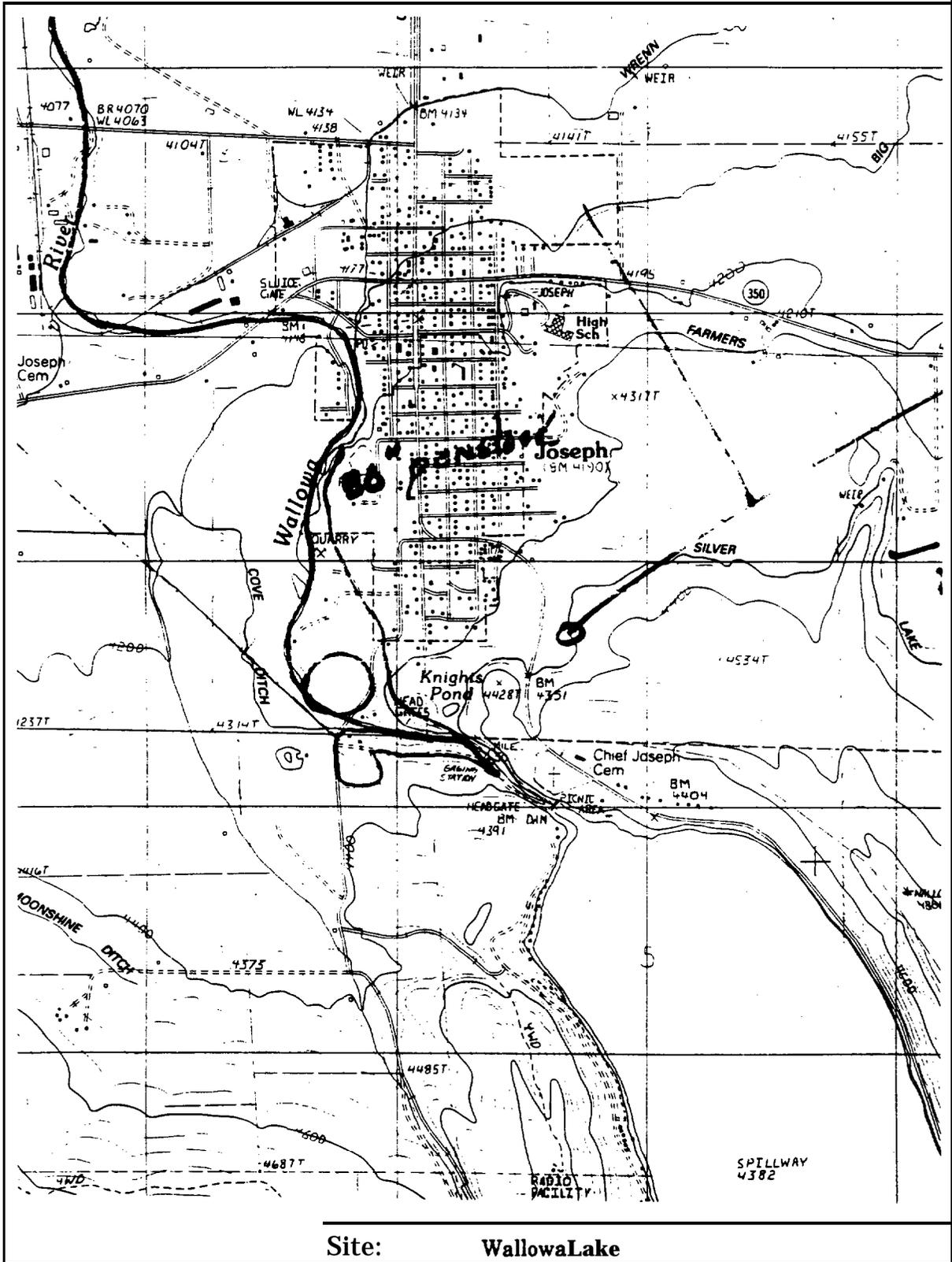
ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: River has moderate bedload movement
Anadromous fish: Yes
Upland habitat type: steep slope, grassy
Wetlands: None identified beyond riparian zone.
Permitting Considerations:



Site: Cottonwood Creek

RIVER BASIN	Grande Ronde
SITE NUMBER	GR16
SITE NAME	Wallowa Lake
SITE LOCATION	
county	Wallowa
Road Access Directions	Main road through Joseph to dam at base of Wallowa Lake . General site area on south side of river near USGS gaging station.
River Mile	Wallowa River RM 50
USGS 1:100,000 Quad Ref.	Enterprise, OR
USGS 7.5' Quad Ref.	Joseph, OR
Section 5,6	T o w n s h i p 3S Range 45E
OWNERSHIP	
Owner Name	various private owners
Contact Name	Brad Smith, ODF&W
Contact Phone	426-3279
Zoning	Undetermined
Land Use /Jurisdiction	Mostly residential, some agriculture
GENERAL CHARACTERISTICS	
Proximity to road	Several roads lead to site area
Proximity to power	Power available
Size (acres)	Approx. 5 acres
General topography	Flat
General soil type	Alluvial
Erosion potential	Low, some erosion from residential development
Flood potential and history	Low
Upstream land use	Wallowa Lake
Water rights	Undetermined
WATER SUPPLY	
Gravity supply evaluation	Good location if intake at dam could be developed
Groundwater evaluation	N/A
ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS	
Adjacent stream habitat	
Anadromous fish	Yes. to base of dam
Upland habitat type	Rolling pastureland and forest
Wetlands	None identified outside riparian zone
Permitting Considerations	Water rights, land use



RIVER BASIN: Wallowa
SITE NUMBER: GR17
SITE NAME: Hayes Fork - Praire Ck.

SITE LOCATION:

County : Wallowa
Road Access Directions: South of Enterprise on Highway 82 towards Joseph approximately 2.5 miles. Springs located just east of highway on improved road.
River Mile : .47
USGS 1:100,000 Quad Ref.: Grangeville, ID
USGS 7.5' Quad- Ref.: Joseph NW, OR
Section: 7,8 Township: 2S Range: 45E

OWNERSHIP

Owner Name: Private
Contact Name: Brad Smith ODF&W
Contact Phone: (503) 426-3279
Zoning: Undetermined
Land Use /Jurisdiction: Undetermined

GENERAL CHARACTERISTICS

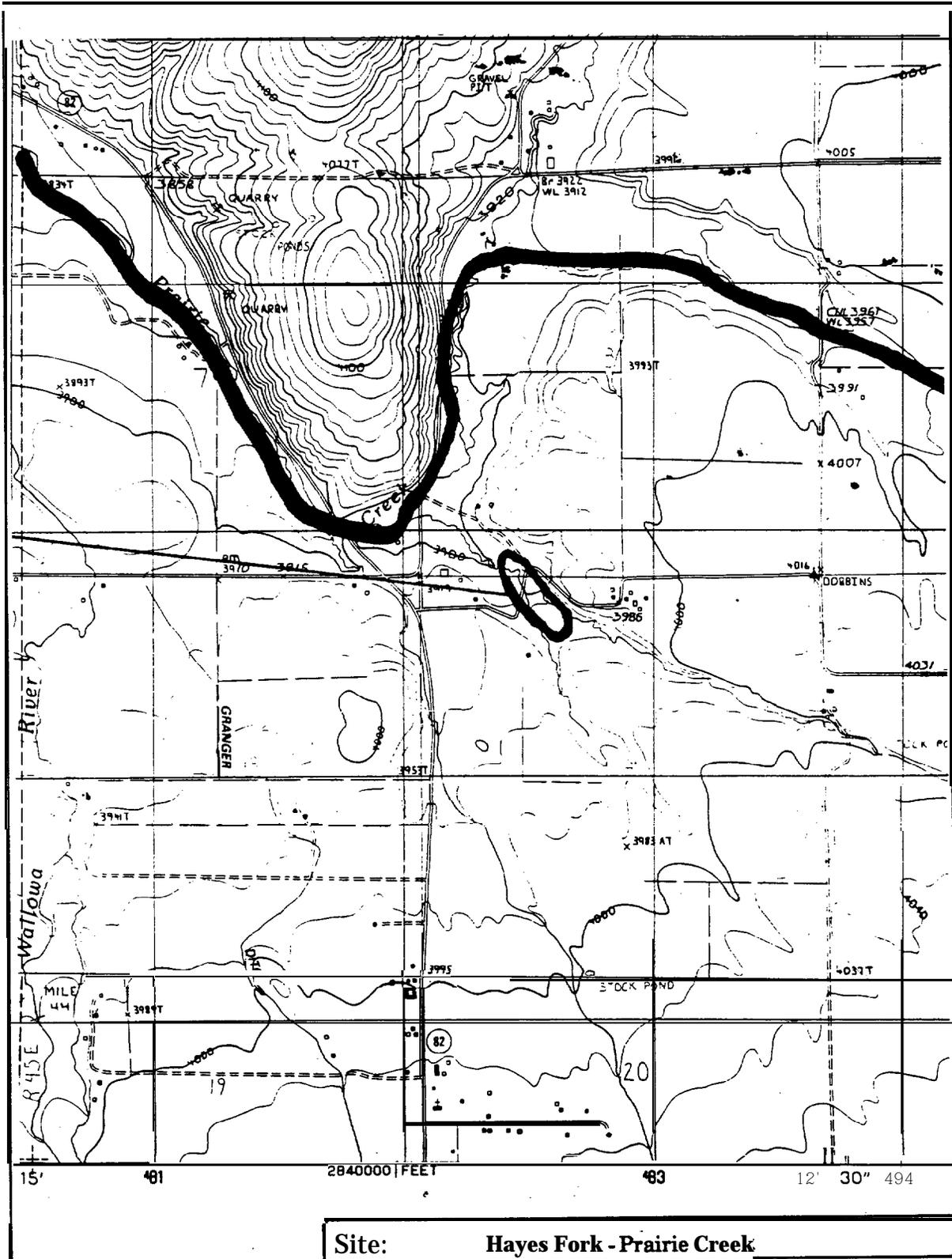
Proximity to road : Adjacent to gravel road.
Proximity to power and type: Power nearby
Size (acres): Some space for a small facility, but most of it appears to be wet bottomland.
General topography: Level
General soil type: Alluvial and very **fine** deposits.
Erosion potential: **Low**
Flood potential and history: **Moderate**
Upstream land use: Grazing
Water rights: Undetermined

WATER SUPPLY

Gravity supply evaluation: Low
Groundwater evaluation: Alluvial or glacial aquifers with good potential for > 500 gpm wells.

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Moderate to fine materials in and along springs.
Anadromous fish: No.
Upland habitat type: Pastures.
Wetlands: Yes, wet meadow vegetation at site.
Permitting Considerations: Water rights



Site: Hayes Fork - Prairie Creek

RIVER BASIN Grande Ronde
SITE NUMBER GR18
SITE NAME Wallowa Hatchery

SITE LOCATION

County Wallowa
Road Access Directions On Fish Hatchery Road, SW side of Enterprise.
River Mile Wallowa River RM 40
USGS 1:100,000 Quad Ref. Grangeville. ID
USGS 7.5' Quad Ref. Enterprise, OR
Section 3 **T o w n s h i p** 2S **Range** 44E

OWNERSHIP

Owner Name ODF&W
Contact Name Brad Smith, ODF&W
Contact Phone 426-3279
Zoning Undetermined
Land Use /Jurisdiction Existing hatchery

GENERAL CHARACTERISTICS

Proximity to road Developed facility with improved road access
Proximity tp power Developed facility with existing power supply
Size (acres) 5-10
General topography Flat
General soil type Alluvial
Erosion potential Low
Flood potential and history Low
Upstream land use Agriculture, residential
Water rights Undetermined

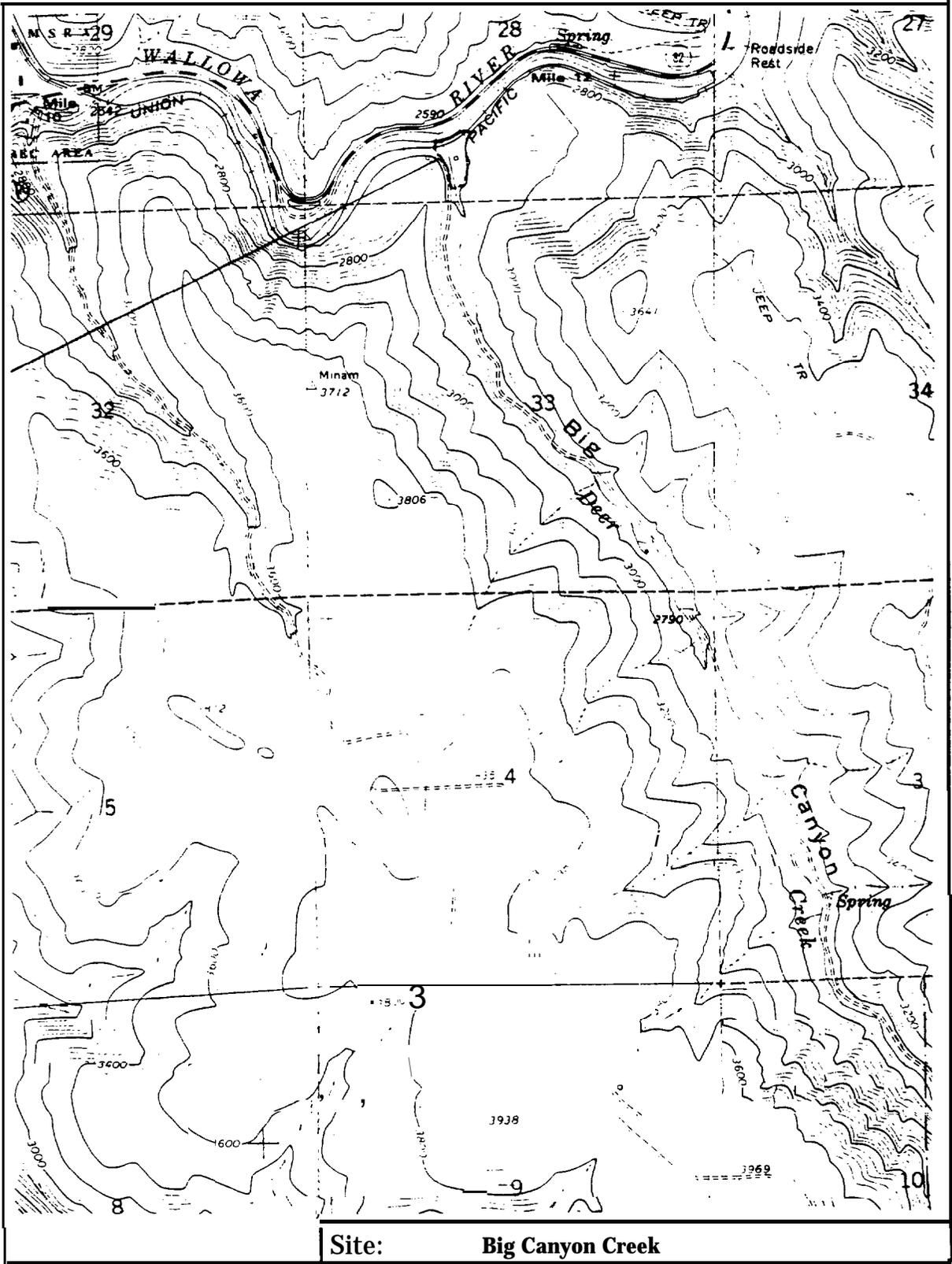
WATER SUPPLY

Gravity supply evaluation Good existing supply
Groundwater evaluation Existing development, Moderate potential for expanded development

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat
Anadromous fish Yes
Upland habitat type Deciduous riparian zone, pasture
Wetlands None identified beyond riparian zone
Permitting Considerations

RIVER BASIN	Grande Ronde
SITE NUMBER	GR19
SITE NAME	Big Canyon Creek
SITE LOCATION	
County	Wallowa
Road Access Directions	Highway 82 between Elgin and Enterprise. Approximately 1 mile east of Minam at confluence of Wallowa River and Big Canyon Creek. On S. side of Wallowa River.
River Mile	Wallowa River RM 11.5
USGS 1:100,000 Quad Ref.	Enterprise, OR
USGS 7.5' Quad Ref.	Minam. OR
Section 28	Township 2 N Range 41E
OWNERSHIP	
Owner Name	ODF&W
Contact Name	Brad Smith, ODF&W, Enterprise District Office
Contact Phone	426-3279
Zoning	Undetermined
Land Use /Jurisdiction	Existing LSRCP steelhead acclimation facility
GENERAL CHARACTERISTICS	
Proximity to road	Improved road access to existing facility
Proximity to power	Power developed at site
Size (acres)	Approx. 5
General topography	Flat
General soil type	Alluvial
Erosion potential	Low
Flood potential and history	Low
Upstream land use	Mixed Wallowa National Forest and private lands
Water rights	Undetermined
WATER SUPPLY	
Gravity supply evaluation	Existing developed gravity supply
Groundwater evaluation	Moderate potential in deep basalt aquifer
ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS	
Adjacent stream habitat	
Anadromous fish	Yes
Upland habitat type	Forested steep slope
Wetlands	None iden tified beyond riparian zone
Permitting Considerations	



RIVER BASIN Grande Ronde
SITE NUMBER GR20
SITE NAME Minam-Wallowa Confluence

SITE LOCATION

County Wallowa
Road Access Directions Highway 82 east from Elgin to Minam. Site is flat bench between river and highway on south side of road just before highway bridge over river.
River Mile Wallowa River RM 9.5
USGS 1:100,000 Quad Ref. Enterprise, OR
USGS 7.5' Quad Ref. Minam, OR
Section 29 **Township** 2 N **Range** 41E

OWNERSHIP

Owner Name Oregon State Parks
Contact Name Brad Smith, ODF&W, Enterprise District Office
Contact Phone 426-3279
Zoning Undetermined
Land Use /Jurisdiction State Park/State of Oregon

GENERAL CHARACTERISTICS

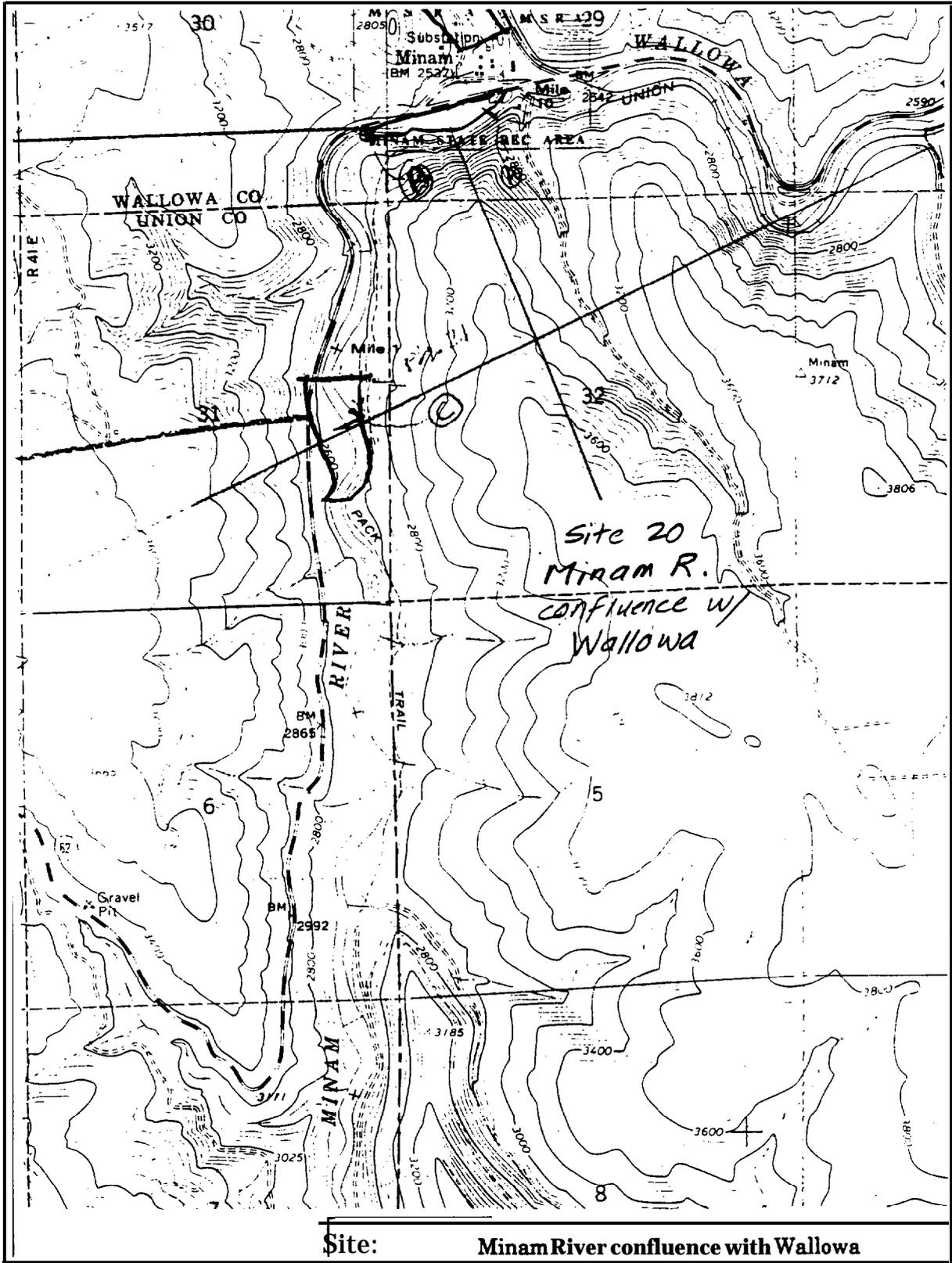
Proximity to road Adjacent to highway
Proximity to power Adjacent to power
Size (acres) Approx. 5- 10
General topography Flat bench approx. 10 feet above river
General soil type Alluvial
Erosion potential Moderate along river edge
Flood potential and history Moderate
Upstream land use Generally undeveloped, railroad and highway parallel Wallowa River
Water rights Undetermined

WATER SUPPLY

Gravity supply evaluation Potential upstream on Minam
Groundwater evaluation Moderate potential for development of groundwater in deep basalt aquifer

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat Broad rocky stream with low gradient.
Anadromous fish Yes
Upland habitat type Forested steep slope
Wetlands None identified beyond riparian zone.
Permitting Considerations Land use and zoning in Minam State Recreation Area. Minam is Wild and Scenic River



RIVER BASIN: Lostine River
SITE NUMBER: GR21
SITE NAME: ODF&W Big Horn Sheep Range

SITE LOCATION:

County : **Wallowa**
Road Access Directions: Five plus miles south of **Lostine** on the Lostine River Rd. to area south and east of Pole Bridge.
River Mile : 10
USGS 1:100,000 Quad Ref.: Enterprise, OR
USGS 7.5' Quad Ref.: Lostine, OR
Section: 10 **Township: 2 S** **Range:** 43 E

OWNERSHIP

Owner Name: ODF&W
Contact Name: Brad Smith, ODF&W, Enterprise District Office
Contact Phone: (503) 426-3279
Zoning: Undetermined
Land Use /Jurisdiction: Big Game wintering area/ODF&W.

GENERAL CHARACTERISTICS

Proximity to road : Adjacent to the paved Lostine River Rd
Proximity to power and type: Adjacent.
Size (acres): >10.
General topography: Level throughout area.
General soil type: Alluvial deposits.
Erosion potential: Low. The river has a very high gradient through this area which shows extremely high, large diameter **bedload** movement. Appears to have very severe icing condition which scours channel creating mounded gravel banks.
Flood potential and history: Potentially high immediately adjacent to the river.
Upstream land use: Eagle Cap Wilderness Area.
Water rights: Undetermined

WATER SUPPLY

Gravity supply evaluation: May be very difficult due to extremely high **bedload** movement.
Groundwater evaluation: Moderate to good potential for > 500 gpm wells based upon geology and local well logs. Glacial or alluvial aquifers.

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Extreme large size **bedload** movement through entire area.
Anadromous fish: **Steelhead** and Chinook.
Upland habitat type: Evergreen trees and cottonwoods throughout site.
Wetlands: None identified outside riparian zone.
Permitting Considerations: Groundwater rights.

RIVER BASIN: Lostine River
SITE NUMBER: GR22
SITE NAME: **Strathearn** Ranch

SITE LOCATION:

County : **Wallowa**
Road Access Directions: Approximately 4 miles south of **Lostine** on the Lostine River Rd. Site is approximately **100 yards** off gravel drive leading to ranch on north side of moraine.
River Mile : 10
USGS 1:100,000 Quad Ref.: Enterprise, Ore.
USGS 7.5' Quad Ref.: **Lostine, OR**
Section: 34 **Township: 1 S** **Range: 43 E**

OWNERSHIP

Owner Name: Bruce **Strathearn**
Contact Name: Brad Smith, **ODF&W**, Enterprise District Office
Contact Phone: (503) 426-3279
Zoning: **Undetermined**
Land Use /Jurisdiction: Undetermined

GENERAL CHARACTERISTICS

Proximity to road : Less than **1/2** mile on gravel road from Lostine River Rd.
Proximity to power and type: 3 Phase power to site.
Size (acres): Approximately 5 acres
General topography: Level bench adjacent to river.
General soil type: Alluvial deposits.
Erosion potential: **Low**
Flood potential and history: **Low**
Upstream land use: Farming and ranching.
Water rights: **Undetermined**

WATER SUPPLY

Gravity supply evaluation: Possible using a weir which would have to be constructed in the vicinity of the reservoir to achieve adequate head. Buried supply pipeline under moraine to site.
Groundwater evaluation: Moderate to good potential for **> 500 gpm** wells based upon geology and local well logs. Glacial or alluvial **aquifers**.

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Low **bedload** movement through a the relative flat gradient reach above potential site.
Anadromous fish: Steelhead and Chinook.
Upland habitat type: Forested upland area. pasture, meadow and private residence.
Wetlands: None identified outside riparian zone.
Permitting Considerations: Water rights.



Site: **Strathearn Ranch**

RIVER BASIN: Lostine River
SITE NUMBER: GR23
SITE NAME: Lostine Dam

SITE LOCATION:

County : **Wallowa**
Road Access Directions: Approximately 1.25 miles south of Lostine on Lostine River Rd., just upstream of Wynan's Trout Farm at the Lostine Dam.
River Mile : 7
USGS 1:100,000 Quad Ref.: Enterprise, OR
USGS 7.5' Quad Ref.: Lostine, OR
Section: 22 **Township: 1 S** **Range:** 43 E

OWNERSHIP

Owner Name: Private, Unknown
Contact Name: Brad Smith, **ODF&W**, Enterprise District Office
Contact Phone: (503) 426-3279
Zoning: Undetermined
Land Use /Jurisdiction: Undetermined

GENERAL CHARACTERISTICS

Proximity to road : This site is for adult capture facility. The existing dam and diversion is very old, but constructed to allow adult fish passage. Immediately upstream, the river is narrower. The best location for a capture facility would require obtaining private land across **from** paved road. Access would be by private **drive** and wood bridge.

Proximity to power and type: **Adjacent.**

Size (acres): Land is a very large pasture, **>10** acres.

General topography: Very limited level area available on east side. West side has narrow river bottom and flood plain with large pasture.

General soil type: Alluvial deposits.

Erosion potential: **Low**

Flood potential and history: Moderate

Upstream land use: Farming and ranching.

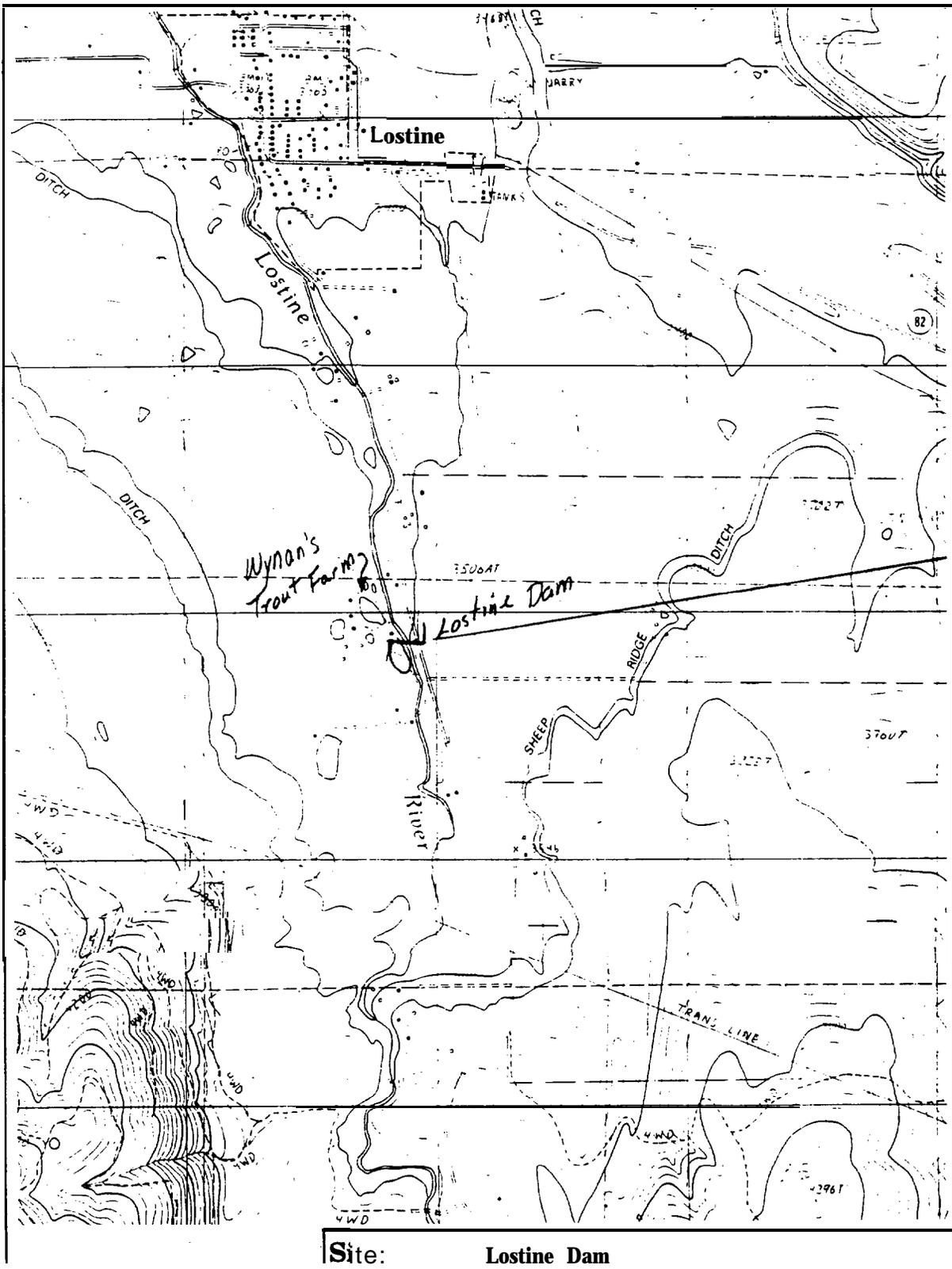
Water rights: Undetermined, irrigation diversion at dam.

WATER SUPPLY

Gravity supply evaluation: Possible using a diversion weir.
Groundwater evaluation: **N/A**

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: High **bedload** movement.
Anadromous fish: St&head and Chinook.
Upland habitat type: Riparian vegetation along river. Upland area pasture
Wetlands: None **identified** beyond riparian zone
Permitting Considerations: Water rights.



Site: **Lostine Dam**

RIVER BASIN: Lostine River
SITE NUMBER: GR24
SITE NAME: Cross-Valley Diversion (Clear Water **Ditch**)Jerry MC Clear Ranch)

SITE LOCATION:

County : **Wallowa**
Road Access Directions: East on gravel road off Hwy 82, approximately 3 miles **north** of Lostine at **the McClear** Ranch.
River Mile : 3
USGS 1:100,000 Quad Ref.: Enterprise, Ore.
USGS 7.5' Quad Ref.: Evans, Ore.
Section: 32.33 **Township:** 1 N **Range:** 43 E

OWNERSHIP

Owner Name: Jerry **McCclear**
Contact Name: Brad Smith, **ODF&W**, Enterprise District Office
Contact Phone: (503) 426-3279
Zoning: **Undetermined**
Land Use /Jurisdiction: **Undetermined**

GENERAL CHARACTERISTICS

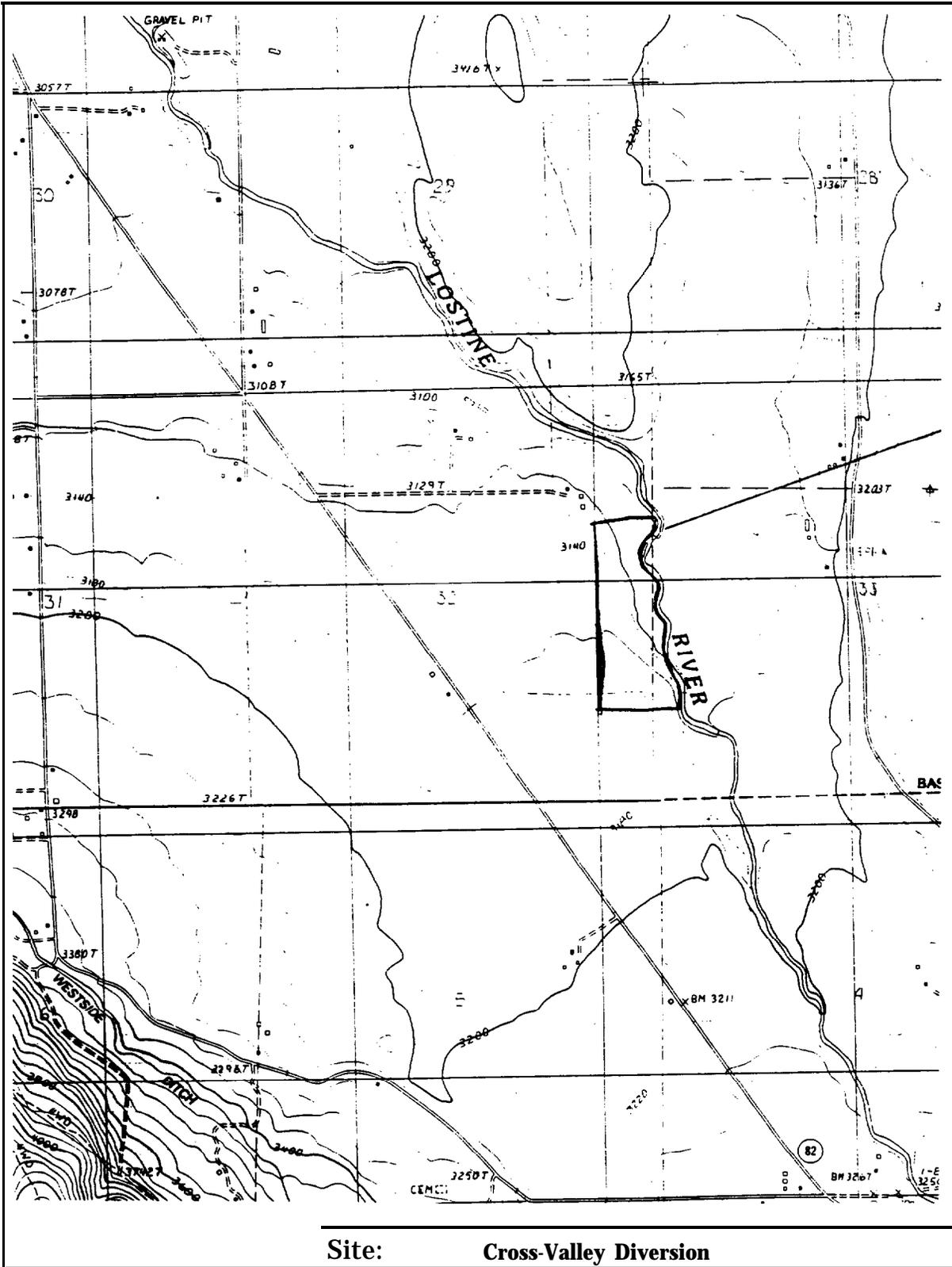
Proximity to road : Estimated at **1/2** mile upstream of ranch building. No vehicle access. A road would have to be constructed, which would encroach on field.
Proximity to power and type: Estimated at **1/2** mile from ranch.
Size (acres): Very little on river. May be enough for small temporary adult holding, if site used for adult capture.
General topography: Limited level area available. River bottom and flood plain..
General soil type: Alluvial deposits.
Erosion potential: High
Flood potential 'and history: High
Upstream land use: Farming and ranching.
Water rights: Undetermined

WATER SUPPLY

Gravity supply evaluation: Possible using a diversion weir.
Groundwater evaluation: **N/A**

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: High **bedload** movement.
Anadromous fish: Steelhead and Chino&.
Upland habitat type: Mature cottonwoods and riparian vegetation along river. Upland area is farmed land.
Wetlands: River bottom riparian zone.
Permitting Considerations: **Water rights**



RIVER BASIN: Grande Ronde, Catherine Creek
SITE NUMBER: GR25
SITE NAME: Catherine Creek at Davis Dam

SITE LOCATION:

County : Union
Road Access Directions: Between **LaGrande** and Union near site of former hot springs resort
River Mile : .
USGS 1:100,000 Quad Ref.: Enterprise, OR
USGS 7.5' Quad Ref.:
Section: **Township:** **Range:**

OWNERSHIP

Owner Name: Private
Contact Name: Duane West, **ODF&W, LaGrande** District Office
Contact Phone: (503) %3-2138
Zoning: **Undetermined**
Land Use /Jurisdiction: **Undetermined**

GENERAL CHARACTERISTICS

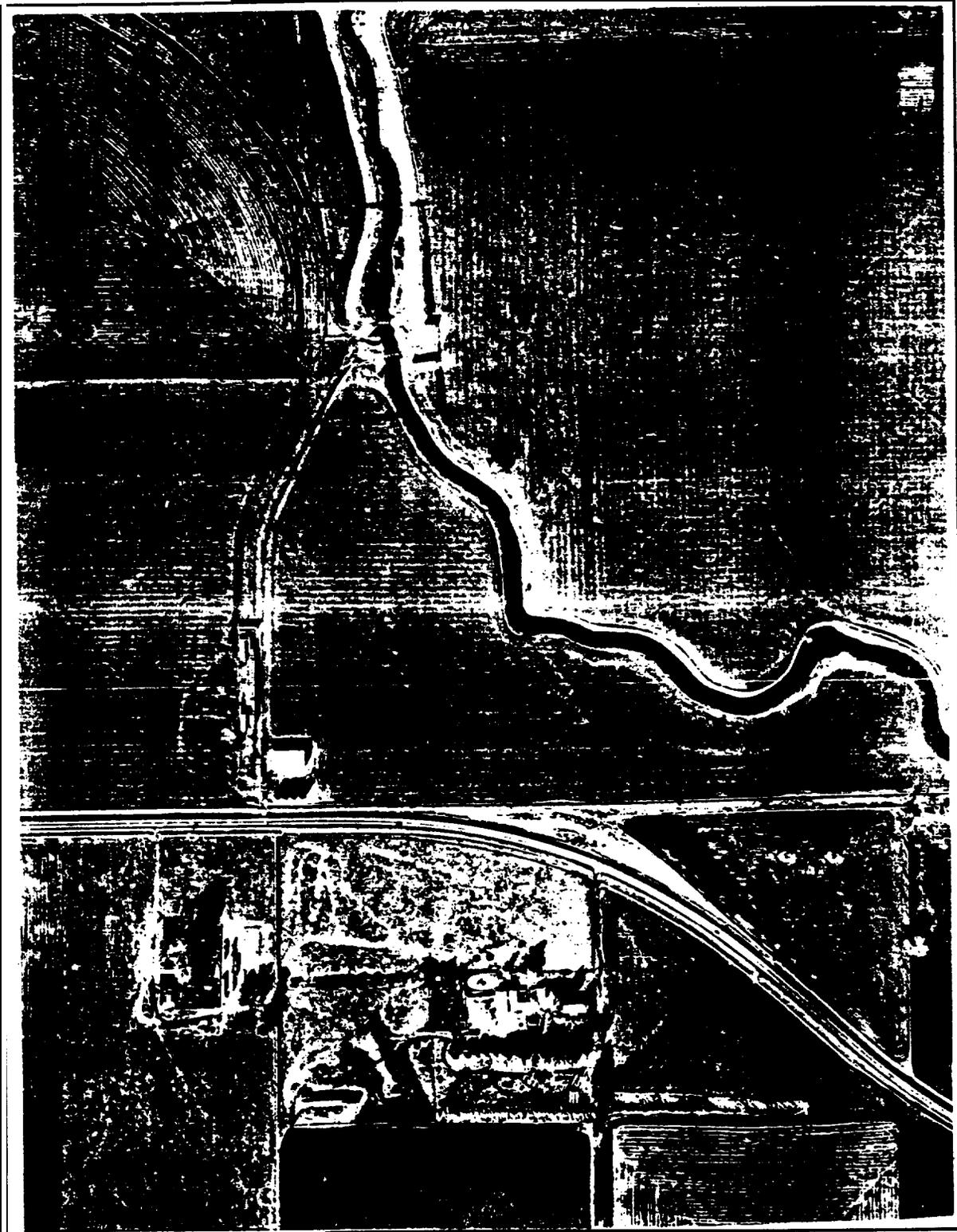
Proximity to road : Estimated at **1/2** mile along gravel road off paved road
Proximity to power and type: Estimated at **1/2** mile from ranch.
Size (acres): **>5 acres**
General topography: River bottom and flood plain. Level pastures above river
General soil type: Alluvial deposits.
Erosion potential: High
Flood potential and history: High
Upstream land use: Farming and ranching.
Water rights: **Undetermined**

WATER SUPPLY

Gravity supply evaluation: Possible using existing diversion weir.
Groundwater evaluation: **N/A**

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Minimal riparian cover.
Anadromous fish: Steelhead and Chinook.
Upland habitat type: Some mature cottonwoods and riparian vegetation along river. **Upland area is fanned land**
Wetlands: River bottom riparian zone.
Permitting Considerations: Water rights



Site: Catherine Creek at Davis Dam

RIVER BASIN Grande **Ronde**, Minam River
SITE NUMBER GR26
SITE NAME Minam River **1/4** to 1 mile above **Wallowa** Confluence

SITE LOCATION

County **Wallowa**
Road Access Directions Highway 82 east from Elgin towards Enterprise. North on road next to grocery store at Minam. Site is flat bench behind grocery store and power substation on west side of **Wallowa** River. Most upriver site is approximately 1 mile south of Minam and reached by steep, dirt access road on E side of highway.
River Mile Minam River RM 0.25 to 1
USGS 1:100,000 Quad Ref. Enterprise, OR
USGS 7.5' Quad Ref. Minam. OR
Section 29, 31 **Township 2 N** **Range** 41E

OWNERSHIP

Owner Name **ODF&W**
Contact Name Duane West, **ODF&W**, Enterprise District Office
Contact Phone **426-3279**
Zoning Undetermined
Land Use /Jurisdiction State Park/State of Oregon

GENERAL CHARACTERISTICS

Proximity to road Adjacent to improved gravel road
Proximity to power Power substation at S. end of site
Size (acres) Approx. 10
General topography Flat bench approx. 10 feet above river
General soil type Alluvial
Erosion potential Moderate along river edge
Flood potential and history Moderate
Upstream land use Generally undeveloped, railroad and highway parallel **Wallowa** River
Water rights Undetermined

WATER SUPPLY

Gravity supply evaluation Potential intake location near **Minam Wallowa confluence** at Highway 82 bridge. Low **head**; pump station on river closer to site may be more practical.
Groundwater evaluation Moderate potential for development of groundwater in deep basalt **aquifer**

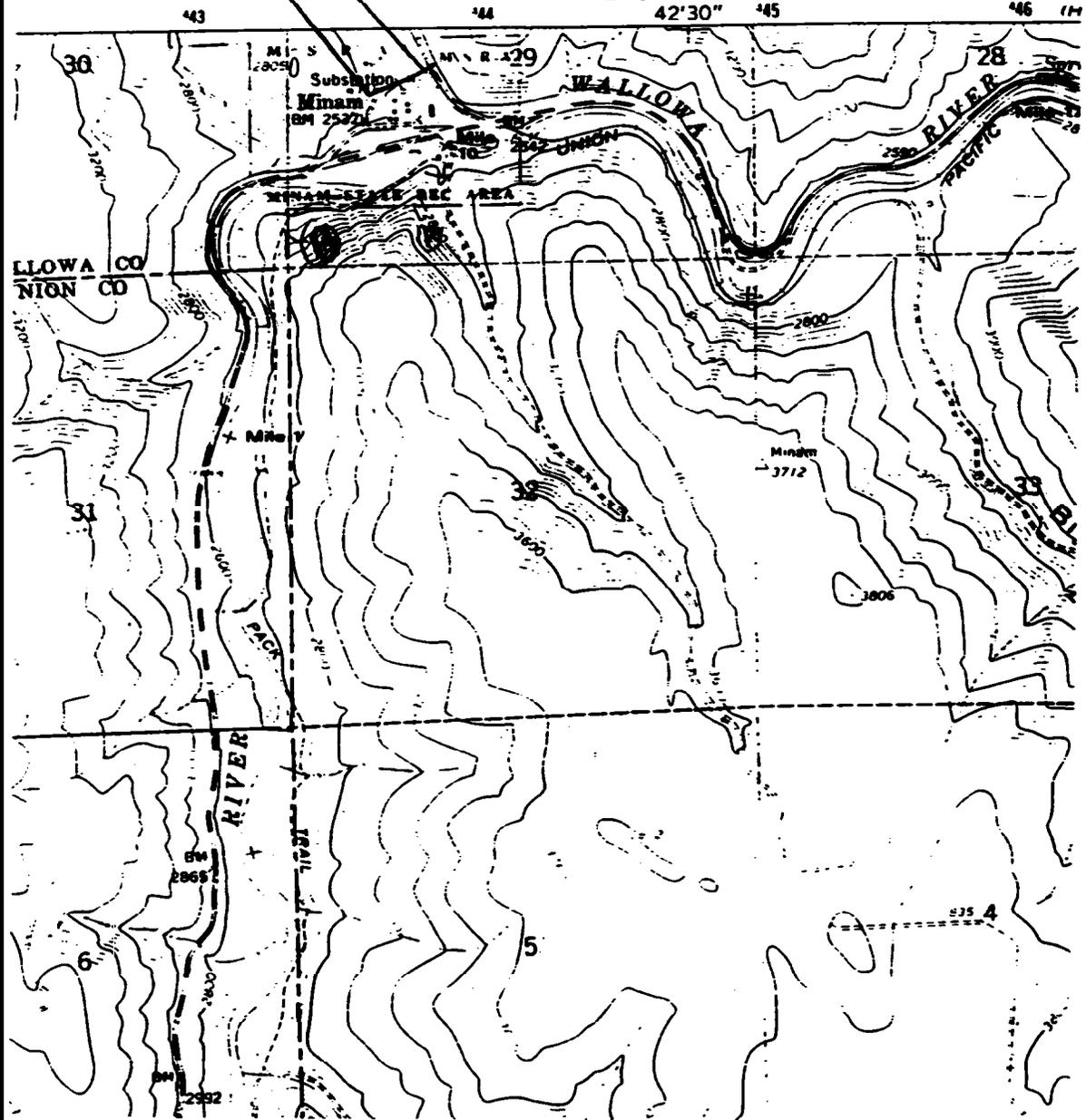
ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat Broad rocky stream with low gradient.
Anadromous fish **Yes**
Upland habitat type Forested steep slope
Wetlands None identified beyond riparian zone.
Permitting Considerations Land use and zoning in Minam State Recreation Area.

RIVER BASIN	Grande Ronde, Wallowa River
SITE NUMBER	GR27
SITE NAME	Wallowa River 1/2 mile below Minam Confluence
SITE LOCATION	
County	Wallowa
Road Access Directions	Highway 82 east from Elgin towards Enterprise. North on road next to grocery store at Minam. Site is flat bench behind grocery store and power substation on west side of Wallowa River.
River Mile	Wallowa River RM 9.5
USGS 1:100,000 Quad Ref.	Enterprise, OR
USGS 7.5' Quad Ref.	Minam and Howard Butte, OR
Section 29	Township 2 N Range 41E
OWNERSHIP	
Owner Name	Oregon State Parks
Contact Name	Brad Smith, ODF&W, Enterprise District Office
Contact Phone	426-3279
Zoning	Undetermined
Land Use /Jurisdiction	State Park/State of Oregon
GENERAL CHARACTERISTICS	
Proximity to road	Adjacent to improved gravel road
Proximity to power	Power substation at S. end of site
Size (acres)	Approx. 10
General topography	Flat bench approx. 10 feet above river
General soil type	Alluvial
Erosion potea tial	Moderate along river edge
Flood potential and bistory	Moderate
Upstream land use	Generally undeveloped, railroad and highway parallel Wallowa River
Water rigbts	Undetermined
WATER SUPPLY	
Gravity supply evaluation	Potential intake location near Minam Wallowa confluence at Highway 82 bridge. Low head; pump station on river closer to site may be more practical.
Groundwater evaluation	Moderate potential for development of groundwater in deep basalt aquifer
ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS	
Adjacent stream habitat	Broad rocky stream with low gradient.
Aaadromous fish	Yes
Upland habitat type	Forested steep slope
Wetlands	None identified beyond riparian zone.
Permitting Considerations	Land use and zoning in Minam State Recreation Area.

STATES
THE INTERIOR
SURVEY

New Minam-Wallowa Confluence
T2N, R41E, S29
Uses Minam



Site: Wallowa R. 1/2 mi. below Minam confl.

RIVER BASIN: Grande Ronde, Wenaha River
SITE NUMBER: GR28
SITE NAME: Wenaha River 1/4 mile above Troy
SITE LOCATION:
County : Wallowa
Road Access Directions: At Troy, OR. Cross Wenaha River at mouth heading south out of Troy. West along gravel road adjacent to Wenaha River to large flat area approximately 1/2 mile outside town.
 River Mile : 45.25
 USGS **1:100,000** Quad Ref.: Enterprise, Ore
 USGS 7.5' **Quad** Ref.: Troy, OR
 Section: **4,5** Towas hip: **5N** **Range:** 43E

OWNERSHIP
Owner Name: ODF&W
Contact Name: Brad Smith, ODF&W, Enterprise District Office
Contact Phone: (503) 426-3279
Zoning: Undetermined
Land Use /Jurisdiction: Wild and Scenic River/USFS jurisdiction

GENERAL CHARACTERISTICS

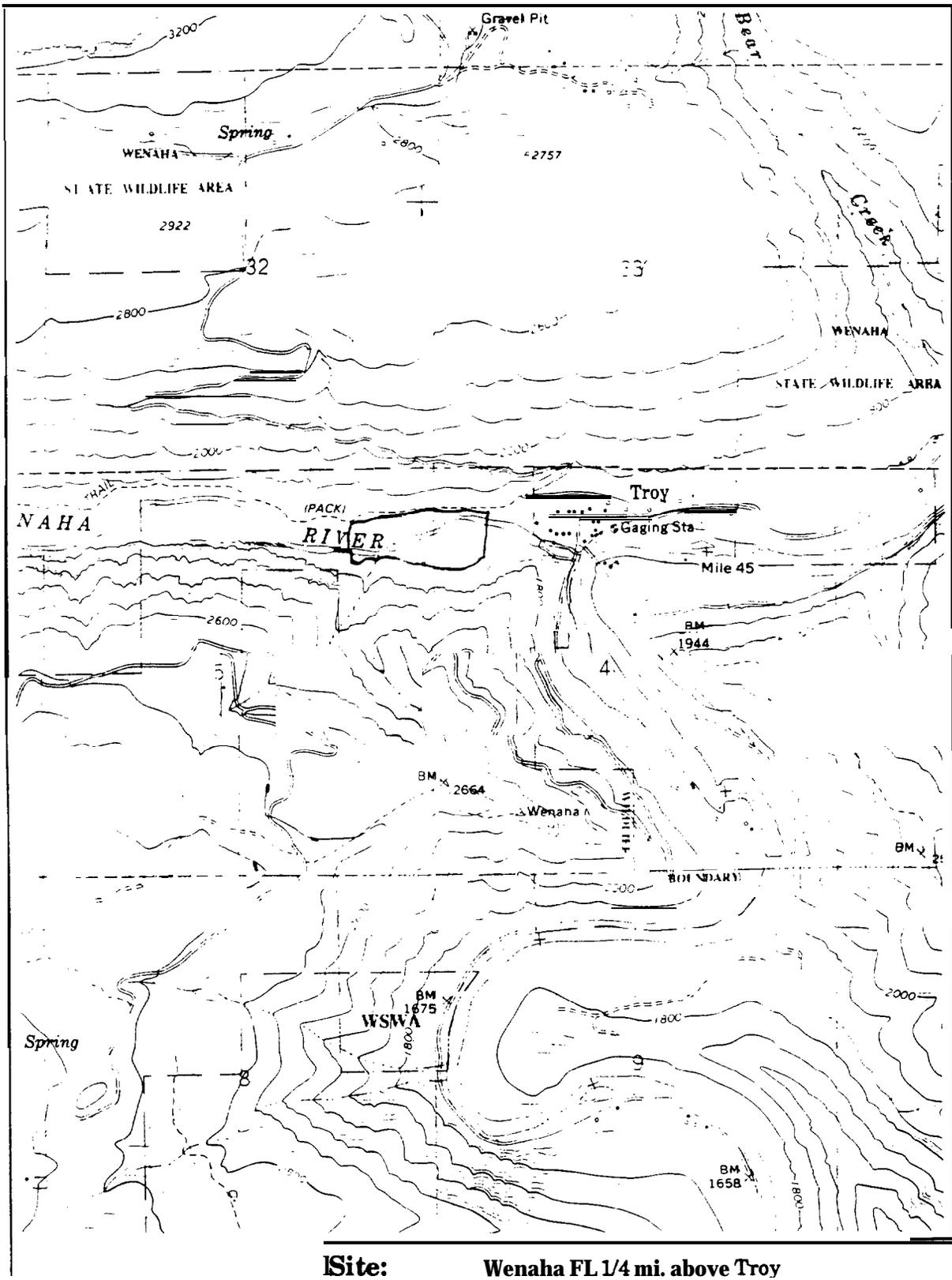
Proximity to road : Adjacent gravel road.
Proximity to power and type: None at site. Available in town.
Size (acres): 5 (approx.)
General topography: Generally level
General soil type: Alluvial
Erosion potential: Moderate
Flood potential and history: Moderate during high flow periods.
Upstream land use: Grazing, National Forest land, Wenaha State Wildlife Area
Water rights: Undetermined

WATER SUPPLY

Gravity supply ● vafoatloa: **Good**
Groundwater evaluation: N/A

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: River has moderate bedload movement
Anadromous fish: Yes
Upland habitat type: Steep grass covered slopes
Wetlands: None identified beyond riparian zone
Permitting Considerations: Wild and Scenic River restrictions



Site: Wenaha FL 1/4 mi. above Troy

RIVER BASIN Imnaha
SITE NUMBER 11
SITE NAME Indian Crossing

SITE LOCATION

County **Wallowa**
Road Access Directions SE. from Enterprise towards Imnaha, S on Forest Service Road 39 towards State Hwy. 86 and Halfway shortly after entering Little Sheep Creek drainage. Continue on **FS 39** over pass and down Gumboot Creek drainage to Imnaha River. Follow road along Imnaha River upstream bearing west at Ollokot Campground onto dirt road. Continue along Imnaha River approximately 9 miles to Indian Crossing Campground. Site on **west** side of river across bridge.
River Mile RM 57

USGS 1:100,000 Quad Ref. Enterprise, OR and **Riggins, ID-OR**
USGS 7.5' Quad Ref. Deadman Pt., OR
Section unmapped **T o w n s h i p** **5S** **Range** **47E**

OWNERSHIP

Owner Name U.S. Forest Service
Contact Name Brad Smith, **ODF&W**, Enterprise District Office
Contact Phone (503) 426-3279
Zoning Undetermined
Land Use /Jurisdiction Wild and Scenic River and **Hells** Canyon National Recreation Area/**USFS** jurisdiction

GENERAL CHARACTERISTICS

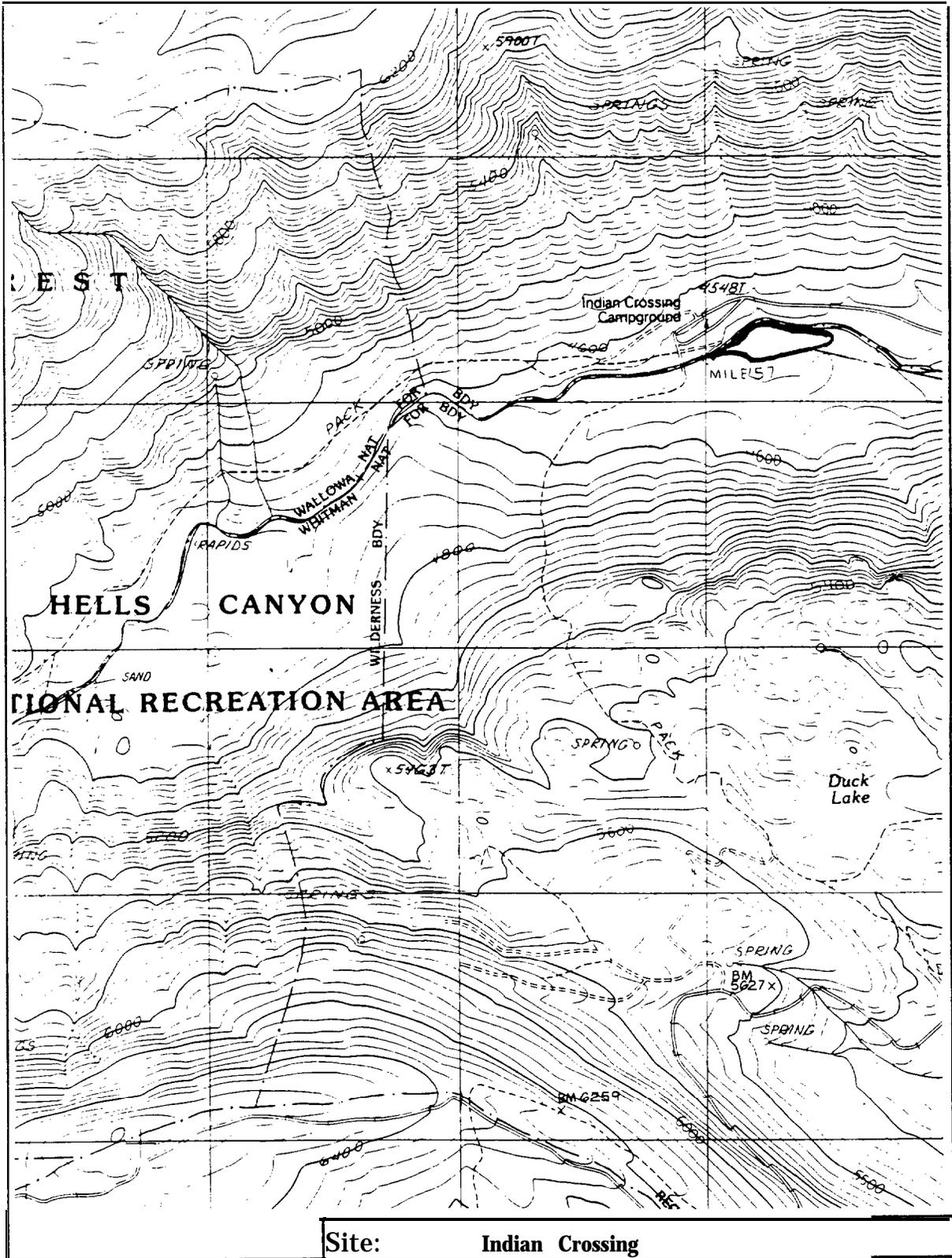
Proximity to road 9 miles from all weather road. Not maintained during winter
Proximity to power
Size (acres) 2-3 acres in flats along river
General topography flat to rolling with rock outcrops
General soil type Alluvial
Erosion potential Low
Flood potential and history Low
Upstream land use Eagle Cap Wilderness Area
Water rights Undetermined

WATER SUPPLY

Gravity supply evaluation Good potential at site below bridge on W side of river
Groundwater evaluation N/A

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat Moderate gradient. Boulder, riffle, pool complexes
Anadromous fish Yes
Upland habitat type Forested steep slope
Wetlands None observed outside riparian zone
Permitting Considerations Wild and Scenic River restrictions, National Recreation Area restrictions



RIVER BASIN: Imnaha
SITE NUMBER: I2
SITE NAME: Gumboot Creek (Fish Weir)

SITE LOCATION:

County : **Wallowa**
Road Access Directions: South of Town of Imnaha on Upper Imnaha Road, USFS Rd #3955 in Hells Canyon National Recreation Area, **Wallowa National Forest.** On Imnaha R. immediately downstream of Gumboot Ck. At existing Gumboot Ck. LSRCP Imnaha Satellite facility (Fish Weir).

River Mile : 47
USGS 1:100,000 Quad Ref.: Grangeville, ID
USGS 7.5' Quad Ref.: Puderbaugh Ridge, Ore.
Section: 30 **Township:** T 4 S **Range:** R 48 E

OWNERSHIP

Owner Name: ODF&W
Contact Name: Brad Smith, ODF&W, Enterprise District Office.
Contact Phone: (503) 426-3279
Zoning: Unknown
Land Use /Jurisdiction: Existing Facility/ U.S. Forest Service -Nat. Rec. Area

GENERAL CHARACTERISTICS

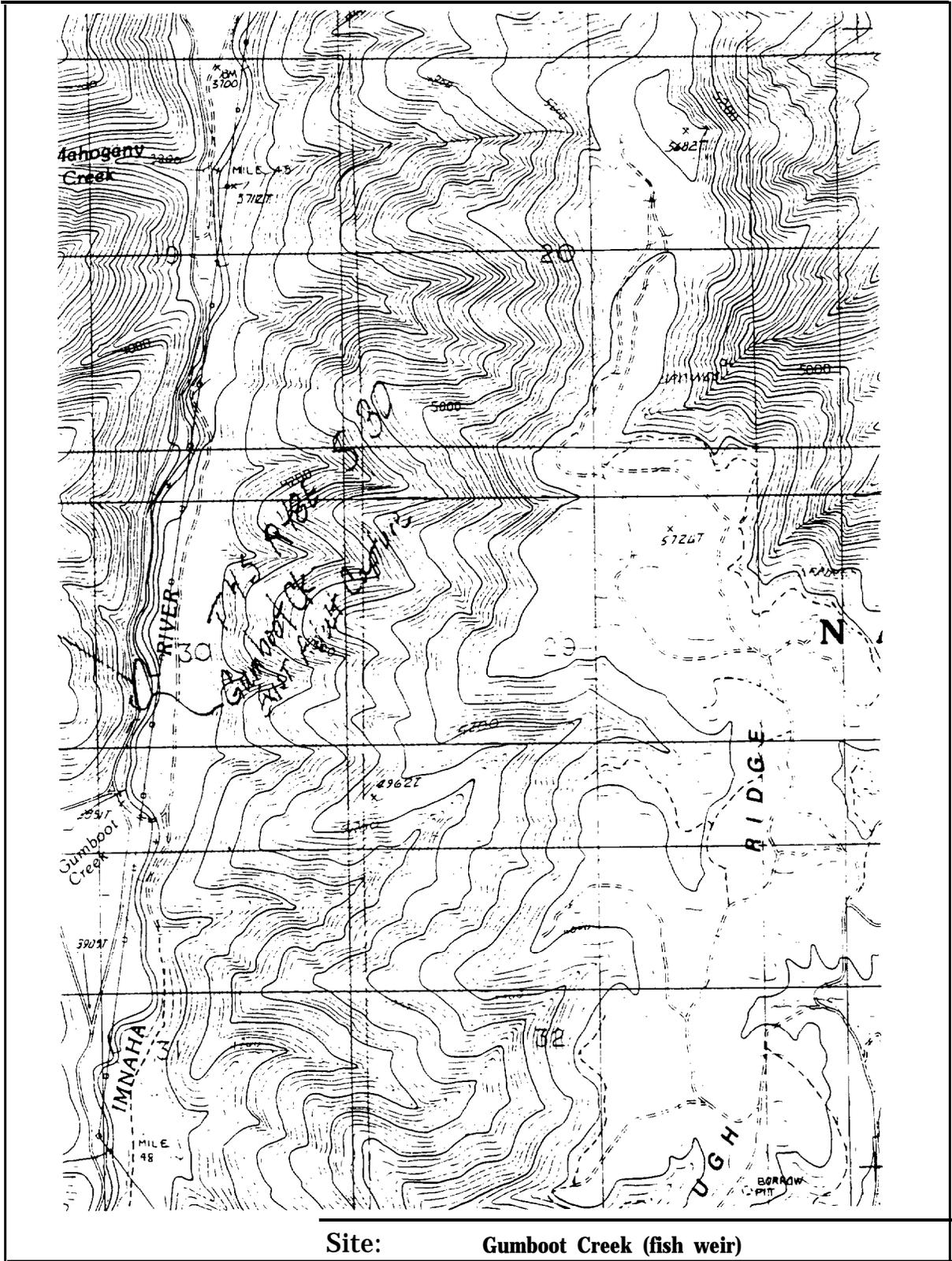
Proximity to road : Adjacent to ah-weather gravel road.
Proximity to power and type: 3-Phase adjacent to site.
Size (acres): Some space available for expansion of existing acclimation facility or other small facility.
General topography: Level
General soil type: Alluvial deposits.
Erosion potential: L O W
Flood potential and history: Low
Upstream land use: National Forest, Hells Canyon National Recreation Area
Water rights: Unknown

WATER SUPPLY

Gravity supply evaluation: Existing gravity intake for existing acclimation facility which is in use March and April. Some minor icing problems, but facility has only been in use for two seasons. Acclimation pond sized at 250K smolts at 15/lb.
Groundwater evaluation: Unknown at this time.

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Moderate to high bedload movement.
Anadromous fish: Steelhead and Spring Chinook.
Upland habitat type: Forested.
Wetlands: No identified wetlands on site.
Permitting Considerations: Water rights, Restrictions within NRA and Wild and Scenic Rivers Act



Site: Gumboot Creek (fish weir)

RIVER BASIN: Imnaha
SITE NUMBER: I3
SITE NAME: Imnaha/ Confluence of Grouse Ck.

SITE LOCATION:

County : **Wallowa**
Road Access Directions: 16 miles south of Town of Imnaha on Upper Imnaha Road. USFS Rd #3955. On Imnaha R. at confluence of Grouse Ck.
River Mile : 35
USGS 1:100,000 Quad Ref.: **Grangeville, ID**
USGS 7.5' Quad Ref.: Jaynes Ridge, OR
Section: 16/21 **Township:** T 3 S **Range:** R 48 E

OWNERSHIP

Owner Name: Private
Contact Name: Brad Smith ODF&W
Contact Phone: (503) 426-3279
Zoning: Undetermined
Land Use /Jurisdiction: Undetermined

GENERAL CHARACTERISTICS

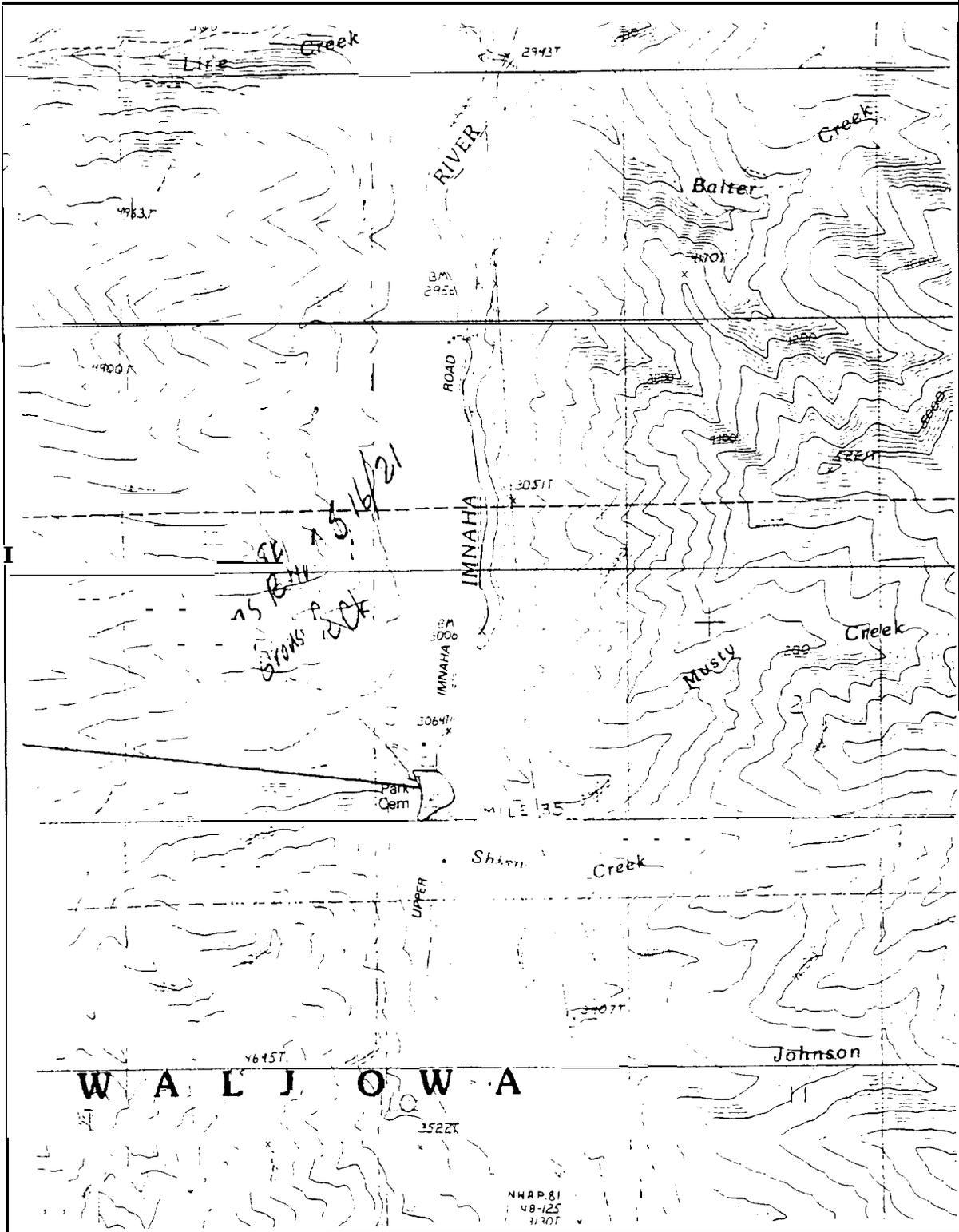
Proximity to road : Adjacent to ah-weather gravel road.
Proximity to power and type: 3-Phase adjacent to sites.
Size (acres): Very limited area at site.
General topography: Moderate slopes.
General soil type: Aluvial deposits.
Erosion potential: Low
Flood potential and history: Low
Upstream land use: Grazing
Water rights: Unknown

WATER SUPPLY

Gravity supply evaluation: Site well above river.
Groundwater evaluation: N/A

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Moderate to high **bedload** movement.
Anadromous fish: Steelhead and Spring Chinook.
Upland habitat type: Pasture and forest.
Wetlands: No identified wetlands on site beyon riparian zone.
Permitting Considerations: Water rights



Site: Grouse Creek-Imnaha confluence

RIVER BASIN Innaha
SITE NUMBER 14
SITE NAME Big Sheep-Lick Creek Confluence

SITE LOCATION

County **Wallowa Co.**
Road Access Directions SE. from Enterprise towards Innaha. **S** on **Forest Service Road 39** towards State Hwy. 86 and Halfway shortly after entering Little Sheep Creek drainage. Continue up to Big Sheep Creek and bear NE on FS road 140 down Big Sheep Creek drainage. Approximately 2 miles to site area at confluence of Big Sheep Creek and Lick Creek.
River Mile Approximate RM 32-33 on Big Sheep Creek
USGS 1:100,000 Quad Ref. Enterprise, OR
USGS 7.5' Quad Ref: Lick Creek, OR
Section unmapped **Township** **4S** **Range** **46E**

OWNERSHIP

Owner Name U.S. Forest Service, **Wallowa Nat'l. Forest**
Contact Name Brad Smith **ODF&W**
Contact Phone (503) 426-3279
Zoning Undetermined
Land Use /Jurisdiction Undetermined

GENERAL CHARACTERISTICS

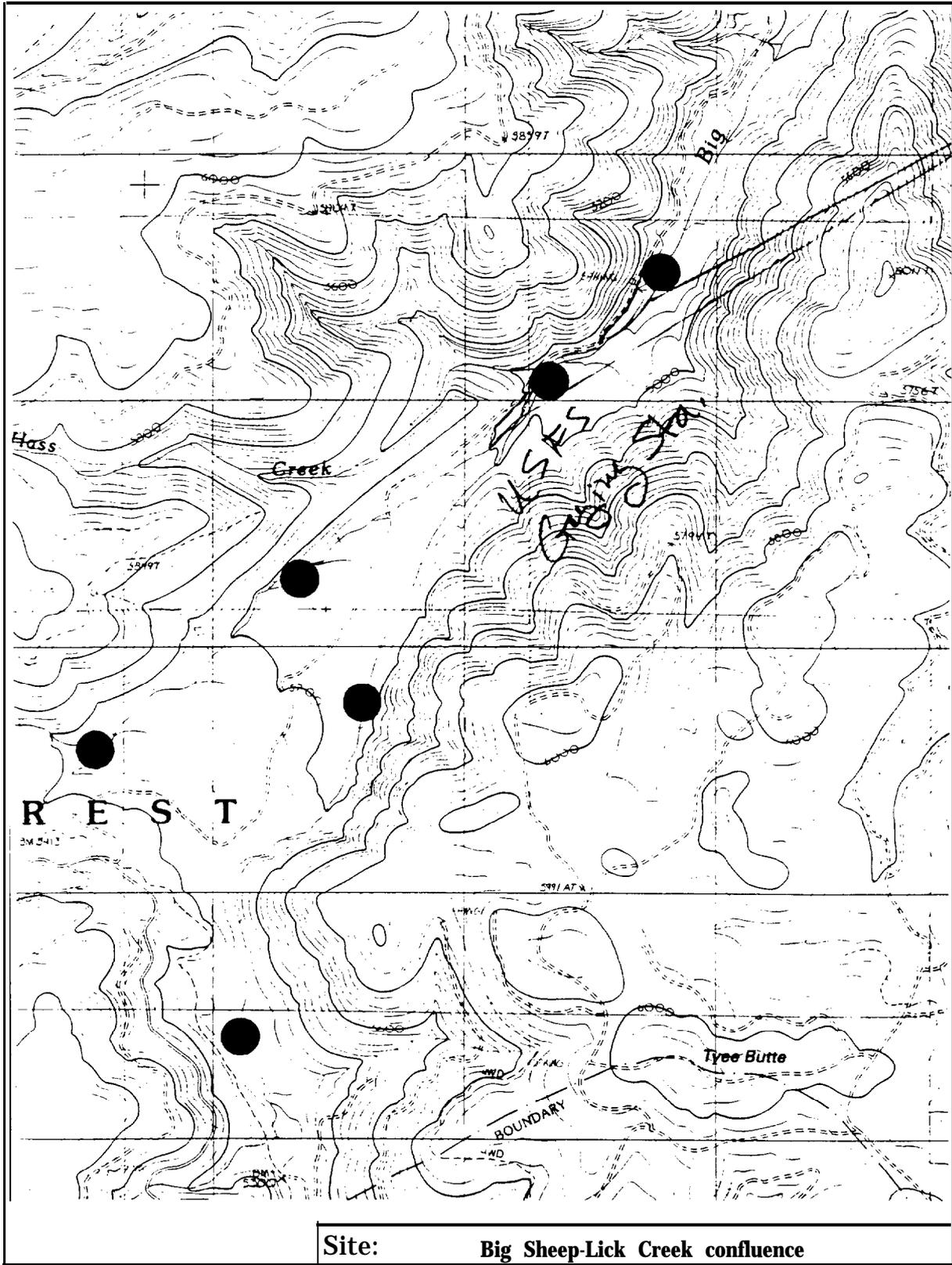
Proximity to road Approximately 2 miles from all-weather road. Winter snow access difficulty
Proximity to power No power in vicinity
Size (acres) 5- 10 acres over broad area
General topography Flat to gently sloping
General soil type Alluvial
Erosion potential Moderate, recent burned area on upper drainage of Big Sheep Creek continuing down close to site area.
Flood potential and history **Low**
Upstream land use National Forest (Big Sheep), Nat. Rec. Area (Lick Creek).
Water rights Undetermined

WATER SUPPLY

Gravity supply evaluation Good potential at a number of locations
Groundwater evaluation N/A

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat Pool, Riffle complexes
Anadromous fish **Yes**
Upland habitat type Forested steep slope, **fire** damage
Wetlands Much of the site area appears to contain wetland vegetations. Development would require delineation of these areas.
Permitting Considerations Wetlands



RIVER BASIN: Innaha
SITE NAME: 15
SITE NAME: Big Sheep Creek - Innaha Confluence

SITE LOCATION:

County : Wallowa
Road Access Directions: On Innaha R. immediately upstream of the Town of Innaha, in the area adjacent the confluence of Big Sheep Creek. Two possible sites. Site 1 on west bank of Innaha R. immediately upstream of Big Sheep Ck. Site 2 on the east bank, directly across from Big Sheep Ck. Both sites on paved road, immediately upstream of the Town of Innaha.

River Mile : 19
USGS 1:100,000 Quad Ref.: Grangeville, ID
USGS 7.5' Quad Ref.: Innaha, OR
Section: 16/21 **Township:** T 1 N **Range:** R 48 E

OWNERSHIP

Owner Name: Private/Unknown
Contact Name: Brad Smith ODF&W, Enterprise District Office
Contact Phone: (503) 426-3279
Zoning: Undetermined
Land Use /Jurisdiction: Undetermined

GENERAL CHARACTERISTICS

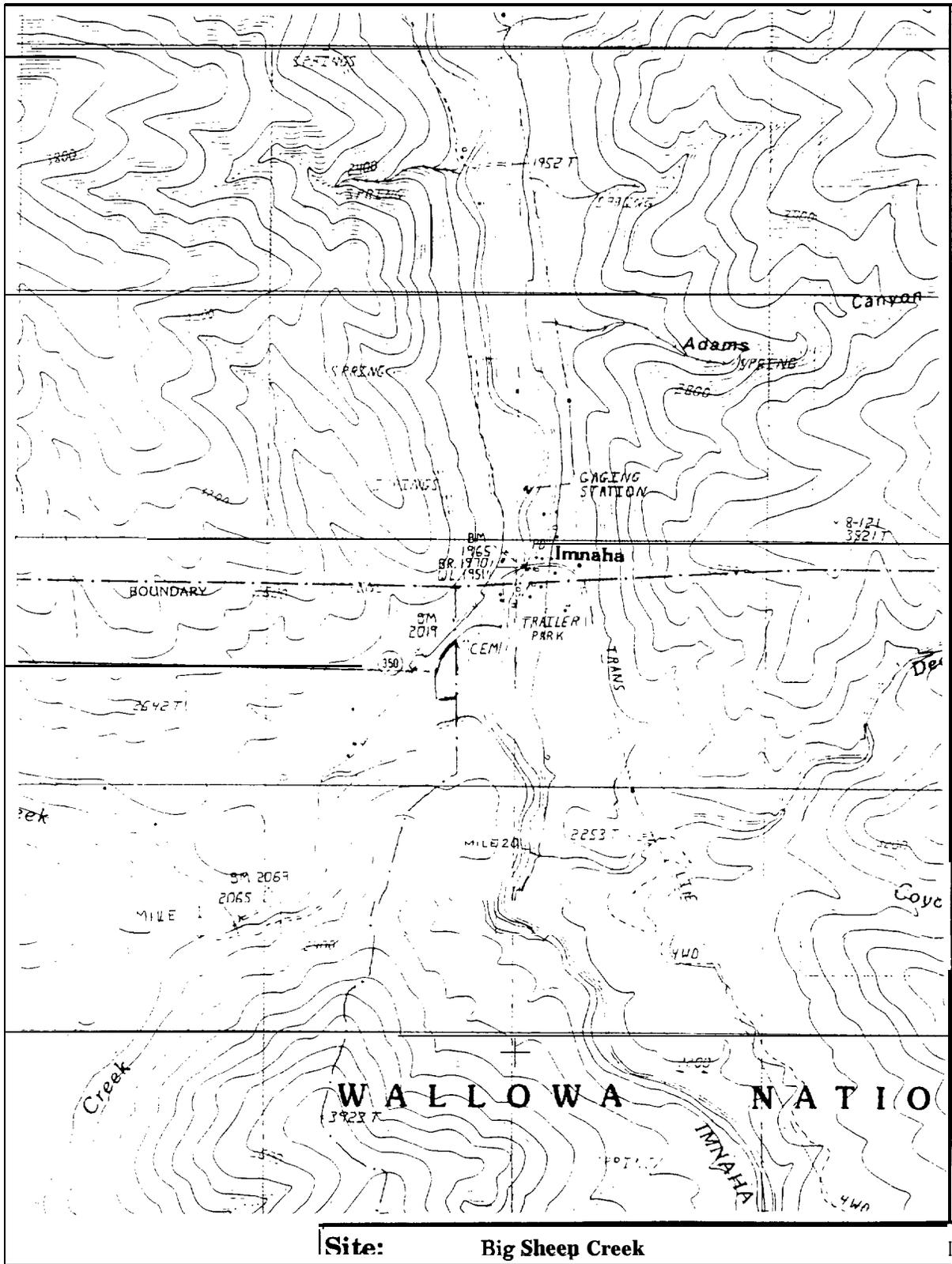
Proximity to road : Both sites immediately adjacent to paved road.
Proximity to power and type: 3-Phase adjacent to sites.
Size (acres): 3 plus
General topography: Both sites with moderate slopes.
General soil type: Alluvial deposits.
Erosion potential: Low
Flood potential and history: Low
Upstream land use: Stock yard at site 1 and hay field/cattle grazing on site 2.
Water rights: Unknown

WATER SUPPLY

Gravity supply evaluation: Good gravity or pumped supply potential.
Groundwater evaluation: Low to moderate potential for > 500 gpm wells based upon geology and local well logs. Igneous and metamorphic aquifers. Town water supplied from spring located in the area.

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Moderate to high bedload movement.
Anadromous fish: Steelhead and Spring Chinook.
Upland habitat type: Pasture and stock yard.
Wetlands: No identified wetlands on site.
Permitting Considerations: Water rights if well or spring supply used.



Site: **Big Sheep Creek**

RIVER BASIN: Imnaha
SITE NAME: 16
SITE NAME: Big Sheep/ Little Sheep Creek

SITE LOCATION:

County : **Wallowa**
Road Access Directions: Estimated 25 miles from Joseph on paved road from Joseph to Imnaha. Site in area near bridge over Big Sheep Creek, immediately below confluence of Big and Little Sheep Creek. Two potential sites exist at this location. They are separated by the private gravel road which goes up Big Sheep Creek.
River Mile : Imnaha R. 23.4 , Big Sheep Ck 3.2
USGS 1:100,000 Quad Ref.: Grangeville, ID
USGS 7.5' Quad Ref.: Imnaha, Ore.
Section: 31 **Township:** T 1 N **Range:** R 48 E

OWNERSHIP

Owner Name: Private/ Unknown
Contact Name: Brad Smith **ODF&W**, Enterprise District Office
Contact Phone: (503) 426-3279
Zoning: Undetermined
Land Use /Jurisdiction: Undetermined

GENERAL CHARACTERISTICS

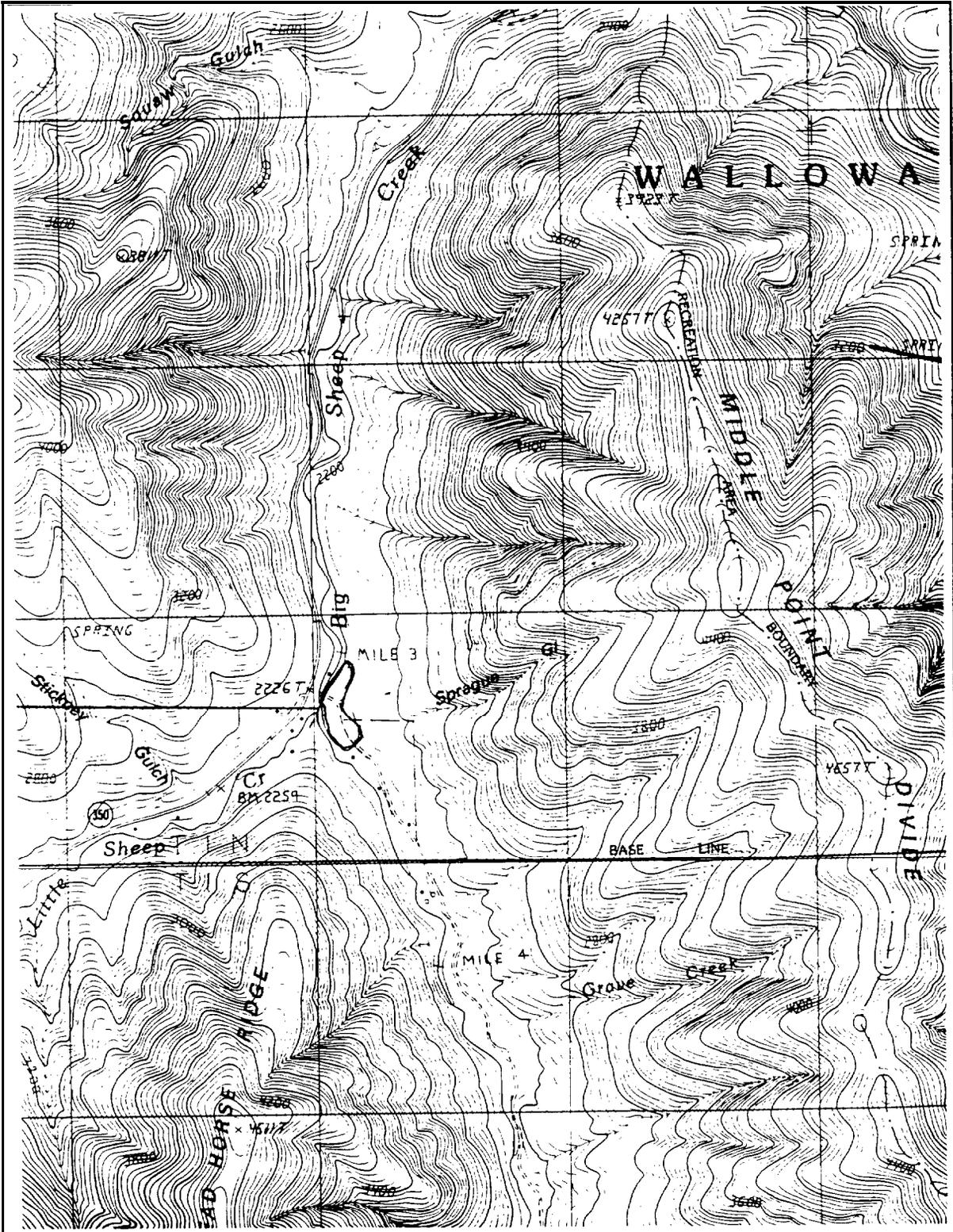
Proximity to road : Adjacent to paved road, across wooden bridge would require rebuilding.
Proximity to power and type: 3-Phase adjacent to site
Size (acres): 2 - estimated 2 acre sites.
General topography: Site 1 is low land with riparian vegetation and potential wetland. Site 2 is upland with moderate side slope.
General soil type: Alluvial deposits
Erosion potential: Site 1 is moderate to high and Site 2 is extremely low.
Flood potential and history: Site 1 is moderate to high and Site 2 is extremely low.
Upstream land use: Forested with potential logging and grazing. Cattle and sheep grazing along creek immediately above site.
Water rights: Unknown

WATER SUPPLY

Gravity supply evaluation: Site 1 has moderate potential but quantity may be limited. Site 2 would most likely require pumping and quantity may be limiting.
Groundwater evaluation: Low to moderate potential for > 500 gpm wells based upon geology and local well logs. Igneous and metamorphic aquifers.

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Small river gravels with moderate **bedload** movement.
Anadromous fish: Steelhead and Spring Chinook.
Upland habitat type: Grazing of sheep and cattle at and immediately above site.
Wetlands: Site 1 has riparian vegetation including a long and narrow strip of cattails running through it.
Permitting Considerations: Water rights on both sites and wetland determination on Site 1.



Site: Big Sheep - Little Sheep confluence

RIVER BASIN	Imnaha
SITE NUMBER	17
SITE NAME	Little Sheep Creek
SITE LOCATION	
County	Wallowa
Road Access Directions	From Enterprise along road to Imnaha down Little Sheep Creek drainage. At existing LSRCF facility on Little Sheep Creek.
River Mile	
USGS 1:100,000 Quad Ref.	Enterprise, OR
USGS 7.5' Quad Ref.	Clear Lake Ridge, OR
Section	undetermined
	Township 1S
	Range 47E
OWNERSHIP	
Owner Name	ODF&W
Contact Name	Brad Smith ODF&W, Enterprise District Office
Contact Phone	(503) 426-3279
Zoning	Undetermined
Land Use /Jurisdiction	Existing Facility
GENERAL CHARACTERISTICS	
Proximity to road	Adjacent to paved road
Proximity to power	Power at facility
Size (acres)	aprox. 5
General topography	Flat
General soil type	Alluvial
Erosion potential	Low, but large quantities of silt deposited upstream
Flood potential and history	Low
Upstream land use	Ranching
Water rights	Undetermined
WATER SUPPLY	
Gravity supply evaluation	Existing intake
Groundwater evaluation	N/A
ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS	
Adjacent stream habitat	Pool and riffle, riparian vegetation limited
Anadromous fish	Yes
Upland habitat type	Steep, brushy slope
Wetlands	None identified beyond riparian zone.
Permitting Considerations	Water rights.

RIVER BASIN: Imnaha
SITE NUMBER: 18
SITE NAME: Marr Ranch

SITE LOCATION:

County : **Wallowa**
Road Access Directions: Lower Imnaha Rd., which is paved, to private dirt lane along Fence Ck. Site is on the ranch. immediately adjacent to river. On Imnaha R. immediately below confluence of Fence Ck. and extends along river to Fall Ck.

River Mile : 14
USGS 1:100,000 Quad Ref.: Grangeville, ID
USGS 7.5' Quad Ref.: Haas Hollow, OR
Section: Comer of 16,17,20,21 **Township:** T 2 N **Range:** R 48 E

OWNERSHIP

Owner Name: Gene Marr
Contact Name: Brad Smith ODF&W, Enterprise District Office
Contact Phone: (503) 426-3279
Zoning: Undetermined
Land Use /Jurisdiction: Undetermined

GENERAL CHARACTERISTICS

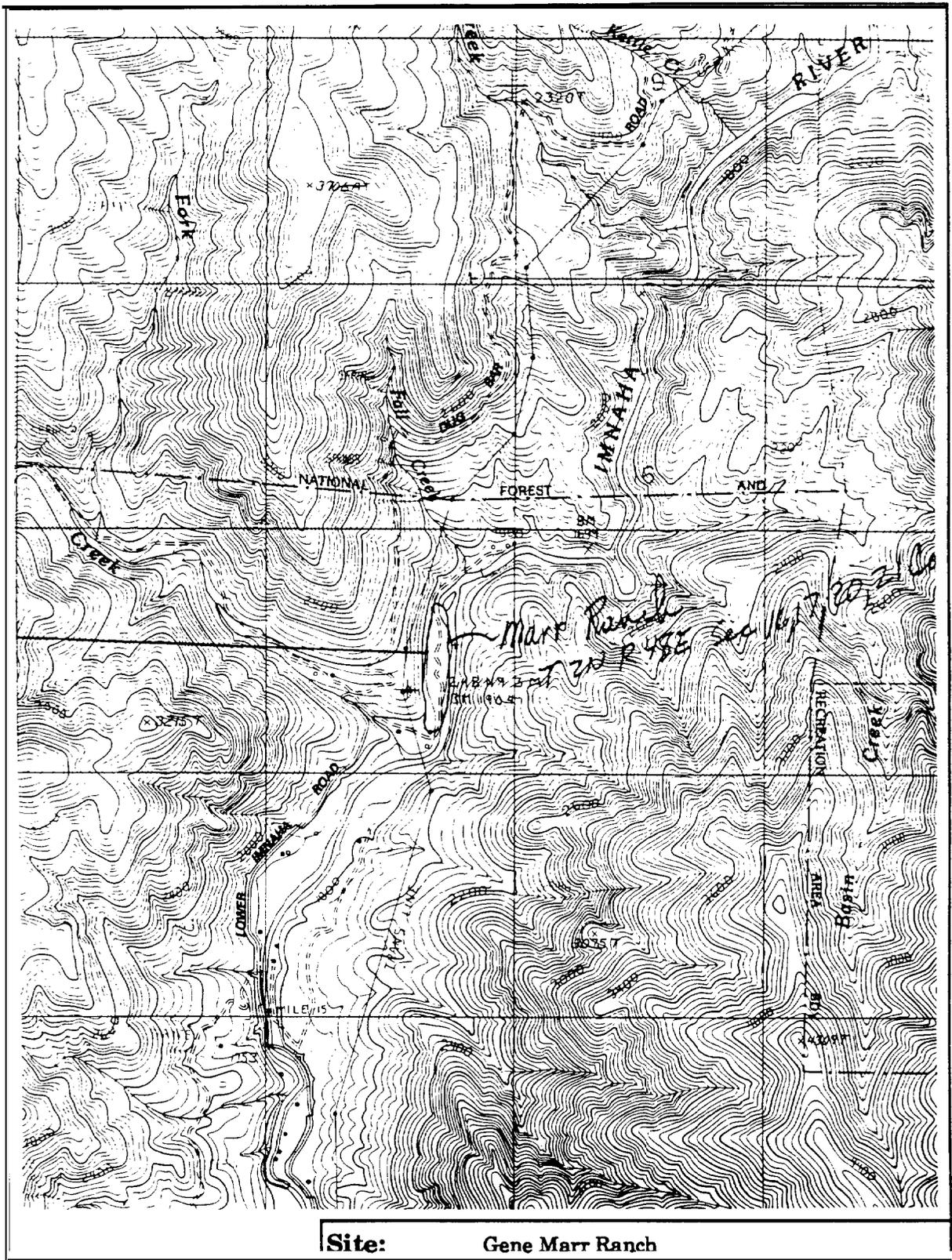
Proximity to road : Adjacent to paved road, down private dirt lane.
Proximity to power and type: 3-Phase adjacent to site. Major power corridor through area.
Size (acres): 5 plus
General topography: Entire site level.
General soil type: Aluvial deposits
Erosion potential: Low
Flood potential and history: Site is in flood plain. Gene Marr indicated that area was only moderately inundated during extreme river flows and this was caused by ice jams immediately above site. There was very minimal physical evidence of eroding flow, ice scouring action or old river braid channels on the site.
Upstream land use: Cattle grazing along river immediately above site.
Water rights: Unknown

WATER SUPPLY

Gravity supply evaluation: Good gravity or pumped supply potential.
Groundwater evaluation: Low potential for 500 gpm wells based upon geology. Some potential from Fence and Fall Creeks.

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Moderate to high **bedload** movement.
Anadromous fish: **Steelhead** and Spring Chinook.
Upland habitat type: Sparse mature cottonwoods and scrub willows on site. Very steep canyon walls with springs immediately adjacent to site.
Wetlands: No identified wetlands on site.
Permitting Considerations: Water **rights** to springs and wetland impact if springs are used as water supply will have to be determined.



Site: Gene Marr Ranch

RIVER BASIN: Innaha
SITE NUMBER: 19
SITE NAME: Horse Creek

SITE LOCATION:

County : Wallowa
Road Access Directions: North of Town of Innaha on Lower Innaha Road which continues as the Dug Bar Rd. at Fence Ck. Dug Bar Rd. is gravel/dirt, narrow, steep grades, switch backs and sharp comers. Site is on Innaha R. in the area near the bridge which crosses the Innaha R. immediately down stream of Horse Creek.

River Mile : 9.6
USGS 1:100,000 Quad Ref.: Grangeville. ID
USGS 7.5' Quad Ref.: Haas Hollow, OR
Section: 35 **Township:** T 3 N **Range:** R 48 E

OWNERSHIP

Owner Name: USFS Wallowa National Forest, Hells Canyon National Recreation Area.
Contact Name: Brad Smith ODF&W, Enterprise District Office
Contact Phone: (503) 426-3279
Zoning: Undetermined
Land Use /Jurisdiction: Undetermined

GENERAL CHARACTERISTICS

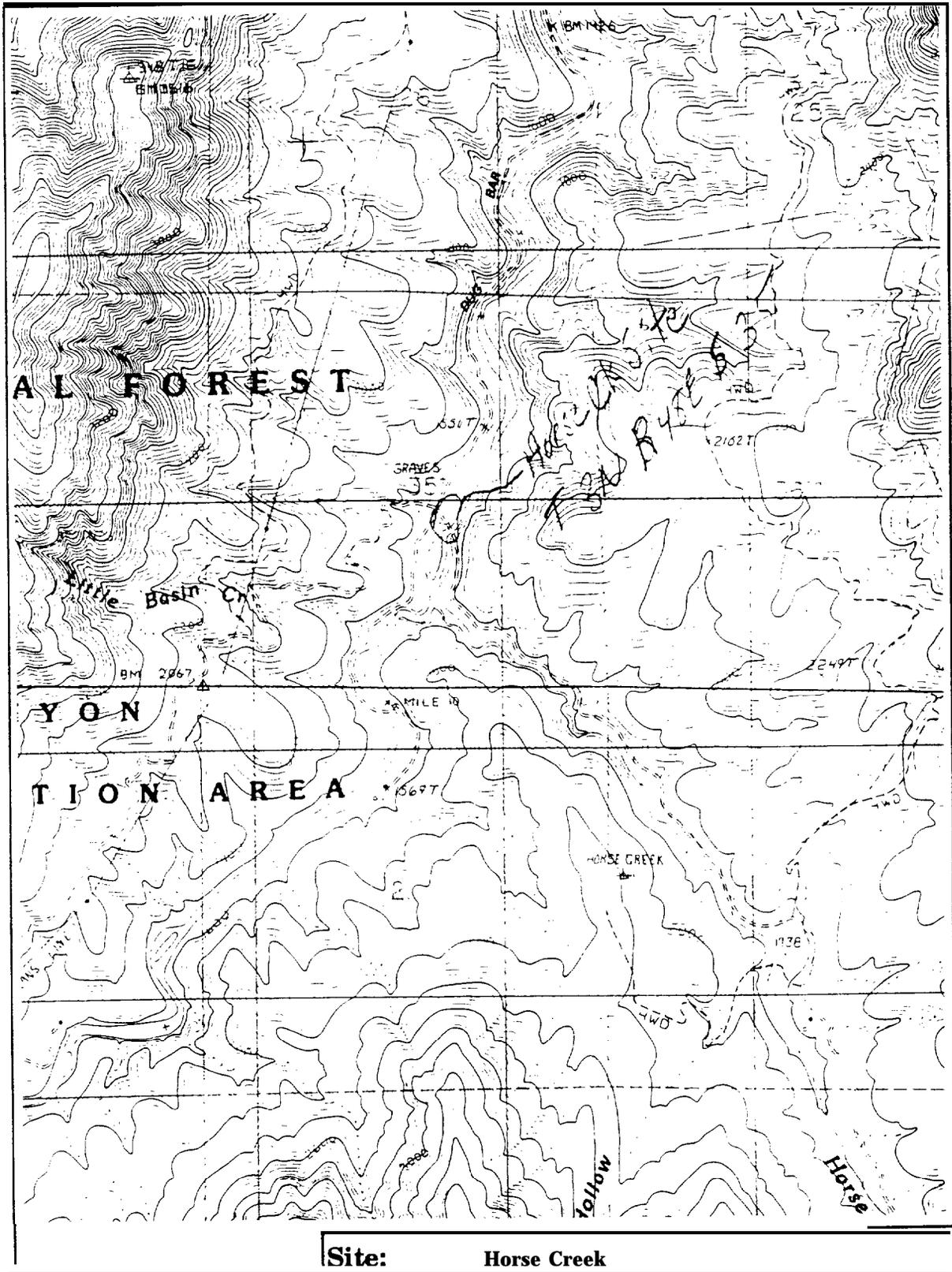
Proximity to road : Adjacent to dirt road.
Proximity to power and type: Main power corridor 1/3 mile west and approximately 600 feet in elevation above site.
Size (acres): 3-4 acres.
General topography: Limited level area available.
General soil type: Alluvial deposits.
Erosion potential: LOW
Flood potential and history: Low
Upstream land use: National Forest, Hells Canyon National Recreation Area
Water rights: Unknown

WATER SUPPLY

Gravity supply evaluation: Possible, but due to limited low level site. most likely would require pumped intake.
Groundwater evaluation: Low potential for > 500 gpm wells based upon geology. No local well log data. Igneous and metamorphic aquifers.

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Moderate to high bedload movement.
Anadromous fish: Steelhead and Chinook.
Upland habitat type: Grassland and sagebrush with willows and cottonwoods along river channel.
Wetlands: No identified wetlands on site.
Permitting Considerations: Water rights and National Recreation Area, scenic consideration for building of any structures.



Site: Horse Creek

RIVER BASIN: Imnaha
SITE NUMBER: I10
SITE NAME: Wayne Marks Property

SITE LOCATION:

County : **Wallowa**
Road Access Directions: Imnaha River Rd. upstream from town of Imhaha approximately 4.8 miles to barbed-wire gate in fence leading to bridge across Imnaha. Cross bridge and follow tracks through fenced pastures and about 4 to 6 gates. Site is located at **final** gate at top end of large meadow across river from house and corrals. Marks home is across river at downstream end of site. Site is on west side of river opposite road, across from and **between** mouths of **Dunlap** and Thorn Creeks (on E. side of river).

River Mile : 24.25
USGS 1:100,000 Quad Ref.: **Grangeville, ID**
USGS 7.5' Quad Ref.: Sheep Creek Divide, OR
Section: undesignated **Township:** **T 1S** **Range:** R 48 E

OWNERSHIP

Owner Name: Wayne Marks
Contact Name: Brad Smith **ODF&W**, Enterprise District Office
Contact Phone: (503) 426-3279
Zoning: **Undetermined**
Land Use /Jurisdiction: Hells Canyon **NRA/US** Forest Service

GENERAL CHARACTERISTICS

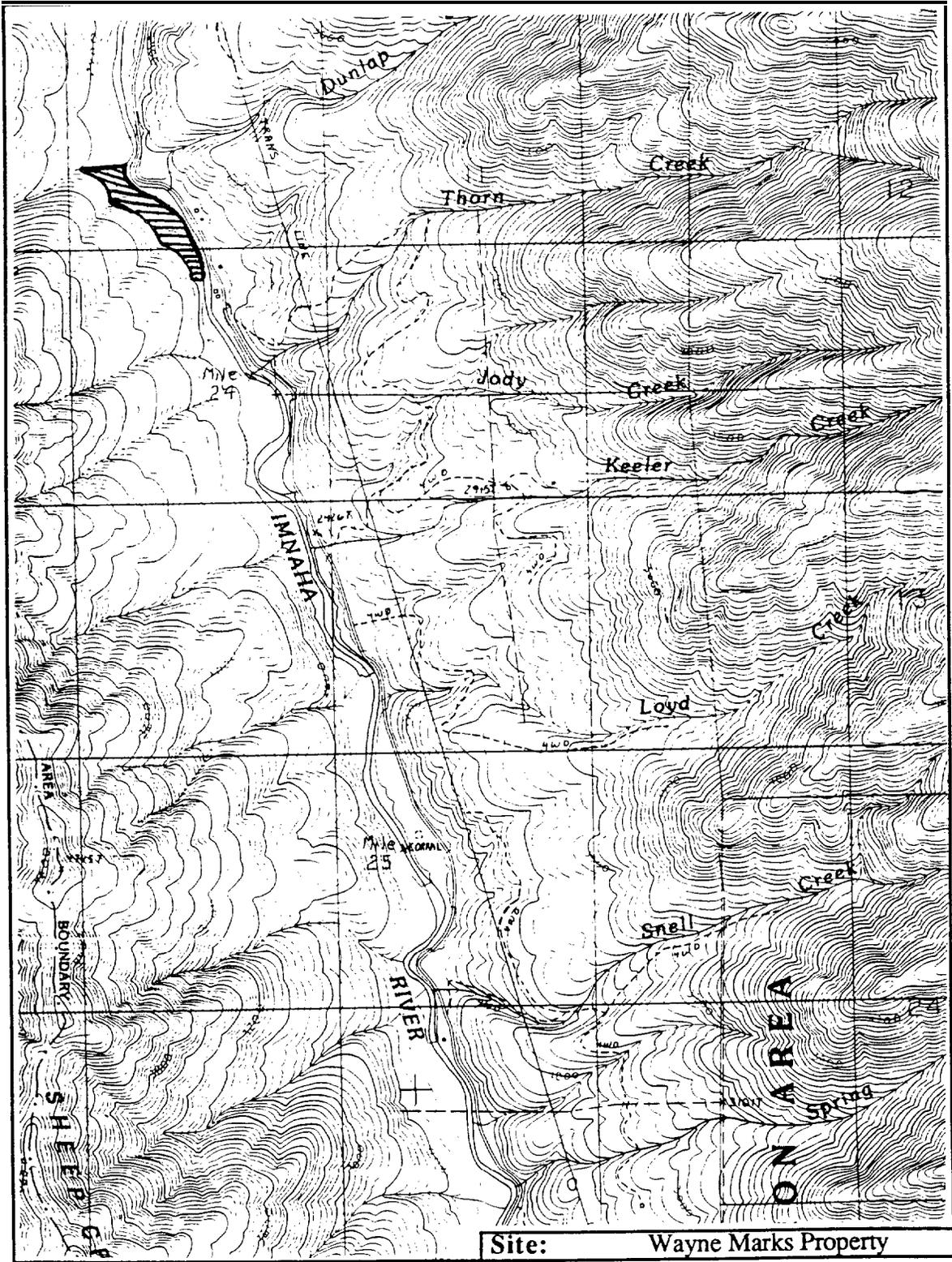
Proximity to road : Approximately 0.5 miles through fields from all weather gravel road.
Proximity to power and type: 3-Phase adjacent to site across Imnaha River.
Size (acres): 5 plus
General topography: Flat, sloping gradually downstream and to river.
General soil type: Alluvial deposits
Erosion potential: Low
Flood potential and history: Upstream end of site may be prone to flooding.
Upstream land use: Cattle grazing along river immediately above site.
Water rights: Owner has old diversion ditch on site, unused for a number of years.

WATER SUPPLY

Gravity supply evaluation: Good gravity supply potential, approx. 10-12' drop across site
Groundwater evaluation: Potential for 500 gpm wells in deep basalt based upon geology.

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat: Moderate to high **bedload** movement
Anadromous fish: Steelhead and Spring Chinook.
Upland habitat type: Steep slope, rocky and brushy
Wetlands: No identified wetlands on site.
Permitting Considerations: Wild and Scenic River Act limits on development type and structures



RIVER BASIN Walla Walla
SITE NUMBER WW1
SITE NAME NE 8th Street Bridge

SITE LOCATION

County Umatilla
Road Access Directions Take NE 8th Street east out of Milton-Freewater to crossing of **Walla Walla** River. Existing ladder on NW side of river at NE 8th St. bridge.

River Mile
USGS 1:100,000 Quad Ref. Pendleton
USGS 7.5' Quad Ref. Milton-Freewater
Section 1 **Township** 5N **Range** 35E

OWNERSHIP

Owner Name Undetermined
Contact Name Don Sampson, **CTUIR**
Contact Phone (503) 2764 109
Zoning undetermined
Land Use /Jurisdiction undetermined, within City Limits

GENERAL CHARACTERISTICS

Proximity to road Adjacent to paved road
Proximity to power 3-phase power along NE 8th
Size (acres) cl acre
General topography fiat, channeled river bank with rip-rap
General soil type alluvial
Erosion potential appears to be low
Flood potential and history undetermined
Upstream land use urban
Water rights undetermined, ladder just downstream of irrigation diversion

WATER SUPPLY

Gravity supply evaluation n/a
Groundwater evaluation n/a

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat channelized stream with wide bed, meandering channel
Anadromous fish Steelhead
Upland habitat type urban, developed
Wetlands riparian zone, other types not determined
Permitting Considerations Water rights

RIVER BASIN Walla Walla
SITE NUMBER WW2
SITE NAME 9th and Walnut (9th Ave. Bridge)

SITE LOCATION

County Umatilla
Road Access Directions On east side of Milton-Freewater just off state highway at intersection of 9th Ave. and Walnut St. Existing **smolt/kelt** trap located just downstream of the 9th Ave. Bridge on west side of river.

River Mile
USGS 1:100,000 Quad Ref. Pendleton
USGS 7.5' Quad Ref. Milton-Freewater
Section 12 **T o w n s h i p** 5N **Range** 35E

OWNERSHIP

Owner Name Undetermined
Contact Name Don Sampson, CTUIR
Contact Phone (503) 2764 109
Zoning undetermined
Land Use /Jurisdiction undetermined

GENERAL CHARACTERISTICS

Proximity to road adjacent to paved road
Proximity to power 3-phase power along road
Size (acres) <1 acre
General topography Flat, near head end of irrigation diversion
General soil type alluvial
Erosion potential low
Flood potential and history low
Upstream land use urban, developed
Water rights all water to irrigation at site

WATER SUPPLY

Gravity supply evaluation n/a
Groundwater evaluation n/a

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat irrigation canal has woody brushy riparian habitat
Anadromous fish steelhead above site in mainstem, none below trap
Upland habitat type urban, developed
Wetlands riparian zone, other types not determined
Permitting Considerations undetermined

RIVER BASIN	Walla Walla
SITE NUMBER	WW3
SITE NAME	Harris Park No. 1
SITE LOCATION	
County	Umatilla
Road Access Directions	S. Fork Walla Walla Road at road mile 7.25, Harris County Park
River Mile	
USGS 1:100,000 Quad Ref.	Pendleton
USGS 7.5' Quad Ref.	Blalock Mountain
Section	10
	Township 4 N
	Range
	37E
OWNERSHIP	
Owner Name	Umatilla County Parks and Recreation
Contact Name	Gene Miller, Park Manager
Contact Phone	(503) 9384237
Zoning	undetermined
Land Use /Jurisdiction	county park/Umatilla County

GENERAL CHARACTERISTICS

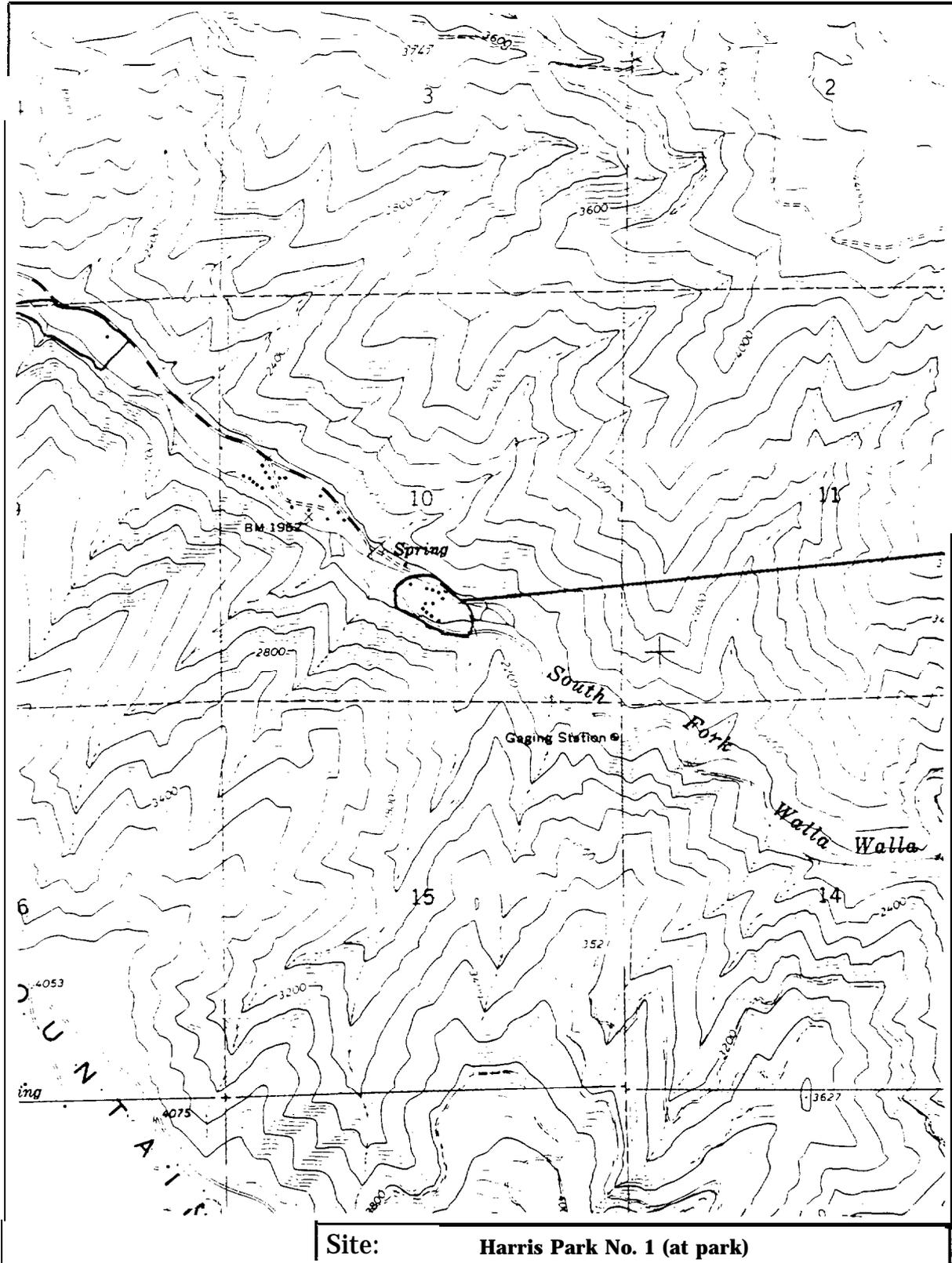
Proximity to road	Paved road to near site, gravel to site
Proximity to power	3-phase power to site
Size (acres)	6 to 8 acres
General topography	Flat bench next to S. Fork
General soil type	alluvial
Erosion potential	low
Flood potential and history	appears low, history undetermined
Upstream land use	BLM and USFS land, undeveloped, 1 gravel road
Water rights	undetermined

WATER SUPPLY

Gravity supply evaluation	Good potential location, reports of freezing solid in Dec.-Jan. period. Temperature and flow information show suitable conditions for most facility types. Need verification.
Groundwater evaluation	Potential, requires further investigation

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat	riffles, pools
Anadromous fish	S steelhead at and above site
Upland habitat type	Forested and grassy steep-slopes
Wetlands	riparian zone cattails and rushes
Permitting Considerations	Current land use as park may present permitting constraints.



RIVER BASIN Walla Walla
SITE NUMBER WW4
SITE NAME Harris Park No. 2

SITE LOCATION

County Umatilla
Road Access Directions S. Fork Walla Walla Road to road end approx. 1 mile above **Harris** park. 1/4 mile beyond barricade **across** footbridge, located on east bank of river.

River Mile

USGS 1:100,000 Quad Ref. Pendleton
USGS 7.5' Quad Ref. Blalock Mountain
Section 14,15 **Township** 4 N **Range** 37E

OWNERSHIP

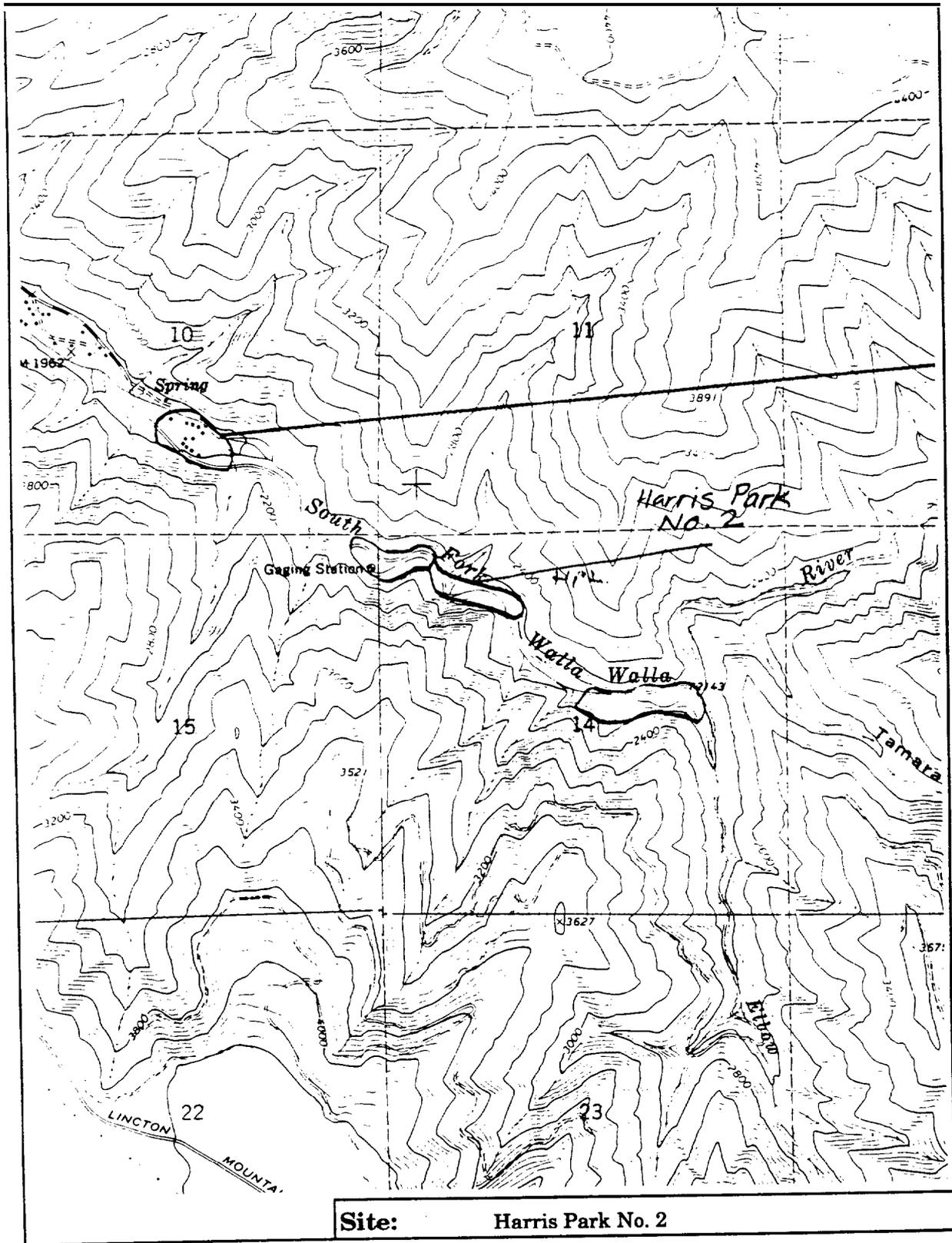
Owner Name BLM
Contact Name Don Sampson, CTUIR or Jim Phelps, ODF&W
Contact Phone (503) 276-4109 or (503) 276-2344
Zoning undetermined
Land Use /Jurisdiction public land under BLM jurisdiction

GENERAL CHARACTERISTICS

Proximity to road adjacent to gravel road, approx. 1/4 mile beyond end of vehicle access at barricade
Proximity to power 3-phase power 1.5 miles away at Harris Park
Size (acres) approx. 2 acres
General topography flat bench between toad and river
General soil type alluvial
Erosion potential low
Flood potential and history appears low, history undetermined
Upstream land use BLM and USFS land
Water rights undetermined
WATER SUPPLY
Gravity supply evaluation good potential, would require pipeline river crossing or anchoring to rock wall on **upstream** end of site.
Groundwater evaluation need to investigate

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat riffles, pools
Anadromous fish steelhead at and above site
Upland habitat type forested and grassy steep slopes
Wetlands riparian zone cattails and rushes
Permitting Considerations undetermined



RIVER BASIN Walla Walla
SITE NUMBER WW5
SITE NAME S. Fork - Elbow Creek confluence

SITE LOCATION

County Umatilla
Road Access Directions S. Fork Walla Walla Road to road end approx. 1 mile above Harris park. 1/2 mile beyond barricade across footbridge, located at Elbow Creek and South Fork confluence.

River Mile

USGS 1:100,000 Quad Ref. Pendleton
USGS 7.5' Quad Ref. Blalock Mountain
Section 14 **Township** 4N **Range** 37E

OWNERSHIP

Owner Name BLM
Contact Name Don Sampson, CTUIR or Jim Phelps, ODF&W
Contact Phone (503) 276-4109 or (503) 276-2344
Zoning undetermined
Land Use /Jurisdiction undeveloped public land under BLM jurisdiction

GENERAL CHARACTERISTICS

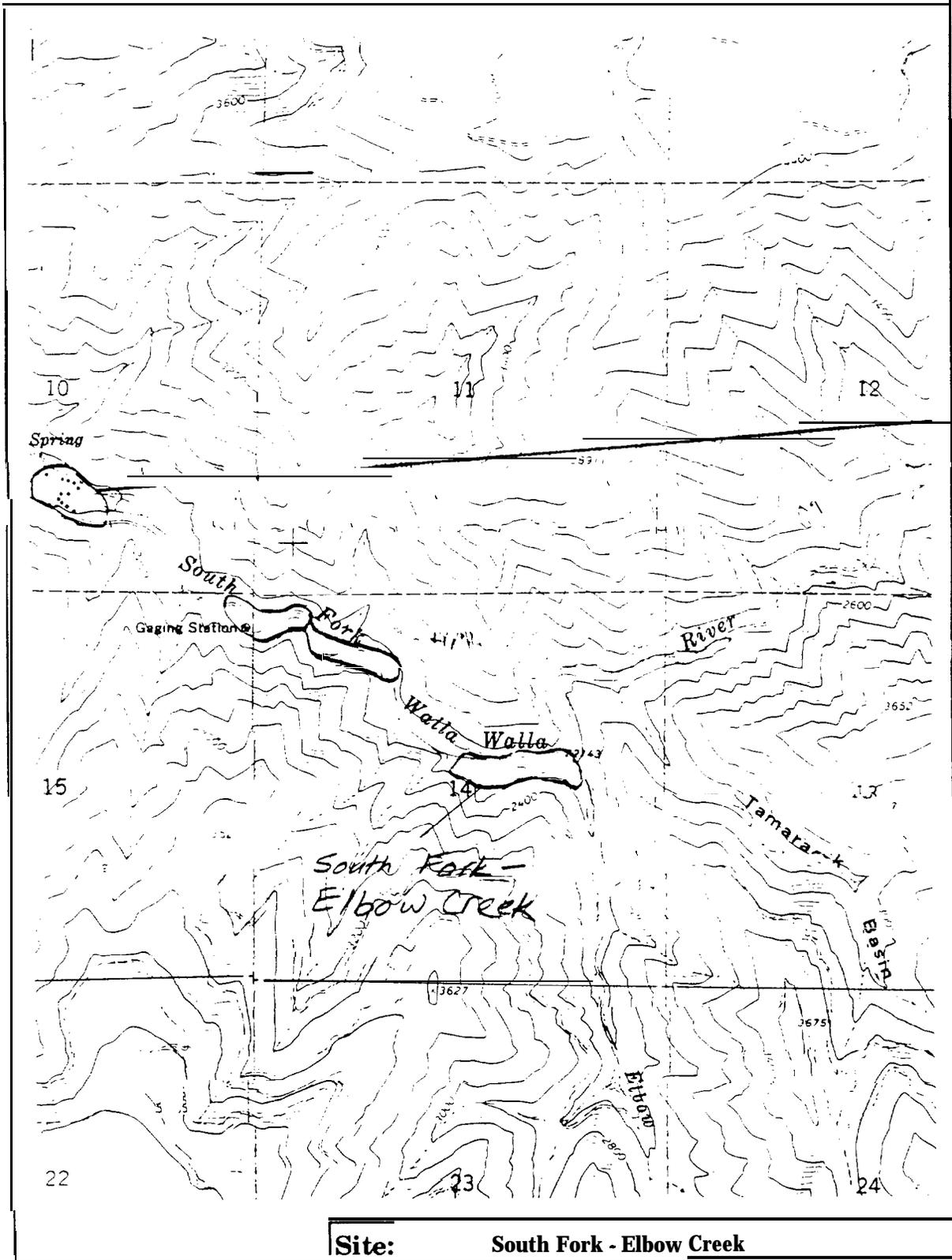
Proximity to road adjacent to gravel road but approximately 0.5 miles beyond road end at barricade.
Proximity to power approximately 1.75 miles away at Harris Park
Size (acres) 2 to 4 acres
General topography mostly flat
General soil type alluvial
Erosion potential low
Flood potential and history appears to be low, history unknown
Upstream land use undeveloped wilderness
Water rights undetermined

WATER SUPPLY

Gravity supply evaluation good potential
Groundwater evaluation potential as gravity backup

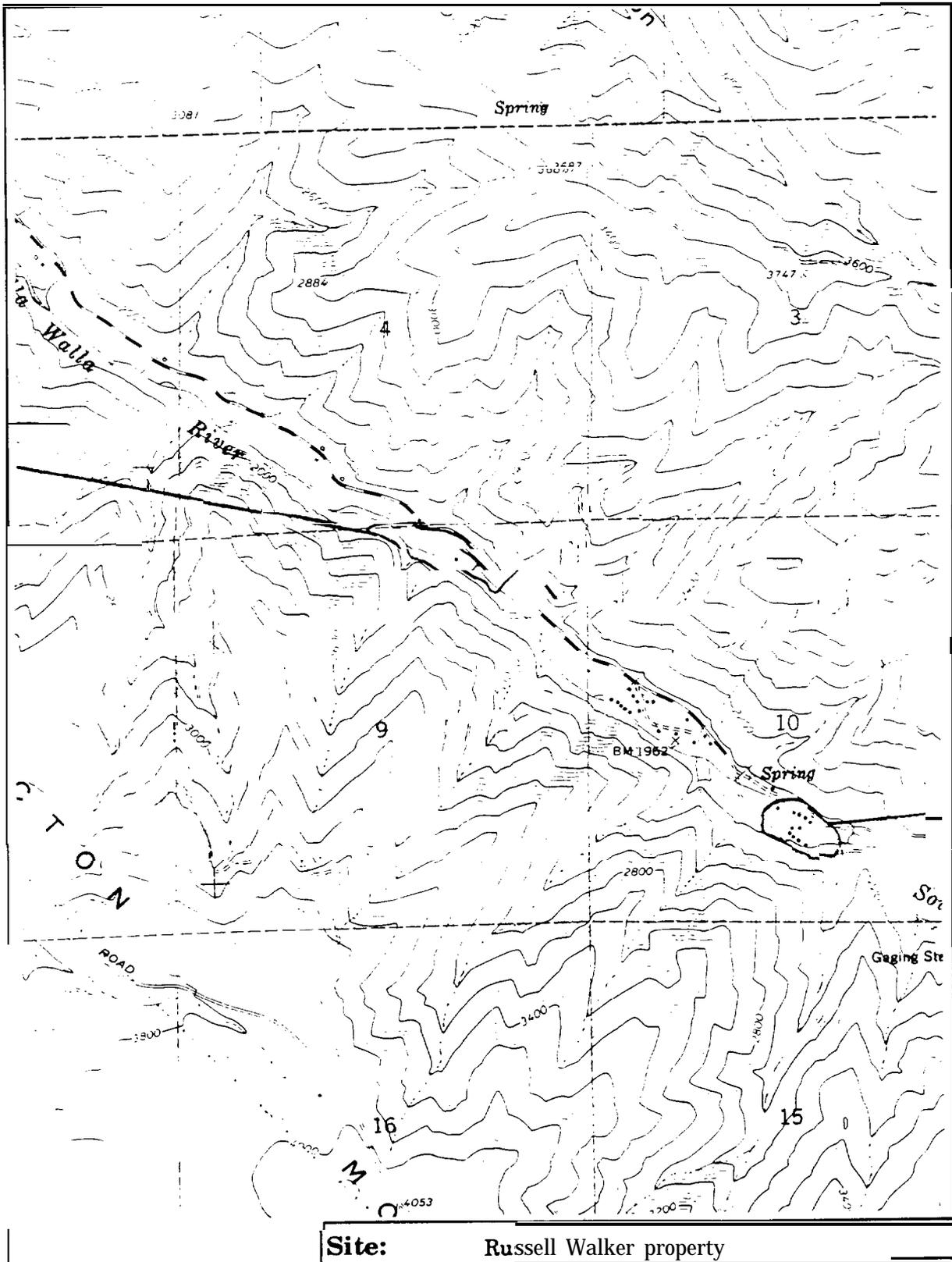
ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat riffles, pools
Anadromous fish steelhead at and above site
Upland habitat type forested and grassy steep slope
Wetlands riparian zone cattails and rushes.
Permitting Considerations undetermined



Site: South Fork - Elbow Creek

RIVER BASIN	Walla Walla
SITE NUMBER	WW6
SITE NAME	Russell Walker
SITE LOCATION	
County	Umatilla
Road Access Directions	S. Fork Road to approximately mile 6 to 7.25. Flat land along river below Harris Park
River Mile	
USGS 1:100,000 Quad Ref.	Pendleton
USGS 7.5' Quad Ref.	Blalock Mountain
Section 9	Township 4 N Range 37E
OWNERSHIP	
Owner Name	Russell Wlaker
Contact Name	Don Sampson, CTUIR or Jim Phelps, ODF&W
Contact Phone	(503) 276-4109 or (503) 276-2344
Zoning	undetermined
Land Use /Jurisdiction	undetermined
GENERAL CHARACTERISTICS	
Proximity to road	access off paved S. Fork Road
Proximity to power	3-phase power available
Size (acres)	> 10 acres
General topography	flat, river-bottom
General soil type	alluvial
Erosion potential	low
Flood potential and history	low
Upstream land use	County park and undeveloped roadless
Water rights	undetermined
WATER SUPPLY	
Gravity supply evaluation	Good potential
Groundwater evaluation	Moderate shallow zone potential, Low deep zone potential
ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS	
Adjacent stream habitat	Moderate gradient, pool and riffle
Anadromous fish	steelhead at and above this area
Upland habitat type	flat, river bottom pasture land and forested slopes
Wetlands	None identified, some seeps in pasture area that may contain wetland vegetation
Permitting Considerations	Water rights



RIVER BASIN Walla Walla
SITE NUMBER WW7
SITE NAME Wolf Fork confluence with Touchet River

SITE LOCATION

County ColumbiaCO., WA
Road Access Directions Wolf Fork Road to SW 5.6 miles outside Dayton, WA (Follow signs to ski area from Dayton). Cross Touchet River going west and park at gravel turnout. Wolf Fork Road is off S 4th Street which is off Main St.
River Mile Touchet River RM 59 (approx.)
USGS 1:100,000 Quad Ref.
USGS 7.5' Quad Ref. Dayton, WA
Section 11 **Township** 9 N **Range** 39E

OWNERSHIP

Owner Name private, unknown
Contact Name Don Sampson, CTUIR
Contact Phone (503) 2764 109
Zoning undetermined
Land Use /Jurisdiction agriculture

GENERAL CHARACTERISTICS

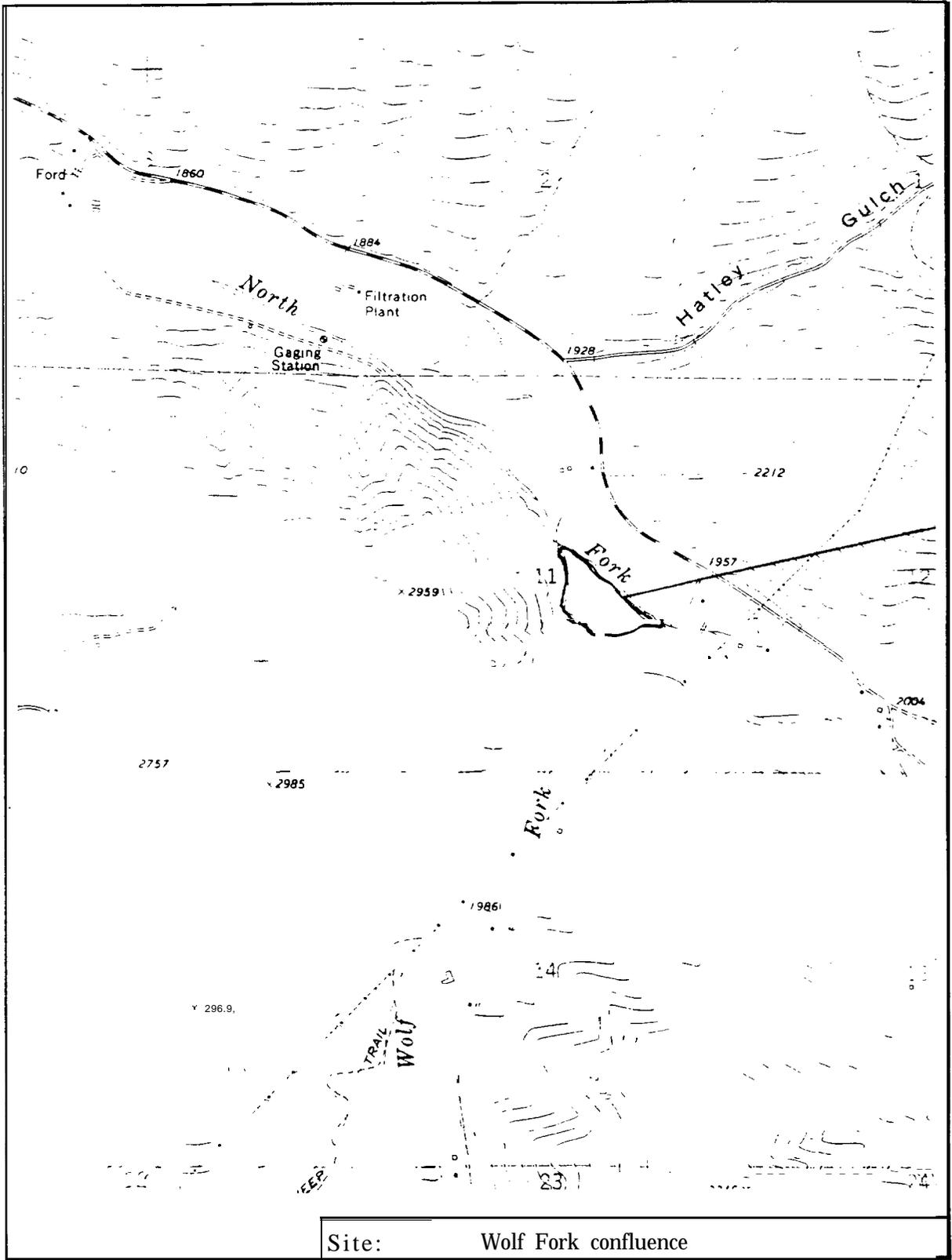
Proximity to road paved road to within 1/4 mile of confluence
Proximity to power 3-phase power along road.
Size (acres) undetermined, probably 1-4 developable acres
General topography flat to gently rolling
General soil type alluvial
Erosion potential undetermined
Flood potential and history undetermined
Upstream land use cattle grazing, agriculture
Water rights undetermined

WATER SUPPLY

Gravity supply evaluation appears poor, pumping may be required with any holding facility
Groundwater evaluation N/A

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat small 10-15" wide riffle, low gradient
Anadromous fish possibly steelhead
Upland habitat type mixed coniferous, deciduous grassland. Steep slope away from confluence
Wetlands riparian zone wetlands, others undetermined
Permitting Considerations undetermined water rights and property ownership



RIVER BASIN Walla Walla
SITE NUMBER WW8
SITE NAME WDW Dayton Conditioning Pond

SITE LOCATION

County Columbia
Road Access Directions Turn off Main St. in Dayton on Cottonwood Road of west side of Touchet River. Approx. 1 mile on Cottonwood Road to facility.
River Mile Touchet River RM 53.5 to 54 (approx.)
USGS 1:100,000 Quad Ref.
USGS 7.5' Quad Ref. Dayton, WA
Section 30 **Township** 10N **Range** 39E

OWNERSHIP

Owner Name Washington Department of Wildlife
Contact Name Don Sampson, CTUIR
Contact Phone (503) 2764109
Zoning undetermined
Land Use /Jurisdiction undetermined

GENERAL CHARACTERISTICS

Proximity to road road to all areas of facility
Proximity to power power to facility
Size (acres) asphalt pond approx. 1 acre
General topography flat
General soil type alluvial
Erosion potential low, west bank has armor rock on dike, east bank is flatter with dike.
Flood potential and history appears low, history undetermined
Upstream land use urban, some agriculture
Water rights undetermined

WATER SUPPLY

Gravity supply evaluation existing low head intake about 1/4 mile upstream of pond
Groundwater evaluation undetermined

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat some deciduous trees and grasses in riparian zone
Anadromous fish steelhead
Upland habitat type brush and grass, some trees
Wetlands appears minimal outside riparian zone
Permitting Considerations undetermined



RIVER BASIN Walla Walla
SITE NUMBER WW10
SITE NAME Pond at Forest Service Boundary

SITE LOCATION

County Columbia
Road Access Directions On N. Fork Touchet River Road outside Dayton just below Lewis Creek. National Forest Boundary sign near site.
River Mile undetermined
USGS 1:100,000 Quad Ref.
USGS 7.5' Quad Ref. Eckler Mtn., WA
Section 5 **Township 8 N** **Range** **40E**

OWNERSHIP

Owner Name U.S. Forest Service
Contact Name Don Sampson, CTUIR
Contact Phone (503) 2764109
Zoning undetermined
Land Use /Jurisdiction undetermined/U.S. Forest Service

GENERAL CHARACTERISTICS

Proximity to road adjacent to paved road
Proximity to power power nearby
Size (acres) pond approx. 1 acre
General topography flat
General soil type alluvial
Erosion potential low
Flood potential and history appears low, history undetermined
Upstream land use National Forest
Water rights undetermined

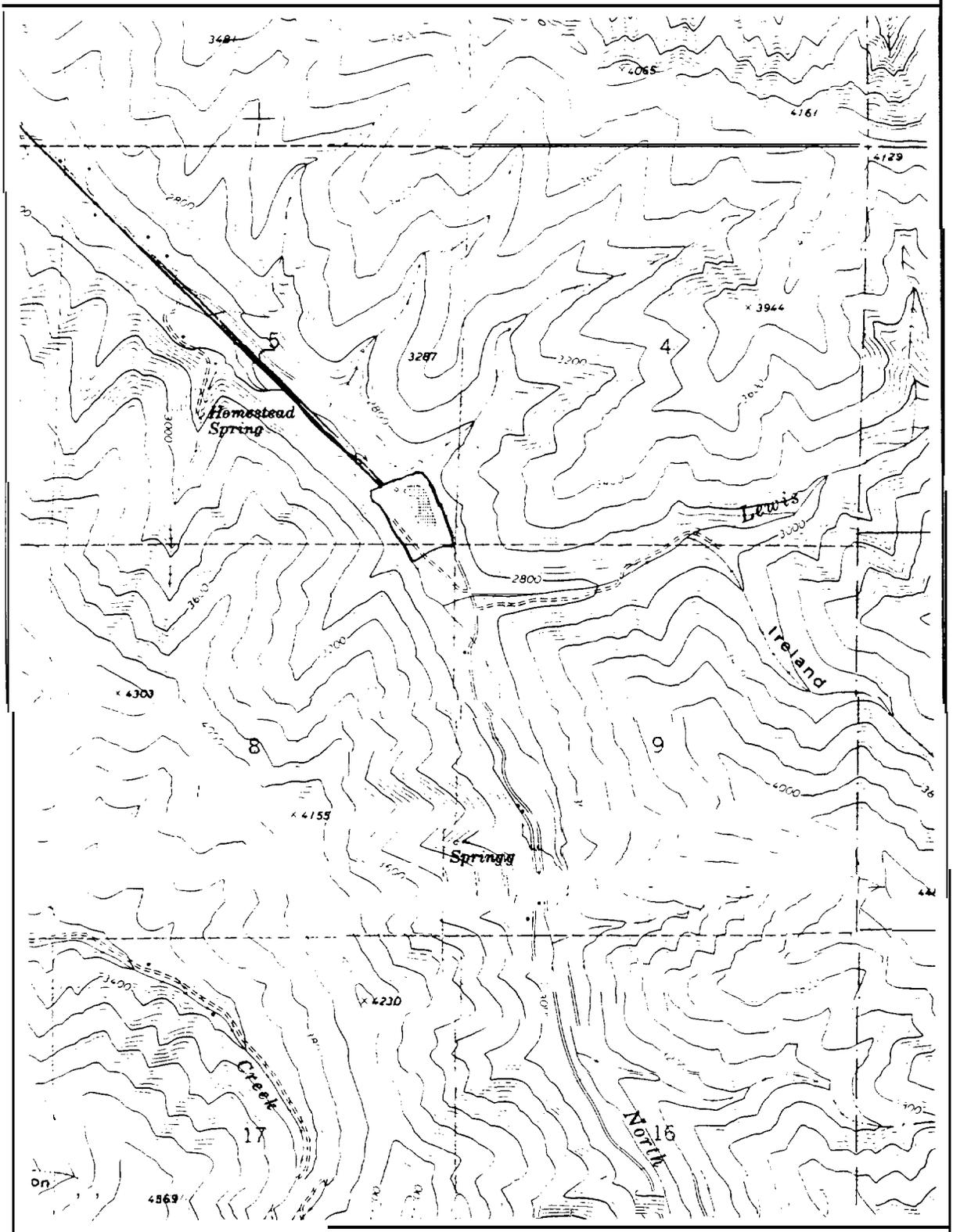
WATER SUPPLY

Gravity supply evaluation Existing pond elevated on bench above Touchet River. Supply line from river would need to be brought in from upstream. Current supply from small drainages.

Groundwater evaluation undetermined

ENVIRONMENTAL CHARACTERISTICS/CONSTRAINTS

Adjacent stream habitat Mixed pool, riffles, boulders
Anadromous fish steelhead
Upland habitat type forested steep slope
Wetlands Pond may have developed wetland vegetation over time. Delineation survey would be required prior to development.
Permitting Considerations undetermined



Site: Pond at FS boundary